CANDIDATE – PLEASE NOTE!

PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.

ORM TP 2024025

TEST CODE **01238010**

JANUARY 2024

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

16 JANUARY 2024 (p.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.

In addition to this test booklet, you should have an answer sheet.

Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.

On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

The SI unit of length is the

(A) metre
(B) second
(C) newton
(D) kilogram

Sample Answer

● Ⓑ Ⓒ Ⓓ

The best answer to this item is "metre", so (A) has been shaded.

If you want to change your answer, erase it completely before you fill in your new choice.

When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to that item later.

You may do any rough work in this booklet.

Figures are not necessarily drawn to scale.

You may use a silent, non-programmable calculator to answer items.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

An object is removed from the ground and placed on a shelf. Which of the object's properties is expected to increase?

(A) Mass
(B) Volume
(C) Kinetic energy
(D) Potential energy

A student sets up a simple pendulum and finds that the period is 1.7 s. To obtain a period nearer to one second, he should

(A) use a lighter bob
(B) use a heavier bob
(C) shorten the pendulum
(D) lengthen the pendulum

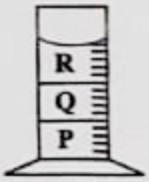
To how many significant figures is the quantity 25.92 m^3 expressed?

(A) 1
(B) 2
(C) 3
(D) 4

4. Three immiscible liquids, P, Q and R, have densities which differ. Q is denser than P but less dense than R. Which of the following diagrams shows how the liquids settle in the measuring cylinder?

(A) 

(B) 

(C) 

(D) 

5. Which of the following quantities has the same value as 6 μC?

(A) 6×10^{-6} C
(B) 6×10^{-3} C
(C) 6×10^{3} C
(D) 6×10^{6} C

6. When standing on the moon, the mass of an astronaut is 70 kg. When he returns to earth, his approximate weight will be

(A) 70 kg
(B) 420 kg
(C) 70 N
(D) 700 N

7. Linear momentum is

(A) measured in newton-metres
(B) the product of mass and velocity
(C) measured in kilograms per metre
(D) the product of mass and acceleration

8. To measure the external diameter of a measuring cylinder most accurately, one should use a

(A) metre rule
(B) tape measure
(C) length of string
(D) pair of vernier calipers

9. The acceleration due to gravity (g) is to be determined by measuring the time (t) taken for a small steel ball to fall through a specific height. Which of the following activities is UNNECESSARY?

(A) Finding the mass of the ball
(B) Measuring the height through which the ball falls
(C) Repeating the time measurements and taking the average
(D) Allowing the ball to drop and starting the stopwatch at the same instant

10. When two bodies collide. momentum is conserved. This means that the

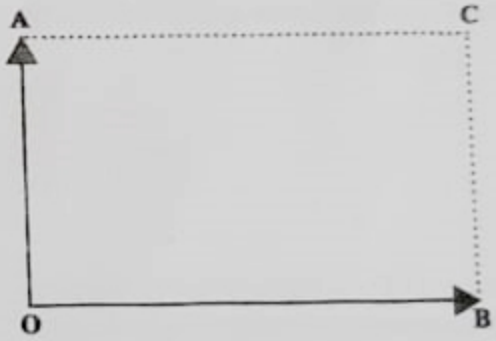
(A) momentum of each body is unchanged
(B) kinetic energy before impact is equal to that after impact
(C) algebraic sum of the velocities before impact is equal to the sum of the velocities after impact
(D) total momentum of the bodies before impact is equal to the total momentum of the bodies after impact

11. Which of the following changes can be caused by a force acting on a body?

I. Density
II. Motion
III. Shape

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

Item 12 refers to the following diagram which shows two vectors of magnitudes a and b represented by $\overrightarrow{OA}$ and $\overrightarrow{OB}$ respectively.



12. The vectors act at point O and are directed perpendicular to each other. Which of the following pairs represents BOTH the magnitude and direction of their resultant?

	Magnitude	Direction
(A)	$a^2 + b^2$	$\overrightarrow{OC}$
(B)	$a + b$	$\overrightarrow{CO}$
(C)	$\sqrt{(a^2 + b^2)}$	$\overrightarrow{CO}$
(D)	$\sqrt{(a^2 + b^2)}$	$\overrightarrow{OC}$

13. Which of the following features must be present in a stable, well-designed racing car?

(A) Low centre of gravity
(B) Narrow wheelbase
(C) Long front
(D) Sunroof

14. Which of the following sources of energy are classified as renewable?

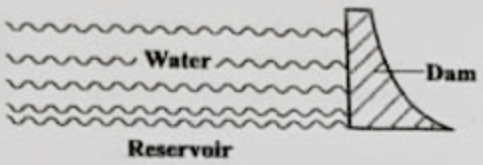
I. Solar energy
II. Wind energy
III. Geothermal energy

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

15. A bubble of gas rises to the surface of a soft drink. This is because the

(A) density of the gas is greater than the density of the drink
(B) upthrust on the bubble is greater than the weight of the bubble
(C) upthrust on the bubble is greater than the weight of the water it displaces
(D) weight of the water displaced by the bubble is less than the weight of the bubble

Item 16 refers to the following diagram which shows a dam.



16. The pressure on the dam at the bottom of the reservoir depends on the

(A) depth of the water
(B) length of the reservoir
(C) volume of water held by the dam
(D) mass of water held back by the dam

17. What is the unit for the moment of a force?

(A) N
(B) N m
(C) $N\ m^{-1}$
(D) $N\ m^{-2}$

18. When heating a substance, a point is reached where no further change in temperature is observed. The MOST likely reason for this is that the

(A) substance is losing heat to the atmosphere
(B) substance needs to be stirred less frequently
(C) heater is supplying less heat
(D) substance is changing state

19. Which scientist was responsible for arriving at the conclusion that measured amounts of electrical and mechanical energy can be converted to proportionate amounts of heat energy?

(A) Joule
(B) Newton
(C) Coulomb
(D) Rumford

20. Which of the following temperature ranges is MOST suitable for a clinical thermometer?

(A) 0 °C to 44 °C
(B) –10 °C to 110 °C
(C) 35 °C to 44 °C
(D) 35 °C to 100 °C

21. According to the pressure law, which of the following statements is true?

(A) Pressure is constant.
(B) Volume is constant.
(C) The ratio of volume to pressure is constant.
(D) The ratio of volume to temperature is constant.

22. Which of the following statements about evaporation is FALSE?

(A) Evaporation requires heat energy and causes cooling.
(B) During evaporation, the faster molecules escape the liquid.
(C) Evaporation occurs at room temperature only.
(D) Evaporation occurs only at the surface.

23. The heat capacity of a substance is defined as the amount of heat energy

(A) the substance can hold
(B) 1 kg of the substance can hold
(C) required to change the substance to another state
(D) needed to raise the temperature of the substance by 1 degree

24. Which of the following processes MOST likely accounts for the fact that pot handles are usually made of wood or plastic?

(A) Evaporation
(B) Conduction
(C) Convection
(D) Radiation

25. The heat from a nearby fire reaches other places MAINLY by

(A) conduction
(B) convection
(C) absorption
(D) radiation

26. A light bulb is filled with a gas at a temperature of 293 K. If the initial pressure of the gas is P, what will the pressure be when the temperature increases to 360 K?

(A) $\frac{360}{293} \times P$

(B) $\frac{360}{393} \times P$

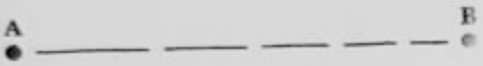
(C) $\frac{393}{360} \times P$

(D) $\frac{293}{360} \times P$

27. Which of the following wave phenomena play a role in the greenhouse effect?

(A) Sound waves
(B) Water waves
(C) Infrared rays
(D) Gamma rays

Item 28 refers to the following diagram of a slinky.



28. In using the slinky to demonstrate longitudinal waves moving from Point A to Point B, the spring is made to vibrate

(A) parallel to AB
(B) perpendicular to AB
(C) at an acute angle to AB
(D) at an obtuse angle to AB

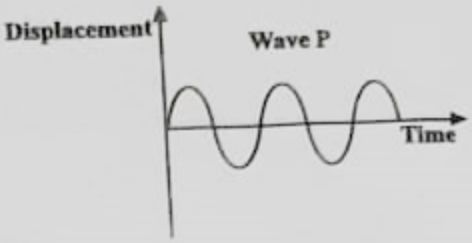
29. Which of the following statements about waves is true?

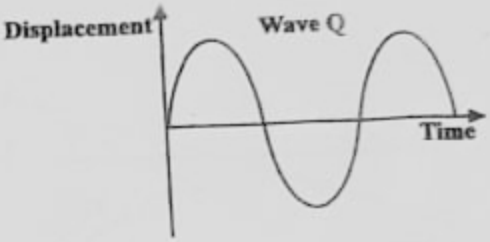
(A) Longitudinal waves do not undergo refraction but may be reflected.
(B) All waves undergo reflection, refraction and diffraction.
(C) Diffraction can only take place with light waves.
(D) Only transverse waves undergo reflection.

30. Which of the following statements about sound is NOT correct?

(A) Sound travels more slowly than light.
(B) Sound does not travel through a vacuum.
(C) Sound is transmitted as transverse waves.
(D) Sound may be produced by vibrating systems.

Item 31 refers to the following graphs (with axes having the same scales) of two sound waves, P and Q.





31. Which of the following statements is true?

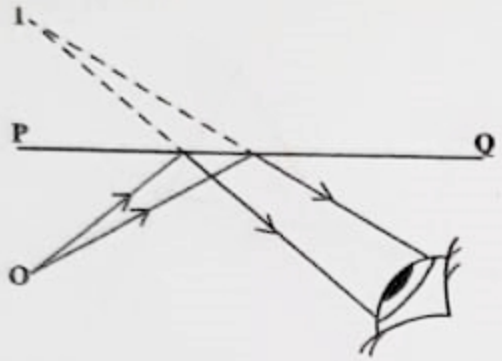
(A) Q is louder than P but P has a higher pitch.
(B) P is louder than Q but Q has a higher pitch.
(C) P is louder than Q and also has a higher pitch than Q.
(D) Q is louder than P and also has a higher pitch than P.

32. Which of the following objects can detect X-rays?

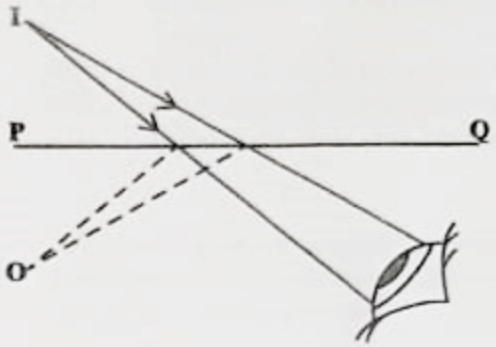
(A) Oscilloscopes
(B) Thermometers
(C) Television aerials
(D) Photographic film

33. An object O is viewed in a plane mirror, PQ. Which of the following diagrams correctly shows the formation of the image I?

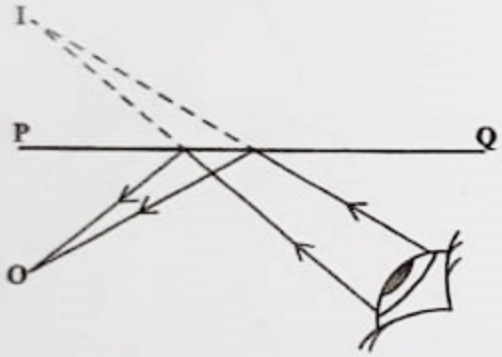
(A)



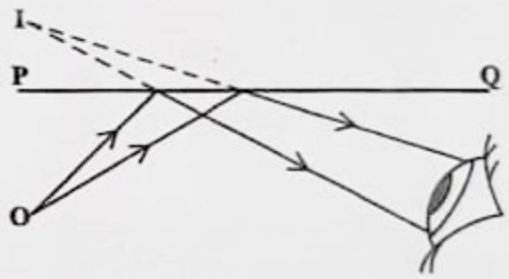
(C)



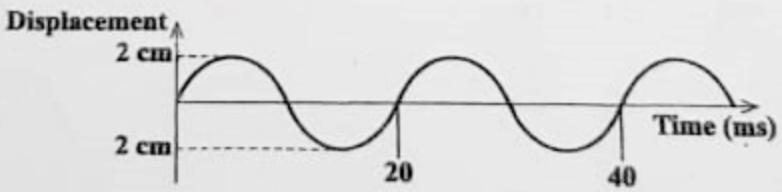
(B)



(D)



Item 34 refers to the following diagram which shows a profile of a wave travelling across a water surface.



34. From the information given, the frequency is

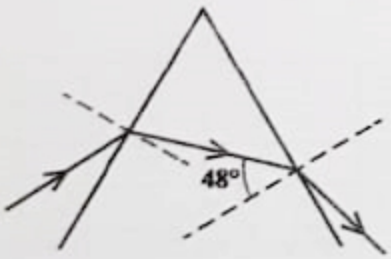
(A) 20 Hz
(B) 25 Hz
(C) 50 Hz
(D) 100 Hz

35. The critical angle of glass is 42°. Which of the following diagrams correctly shows the path of a ray of light through a triangular glass prism?

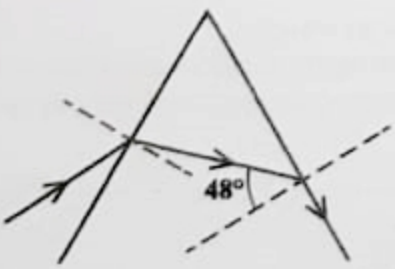
(A)

(B)

(C)



(D)



36. Which of the following statements is true of a diverging lens?

(A) It is thinner at the centre than at the edges.
(B) It can form only inverted images.
(C) It can form only enlarged images.
(D) It can form only real images.

37. Whenever there is complete destructive interference between two coherent wave trains, the waves must be

(A) in phase
(B) out of phase by one wavelength
(C) out of phase by half of a wavelength
(D) out of phase by a quarter of a wavelength

38. A ray of light leaves the air and enters glass of refractive index 1.5. If the angle of incidence is 37°, what is the sine of the angle of refraction?

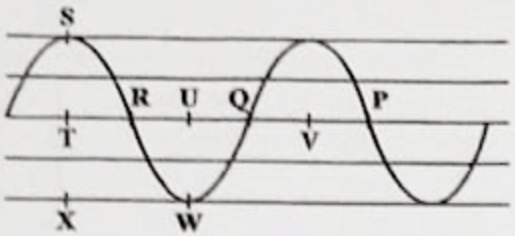
(A) $1.5 \sin 37°$

(B) $1.5 + \sin 37°$

(C) $\dfrac{1.5}{\sin 37°}$

(D) $\dfrac{\sin 37°}{1.5}$

Item 39 refers to the following graph.



39. The amplitude of the wave on the graph above is represented by

(A) UW
(B) TR
(C) QP
(D) SX

Item 40 refers to the following table which lists the refractive indices of four different materials.

Material	Refractive Index
Air	1.0
Ice	1.3
Perspex	1.5
Diamond	2.4

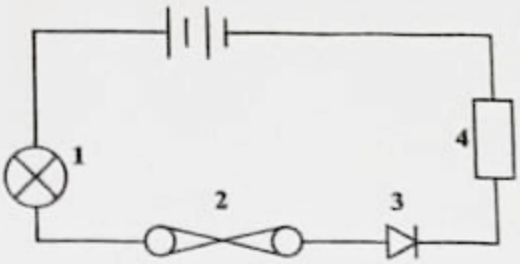
40. In which material would the light waves have the SLOWEST speed?

(A) Air
(B) Ice
(C) Perspex
(D) Diamond

41. A glass rod is rubbed with a piece of silk and is positively charged. The glass rod became charged by

(A) losing protons
(B) losing electrons
(C) gaining protons
(D) gaining electrons

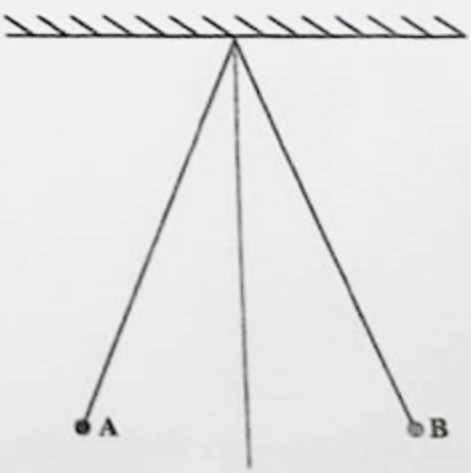
Item 42 refers to the following circuit diagram.



42. Which of the following options shows the name of the component correctly matched with its number?

	Diode	Lamp	Resistor	Fuse
(A)	2	4	3	1
(B)	1	3	4	2
(C)	4	3	1	2
(D)	3	1	4	2

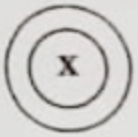
Item 43 refers to the following diagram.



43. Two light aluminium spheres, A and B, are suspended by insulating threads. If they come to rest as shown in the diagram, the force keeping them apart is

(A) magnetic
(B) centripetal
(C) electrostatic
(D) gravitational

Item **44** refers to the following diagram which represents a straight wire carrying a current into the plane of the paper.

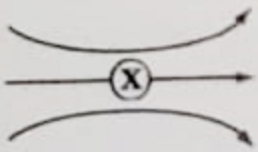


44. Which of the following diagrams BEST represents the magnetic field around the wire?

(A)

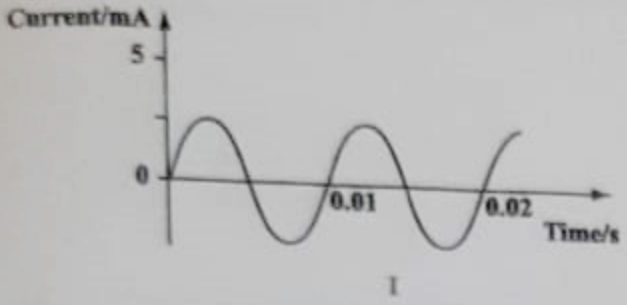
(B)

(C)

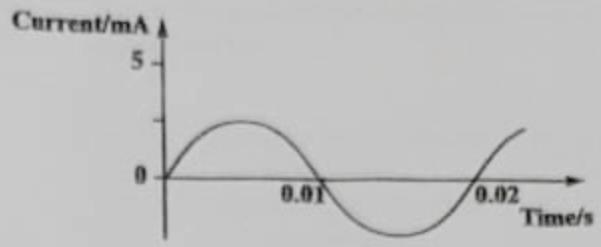


(D)

Item 45 refers to the following graphs which represent two alternating currents.



I

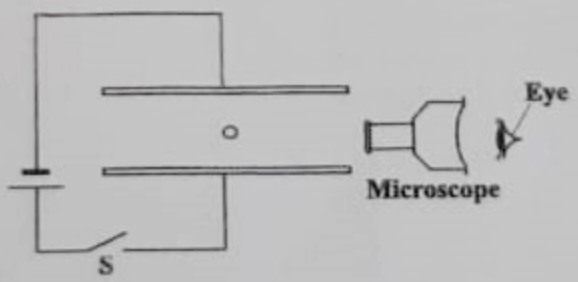


II

45. Which of the following combinations correctly identifies the currents?

	Current with Greater Frequency	Current with Greater Peak Value
(A)	I	II
(B)	I	Neither
(C)	Neither	I
(D)	II	Neither

Item 46 refers to the following diagram which shows a small, negatively charged dust particle, midway between two plates, being observed with a microscope.



46. Which of the following arrows correctly indicates the direction of movement of the dust particle when the switch, S, is closed?

(A) →
(B) ←
(C) ↓
(D) ↑

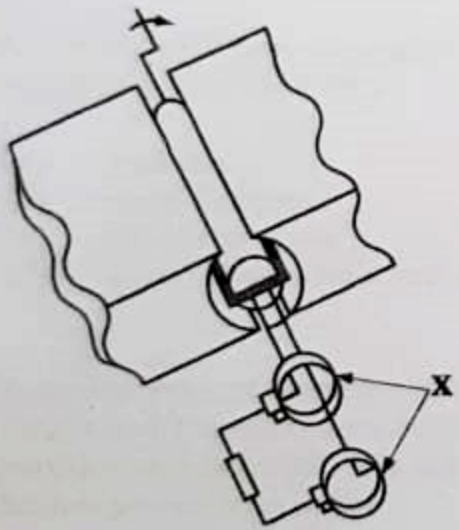
. The BEST material for the core of an electromagnet is

(A) iron
(B) steel
(C) wood
(D) aluminium

. The SI unit of charge is the

(A) ohm
(B) volt
(C) ampere
(D) coulomb

Item 49 refers to the following diagram of a simple a.c. generator.



49. The parts labelled X in the diagram are known as the

(A) commutators
(B) armatures
(C) slip rings
(D) coils

50. Which of the following sequences of events occur when an excessive current passes through a fuse?

(A) Wire gets hot → current is cut off → wire melts
(B) Wire gets hot → wire melts → current is cut off
(C) Wire melts → current is cut off → wire gets hot
(D) Wire melts → wire gets hot → current is cut off

51. A device which converts sound into electricity is called

(A) a microphone
(B) a loudspeaker
(C) an amplifier
(D) a motor

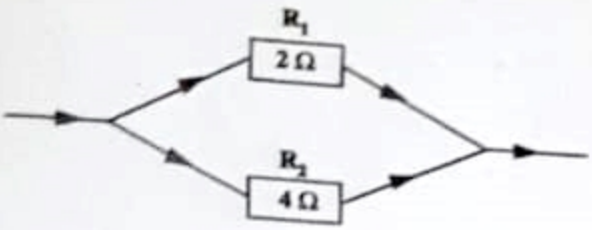
52. An ideal transformer has 1200 turns on the primary and 600 turns on the secondary. If the voltage across the secondary is 20 V, the voltage across the primary is

(A) 40 V
(B) 20 V
(C) 10 V
(D) 5 V

53. Which of the following combinations of ammeter characteristics is correct?

	Resistance of an Ammeter	How is it Connected to the Component?
(A)	High	In series
(B)	High	In parallel
(C)	Low	In series
(D)	Low	In parallel

Item **54** refers to the following circuit diagram of two resistors.



54. What is the equivalent resistance of the two resistors?

(A) 0.5 Ω
(B) 1.3 Ω
(C) 6 Ω
(D) 8 Ω

55. Madame Curie's work in scientific research was chiefly concerned with

(A) radioactivity
(B) atomic structure
(C) nuclear structure
(D) energy from atomic nuclei

56. In the scattering experiment conducted by Geiger and Marsden, some of the alpha particles were deflected. The explanation for this phenomenon is that

(A) electrons have a small mass
(B) electrons have a small charge
(C) the metal foil was only a few atoms thick
(D) the nuclear charge and mass are concentrated in a small volume in the atom

57. ${}^{14}_{6}C$ (Carbon–14) decays in accordance with the equation ${}^{14}_{6}C \rightarrow {}^{14}_{7}N + X$. The emission X is

(A) a proton
(B) a gamma ray
(C) a beta particle
(D) an alpha particle

58. Which of the following are possible symbols for an isotope of the nuclide ${}^{A}_{Z}X$?

I. ${}^{A-2}_{Z}X$

II. ${}^{A}_{Z-2}X$

III. ${}^{A+2}_{Z}X$

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

59. Alpha particles, beta particles and gamma rays from a radioactive source are subjected to a transverse magnetic field. Which of them would NOT be deviated from the original path?

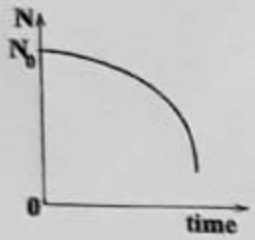
I. Alpha
II. Beta
III. Gamma

(A) II only
(B) III only
(C) I and II only
(D) II and III only

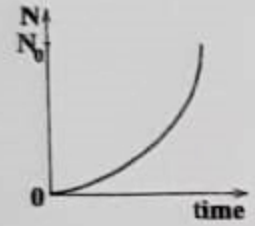
60. The number of radioactive nuclei present in a sample at the time $t = 0$ is N_0.

Which of the following graphs BEST represents the variation with time of the number, N, of undecayed nuclei present?

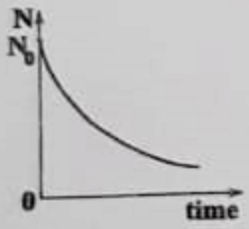
(A)



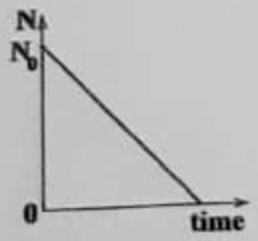
(B)



(C)



(D)



END OF TEST

IF TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

3106

CANDIDATE – PLEASE NOTE!

PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.

TEST CODE **01238010**

FORM TP 2023106

MAY/JUNE 2023

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

07 JUNE 2023 (p.m.)

299

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.

2. In addition to this test booklet, you should have an answer sheet.

3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.

4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

   Sample Item

   The SI unit of length is the

   (A) metre
   (B) second
   (C) newton
   (D) kilogram

   Sample Answer

   ● Ⓑ Ⓒ Ⓓ

   The best answer to this item is "metre", so (A) has been shaded.

A010

5. If you want to change your answer, erase it completely before you fill in your new choice.

6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to that item later.

7. Figures are not necessarily drawn to scale.

8. You may do any rough work in this booklet.

9. You may use a silent, non-programmable calculator to answer items.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. 3.1415926 expressed as TWO significant figures is

(A) 3.1
(B) 3.14
(C) 3.2
(D) 31

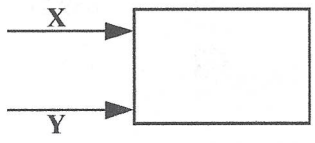
2. An example of a vector quantity is

(A) resistance (electrical)
(B) heat capacity
(C) displacement
(D) density

3. Which of the following instruments is suitable for measuring the diameter of a human hair?

(A) Metre rule
(B) Tape measure
(C) Vernier caliper
(D) Micrometer screw gauge

Item 4 refers to the following diagram which shows two forces, X and Y, applied onto an object.



4. What should be the magnitude and direction of a third force which will cause the object to remain stationary?

(A) $X - Y$ to the left
(B) $X + Y$ to the left
(C) $X - Y$ to the right
(D) $X + Y$ to the right

5. Which of the following is a derived unit?

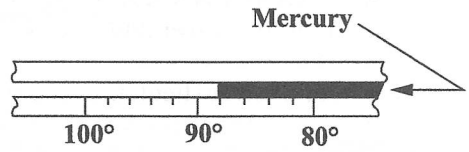
(A) K
(B) s
(C) m^3
(D) kg

6. A block is allowed to fall freely towards the ground. As it falls, its gravitational potential energy

(A) increases
(B) remains constant
(C) is converted to internal energy
(D) is converted to kinetic energy

Item 7 refers to the following diagram which shows a section of a thermometer.

7. What is the reading shown on the thermometer?



(A) 88°
(B) 89°
(C) 91°
(D) 92°

8. Which of the following is the unit of momentum?

(A) kg m s^{-2}
(B) kg m s^{-1}
(C) m s^{-1}
(D) N s

9. The kinetic energy of a body of mass, m, and velocity, v, is given by

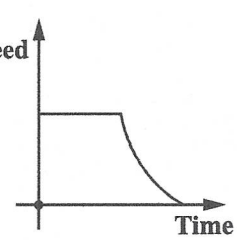
(A) mv

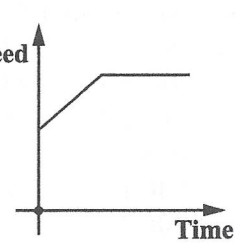
(B) mv^2

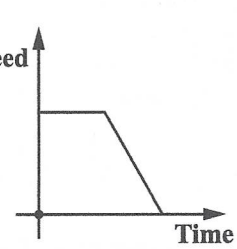
(C) $\frac{m}{v}$

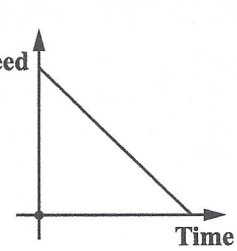
(D) $\frac{mv^2}{2}$

10. A body initially moving at a constant speed is brought to rest at a uniform rate. Which of the following speed/time graphs indicates the motion of the body?

(A)


(B)


(C)


(D)


11. A 4 kg mass is travelling with a constant speed of 5 m s^{-1}. It is brought to rest in 2 seconds. The average force acting on the mass to bring it to rest is

(A) 1.6 N
(B) 2.5 N
(C) 10.0 N
(D) 40.0 N

12. An ice cube sinks in Liquid A but floats in Liquid B. Which of the following statements is true of Liquid A and Liquid B?

(A) The upthrust is less in Liquid A than in Liquid B.
(B) The upthrust is greater in Liquid A than in Liquid B.
(C) The weight of the ice cube is less in Liquid A than in Liquid B.
(D) The weight of the ice cube is greater in Liquid A than in Liquid B.

13. A bus with luggage loaded on top is more likely to tip over when rounding a corner than the same bus without the luggage. The reason for this is that the luggage

(A) increases the weight of the bus
(B) raises the centre of gravity of the bus
(C) lowers the centre of gravity of the bus
(D) increases the momentum of the bus

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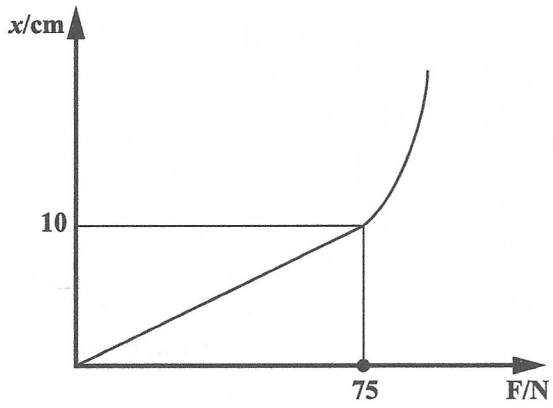
Item 14 refers to the following graph of a light spring which shows a simple extension, x, versus force, F.



14. Which of the following statements are true about the spring above?

I. The elastic limit of the spring was exceeded.
II. The spring obeyed Hooke's law over its entire extension.
III. The force per unit extension in the elastic region was 7.5 N cm^{-1}.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

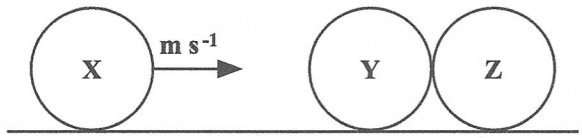
15. Power is a measure of the

(A) work done
(B) total change of energy
(C) rate of change of energy
(D) rate of change of momentum

16. Two forces of 8 N and 10 N CANNOT give a resultant of

(A) 1 N
(B) 2 N
(C) 9 N
(D) 18 N

Item 17 refers to the following diagram.



17. X, Y and Z are three billiard balls of equal mass whose centres lie in a straight line. Y and Z are touching one another. X, travelling with a velocity of 20 m s^{-1}, impinges on Y. Assuming that the spheres are perfectly elastic, the resultant motion after impact will be that

(A) X, Y and Z remain stationary
(B) X and Y remain stationary while Z moves on with a velocity of 20 m s^{-1}
(C) X, Y and Z all move on together, each with a velocity of 10 m s^{-1}
(D) X remains stationary while Y and Z move on together each with a velocity of 10 m s^{-1}

18. What is the gain in the gravitational potential energy of a body of weight 200 N, as it rises from a height of 30 m to a height of 35 m above the earth's surface?

(A) 40 J
(B) 100 J
(C) 1000 J
(D) 2000 J

19. Which of the following quantities remains unchanged with an increase in temperature?

(A) Mass
(B) Density
(C) Volume
(D) Relative density

GO ON TO THE NEXT PAGE

20. The specific heat capacity of a substance is defined as the amount of thermal energy required to

(A) raise the temperature of the substance by 1 K
(B) convert unit mass of the substance from liquid to vapour
(C) convert unit mass of the substance from solid to liquid
(D) raise the temperature of unit mass of the substance by 1K

21. The specific latent heat of vaporization of water is 2.26×10^6 J kg^{-1}. When 0.01 kg of water is converted into steam, it

(A) absorbs 2.26×10^4 J
(B) gives out 2.26×10^4 J
(C) absorbs 2.26×10^8 J
(D) gives out 2.26×10^8 J

22. A gas occupies 2 m^3 at 27 °C at a pressure of 1 atmosphere. At a pressure of 2 atmospheres it occupies a volume of 1 m^3. What is its temperature at this new volume and pressure?

(A) 54.0 °C
(B) 27.0 °C
(C) 6.75 °C
(D) −198 °C

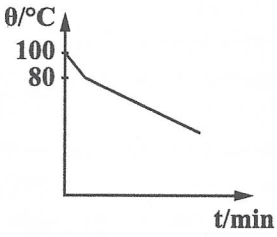
23. Which of the following methods is the MOST suitable means of heating a brass bob in order to determine its specific heat capacity by the method of mixtures?

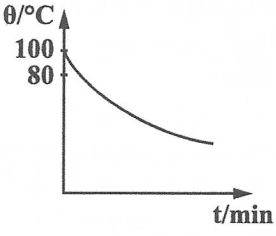
(A) Subjecting it to an open flame for ten minutes
(B) Subjecting it to an infrared beam for ten minutes
(C) Placing it in a boiling water-bath for ten minutes
(D) Placing it in contact with an electrical heater for ten minutes

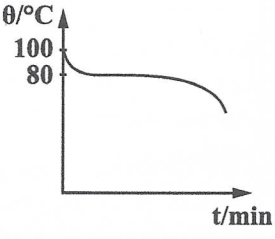
24. According to the kinetic theory, when a gas in a closed container is heated the pressure rises because

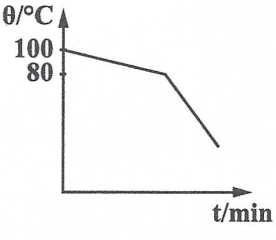
(A) there are more molecules hitting the walls of the container
(B) the molecules move faster and hit each other harder and more often
(C) the molecules expand and push harder on the walls of the container
(D) the molecules move faster and hit the walls of the container harder and more often

25. Molten naphthalene at 100 °C is allowed to cool down to room temperature. If naphthalene has a melting point of 80 °C, which of the following graphs BEST represents the cooling curve?

(A)


(B)


(C)


(D)


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26. In which of the following is conduction the MAIN method of energy transfer?

(A) Food heated in a microwave oven
(B) Energy transferred from the sun to earth
(C) Food being cooked on a barbecue
(D) Food being cooked in a pot on an electric stove

27. Which of the following are reasons why a hot liquid, placed in a double-walled vacuum flask, retains its heat for a long time?

I. Silver inner walls reduce the loss of heat by radiation.
II. The silvered outer wall helps to absorb heat from the surroundings.
III. Evacuated space between the double walls reduces the loss of heat by conduction.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

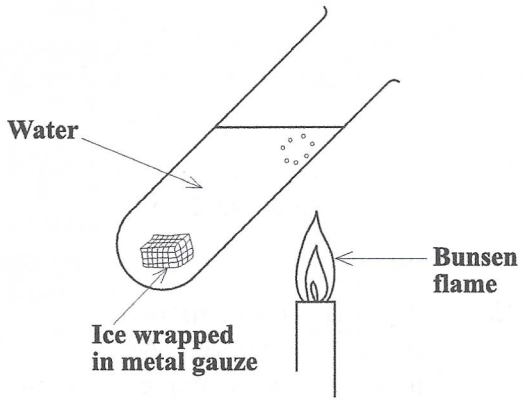
28. A person coming out of the sea would feel cool because

(A) the sea is cold
(B) heat is lost by radiation
(C) seawater evaporates from the skin
(D) convection of thermal energy occurs into the air

29. The kinetic theory of matter suggests that the molecules of a gas are

(A) closely packed and vibrating
(B) closely packed and moving over each other
(C) far apart and vibrating about a fixed point
(D) far apart and moving at random

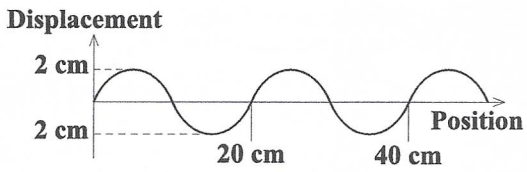
Item **30** refers to the following diagram which shows water boiling at the top of a glass test tube while a piece of ice remains unmelted at the bottom.



30. Which of the following statements provides the reason for this occurrence?

(A) Water is a poor conductor of heat.
(B) Water is a good conductor of heat.
(C) Gauze is a poor conductor of heat.
(D) Glass is a good conductor of heat.

Item 31 refers to the following diagram which shows the instantaneous profile of a wave travelling across a water surface.



31. From the information above, the frequency is

(A) $\frac{1}{20}$ Hz

(B) 10 Hz
(C) 20 Hz
(D) unknown

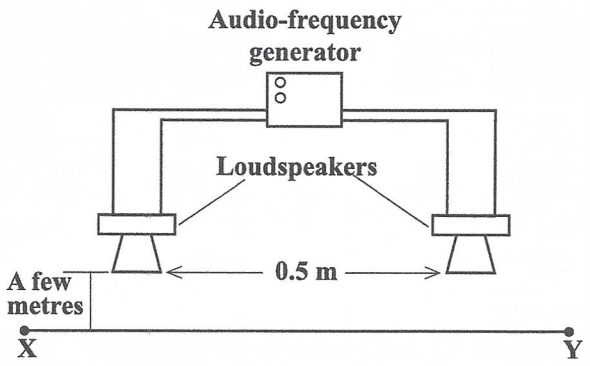
32. The sharp edges of shadows suggest that light

(A) travels in straight lines
(B) travels very quickly
(C) is a form of energy
(D) has a wave nature

33. An echo is quieter than the original sound that produced it. This shows that, compared to the original sound, the echo has a

(A) shorter wavelength
(B) smaller amplitude
(C) lower frequency
(D) slower speed

Item 34 refers to the following diagram which shows two similar loudspeakers connected to the same audio-frequency generator. The speakers are set up a few metres away from a path, XY.



34. At some points along XY no sound is heard because

(A) the sound waves are diffracted
(B) interference of the sound waves takes place
(C) the sound waves are refracted away from those points
(D) the sound waves are reflected back to the same source

35. A ray of light leaving air enters glass of refractive index 1.6. The angle of refraction is 27°. What is the sine of the angle of incidence?

(A) $1.6 + \sin 27°$

(B) $\frac{1.6}{\sin 27°}$

(C) $\frac{\sin 27°}{1.6}$

(D) $1.6 \sin 27°$

GO ON TO THE NEXT PAGE

36. Which of the following waves travel only longitudinally?

I. Sound waves
II. Radio waves
III. Water waves

(A) I only
(B) II only
(C) II and III only
(D) I, II and III

37. Which of the following can produce a diminished virtual image of a real object?

(A) A converging lens
(B) A diverging lens
(C) A plane mirror
(D) A glass block

38. Total internal reflection in glass occurs when

(A) all the light is transmitted
(B) the angle of incidence is 90
(C) the critical angle is exceeded
(D) the incident ray is perpendicular to the glass boundary

39. A ray of light in air strikes a glass block at an angle of incidence of 0°. On entering the glass block, the light will be

(A) undeviated
(B) totally reflected
(C) refracted at 90° to the normal
(D) refracted at an unknown angle

40. The position of an image formed by a plane mirror depends on the

(A) distance of the observer from the mirror
(B) distance of the object from the mirror
(C) angle at which the image is viewed
(D) angle at which the object is viewed

41. Which of the following expressions would represent the formula(e) for linear magnification?

I. $\frac{\text{Height of image}}{\text{Height of object}}$

II. $\frac{\text{Height of object}}{\text{Height of image}}$

III. $\frac{\text{Object distance}}{\text{Image distance}}$

(A) I only
(B) II only
(C) I and III only
(D) II and III only

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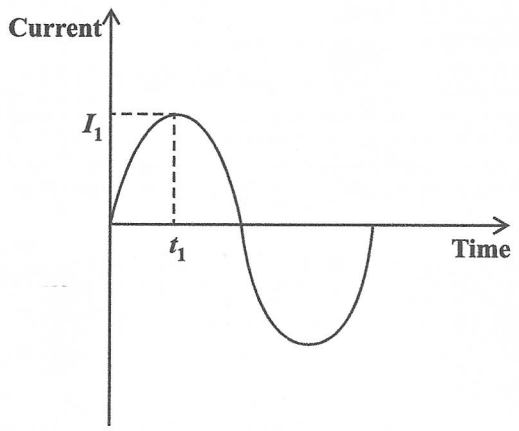
Item 42 refers to the following graph showing the variations of alternating current with time.



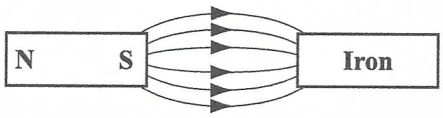
42. The value of the current, I_1, at time, t_1, is called the

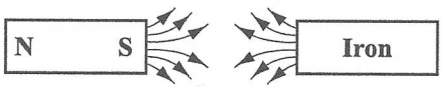
(A) root mean square value
(B) sinusoidal value
(C) average value
(D) peak value

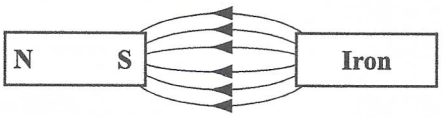
43. When a polythene rod is rubbed with a cloth, it becomes

(A) positively charged by gaining protons
(B) negatively charged by gaining electrons
(C) positively charged by gaining electrons
(D) negatively charged by losing protons

44. Which of the following diagrams shows the magnetic field formed between a bar magnet and a piece of iron?

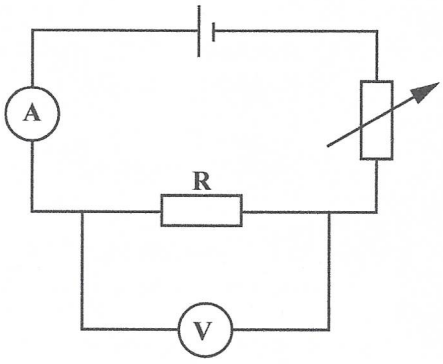
(A)


(B)


(C)


(D)


Item 45 refers to the following circuit where the ammeter reads 0.4 A and the voltmeter reads 0.6 V.



45. What is the resistance of R?

(A) 15 Ω
(B) 1.5 Ω
(C) 0.67 Ω
(D) 0.24 Ω

46. A conductor, rotating in a uniform magnetic field, induces maximum instantaneous current when the conductor cuts the magnetic field lines at

(A) 30°
(B) 45°
(C) 90°
(D) 180°

47. Which of the following relationships is correct for the combined resistance, R_T, of resistors R_1, R_2, and R_3 connected in parallel?

(A) $R_T = R_1 + R_2 + R_3$

(B) $\frac{1}{R_T} = R_1 + R_2 + R_3$

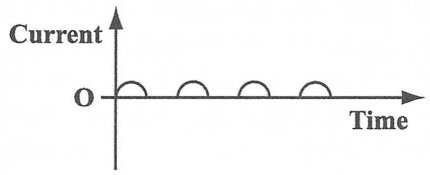
(C) $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

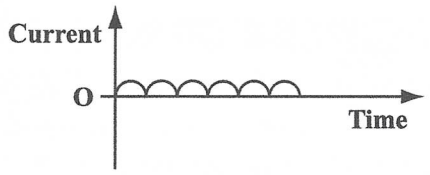
(D) $R_T = \frac{R_1 R_2 R_3}{R_1 + R_2 + R_3}$

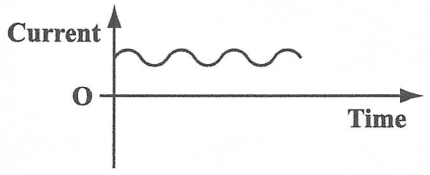
48. A voltmeter has a very high resistance so that it can be placed in

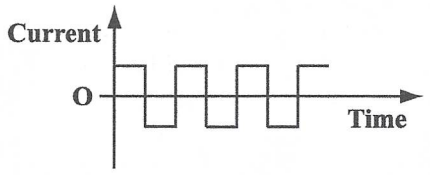
(A) parallel with a component and not affect the circuit
(B) series with a component and not affect the circuit
(C) parallel with a component and the voltmeter does not heat up
(D) series with a component and the voltmeter does not heat up

49. Which of the following graphs illustrates an **alternating** current?

(A)


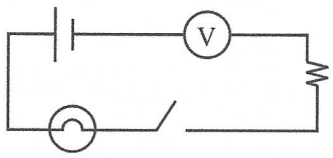
(B)


(C)


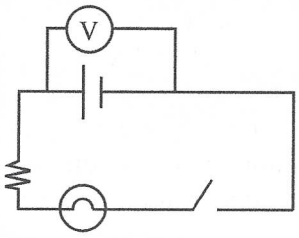
(D)


50. Which of the following circuit arrangements is BEST suited for measuring a lamp's voltage?

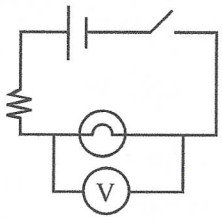
(A)



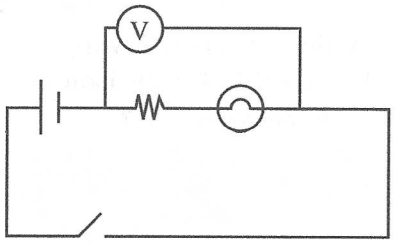
(B)



(C)

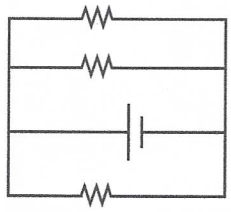


(D)

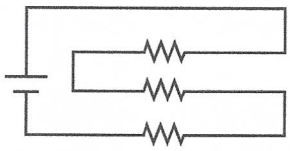


51. Which of the following circuit diagrams BEST represents a series arrangement?

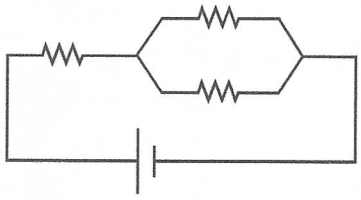
(A)



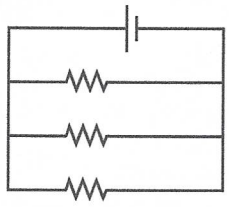
(B)



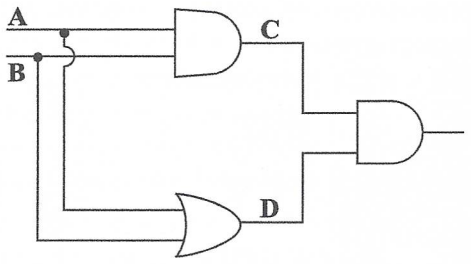
(C)



(D)



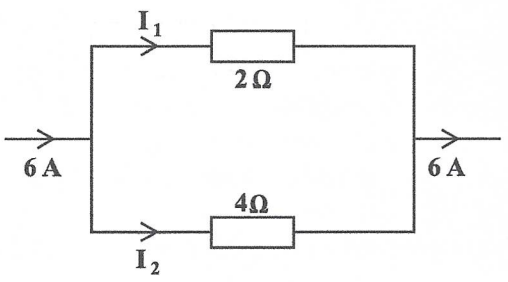
Item 52 refers to the following diagram.



52. What is the output at **C** and **D** when an input of 0 0 is made at **A** and **B**?

	C	D
(A)	0	0
(B)	1	1
(C)	0	1
(D)	1	0

Item 53 refers to the following circuit diagram.



53. Using the information given in the circuit diagram, which pair of values of I_1 and I_2 is correct?

	I_1	I_2
(A)	1	5
(B)	2	4
(C)	3	3
(D)	4	2

54. Which of the following materials is MOST suitable for the core of an electromagnet?

(A) Steel
(B) Copper
(C) Carbon
(D) Soft iron

55. According to the Rutherford–Bohr model of a neutral, stable atom, if

n = number of neutrons,
p = number of protons, and
e = number of electrons in the atom,

then for all elements

(A) $n = e$
(B) $p = e$
(C) $n + e = p$
(D) $n + p = e$

56. Which of the following symbols would be possible for an isotope of a nuclide represented by ${}^{A}_{Z}X$?

(A) ${}^{A-2}_{Z+2}X$

(B) ${}^{A}_{Z-1}X$

(C) ${}^{A-2}_{Z-2}X$

(D) ${}^{A+2}_{Z}X$

57. Which of the following CANNOT be deflected by a magnetic field?

(A) Alpha particles
(B) Beta particles
(C) Gamma rays
(D) Electrons

58. Which of the following pairs of statements is true for BOTH iron and steel?

	Iron	Steel
(A)	Easily magnetized	Does not retain its magnetism
(B)	Easily magnetized	Retains its magnetism well
(C)	Not easily magnetized	Retains its magnetism well
(D)	Not easily magnetized	Does not retain its magnetism

59. Which of the following scientists discovered radium?

(A) Marie Curie
(B) Isaac Newton
(C) J.J. Thompson
(D) Albert Einstein

60. Which of the following equations is correct?

(A) $^{226}_{88}Ra \rightarrow {}^{222}_{86}Rn + \beta\text{-particle}$

(B) $^{14}_{6}C \rightarrow {}^{15}_{7}N + \beta\text{-particle}$

(C) $^{226}_{88}Ra \rightarrow {}^{222}_{86}Rn + \alpha\text{-particle}$

(D) $^{14}_{6}C \rightarrow {}^{15}_{7}N + \alpha\text{-particle}$

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

CANDIDATE – PLEASE NOTE!

PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.

TEST CODE **01238010**

FORM TP 2022102

MAY/JUNE 2022

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

01 JUNE 2022 (p.m.)

680

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

   Sample Item

   The SI unit of length is the

   (A) metre
   (B) second
   (C) newton
   (D) kilogram

   Sample Answer

   ● Ⓑ Ⓒ Ⓓ

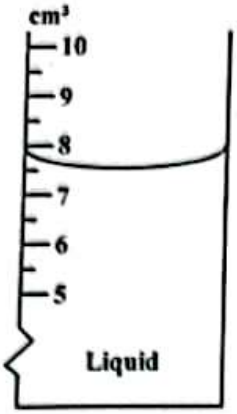
   The best answer to this item is "metre", so (A) has been shaded.

A017

5. If you want to change your answer, erase it completely before you fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to that item later.
7. Figures are not necessarily drawn to scale.
8. You may do any rough work in this booklet.
9. You may use a silent, non-programmable calculator to answer items.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

Item 1 refers to the following measuring cylinder which is used to determine the volume of a liquid.



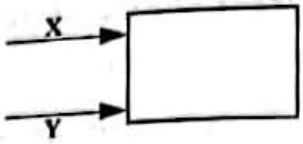
1. The volume of the liquid is

(A) 7.0 cm^3
(B) 7.5 cm^3
(C) 7.8 cm^3
(D) 8.0 cm^3

2. Given that force = mass × acceleration, the unit of force could be written as

(A) $kg^{-1}\ m\ s^2$
(B) $kg\ m^{-1}\ s^2$
(C) $kg\ m^{-1}\ s^{-2}$
(D) $kg\ m\ s^{-2}$

Item 3 refers to the following diagram which shows two forces, X and Y, applied onto an object.



3. What should be the magnitude and direction of a third force which will cause the object to remain stationary?

(A) $X - Y$ to the left
(B) $X + Y$ to the left
(C) $X - Y$ to the right
(D) $X + Y$ to the right

4. A diving ball is to be used at great depths and so its walls are made thick. The MAIN reason for this is that

(A) water pressure increases with depth
(B) water is much colder at greater depths
(C) a thin-walled vessel would float up to the surface
(D) the density of water is much greater at great depths

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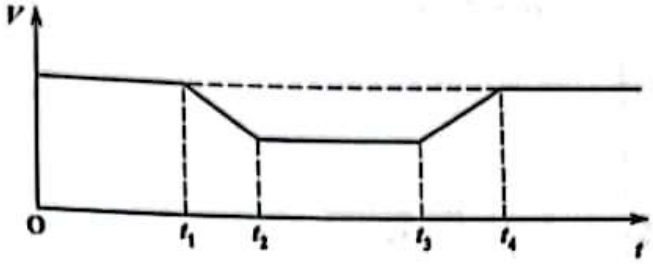
Item 5 refers to the following diagram which shows a velocity/time graph for a moving object.



5. Which of the following statements about the object are true?

I. It returns to its starting point.
II. It has zero acceleration between times t_2 and t_3.
III. Its velocity at t_4 is the same as its initial velocity.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

---

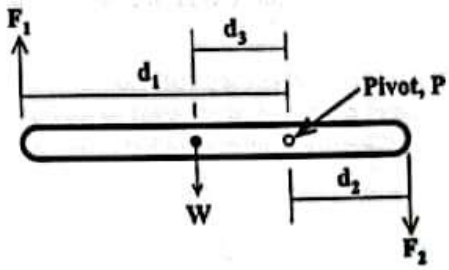
6. The unit for momentum is

(A) $kg\ s^{-1}$
(B) $kg\ m\ s^{-1}$
(C) $kg\ m\ s^{-2}$
(D) N m

7. A 4 kg mass is travelling with a constant speed of 5 $m\ s^{-1}$. It is brought to rest in 2 seconds. The average force acting on it to bring it to rest is

(A) 1.6 N
(B) 2.5 N
(C) 10.0 N
(D) 40.0 N

Item 8 refers to the following diagram which shows a non-uniform bar pivoted at P. W indicates the weight of the bar and forces F_1 and F_2 are applied at the positions shown.



8. The sum of the clockwise moments about P equals

(A) $F_2 d_2$
(B) $F_1 d_1 + W d_3$
(C) $(F_1 + W)(d_1 + d_3)$
(D) $F_1 d_1 + F_2 d_2$

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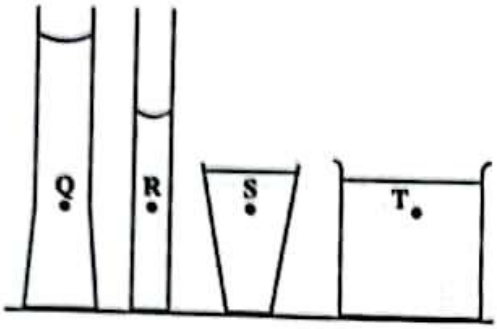
Item 9 refers to the following diagrams of four vessels, each filled with water.



9. The pressure due to the water is GREATEST at

(A) Q
(B) R
(C) S
(D) T

10. A piece of string is tied onto a small stone and then the stone is totally immersed in water. The tension in the string will be

(A) zero
(B) equal to the weight of the stone
(C) less than the weight of the stone
(D) more than the weight of the stone

11. Which of the following properties remains unchanged in a substance with an INCREASE in temperature?

(A) Mass
(B) Density
(C) Volume
(D) Relative density

12. When a ball is thrown vertically upwards and reaches its maximum height, it has

(A) maximum kinetic energy and maximum potential energy
(B) maximum kinetic energy and minimum potential energy
(C) minimum kinetic energy and minimum potential energy
(D) maximum potential energy and minimum kinetic energy

13. The time period of a simple pendulum oscillating with a small amplitude depends on the

(A) force with which the pendulum is set into motion
(B) amplitude of the oscillation
(C) length of the pendulum
(D) mass of the pendulum bob

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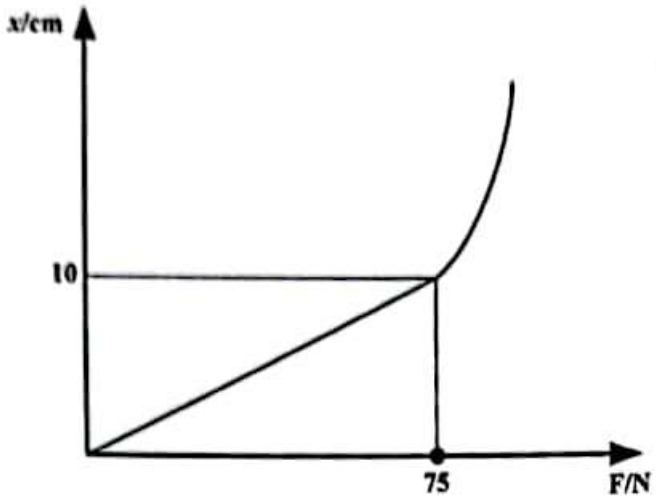
Item 14 refers to the following diagram which shows a simple extension (x) against Force (F) graph for a light spring.



14. Based on the graph above, which of the following statements would be true?

I. The elastic limit of the spring was exceeded.
II. The spring obeyed Hooke's law over its entire extension.
III. The force per unit extension in the elastic region was 7.5 N cm^{-1}.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

---

15. Which of the following is an SI base unit?

(A) Volt
(B) Ohm
(C) Ampere
(D) Coulomb

16. Which of the following implements are designed to take advantage of a large moment provided by a relatively small force?

I. Crowbar
II. Claw hammer
III. Pair of tweezers

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

17. There are NO attractive forces between the molecules in a

(A) solid and liquid
(B) liquid and gas
(C) liquid
(D) gas

18. Which of the following statements about the pressure law are true?

I. The ratio of pressure to Kelvin temperature is constant.
II. Volume is constant.
III. Pressure is constant.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

19. Which of the following ranges of temperature is MOST suitable for a clinical thermometer?

(A) 0 °C to 44 °C
(B) −10 °C to 110 °C
(C) 35 °C to 100 °C
(D) 35 °C to 44 °C

20. The specific latent heat of vaporization of water is the energy required to change 1 kg of water at

(A) 0 °C to ice at 0 °C
(B) 0 °C to steam at 100 °C
(C) 100 °C to steam at 100 °C
(D) 99.9 °C to steam at 100.1 °C

21. The energy required to change the state of a substance was determined to be E_H. If the mass of the substance is DOUBLED, the value of E_H will

(A) remain constant
(B) be quadrupled
(C) be doubled
(D) be halved

22. A metal of mass m requires energy, E, to raise its temperature from T_1 to T_2. The specific heat capacity of the metal will be given by

(A) $\frac{E}{mT_2}$

(B) $\frac{Em}{(T_1 - T_2)}$

(C) $\frac{E}{m(T_1 - T_2)}$

(D) $\frac{E}{m(T_2 - T_1)}$

23. Which of the following materials is BOTH a good absorber and a good emitter of thermal (heat) energy?

(A) A flat, polished metal plate
(B) A polished, convex metal plate
(C) A polished, concave metal plate
(D) A flat metal plate, painted black

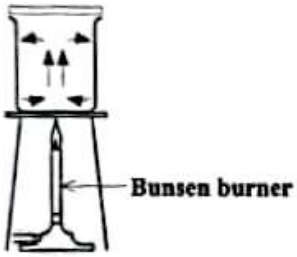
24. The specific latent heat of vaporization of water is 2.26×10^6 J kg $^{-1}$. When 0.01 kg of water is converted into steam, it

(A) absorbs 2.26×10^4 J
(B) gives out 2.26×10^4 J
(C) absorbs 2.26×10^8 J
(D) gives out 2.26×10^8 J

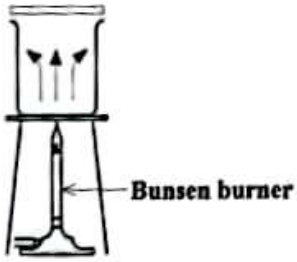
25. Which of the following diagrams BEST illustrates convection current in a liquid?

(A)

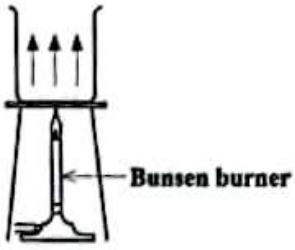
(B)



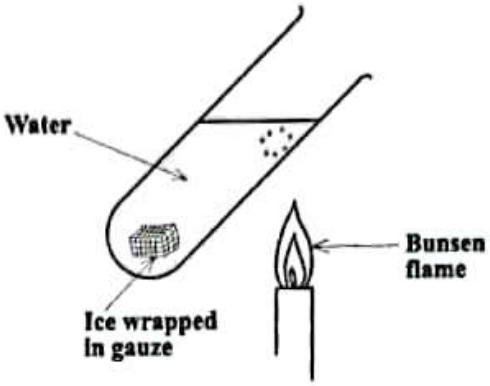
(C)



(D)



Item 26 refers to the following diagram which shows water boiling at the top of a glass test tube while a piece of ice remains unmelted at the bottom.



26. Which of the following statements provides the reason for this occurrence?

(A) Gauze is a poor conductor of heat.
(B) Water is a good conductor of heat.
(C) Water is a poor conductor of heat.
(D) Glass is a good conductor of heat.

27. Two types of radiation, L and R, fall on a woman's left and right hands respectively. Her left hand feels hot but does not become tanned; her right hand does not feel hot but it eventually becomes tanned. Radiations L and R are

	L	R
(A)	visible light	X-rays
(B)	X-rays	visible light
(C)	ultraviolet	infrared
(D)	infrared	ultraviolet

28. A student carries out an experiment to determine the specific heat capacity, c, of a solid using the electrical method. Which of the following equations should be used?

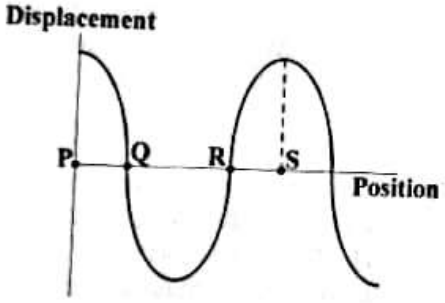
(A) $c = \frac{M\Delta\theta}{PI}$

(B) $c = \frac{F \times D}{M\Delta\theta}$

(C) $c = \frac{IVt}{M\Delta\theta}$

(D) $c = \frac{M\Delta\theta}{IVt}$

Item 29 refers to the following diagram which shows a transverse wave at a particular instant.



29. The wavelength of the wave is equal to the distance

(A) RS
(B) QS
(C) PR
(D) PS

30. Which of the following equations expresses the correct relationship between the wavelength, λ, speed, v, and frequency, f, of a wave?

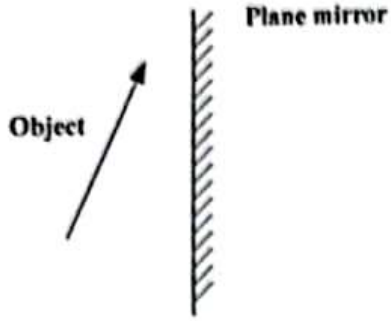
(A) $f = \frac{v}{\lambda}$

(B) $f = \frac{\lambda}{v}$

(C) $\lambda = fv$

(D) $\lambda = \frac{f}{v}$

Item 31 refers to the following diagram which shows an object in front of a plane mirror.



31. Which of the following options BEST represents the image produced by the plane mirror?

(A)

(B)

(C)

(D)

Item 32 refers to the following diagram which shows a longitudinal wave, where C and R represent compressions and rarefractions respectively.

32. If λ = wavelength, the distance between C_1 and R_2 is

(A) $\frac{1}{2}\lambda$

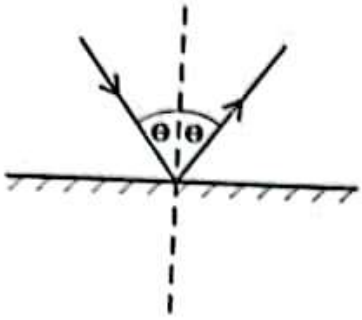
(B) 1λ

(C) $1\frac{1}{2}\lambda$

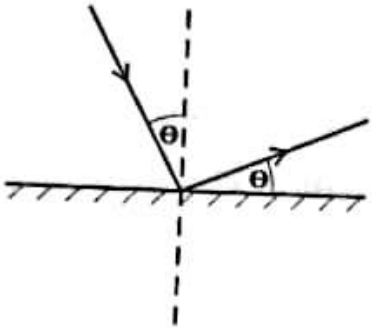
(D) 2λ

33. Which of the following diagrams illustrates the law of reflection?

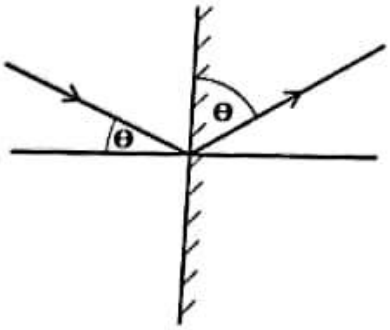
(A)



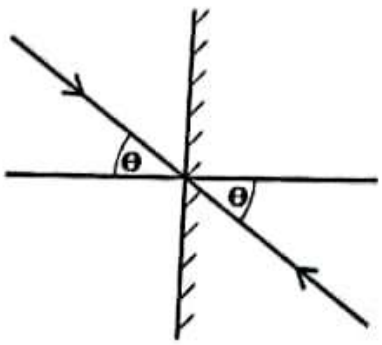
(B)



(C)



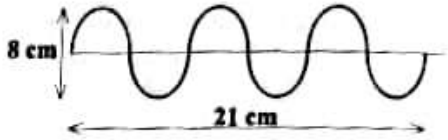
(D)



34. Which of the following properties is true of BOTH light waves and sound waves?

(A) They are electromagnetic waves.
(B) They are longitudinal waves.
(C) They may be transmitted through a vacuum.
(D) They undergo refraction.

Item 35 refers to the following diagram which illustrates the side view of a water wave.



35. The amplitude of the wave is

(A) 4 cm
(B) 7 cm
(C) 8 cm
(D) 21 cm

36. The refractive index of a transparent medium with a critical angle, c, for light travelling from the medium to air is

(A) $\frac{1}{c}$

(B) $\frac{\sin 90^\circ}{\sin c}$

(C) $\frac{90^\circ}{\sin c}$

(D) $\sin c$

GO ON TO THE NEXT PAGE

37. An explosion causes the emission of the following types of waves.

I. Light
II. Sound
III. Infrared

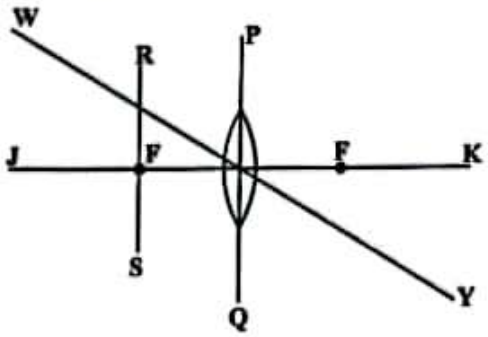
Which of these will be received first by a person some distance away from the source?

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

38. The note from a drum is louder when it is struck harder because the sound waves produced have a greater

(A) velocity
(B) frequency
(C) amplitude
(D) wavelength

Item 39 refers to the following diagram.



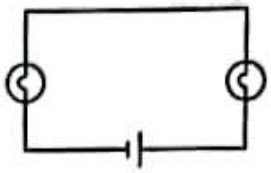
39. Which line lies along the principal axis of the converging lens?

(A) JK
(B) PQ
(C) RS
(D) WY

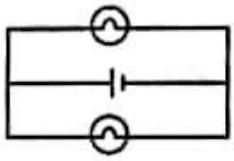
40. Rectification can BEST be done by using a

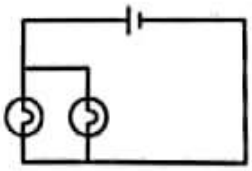
(A) transformer
(B) capacitor
(C) transistor
(D) diode

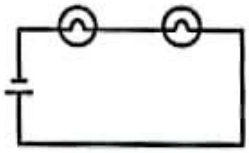
Item 41 refers to the following diagram which shows an electrical circuit with a cell and two filament bulbs.

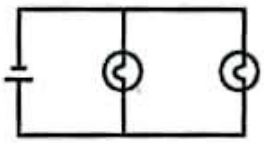


41. Which of the following circuits is electrically the same as the circuit above?

(A)


(B)


(C)


(D)


42. Given the following truth table with inputs A and B and output C, which logic gate does it describe?

A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

(A) NAND
(B) NOR
(C) AND
(D) OR

43. Which of the following equations CANNOT be used to determine the power dissipated in a resistor?

(A) $P = I^2R$

(B) $P = VI$

(C) $P = \frac{R}{V^2}$

(D) $P = \frac{V^2}{R}$

44. Magnetic induction occurs when

(A) an N pole attracts an S pole
(B) iron nails near a magnet become magnetized
(C) a magnet is suspended and points in the NS direction
(D) an electroscope is charged

45. Which of the following circuit symbols represents a fuse?

(A) 

(B) 

(C) 

(D) 

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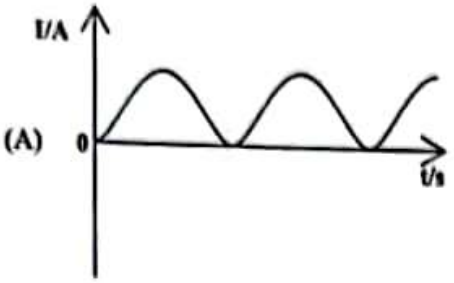
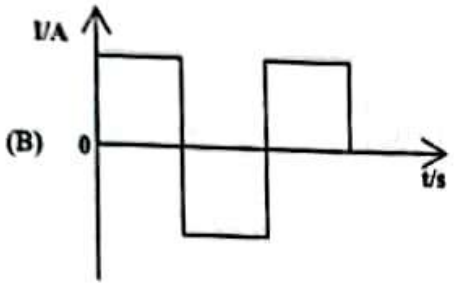
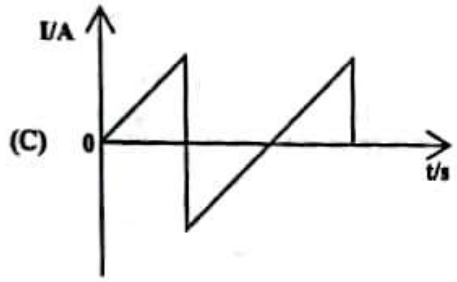
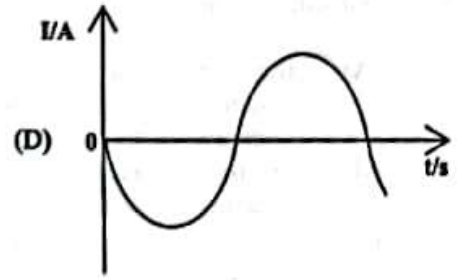
46. Which of the following current (I)–time (t) graphs BEST represents a d.c. current?

(A)


(B)


(C)


(D)


47. Which of the following materials is MOST suitable for the core of an electromagnet?

(A) Steel
(B) Carbon
(C) Copper
(D) Soft iron

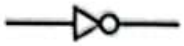
48. An ammeter has a very low resistance so that it can be placed in

(A) parallel with a component and not affect the circuit
(B) series with a component and not affect the circuit
(C) parallel with a component and not heat up
(D) series with a component and not heat up

49. An ideal transformer has a primary to secondary turns ratio of 1:3. An alternating potential difference of 200 V is applied to the primary coil and a resistance of 200 Ω attached to the secondary coil. What is the current in the secondary circuit?

(A) 0.33 A
(B) 1.00 A
(C) 1.50 A
(D) 3.00 A

50. Which of the following symbols represents the AND gate?

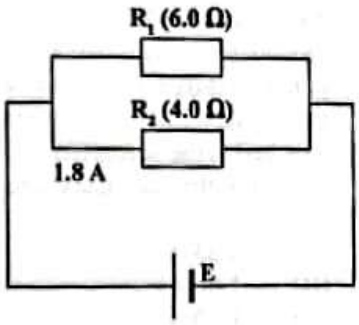
(A) 

(B) 

(C) 

(D) 

Item 51 refers to the following diagram which shows two resistors, R_1 of 6.0 Ω and R_2 of 4.0 Ω, in parallel.



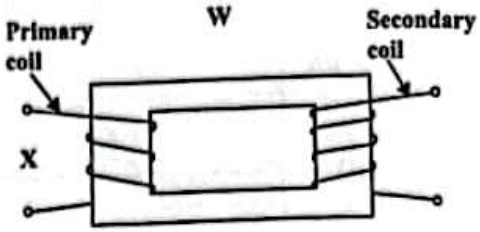
51. What is the current through R_1 if the current through R_2 is 1.8 A?

(A) 1.2 A
(B) 1.8 A
(C) 2.7 A
(D) 3.0 A

52. Which device allows one circuit to switch another circuit on or off without any direct contact between them?

(A) Magnetic relay
(B) Electromagnet
(C) Generator
(D) Motor

Item 53 refers to the following diagram.



53. Appropriate labels for device W and input X are

	W	X
(A)	step-down transformer	a.c. input
(B)	step-down transformer	d.c. input
(C)	step-up transformer	a.c. input
(D)	step-up transformer	d.c. input

54. Which of the following describes two properties of an α-particle?

(A) No charge, very penetrating
(B) Positive charge, very penetrating
(C) Negative charge, not very penetrating
(D) Positive charge, not very penetrating

55. Half-life is defined as

(A) the time it takes half of the radioactive atoms in a sample to decay
(B) the time it takes the radioactive atoms in a sample to decay
(C) half the time it takes a radioactive nucleus to decay
(D) half the lifetime of a radioactive sample

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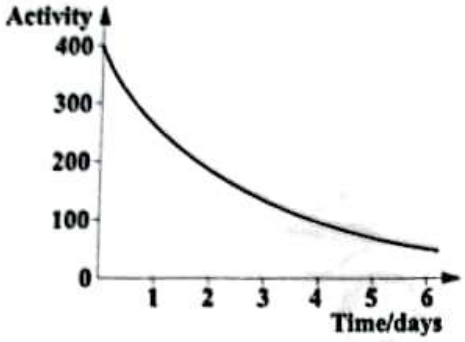
Item 56 refers to the following information.

The activity of a radioactive substance was measured at suitable intervals over a period of days and its radioactive decay curve plotted as shown below.



56. The half-life of the radioactive substance is approximately

(A) 1 day
(B) 2 days
(C) 3 days
(D) 4 days

57. The nuclide $^{234}_{90}Th$ contains

(A) 90 protons and 234 neutrons
(B) 235 protons and 90 neutrons
(C) 90 protons and 144 neutrons
(D) 144 protons and 90 neutrons

58. Which of the following statements about radioactive decay are correct?

I. It is dependent on conditions external to the nucleus.
II. It is a random process.
III. It is due to changes in the nuclei of atoms.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

59. Which of the following statements about a proton is NOT true?

(A) It is a hydrogen atom minus an electron.
(B) It has the same mass as that of an electron.
(C) It has a mass about 2000 times that of an electron.
(D) It has a charge equal in size but opposite in sign to that of an electron.

60. An isotope of uranium, $^{234}_{92}U$, changes to $^{230}_{90}Th$. This is an example of

(A) α decay
(B) β decay
(C) fission
(D) fusion

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

CANDIDATE – PLEASE NOTE!

PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.

TEST CODE **01238010**

FORM TP 2021101

MAY/JUNE 2021

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

02 JUNE 2021 (p.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

The SI unit of length is the

(A) metre
(B) second
(C) newton
(D) kilogram

Sample Answer

● Ⓑ Ⓒ Ⓓ

The best answer to this item is "metre", so (A) has been shaded.

1101

5. If you want to change your answer, erase it completely before you fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to that item later.
7. Figures are not necessarily drawn to scale.
8. You may do any rough work in this booklet.
9. You may use a silent, non-programmable calculator to answer items.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. Power can be defined as

(A) force × distance moved

(B) $\frac{\text{force}}{\text{time}}$

(C) $\frac{\text{work done}}{\text{time}}$

(D) work done × time

2. Errors due to parallax can be minimized by

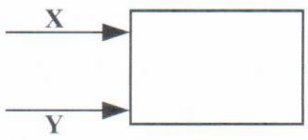
(A) taking more than one reading
(B) placing the eye at a right angle to the mark being read
(C) taking readings from different angles
(D) taking an average of two readings using two separate scales

3. Which of the following pairs consist(s) of fundamental quantities?

I. Mass and weight
II. Mass and length
III. Time and current

(A) I only
(B) II only
(C) I and III only
(D) II and III only

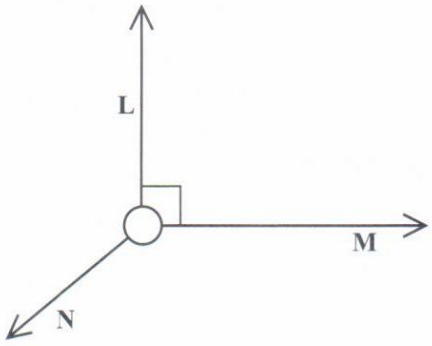
Item 4 refers to the following diagram which shows two forces, X and Y, applied onto an object.



4. What should be the magnitude and direction of a third force which would cause the object to remain stationary?

(A) $X - Y$ to the left
(B) $X + Y$ to the left
(C) $X - Y$ to the right
(D) $X + Y$ to the right

Item 5 refers to the following diagram which shows three forces of magnitudes L, M and N, all in the **same plane** and applied on a ring.



5. Which of the following equations must be true in order for the ring to remain stationary?

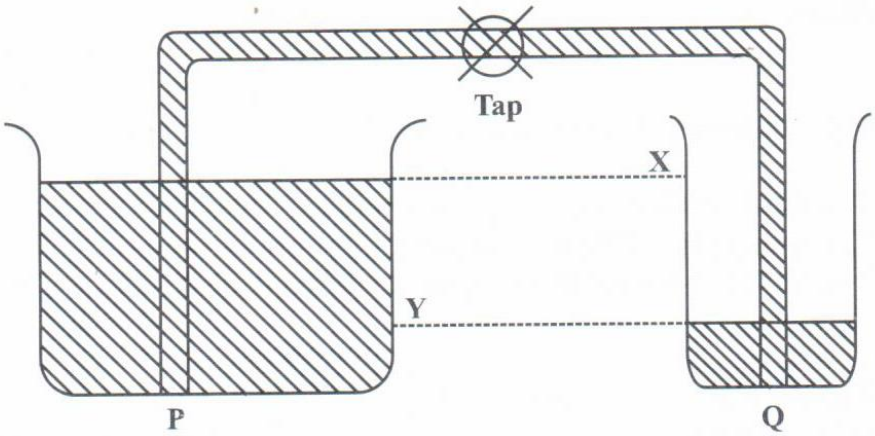
(A) $L^2 = M^2 + N^2$
(B) $N^2 = L^2 + M^2$
(C) $N^2 = L^2 - M^2$
(D) $N = L + M$

6. Which of the following changes can be caused by a force acting on a body?

I. Shape
II. Motion
III. Density

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

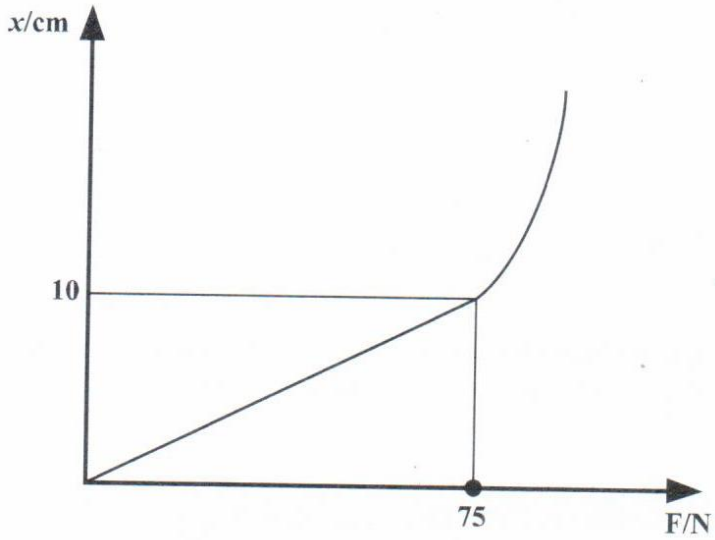
Item 7 refers to the following diagram which shows two different sized containers, P and Q, with water at different levels, connected by a glass tube and controlled by a tap.



7. When the tap is opened, water will flow from P to Q until

(A) the water level of Q is at X
(B) container P is empty
(C) the water level of P is at Y
(D) the water levels of P and Q are equal

Item 8 refers to the following graph of a light spring which shows a simple extension, x, versus force, F.



8. Which of the following statements is/are true?

I. The elastic limit of the spring was exceeded.
II. The spring obeyed Hooke's law over its entire extension.
III. The force per unit extension in the elastic region is 7.5 N cm^{-1}.

(A) I only
(B) I and III only
(C) II and III only
(D) I, II and III

9. The kinetic energy of a body of mass, m, and velocity, v, is given by

(A) mv

(B) mv^2

(C) $\frac{m}{v}$

(D) $\frac{mv^2}{2}$

10. Which of the following will be constant, if a constant net force is applied to a body?

(A) Velocity
(B) Momentum
(C) Acceleration
(D) Kinetic energy

11. Pressure in a liquid can be calculated using the formula

$$P = \rho gh.$$

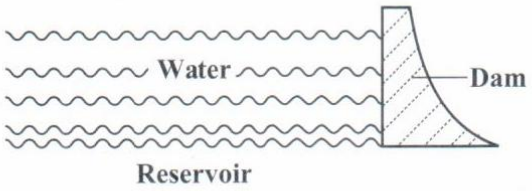
Which of the following sets of units will result in the SI unit of pressure?

	ρ	g	h
(A)	g cm^{-3}	m s^{-2}	mm
(B)	kg m^{-3}	N kg^{-1}	m
(C)	g cm^{-3}	N kg^{-1}	m
(D)	kg m^{-3}	cm s^{-2}	cm

12. An ice cube sinks in Liquid A but floats in Liquid B. Which of the following statements is true of Liquid A and Liquid B?

(A) The upthrust is less in Liquid A than in Liquid B.
(B) The upthrust is greater in Liquid A than in Liquid B.
(C) The weight of the ice cube is less in Liquid A than in Liquid B.
(D) The weight of the ice cube is greater in Liquid A than in Liquid B.

Item **13** refers to the following diagram which shows a dam.



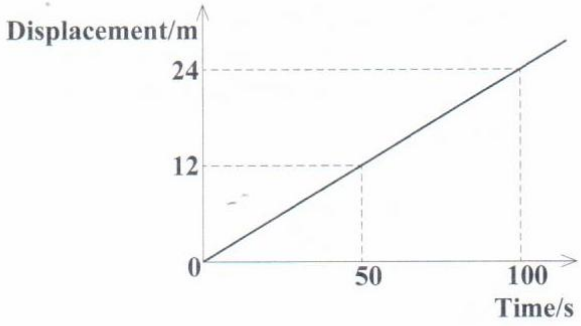
13. The pressure on the dam at the bottom of the reservoir depends on the

(A) mass of water held back by the dam
(B) volume of water held by the dam
(C) length of the reservoir
(D) depth of the water

14. Which of the following is an SI base unit?

(A) Volt
(B) Ohm
(C) Ampere
(D) Coulomb

Item **15** refers to the following graph which shows how the displacement of a runner from a starting line varies with time.



15. From the graph it can be deduced that the runner is

(A) going slower and slower
(B) going at a steady speed
(C) going faster and faster
(D) not moving

16. Two forces of 8 N and 10 N CANNOT give a resultant of

(A) 1 N
(B) 2 N
(C) 9 N
(D) 18 N

17. A piece of string is tied onto a small stone and the stone is then suspended, totally immersed, in water. The tension in the string will be

(A) close to zero
(B) equal to the weight of the stone
(C) less than the weight of the stone
(D) more than the weight of the stone

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18. What is the gain in the gravitational potential energy of a body of weight 200 N, as it rises from a height of 30 m to a height of 35 m above the earth's surface?

(A) 40 J
(B) 100 J
(C) 1000 J
(D) 2000 J

19. Who was responsible for arriving at the conclusion that measured amounts of electrical and mechanical energy can be converted to proportionate amounts of heat energy?

(A) Rumford
(B) Coulomb
(C) Newton
(D) Joule

20. A metal of mass m requires energy, E, to raise its temperature from T_1 to T_2. The specific heat capacity of the metal will be given by

(A) $\frac{E}{mT_2}$

(B) $\frac{Em}{(T_1 - T_2)}$

(C) $\frac{E}{m(T_1 - T_2)}$

(D) $\frac{E}{m(T_2 - T_1)}$

21. The specific latent heat of vaporization of water is 2.26×10^6 J kg $^{-1}$. When 0.01 kg of water is converted into steam it

(A) absorbs 2.26×10^4 J
(B) gives out 2.26×10^4 J
(C) absorbs 2.26×10^8 J
(D) gives out 2.26×10^8 J

22. A gas occupies 2 m^3 at 27 °C at a pressure of 1 atmosphere. At a pressure of 2 atmospheres it occupies a volume of 1 m^3. What is its temperature at this new volume and pressure?

(A) 54.0 °C
(B) 27.0 °C
(C) 6.75 °C
(D) – 198 °C

23. Which of the following statements about evaporation is FALSE?

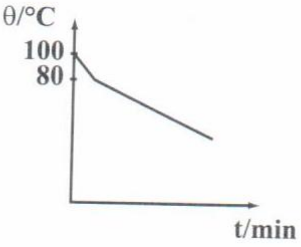
(A) Evaporation occurs only at the surface.
(B) Evaporation requires heat energy and causes cooling.
(C) In evaporation the faster molecules escape the liquid.
(D) Evaporation occurs at room temperature only.

24. Which of the following is the POOREST conductor of thermal energy?

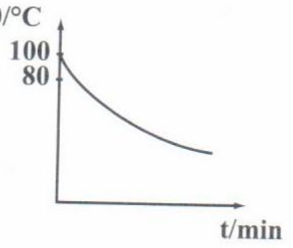
(A) Air
(B) Copper
(C) Mercury
(D) Aluminium

25. Some molten naphthalene at 100 °C is allowed to cool to room temperature. If naphthalene has a melting point of 80 °C, which of the following graphs BEST represents the cooling curve of naphthalene?

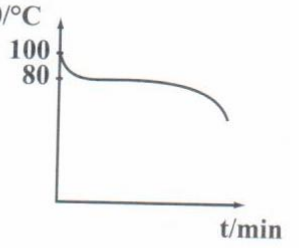
(A)



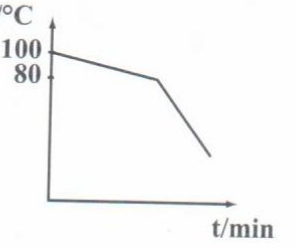
(B)



(C)



(D)



26. An electric kettle full of water is plugged into the mains. The MAJOR process by which heat travels through the water is

(A) radiation
(B) convection
(C) conduction
(D) electrification

27. Which of the following are reasons why a hot liquid, placed in a double-walled vacuum flask, retains its heat for a long time?

I. Evacuated space between the double walls reduces the loss of heat by conduction.
II. Silvered inner walls reduce the loss of heat by radiation.
III. The silvered outer wall helps to absorb heat from the surroundings.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

28. As the temperature of a liquid rises

(A) its density increases
(B) the kinetic energy of its molecules increases
(C) the forces between its molecules increase
(D) the pressure it exerts at the bottom of the container increases

29. A light bulb is filled with a gas at a temperature of 293 K. If the initial pressure of the gas is P, what will the pressure be when the temperature increases to 360 K?

(A) $\frac{393}{360} \times P$

(B) $\frac{360}{393} \times P$

(C) $\frac{293}{360} \times P$

(D) $\frac{360}{293} \times P$

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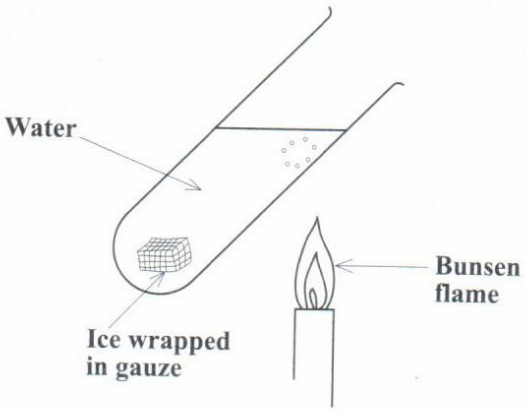
Item **30** refers to the following diagram which shows water boiling at the top of a glass test tube while a piece of ice remains unmelted at the bottom.

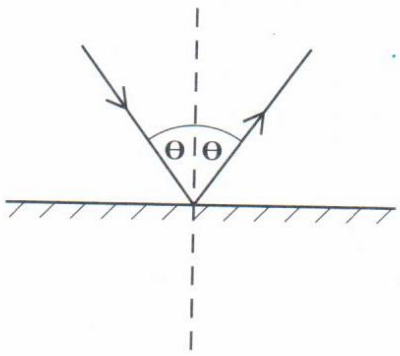


30. Which of the following statements explains the reason for this occurrence?

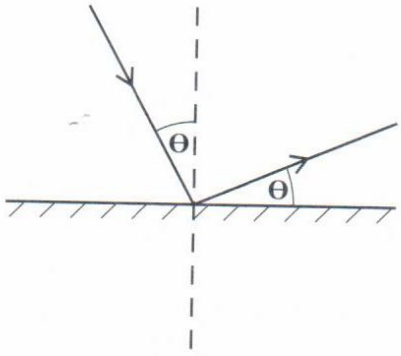
(A) Water is a poor conductor of heat.
(B) Gauze is a poor conductor of heat.
(C) Water is a good conductor of heat.
(D) Glass is a good conductor of heat.

31. Which of the following diagrams illustrates the law of reflection?

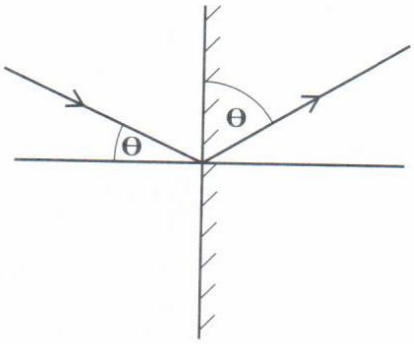
(A)



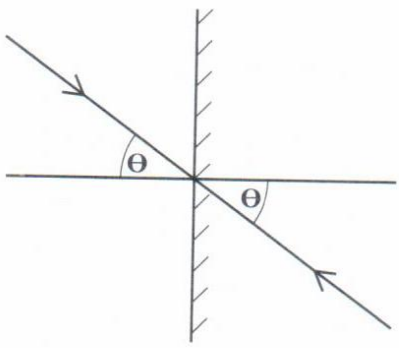
(B)



(C)



(D)



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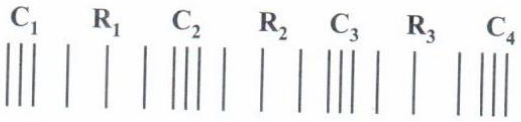
32. The human ear is incapable of hearing a silent dog whistle because

(A) the dog whistle does not make a noise
(B) the speed of sound is too fast to be detected by the human ear
(C) the frequency of the waves are above the range detected by the human ear
(D) the waves are infrasound with frequencies below that detectable by the human ear

33. An echo is quieter than the original sound that produced it. This shows that, compared to the original sound, the echo has a

(A) smaller amplitude
(B) shorter wavelength
(C) lower frequency
(D) slower speed

Item **34** refers to the following diagram which shows a longitudinal wave, where C and R represent compressions and rarefactions respectively.



34. If λ = wavelength, the distance between C_1 and R_2 is

(A) $\frac{1}{2}\lambda$
(B) $1\,\lambda$
(C) $1\frac{1}{2}\lambda$
(D) $2\,\lambda$

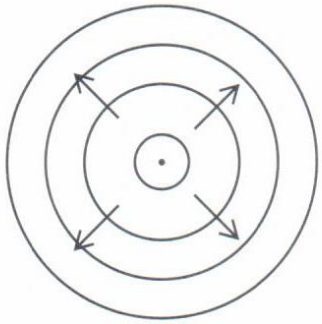
35. A ray of light leaving air enters glass of refractive index 1.6. The angle of refraction is 27°. What is the sine of the angle of incidence?

(A) $1.6 + \sin 27°$
(B) $\frac{1.6}{\sin 27°}$
(C) $\frac{\sin 27°}{1.6}$
(D) $1.6 \sin 27°$

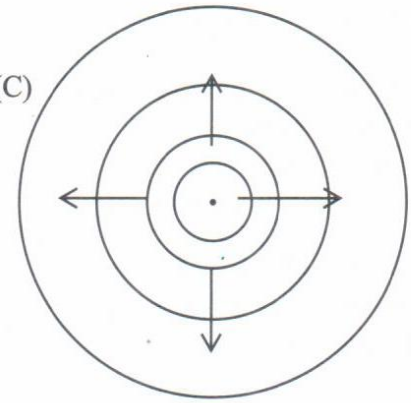
GO ON TO THE NEXT PAGE

36. Which of the following diagrams BEST represents the wave generated in a ripple tank by a small spherical dipper vibrating at a constant frequency?

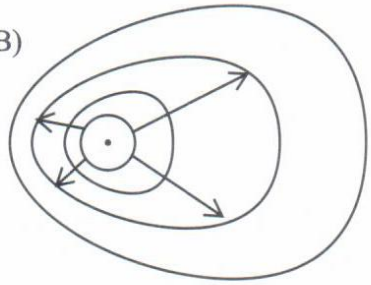
(A)



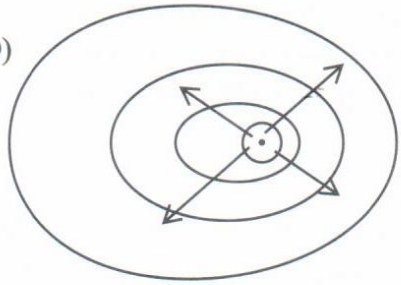
(C)



(B)



(D)



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37. Which of the following statements about waves is true?

(A) Only transverse waves undergo reflection.
(B) Diffraction can only take place with light waves.
(C) All waves undergo reflection, refraction and diffraction.
(D) Longitudinal waves do not undergo refraction, but may be reflected.

38. Which of the following objects can detect X-rays?

(A) Thermometers
(B) Oscilloscopes
(C) Television aerials
(D) Photographic film

39. A ray of light in air strikes a glass block at an angle of incidence of 0°. The light will be

(A) undeviated
(B) totally reflected
(C) refracted at 90° to normal
(D) refracted at an unknown angle

40. The position of an image formed by a plane mirror depends on the

(A) distance of the observer from the mirror
(B) distance of the object from the mirror
(C) angle at which the image is viewed
(D) angle at which the object is viewed

41. The refractive index of a transparent medium with a critical angle, c, for light travelling from the medium to air is

(A) $\frac{1}{c}$

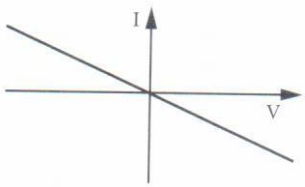
(B) $\frac{90°}{\sin c}$

(C) $\frac{\sin 90°}{\sin c}$

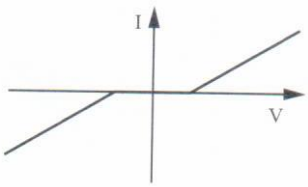
(D) $\sin c$

42. Which of the following diagrams is a graphical representation of current versus potential difference for a metallic conductor at a constant temperature?

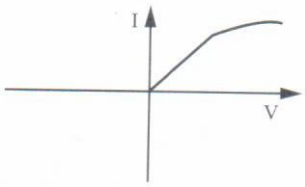
(A)



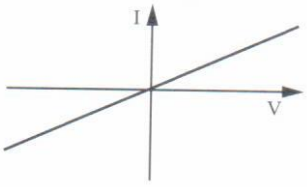
(B)



(C)



(D)



43. When a polythene rod is rubbed with a cloth, it becomes

(A) positively charged by gaining protons

(B) negatively charged by gaining electrons

(C) positively charged by gaining electrons

(D) negatively charged by losing protons

44. Which of the following relationships between electrical quantities is correct?

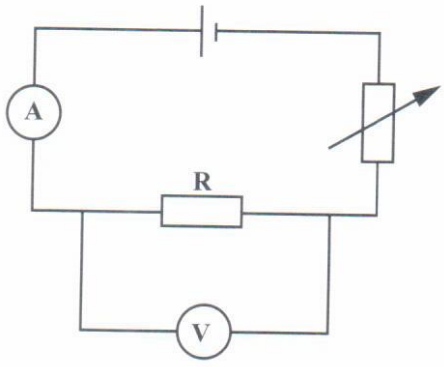
(A) $V = P I$

(B) $R = V I$

(C) $Q = I t$

(D) $E = V I$

Item **45** refers to the following circuit where the ammeter reads 0.4 A and the voltmeter reads 0.6 V.



45. What is the resistance of R?

(A) 15 Ω

(B) 1.5 Ω

(C) 0.67 Ω

(D) 0.24 Ω

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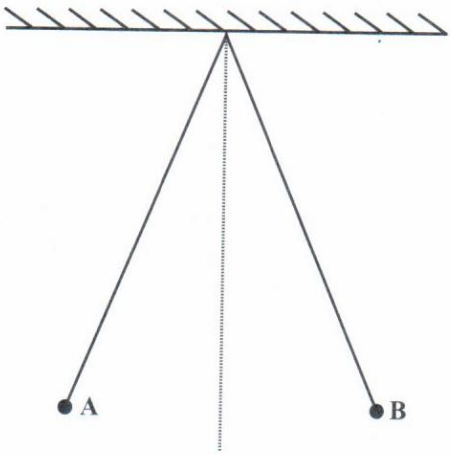
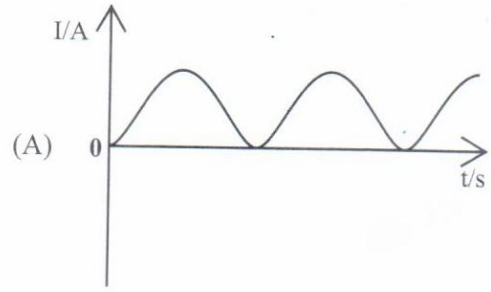
Item **46** refers to the following diagram.

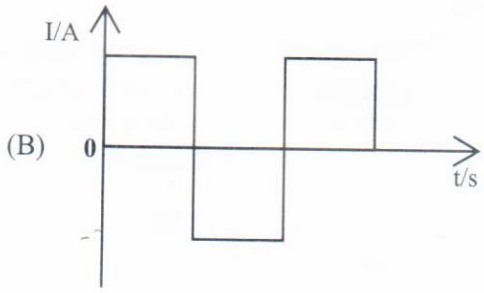


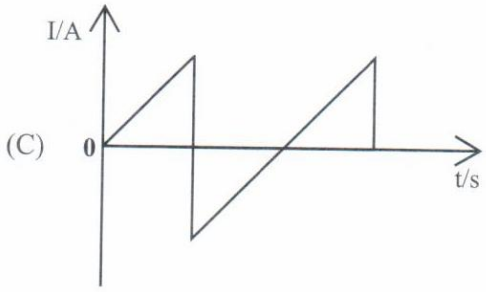
46. Two light aluminium spheres, A and B, are suspended by insulating threads. If they come to rest as shown in the diagram, the force keeping them apart is

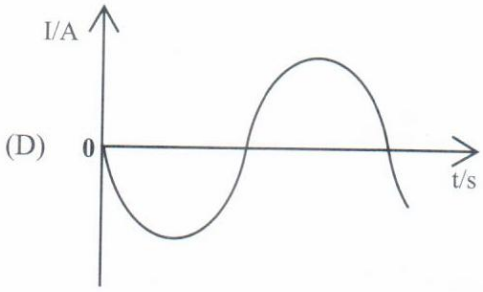
(A) magnetic
(B) centripetal
(C) electrostatic
(D) gravitational

47. Which of the following current (I)–time (t) graphs BEST represents a d.c. current?

(A)


(B)


(C)


(D)


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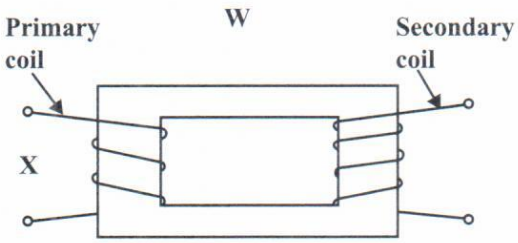
Item **48** refers to the following diagram.



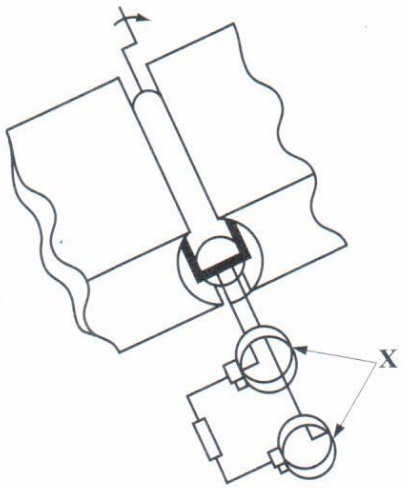
48. Appropriate labels for W and X are

	W	X
(A)	step-down transformer	a.c. input
(B)	step-down transformer	d.c. input
(C)	step-up transformer	a.c. input
(D)	step-up transformer	d.c. input

49. Rectification is BEST done by using a

(A) transformer
(B) transistor
(C) capacitor
(D) diode

Item **50** refers to the following diagram of a simple a.c. generator.

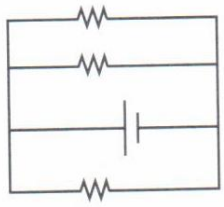


50. The parts labelled X in the diagram are known as the

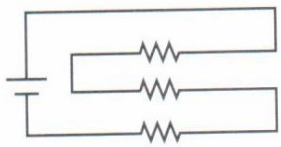
(A) commutators
(B) armatures
(C) slip rings
(D) coils

51. Which of the following circuit diagrams BEST represents a series arrangement?

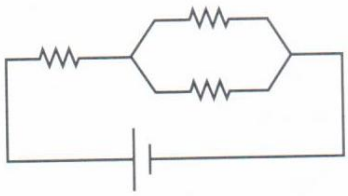
(A)



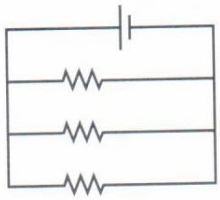
(B)



(C)



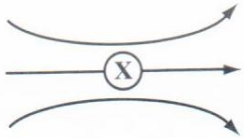
(D)



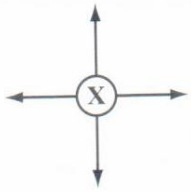
Item **52** refers to the following diagram which represents a straight wire carrying a current into the plane of the paper.

52. Which of the following diagrams BEST represents the magnetic field around the wire?

(A)



(B)



(C)

(D)

53. Which of the following symbols represents the AND gate?

(A) 

(B) 

(C) 

(D) 

54. Which of the following materials is MOST suitable for the core of an electromagnet?

(A) Steel
(B) Copper
(C) Carbon
(D) Soft iron

Item **55** refers to the following diagram of a portion of the periodic table.

					He
B	**C**	**N**	**O**	**9 F**	**Ne**

55. In the diagram above, Element F has 9 protons. How many protons does Element B have?

(A) 5
(B) 6
(C) 8
(D) 12

56. The number of neutrons present in the nucleus of the nuclide $^{222}_{86}Rn$ is

(A) 308
(B) 222
(C) 136
(D) 86

57. Which of the following CANNOT be deflected by a magnetic field?

(A) Alpha particles
(B) Beta particles
(C) Gamma rays
(D) Electrons

58. Sodium−24 decays into Magnesium−24 with the emission of a ß-particle and can be represented by the following equation.

$$^{24}_{11}Na \rightarrow {}^{24}_{12}Mg + \square$$

Which of the following options should be placed in the box to complete the equation?

(A) $^{0}_{1}e$

(B) $^{0}_{-1}e$

(C) $^{4}_{1}He$

(D) $^{0}_{-1}He$

59. Which of the following scientists discovered radium?

(A) Marie Curie
(B) Isaac Newton
(C) J.J. Thompson
(D) Albert Einstein

60. A radioactive isotope has a half-life of 20 days. How many days will it take for a given sample to have its activity reduced to $\frac{1}{8}$ of its initial value?

(A) 1.2 days
(B) 60 days
(C) 80 days
(D) 320 days

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

CSEC Physics June 2000

1. 1 gram is equal to

(A) 10 milligrams
(B) 100 milligrams
(C) 1 000 milligrams
(D) 10 000 milligrams

2. 3.1415926 expressed to TWO significant figures is

(A) 3.1
(B) 3.14
(C) 3.2
(D) 31

3. 2 μm means

(A) 2×10^{6} m
(B) 2×10^{3} m
(C) 2×10^{-3} m
(D) 2×10^{-6} m

4. Which of the following has NO units?

(A) Velocity
(B) Relative density
(C) Energy
(D) Momentum

5. Which of the following instruments is BEST suited for measuring the diameter of a strand of hair?

(A) Ruler
(B) Vernier callipers
(C) Engineer's callipers
(D) Micrometer screw gauge

6. Which of the following is NOT an SI base unit?

(A) m
(B) kg
(C) A
(D) cm^3

7. Which of the following energy sources is/are renewable?

I. Solar radiation
II. Wind energy
III. Fossil fuels

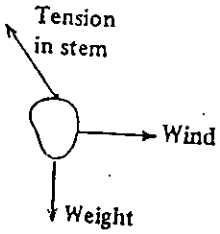
(A) I only
(B) II and III only
(C) I and III only
(D) I and II only

8. If an object is moving along a surface with a constant acceleration, the net force acting on the object is

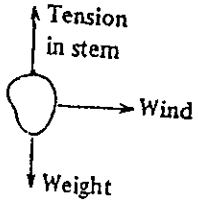
(A) zero
(B) constant
(C) increasing
(D) decreasing

9. A mango hangs from a long stem in a strong horizontal breeze. Which of the diagrams below BEST represents the forces acting on the mango?

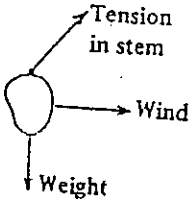
(A)



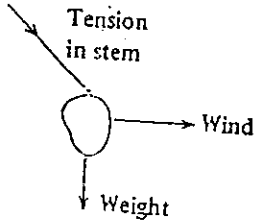
(B)



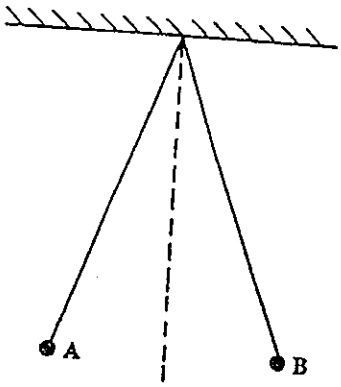
(C)



(D)



10.



Two light, aluminium spheres, A and B, are suspended by insulating threads. If they come to rest as shown in the diagram, the force keeping them apart is

(A) gravitational force
(B) electrostatic force
(C) magnetic force
(D) centripetal force

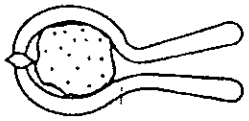
11. A stable well-designed racing car must have a

(A) low centre of gravity
(B) narrow wheel base
(C) sun roof
(D) long front

GO ON TO THE NEXT PAGE

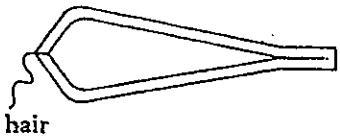
Item 12 refers to the following diagrams which depict some simple machines.

I



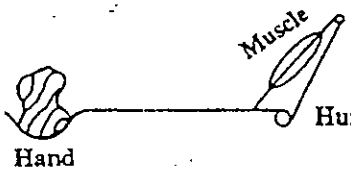
Nut cracker

II



Tweezers used for pulling out hair

III



Human forearm

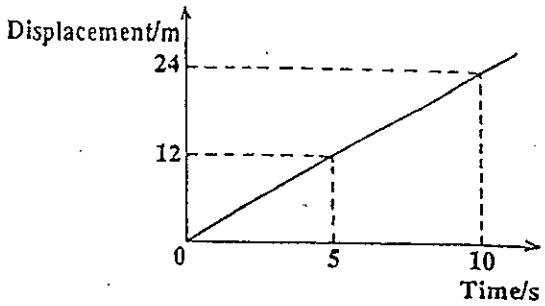
IV

Wheel-barrow

12. In which of these machines would the effort applied be less than the load?

(A) I and II only
(B) I and IV only
(C) II and IV only
(D) II and III only

13.



The graph above shows how the displacement of a runner from a starting line varies with time. This runner is

(A) going at a steady speed
(B) going faster and faster
(C) not moving
(D) going slower and slower

14. A falling raindrop reaches a constant speed when

(A) there is no net force acting on it
(B) the pull of the earth on the raindrop is equal to the weight of the raindrop
(C) the upthrust due to the air is at a minimum
(D) the air surrounding the raindrop becomes saturated with water vapour

15. The constant unbalanced force acting on a body is at right angles to its velocity. Which of the following statements about this motion is correct?

(A) The body has no acceleration.
(B) The kinetic energy of the body is increasing.
(C) The body is slowing down.
(D) The body is moving in a circular path.

16. The kinetic energy of a body of mass, m, and velocity, v, is

(A) $\frac{m}{v}$

(B) mv

(C) $\frac{mv^2}{2}$

(D) mv^2

17. Which of the following gives the efficiency of a machine?

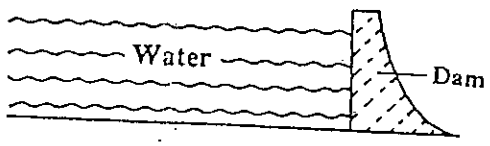
(A) $\frac{\text{Load x Distance moved by Effort}}{\text{Effort x Distance moved by Load}} \times \frac{100\%}{1}$

(B) $\frac{\text{Load x Distance moved by Load}}{\text{Effort x Distance moved by Effort}} \times \frac{100\%}{1}$

(C) $\frac{\text{Effort x Distance moved by Effort}}{\text{Load x Distance moved by Load}} \times \frac{100\%}{1}$

(D) $\frac{\text{Effort x Distance moved by Load}}{\text{Load x Distance moved by Effort}} \times \frac{100\%}{1}$

18.



The diagram above shows a dam. The pressure on the dam at the bottom of the reservoir depends on the

(A) depth of the water
(B) volume of water held by the dam
(C) mass of water held by the dam
(D) length of the reservoir

19. When liquids X and Y are taken from bottles at room temperatures and dabbed on the back of your hand, X feels cooler than Y. The MOST likely reason is that

(A) X has a higher specific heat capacity than Y
(B) X is a poorer conductor of heat than Y
(C) X evaporates more quickly than Y
(D) X is less dense than Y

20. Which of the following would explain why an ordinary 0 – 110 °C laboratory thermometer is not used to measure human body temperature?

I. The reading would change when the thermometer is taken from the patient's mouth.
II. It is not sensitive enough to measure small changes in temperature.
III. It does not have a large enough range.

(A) I only
(B) I and II only
(C) II and III only
(D) I, II and III

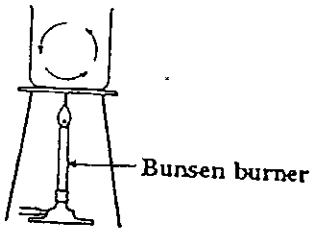
21. A fixed mass of gas at constant temperature is reduced in volume. Which of the following statements is NOT true about the gas?

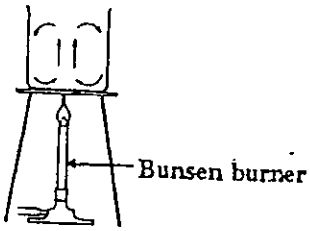
(A) The pressure of the gas increases.
(B) The average distance between the molecules decreases.
(C) The average speed of the molecules decreases.
(D) The molecules collide with the walls of the container more often.

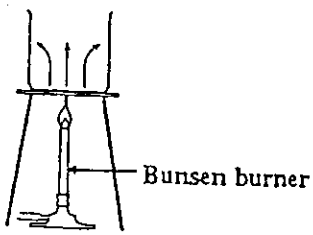
22. Which of the following statements about heat radiation is NOT true?

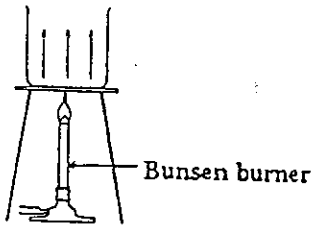
(A) Radiation is the transfer of heat by electromagnetic waves.
(B) A shiny surface is a better emitter of radiation than a dull black surface.
(C) Radiation can occur through a vacuum.
(D) Solar heat panels on houses are painted black to absorb more thermal radiation.

23. Which of the following diagrams BEST illustrates convection current in a liquid?

(A)


(B)


(C)


(D)


24. An experiment is set up with a smoke cell for demonstrating Brownian motion. The moving specks observed are

(A) smoke particles seen by reflected light
(B) smoke particles in constant vibration
(C) molecules of vibrating air
(D) molecules of carbon in random motion

25. Young's double slit experiment demonstrates that light

(A) has a particle nature
(B) produces sharp images
(C) travels in a straight line
(D) is a wave motion

26. Which of the following is the correct relation between the wavelength, λ, speed, υ, and frequency, f, of a wave?

(A) $\lambda = f\upsilon$

(B) $f = \frac{\lambda}{\upsilon}$

(C) $f = \frac{\upsilon}{\lambda}$

(D) $\lambda = \frac{f}{\upsilon}$

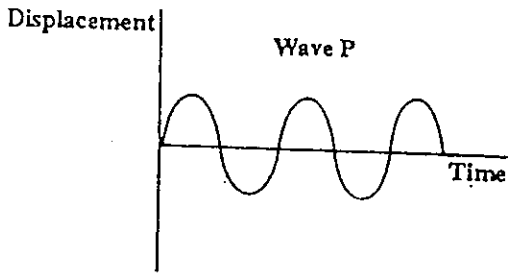
27. The table below lists the refractive indices for light of four different materials

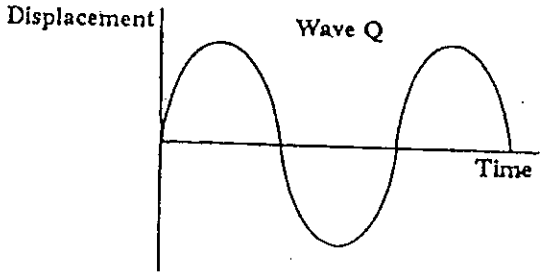
Material	Refractive Index
Air	1.0
Ice	1.3
Perspex	1.5
Diamond	2.4

In which medium would the light waves have the slowest speed?

(A) Air
(B) Ice
(C) Perspex
(D) Diamond

Item 28 refers to the following graphs (with axes having the same scales) of two sound waves, P and Q.





28. Which of the following statements is true?

(A) P is louder than Q but Q has a higher pitch.
(B) P is louder than Q and also has a higher pitch than Q.
(C) Q is louder than P but P has a higher pitch.
(D) Q is louder than P and also has a higher pitch than P.

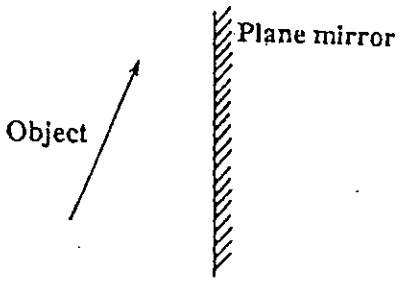
29. The normal hearing range of a young person is about

(A) 20 Hz to 2 000 Hz
(B) 20 Hz to 20 000 Hz
(C) 200 Hz to 2 000 Hz
(D) 200 Hz to 20 000 Hz

30. In the electromagnetic spectrum, X-rays are between

(A) gamma rays and ultra-violet rays
(B) ultra-violet rays and visible light
(C) visible light and infra-red rays
(D) infra-red rays and radio waves

31.



The diagram above represents an object placed in front of a plane mirror. Which of the following BEST represents the image produced by the plane mirror?

(A)

(B)

(C)

(D)

32. Which of the following does NOT sugg that light travels in straight lines?

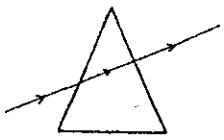
(A) Sunbeams streaming through tr
(B) A rainbow formation in the sky
(C) The formation of shadows
(D) Light from a projector on its way a screen

33. A ray of light in air strikes a glass block an angle of incidence of 0°. The light w be

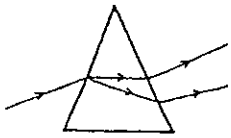
(A) undeviated
(B) totally reflected
(C) refracted at 90° to normal
(D) refracted at an unknown angle

34. Which of the diagrams BEST represer the passage of a beam of white light throu a triangular glass prism?

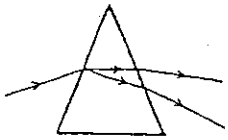
(A)



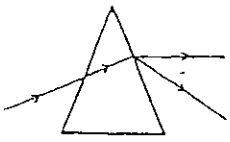
(B)



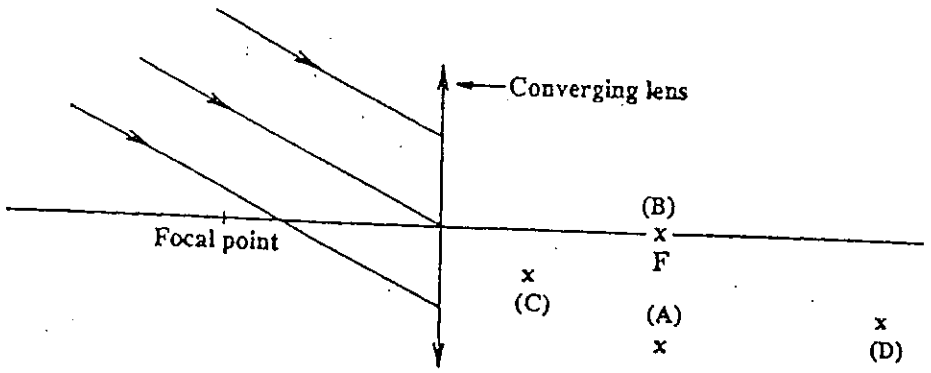
(C)



(D)

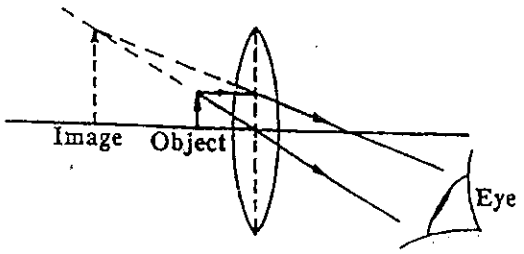


35.



In the diagram above, the incident rays of light from an object are parallel. Where will the image of the object be formed?

36.



The diagram above shows the formation of an image by a

(A) lens camera
(B) pin hole camera
(C) telescope
(D) magnifying glass

---

37. The current in a wire is one ampere if a charge of

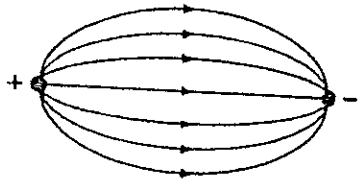
(A) 10 coulombs flows through it in 10 seconds
(B) 1 coulomb flows through it in 10 seconds
(C) 10 coulombs flow through it in 1 second
(D) 100 coulombs flow through it in 10 seconds

38. Which of the following relationships between electrical quantities is correct?

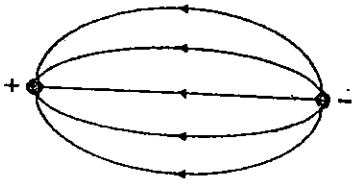
(A) $V = PI$
(B) $R = VI$
(C) $Q = \frac{E}{V}$
(D) $E = VI$

39. Which of the following diagrams represents the electric field existing between two oppositely charged point charges?

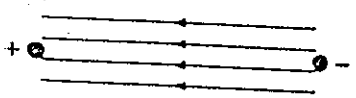
(A)



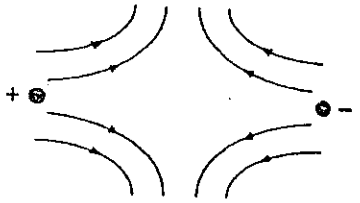
(B)



(C)



(D)



40. Which of the following ratios could represent the ampere?

I. $\frac{\text{Coulomb}}{\text{Second}}$

II. $\frac{\text{Volt}}{\text{Ohm}}$

III. $\frac{\text{Watt}}{\text{Volt}}$

(A) I only
(B) I and III only
(C) II and III only
(D) I, II and III

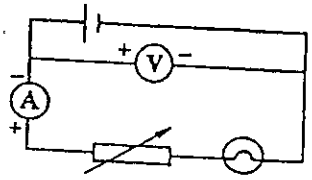
41. Which of the following units can be used measure quantities of energy?

I. Joule
II. Coulomb
III. Kilowatt-hour

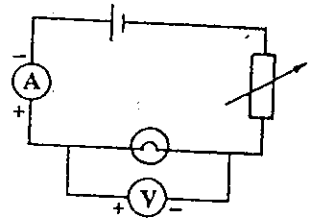
(A) I only
(B) I and II only
(C) I and III only
(D) II and III only

42. In which of the circuits below would th meters give readings which would enabl you to determine the resistance of the fil ment lamp?

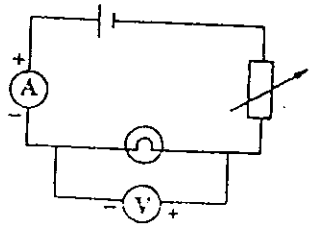
(A)



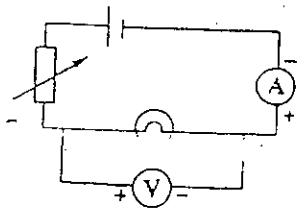
(B)



(C)

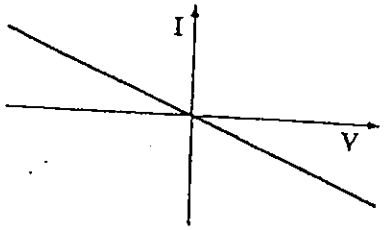


(D)

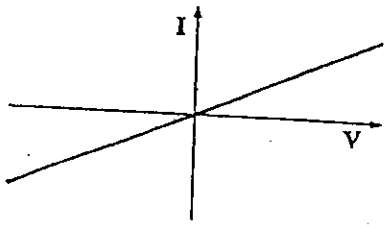


43. Which of the following is a representation of the current/p.d. relationship for a metallic conductor at a constant temperature?

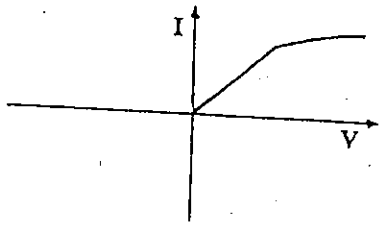
(A)



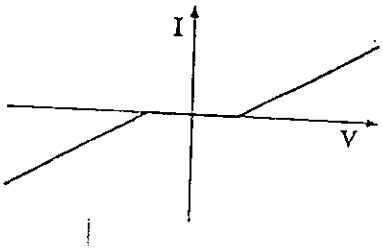
(B)



(C)



(D)

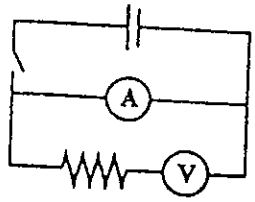


44. An appliance is connected to the mains by a cable which has three wires. What colour should the insulation be on the wire connected to the fuse?

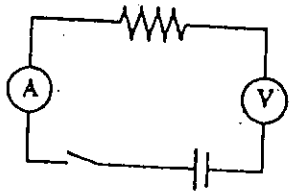
(A) Brown
(B) Black
(C) Blue
(D) Green/yellow

45. A student requires a circuit to measure the resistance of a resistor. Which of the circuits below is correctly connected?

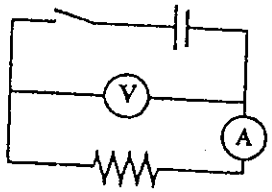
(A)



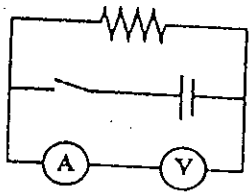
(B)



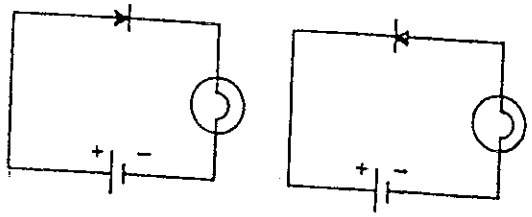
(C)



(D)



46.



An experiment was conducted using the circuit diagrams shown above. The same components were used and the bulb was lit to normal brightness in each case.

Which of the following statements would be correct?

I. The bulb is defective.
II. The battery is defective.
III. The diode is defective.

(A) I only
(B) III only
(C) I and II only
(D) II and III only

47. A semi-conductor diode produces half-wave rectification of alternating current. Which of the following statements would be true?

I. The current obtained has a constant value.
II. The current obtained flows only in one direction.
III. There are periods when no current flows from the source.

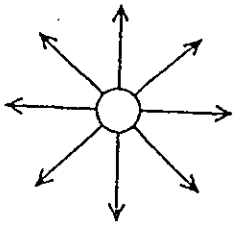
(B) II only
(C) I and III only
(D) II and III only

48. A suspended bar magnet always settl

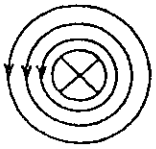
(A) with its N-pole pointing north
(B) with its N-pole pointing south
(C) perpendicular to the Ear magnetic field
(D) opposite to the direction from w it started

49. Which of the following shows the shap the magnetic field around a straight c ductor perpendicular to the page and ca ing current INTO the page?

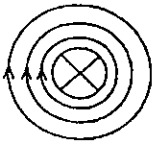
(A)



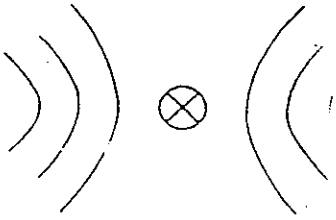
(B)



(C)

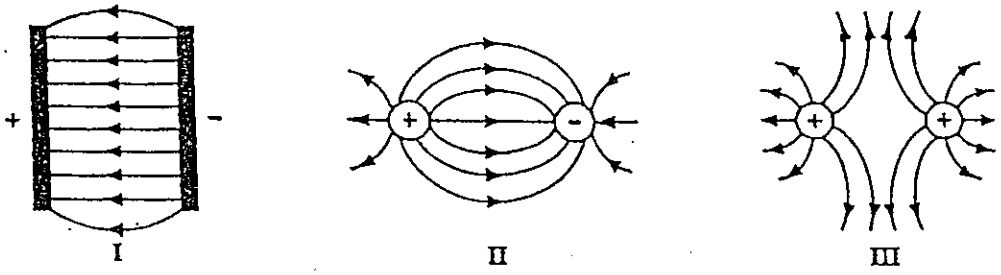


(D)



GO ON TO THE NEXT PA

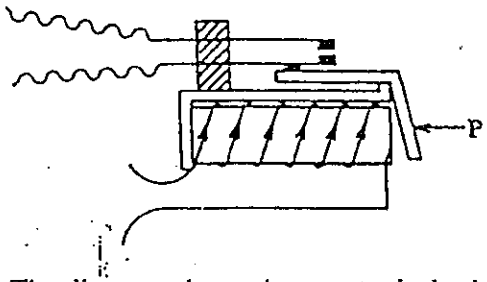
50.



The diagrams above represent the electric fields around and between point charges and parallel plates as drawn by a student. Which of the diagrams are correct?

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

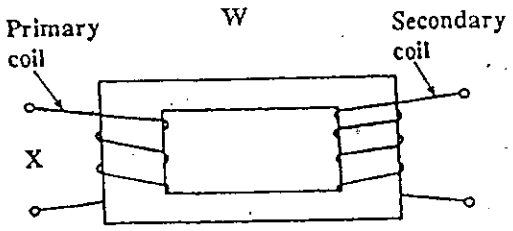
51.



The diagram above shows a typical relay. The part labelled P must be made of

(A) iron
(B) copper
(C) plastic
(D) brass

Item 52 refers to the following diagram.



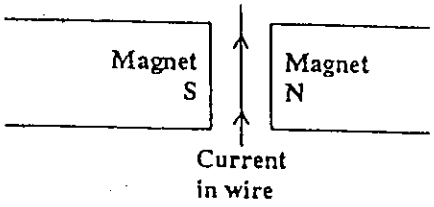
Appropriate labels for W and X would be

	W	X
(A)	step-down transformer	a.c. input
(B)	step-down transformer	d.c. input
(C)	step-up transformer	a.c. input
(D)	step-up transformer	d.c. input

53. An electricity company supplies a.c. but not d.c. to the consumer. This is because

(A) its generators cannot produce d.c.
(B) most electrical appliances cannot run on d.c.
(C) a.c. can be generated at a higher voltage than d.c.
(D) a.c. can be transmitted more efficiently than d.c.

54.



The wire in the diagram above will move

(A) towards N
(B) towards S
(C) into the paper
(D) out of the paper

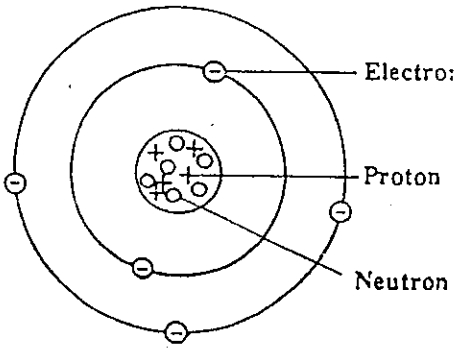
55. In the scattering experiment conducted by Geiger and Marsden, some of the alpha particles were deflected. The explanation for this phenomenon is that

(A) electrons have a small mass
(B) electrons have a small charge
(C) the metal foil was only a few atoms thick
(D) the nuclear charge and mass are concentrated in a small volume

56. The nuclide of an element, X, can be represented as ${}^{A}_{Z}X$. What does the letter A represent?

(A) Proton number
(B) Element symbol
(C) Neutron number
(D) Nucleon number

57. The diagram below shows the shell mo of an atom.



Which of the following statements is correct?

I. The mass (nucleon) number is
II. The atomic (proton) number is
III. The atom shown in the diagra positively charged.

(A) I only
(B) II only
(C) I and II only
(D) I, II and III

58. When alpha particles, beta particles gamma rays from a radioactive sourc subjected to a transverse magnetic which of them would NOT be dev from their original path?

I. Alpha
II. Beta
III. Gamma

(A) II only
(B) III only
(C) I and II only
(D) II and III only

59. Which of the following statements about the expression $E = mc^2$ would be true?

I. It defines the maximum energy that light can have.
II. It represents the fact that mass can be converted into energy.
III. It represents one of the major achievements of Rutherford.

(A) II only
(B) I and II only
(C) II and III only
(D) I, II and III

60. What is the mass number, A, and atomic number, Z, of the new element formed when an alpha particle is emitted from radium $^{226}_{88}Ra$?

	A	Z
(A)	222	86
(B)	224	84
(C)	228	92
(D)	230	90

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

AFFIX SEAL HERE

CANDIDATE – PLEASE NOTE!

You must sign below and return this booklet with the Answer Sheet. Failure to do so may result in disqualification.

Signature

FORM TP 21134

TEST CODE **002401**

MAY/JUNE 2001

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 1/4 hours

11 JUNE 2001 (a.m.)

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. In addition to this test booklet, you should have an answer sheet.
2. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
3. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

The SI unit of length is the

(A) newton
(B) metre
(C) kilogram
(D) second

Sample Answer

The best answer to this item is "metre" so answer space (B) has been shaded.

4. If you want to change your answer, be sure to erase your old answer completely and fill in your new choice.
5. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, omit it and go on to the next one. You can come back to the harder item later. Your score will be the total number of correct answers.
6. Figures are not necessarily drawn to scale.
7. You may do any rough work in this booklet.
8. The use of non-programmable calculators is allowed.
9. This test consists of 60 items. You will have 75 minutes to answer them.
10. Do not be concerned that the answer sheet provides spaces for more answers than there are items in this test.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

AFFIX SEAL HERE

1. Which of the following is NOT a fundamental quantity?

(A) Temperature
(B) Heat energy
(C) Length
(D) Time

2. Which of the following would be correct?

I. 1 milliampere = 10^{-6}A
II 1 megohm = $10^{6}\Omega$
III. 1 microcoulomb = 10^{-3}C

(A) I only
(B) II only
(C) I and II only
(D) I, II and III

3. The instrument MOST suitable for measuring the external diameter of a test tube is the

(A) micrometer screw gauge
(B) vernier calipers
(C) metre rule
(D) set square

4. A student finds the time for a ball to fall 50.0 cm in oil is 14.8 s. She divides the distance by the time to find the speed, and the calculator displays 3.3783783. The best way to write this value is

(A) 3.4 cm s^{-1}
(B) 3.38 cm s^{-1}
(C) 3.378 cm s^{-1}
(D) 3.3783783 cm s^{-1}

5. Which of the following means of measurement would produce the LEAST ACCURATE result assuming the instrument used is working properly?

(A) Using a metre rule to measure the length of a desk
(B) Using vernier calipers to find the thickness of a piece of paper
(C) Using a lever arm balance to find the mass of a book
(D) Using a stop watch to time a 400m race

6. Three immiscible liquids P, Q and R, have densities which differ. Q is denser than P but less dense than R. Which of the following diagrams shows how the liquids settle in the measuring cylinder?

(A) 

(B) 

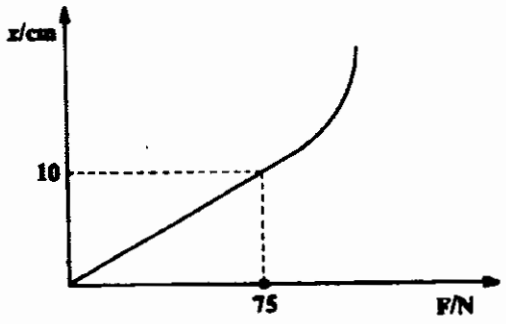
(C) 

(D) 

7. The force which keeps the moon in orbit is

(A) magnetic
(B) centrifugal
(C) reactive
(D) gravitational

8.



The diagram above shows a simple extension (x)/force (F) graph for a light spring. Which of the following statements would be true?

I. The elastic limit of the spring was exceeded.
II. The spring obeyed Hooke's law over its entire extension.
III. The force per unit extension in the elastic region was 7.5 N cm^{-1}.

(A) I only
(B) I and III only
(C) II and III only
(D) I, II and III

9. An object is NOT accelerating if

(A) its direction of motion is changing but its speed is not
(B) its velocity is changing
(C) it is stationary for a moment in mid-air
(D) it has no unbalanced force acting on it

10. Which of the following could be used to find the average speed of an object?

(A) $\frac{\text{Change in velocity}}{\text{Time taken}}$

(B) $\frac{\text{Change in displacement}}{\text{Time taken}}$

(C) $\frac{\text{Distance travelled}}{\text{Time taken}}$

(D) Distance travelled x Time taken

11. A ball attached to a string is whirled round at a constant speed in a horizontal circle. It is true to say that

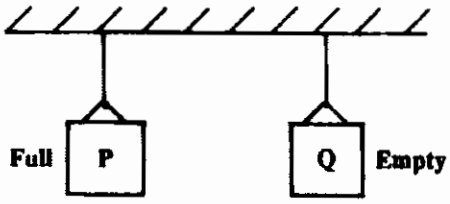
(A) the velocity is constant
(B) there are no forces acting on the body
(C) the motion is accelerated
(D) the ball will drop vertically downward if the string breaks

12. A book of weight 12 N is resting on a table. The force that the table exerts on the book is

(A) 0 N
(B) greater than 0 N but less than 12 N
(C) 12 N
(D) greater than 12 N

GO ON TO THE NEXT PAGE

13.



Two identical covered tins are suspended by strings from a beam. Tin P is full of sand while Tin Q is empty. You can tell which is which by giving each a push. The full tin will require a larger push to start swinging. This is because Tin P is

(A) greater weight than Tin Q
(B) greater mass than Tin Q
(C) greater momentum than Tin Q
(D) greater volume than Tin Q

14. The kinetic energy of a body of mass, m, and velocity, v, is

(A) $\frac{m}{v}$

(B) mv

(C) $\frac{m^2}{v}$

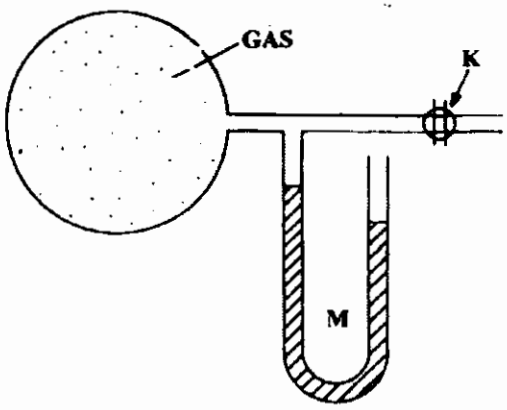
(D) $\frac{1}{2}mv^2$

15. The rate of which of the following determines the power output of a machine?

I. Doing work
II. Converting energy
III. Changing temperature

(A) I only
(B) III only
(C) I and II only
(D) I, II and III

16. The globe shown in the diagram below contains a gas the pressure of which is measured with a manometer, M.

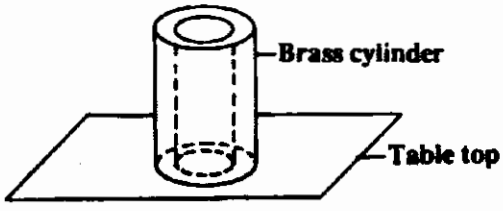


Which of the following statements would be correct?

I. The pressure of the gas is less than that of the atmosphere.
II. If the right hand side of the manometer tube were closed the reading would be more accurate.
III. In order to bring the two menisci in the manometer to the same level one could open the stop-cock, K.

(A) I only
(B) II only
(C) I and II only
(D) I and III only

17.

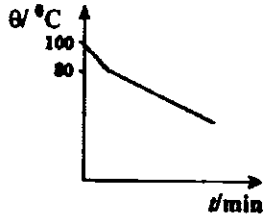


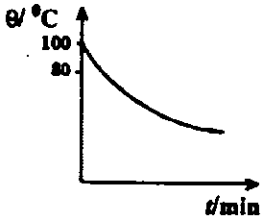
A brass cylinder is standing on a table as shown in the diagram above. It is heated electrically until its temperature reaches 150°C. Which of the following properties increases as its temperature rises?

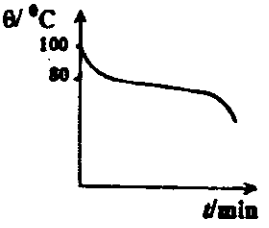
(A) Density
(B) Volume
(C) Pressure it exerts on the table
(D) Specific heat capacity

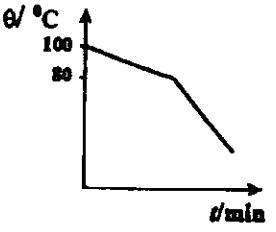
GO ON TO THE NEXT PAGE

18. Some molten naphthalene at 100°C is allowed to cool down at room temperature. If naphthalene has a melting point of 80°C, which of the following BEST represents the cooling curve?

(A)


(B)


(C)


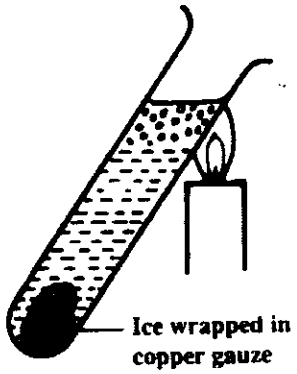
(D)


19. The bombardment by the molecules of a gas on the walls of its containing vessel determines its

(A) mass
(B) volume
(C) pressure
(D) temperature

20. The unit for specific latent heat of fusion is

(A) J
(B) $J\ kg^{-1}$
(C) $J\ K^{-1}$
(D) $J\ kg^{-1}\ K^{-1}$

21.


The figure above shows a piece of ice wrapped in copper gauze and submerged in a glass test tube of water. The water when heated at the top boils long before the ice is melted. The MAIN reason for this is that

(A) the test tube is a poor conductor of heat
(B) copper is a good conductor of heat
(C) ice is less dense than water
(D) water is a poor conductor of heat

22. Which of the following would cause the hot air above a fire to rise?

I. Increase in the speed of the air molecules
II. Expansion of the air
III. Decrease in the density of the air

(A) I only
(B) III only
(C) II and III only
(D) I, II and III

23. Which of the following occurs when atoms arrange themselves in a regularly repeated pattern?

(A) Crystallisation
(B) Evaporation
(C) Diffusion
(D) Condensation

GO ON TO THE NEXT PAGE

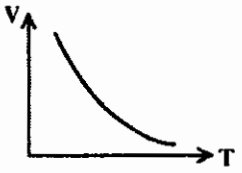
24. Which of the following is true of evaporation?

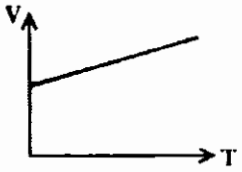
(A) It occurs throughout the liquid at no definite temperature.
(B) It occurs at the surface of the liquid at no definite temperature.
(C) It occurs at the surface of the liquid at a definite temperature.
(D) It occurs throughout the liquid at a definite temperature.

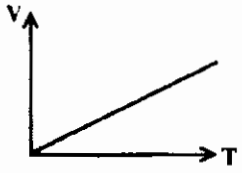
25. The 'glass-house' effect refers to the glass-house acting as a heat trap. This is a direct result of

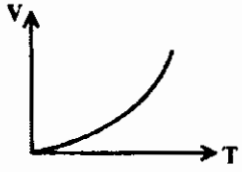
(A) short wavelength infra-red rays which are unable to penetrate glass
(B) long wavelength infra-red rays radiated from the sun which are unable to penetrate glass
(C) short wavelength infra-red rays radiated from the objects within the glass-house which are unable to penetrate glass
(D) long wavelength infra-red rays radiated from the objects within the glass-house which are unable to penetrate glass

26. Which of the following graphs is obtained if the volume of a fixed mass of gas, at a constant pressure, is plotted against its Kelvin temperature?

(A) 

(B) 

(C) 

(D) 

27. 

A longitudinal wave is shown in the above diagram. Which of the following represents a wavelength?

(A) PQ
(B) QS
(C) QR
(D) QT

GO ON TO THE NEXT PAGE

28. Which of the following statements about sound is NOT correct?

(A) Sound is transmitted as transverse waves.
(B) Sound may be produced by vibrating systems.
(C) Sound does not travel through a vacuum.
(D) Sound travels more slowly than light.

Item 29 refers to the following.

Two parallel scratches are made on a slide which is otherwise painted black. The slide is mounted so that the scratches are parallel to the straight filament of a red lamp.

29. An experiment of this type was first performed by

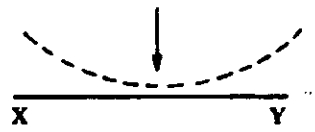
(A) Newton
(B) Young
(C) Huygens
(D) Foucault

30. Which of the following is/are involved in a production of fringes on a Young's double-slit experiment?

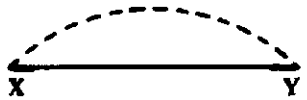
I. Diffraction
II. Refraction
III. Interference

(A) I only
(B) III only
(C) I and III only
(D) I, II and III only

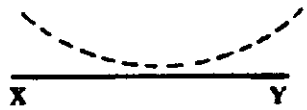
31.

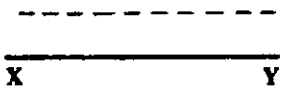


The figure above shows a wave-front about to reach a reflecting surface XY. Which of the following would represent the wavefront after reflection?

(A)


(B)

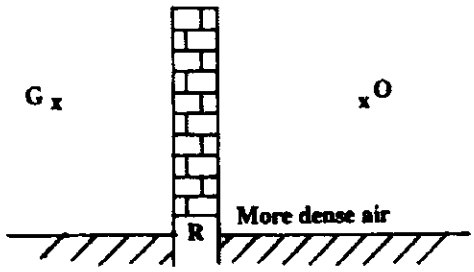

(C)


(D)


32. Sound waves are classified as longitudinal since they

(A) cause the particles of the medium to move along the line of propagation of the waves
(B) require a material medium for transmission
(C) may be produced by vibrating bodies
(D) cause the particles of the medium to move at right angles to the line of propagation of the waves

33.



In the diagram above, R is a tall narrow wall. The report of a gun, fired at G, is heard by an observer at O. Which of the following could account for this fact?

I. Diffraction takes place round the obstacle.
II. The sound waves are longitudinal.
III. Refraction takes place towards the ground.

(A) I only
(B) I and III only
(C) II and III only
(D) I, II and III

34. Which of the following would be involved in a production of fringes in the well-known double-slit experiment?

I. Reflection
II. Refraction
III. Interference

(A) I only
(B) III only
(C) I and III only
(D) I, II and III only

35. Which of the following demonstrates the straight line propagation of light?

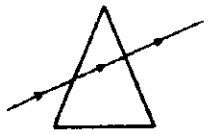
(A) The spreading of light when it passes through a narrow opening
(B) The dispersion of light by a prism
(C) A parallel beam of light coming to a point focus after reflection from a spherical mirror
(D) The formation of shadows

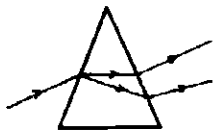
36. For which of the following does the phenomenon of refraction offer an explanation?

I. The apparent bending of a stick in water
II. Swimming pools looking shallower than they really are
III. Formation of a mirage

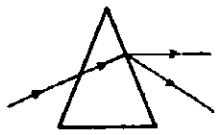
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

37. Which of the diagrams BEST represents the passage of a beam of white light through a triangular glass prism?

(A)


(B)


(C)


(D)


38. A converging lens produces an image which is the same size as the object. It is true to say that the

(A) object is at the principal focus
(B) object is at infinity
(C) image is virtual
(D) image is inverted

GO ON TO THE NEXT PAGE

39. Which of the following would be true of the image formed by the lens of a camera?

I. It is virtual.
II. It is real.
III. It is diminished.
IV. It is upright

(A) I only
(B) II and III only
(C) I and IV only
(D) IV only

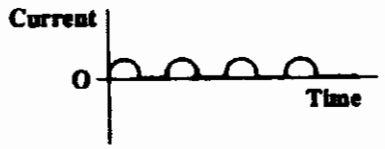
40. Which of the following is NOT one of the ways in which the strength of the magnetic field near a solenoid (long coil) carrying a current can be increased?

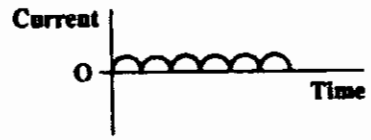
(A) Increasing the resistance of the coil
(B) Increasing the current in the coil
(C) Increasing the number of turns per unit length of the coil
(D) Placing a soft iron core inside the coil

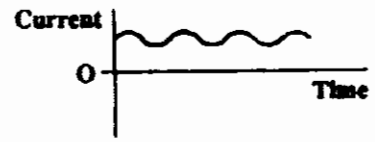
41. Which of the following formulae (in which the symbols have their usual meaning) is a mathematical expression of Ohm's Law?

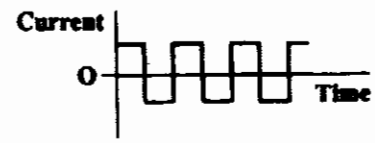
(A) $V = IR$
(B) $P = Vt$
(C) $Q = It$
(D) $E = Pt$

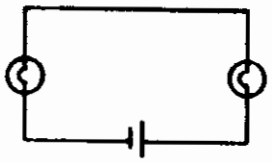
42. Which of the following graphs illustrates an ALTERNATING current?

(A)


(B)


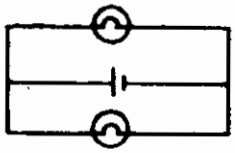
(C)


(D)


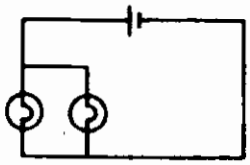


43. The diagram above shows an electrical circuit with a cell and two filament bulbs. Which of the following circuits is electrically the same as the circuit above?

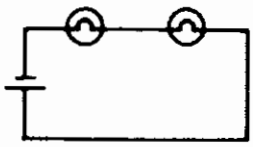
(A)



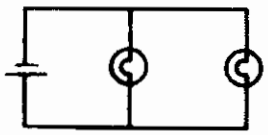
(B)



(C)



(D)



44. Which of the following statements concerning ammeters is correct?

	Its resistance	Circuit connection
(A)	Low	in series
(B)	Low	in parallel
(C)	High	in parallel
(D)	High	in series

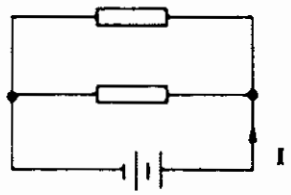
45. Which of the following is true of a secondary cell?

(A) It is formed by connecting two or more primary cells.
(B) It can be recharged by passing a direct current in the same direction as it delivers current.
(C) It can be recharged by passing a direct current in the opposite direction to which it delivers current.
(D) It can be recharged by 'topping up' with dilute sulphuric acid.

46. In an electric water heater the metal parts, not including the heater circuit, are connected to earth by a conductor. The reason for this is to

(A) prevent a short circuit
(B) set up an electric field
(C) set up a potential difference between the metal parts and earth
(D) ensure that the metal parts are kept at the same potential as earth

47.

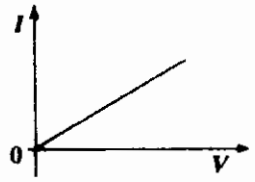


In the parallel circuit shown above, the total current supplied by the battery

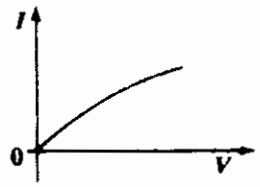
(A) goes through each of the resistors
(B) goes through the largest resistor only
(C) goes through the smallest resistor only
(D) equals the sum of the currents in the two resistors

Item 48 refers to the following *I*-*V* graphs for various conducting media under certain conditions.

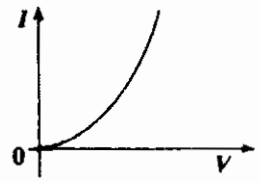
(A)



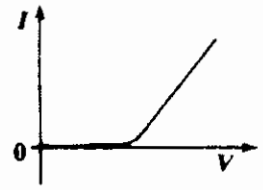
(B)



(C)



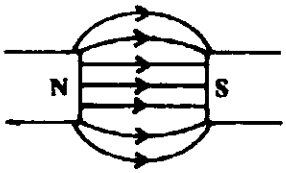
(D)



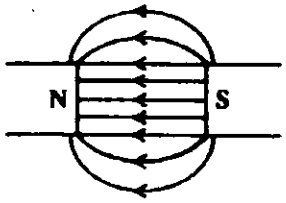
48. Which graph illustrates the relationship between current and applied p.d. for a lamp filament?

49. A north pole and a south pole of two equally strong magnets are brought near each other. If the earth's magnetic field is ignored, the magnetic field lines between the poles would look like

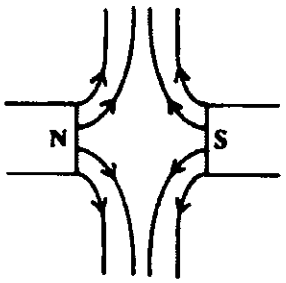
(A)



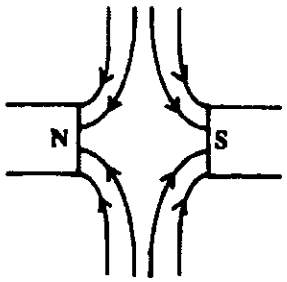
(B)



(C)



(D)

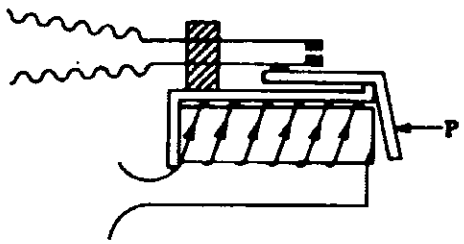


50. A semi-conductor diode produces half-wave rectification of alternating current. Which of the following statements would be true?

I. The current obtained has a constant value.
II. The current obtained flows only in one direction.
III. There are periods when no current flows from the source.

(A) I only
(B) II only
(C) I and III only
(D) II and III only

51.



The diagram above shows a typical relay. The part, labelled P, must be made of

(A) iron
(B) copper
(C) plastic
(D) brass

52. Which of the following is true when a magnet is moved relative to a coil?

I. The induced current is in the same direction as the change causing it.
II. The greater the number of turns of coil the smaller the induced e.m.f.
III. The faster the magnet moves relative to the coil the greater the induced e.m.f.
IV. The stronger the magnet the greater the induced e.m.f.

(A) I and IV only
(B) I and III only
(C) II and III only
(D) III and IV only

GOONTOTHENEXTPAGE

53. A conductor, rotating in a uniform magnetic field, induces maximum instantaneous current when the conductor cuts the magnetic field lines at

(A) 30°
(B) 45°
(C) 90°
(D) 180°

54. An ideal transformer has 6 000 primary turns and 4 000 secondary turns. The secondary current is

(A) 1/2 of the primary current
(B) 2/3 of the primary current
(C) 3/2 times the primary current
(D) twice the primary current

55. α-particles pass through a piece of gold foil. It is observed that some of the α-particles are deflected from their original direction, a very small number of them being deflected through large angles. This experiment provides evidence that

(A) the atom of gold is very small
(B) the atom of gold has a small positively charged nucleus
(C) an α-particle is repelled by the electrons in the gold atom
(D) α-particles are much larger than atoms

56. According to the Rutherford-Bohr model of a neutral, stable atom, if n = number of neutrons, p = number of protons and e = number of electrons in the atom, then for all elements

(A) $n = e$
(B) $p = e$
(C) $n + e = p$
(D) $n + p = e$

57. Which of the following statements may be used to define the term 'half-life'?

I. It is half the time required by a nucleus to decay.
II. It is the time for half of the nuclei of a sample to decay.
III. Time taken for sample undergoing a random decay process, to decay to half its original value

(A) I only
(B) I and II only
(C) II and III only
(D) I, II and III

58. ${}^{x}_{52}\mathrm{Te} \rightarrow {}^{0}_{-1}\mathrm{e} + {}^{137}_{y}\mathrm{I}$

The equation above represents the radioactive decay of a certain nucleus. The values of x and y are.

	x	y
(A)	137	53
(B)	137	52
(C)	137	51
(D)	136	53

59. From which of the following can a sheet of lead of thickness 1 mm provide good protection?

I. α-particles
II. β-particles
III. γ-rays

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

60. Which of the following persons is associated with nuclear energy?

(A) Thompson
(B) Bohr
(C) Chadwick
(D) Einstein

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

1. Which of the following physical quantities does NOT have a unit?

(A) Refractive index
(B) e.m.f.
(C) Density
(D) Frequency

2. The base unit of temperature of the S.I. system is the

(A) degree Celsius
(B) degree Fahrenheit
(C) Kelvin
(D) degree centigrade

3. The mass of a piece of metal is 43.7 g and its volume is 5.6 cm^3. A student uses a calculator to find the density of the metal and obtains the figure 7.803571. He should write the density as

(A) 7.803571 g cm^{-3}
(B) 7.80 g cm^{-3}
(C) 7.8 g cm^{-3}
(D) 8.0 g

4. A simple pendulum oscillates about centre O between positions X and Y. Which of the following could represent one complete oscillation? (The arrows indicate the direction of movement.)

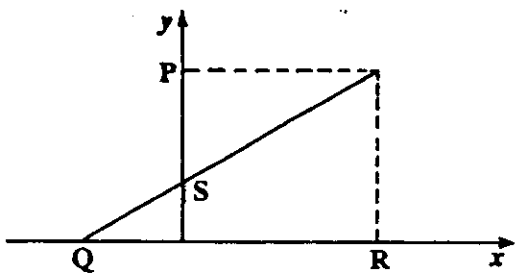
I. $X \rightarrow O \rightarrow Y \rightarrow O \rightarrow X$
II. $O \rightarrow X \rightarrow O \rightarrow Y \rightarrow O$
III. $Y \rightarrow O \rightarrow X$

(A) I only
(B) III only
(C) I and II only
(D) I, II and III

5. The unit of electrical resistance may be expressed as

(A) $1\Omega = 1\ V.A^{-1}$
(B) $1\Omega = 1\ A.V$
(C) $1\Omega + 1\ A.V^{-1}$
(D) $1\Omega = 1\ W.A^{-1}$

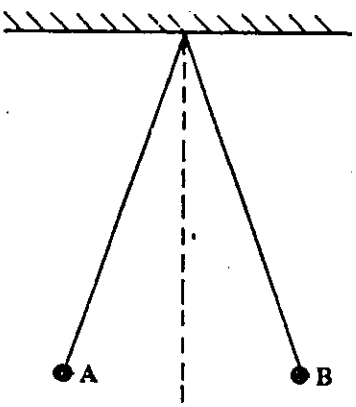
6. Item 6 refers to the diagram below.



When $x = 0$, the value of y is

(A) Q
(B) S
(C) P
(D) P/R

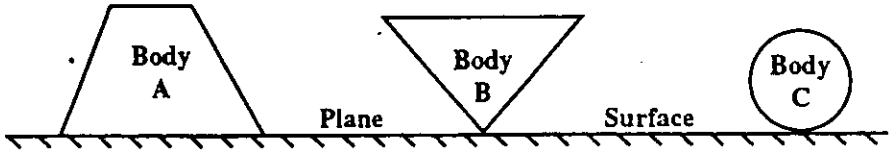
7.



Two light, styrofoam spheres, A and B, are suspended by insulating threads. If they are at rest in the positions shown in the diagram, the force keeping them apart is

(A) gravitational force
(B) electrostatic force
(C) magnetic force
(D) centripetal force

8. In relation to the diagrams below, which of the following statements is/are correct?



I. Body A is in neutral equilibrium.
II. Body B is in unstable equilibrium.
III. Body C is in stable equilibrium.

(A) II only
(B) I and II only
(C) II and III only
(D) I, II and III

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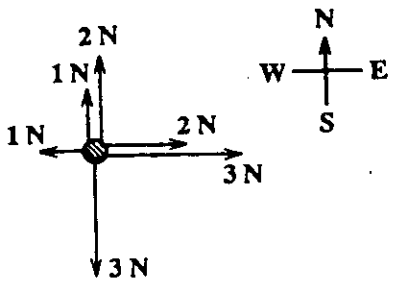
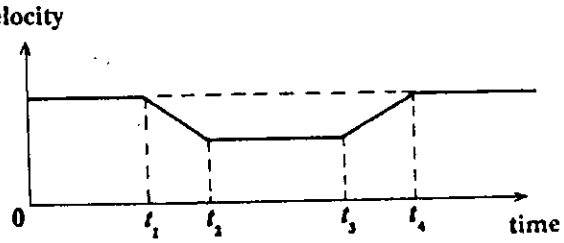
9. Six forces act on a ball as shown in the diagram below. In which direction would you expect the ball to accelerate?



(A) North
(B) South
(C) East
(D) West

10. 

The diagram shows a velocity/time graph for a moving object. Which of the following statements about the object would be true?

I. It returns to its starting point.
II. It has zero acceleration between times t_2 and t_3.
III. Its velocity at t_4 is the same as its initial velocity.

(A) II only
(B) I and II only
(C) II and III only
(D) I, II and III

11. If the resultant force on an object is zero, the object can move with

(A) decreasing velocity
(B) constant velocity
(C) constant acceleration
(D) increasing velocity

12. The constant unbalanced force acting on a body is at right angles to its velocity. Which of the following statements about this motion is correct?

(A) The body has no acceleration.
(B) The kinetic energy of the body is increasing.
(C) The body is slowing down.
(D) The body is moving in a circular path.

13. Which of the following is a unit of work?

(A) $kg\ m\ s^{-2}$
(B) $N\ m^{-2}$
(C) $N\ m$
(D) $J\ s^{-1}$

14. Two bodies, of masses m and 2m, have the some kinetic energy. If the velocity of the smaller body is v, what is the velocity of the other body?

(A) $\frac{v}{\sqrt{2}}$

(B) $\frac{v}{2}$

(C) $\sqrt{2v}$

(D) $2v$

15. A heavy parcel is tied with string. It is less painful for a person to pick up the parcel if a cloth is wrapped around the string. This is because the cloth

(A) exerts less force on the fingers
(B) reduces the tension in the string
(C) makes the parcel lighter
(D) reduces the pressure on the fingers

16. A balloon filled with hydrogen gas and released accelerates upwards. The balloon must therefore have displaced a weight of air

(A) less than its own weight
(B) equal to its own weight
(C) greater than its own weight
(D) equal to the weight of the basket and fabric only

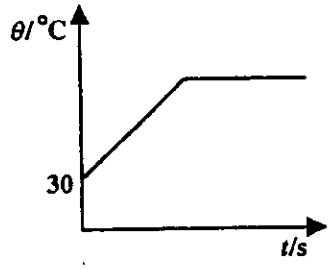
17. A flask contains air under pressure. Some of the air is let out slowly over a period of 10 s. When the flask is closed the

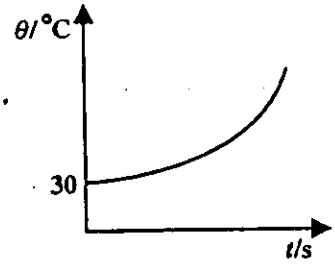
(A) pressure of the air in the flask will have increased
(B) volume of air in the flask will have decreased
(C) temperature in the flask will have increased
(D) number of molecules striking the wall per second will have decreased

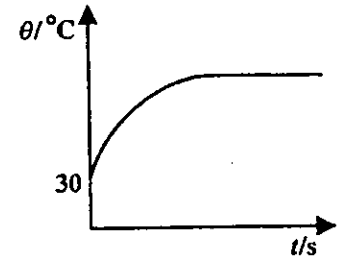
18. The specific heat capacity of a material is the energy required to

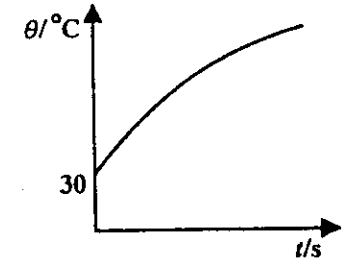
(A) melt 1 kg of the material with no change of temperature
(B) change the temperature of the material by 1 K
(C) change 1 kg of the liquid material to 1 kg of gas without a change in temperature
(D) change the temperature of 1 kg of the material by 1 K

19. An uninsulated closed container with water is heated from room temperature (30°C) until all the water has evaporated. Which of the following graphs most accurately represents the variation of water temperature (θ) with time (t)?

(A)


(B)


(C)


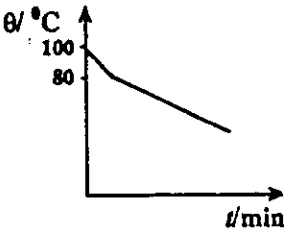
(D)


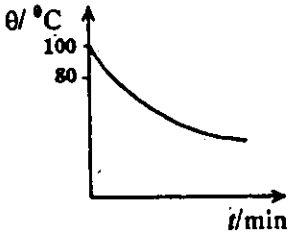
20. Which of the following would be responsible for the heating of the Earth by the Sun?

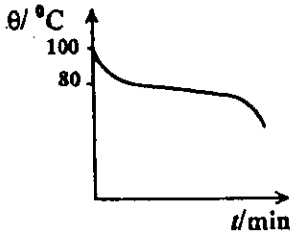
I. Radiation
II. Convection
III. Conduction

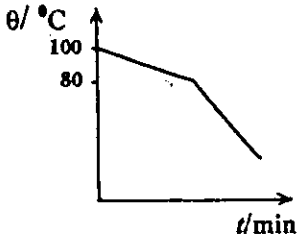
(A) I only
(B) III only
(C) I and II only
(D) II and III only

21. Some molten naphthalene at 100°C is allowed to cool down at room temperature. If naphthalene has a melting point of 80°C, which of the following BEST represents the cooling curve?

(A)


(B)


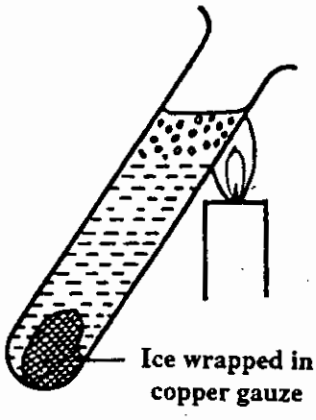
(C)


(D)


22. An experiment is set up with a smoke cell for demonstrating Brownian motion. The moving specks observed are

(A) smoke particles seen by reflected light
(B) smoke particles in constant vibration
(C) molecules of vibrating air
(D) molecules of carbon in random

23.



The figure above shows a piece of ice wrapped in copper gauze and submerged in a glass test tube of water. The water when heated at the top boils long before the ice is melted. The MAIN reason for this is that

(A) the test tube is a poor conductor of heat
(B) copper is a good conductor of heat
(C) ice is less dense than water
(D) water is a poor conductor of heat

24. Radiation is BEST absorbed by surfaces which are

(A) black and shiny
(B) white and shiny
(C) black and dull
(D) white and dull

25. According to the kinetic theory, when a gas in a closed container is heated the pressure rises because

(A) there are more molecules hitting the walls of the container
(B) the molecules move faster and hit each other harder and more often
(C) the molecules move faster and hit the walls of the container with greater force and with greater frequency
(D) the molecules expand and push harder on the walls of the container

26. Water waves which are produced in a ripple tank travel more slowly as they move from deep to shallow water. Which of the following can this fact be used to demonstrate?

I. Reflection
II. Refraction
III. Diffraction

(A) I only
(B) II only
(C) I and III only
(D) I, II and III

27. The note from a drum is louder when it is struck harder because the sound waves produced have a greater

(A) amplitude
(B) frequency
(C) wavelength
(D) velocity

28. Which of the following would have the shortest wavelength?

(A) Infra-red rays
(B) Light rays
(C) Sound waves
(D) Water waves

29. Which of the following statements is/are true?

I. Thermal radiation is a type of electromagnetic radiation.
II. Blue light has a longer wavelength than infra-red radiation.
III. The velocity of X-rays in a vacuum is 300 000 000 m s^{-1}.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

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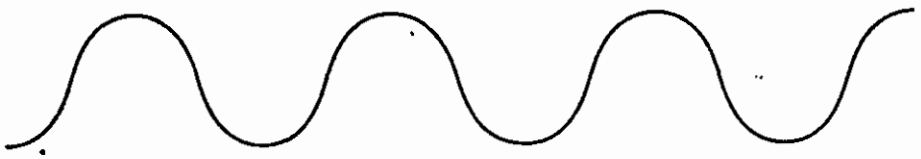
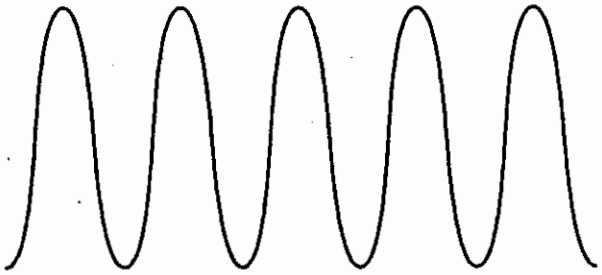
30.



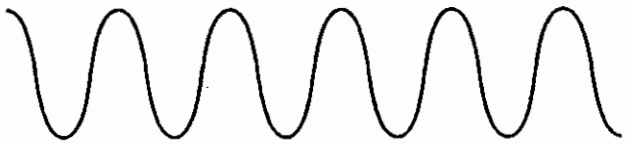
The figure above shows the profile of a water wave. Using the same scale, which diagram below represents a wave twice the frequency and half the amplitude in the same tank of water?

(A)

(B)



(C)



(D)

31. The sharp edges of shadows suggest that light

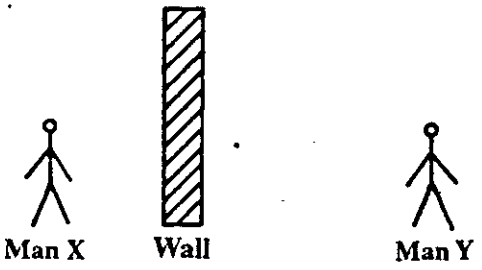
(A) has a wave nature
(B) is a form of energy
(C) travels in straight lines
(D) travels very quickly

32. Which of the following would be involved in the production of fringes in a Young's double-slit experiment?

I. Diffraction
II. Refraction
III. Interference

(A) I only
(B) III only
(C) I and III only
(D) I, II and III

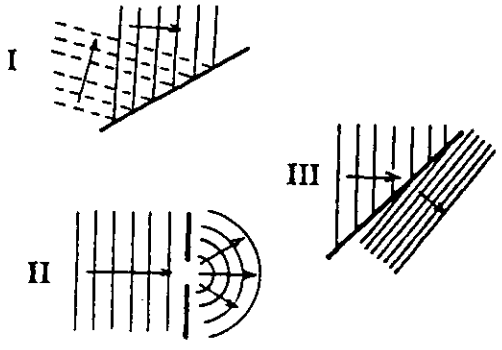
33.



Man X can hear man Y shouting but he cannot see him mainly because sound

(A) is a longitudinal wave, and therefore does not travel in straight lines
(B) has a greater amplitude, and therefore passes around obstacles whereas light does not
(C) has a slower speed, and therefore has more time to pass around obstacles than light does
(D) has a longer wavelength, and therefore diffracts around obstacles more than light does

34. Which of the following diagrams below could represent diffraction of water waves in a ripple tank?



(A) I only
(B) II only
(C) I and II only
(D) II and III only

35. For which of the following does the phenomenon of refraction offer an explanation?

I. The apparent bending of a stick in water
II. Swimming pools looking shallower than they really are
III. The landscape 'shimmering' on a hot day

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

36. A ray of light in air strikes a glass block at an angle of incidence of 0°. The light will be

(A) undeviated
(B) totally reflected
(C) refracted at 90° to normal
(D) refracted at an unknown angle

37. A virtual image

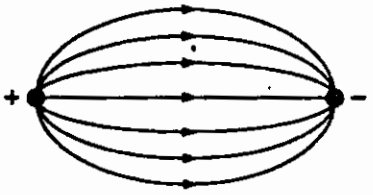
(A) has no light rays actually passing through it
(B) is always magnified
(C) can be projected onto a screen
(D) is always laterally inverted

38. A converging lens produces an image which is the same size as the object. It is true to say that the

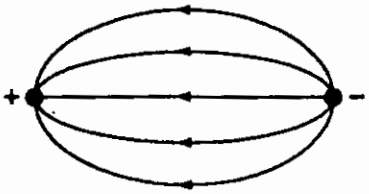
(A) object is at the principal focus
(B) object is at infinity
(C) image is virtual
(D) image is inverted

39. Which of the following diagrams represents the electric field existing between two oppositely charged point charges?

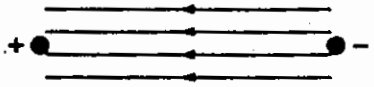
(A)



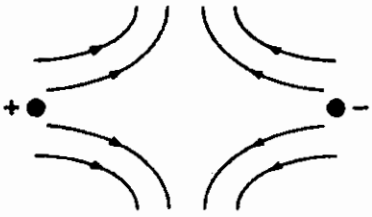
(B)



(C)



(D)



40. An electric current in a metal consists of a flow of

(A) neutrons
(B) protons
(C) electrons
(D) ions

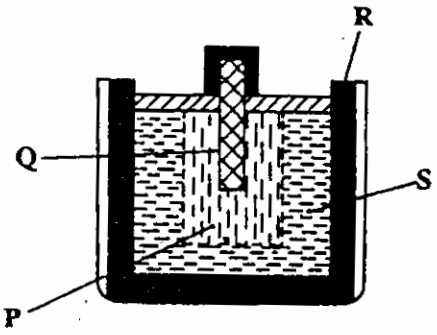
41. Which of the following appliances would require the fuse with the largest rating?

(A) A kettle marked 1 800 W 120 V
(B) A freezer marked 360 W 120 V
(C) An iron marked 1 200 W 240 V
(D) A stove marked 12 000 W 240 V

42. Which of the following formulae (in which the symbols have their usual meaning) is a mathematical expression of Ohm's Law?

(A) $V = IR$
(B) $P = VI$
(C) $Q = IT$
(D) $E = PT$

43. The diagram below shows the construction of a zinc-carbon cell.



Which of the following is correct?

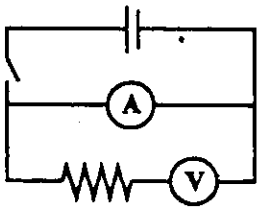
(A) Q is carbon, R is zinc.
(B) P is copper oxide, Q is carbon.
(C) R is iron and S is ammonium chloride.
(D) S is sulphuric acid and P is manganese dioxide.

44. Which of the following concerning ammeters is correct?

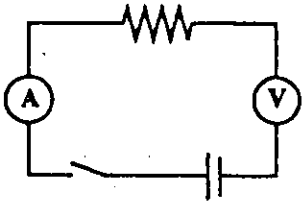
	Its resistance	Circuit Connection
(A)	Low	in series
(B)	Low	in parallel
(C)	High	in parallel
(D)	High	in series

45. A student requires a circuit to measure the resistance of a resistor. Which of the circuits below is correctly connected?

(A)



(B)



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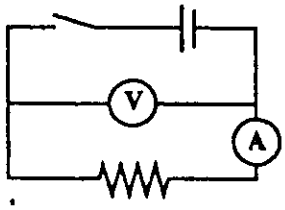

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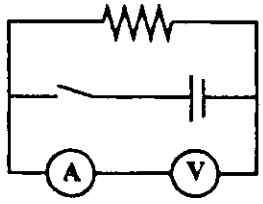


46. Which of the following relationships gives a correct value for the combined resistance of resistors R_1, R_2, and R_3 connected in parallel?

(A) $R_T = R_1 + R_2 + R_3$

(B) $R_T = \dfrac{R_1 R_2 R_3}{R_1 + R_2 + R_3}$

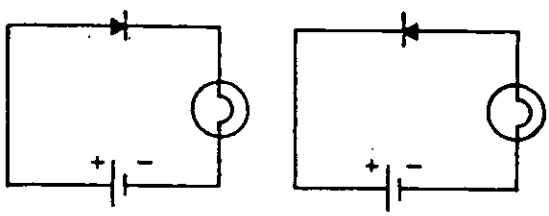
(C) $R_T = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \dfrac{1}{R_3}$

(D) $\dfrac{1}{R_T} = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \dfrac{1}{R_3}$

47. Which of the following pairs of statements is true for both iron and steel?

	Iron is	Steel
(A)	easily magnetised	does not retain magnetism
(B)	not easily magnetised	retains its magnetism well
(C)	easily magnetised	retains its magnetism well
(D)	not easily magnetised	does not retain its magnetism

48.



A experiment was conducted using the circuit diagrams shown above. The same components were used and the bulb was lit to normal brightness in each case.

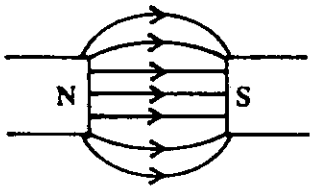
Which of the following statements would be correct?

I. The bulb is defective.
II. The battery is defective.
III. The diode is defective.

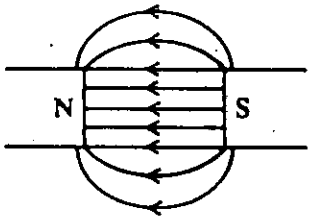
(A) I only
(B) III only
(C) I and II only
(D) II and III only

A north pole and a south pole of two equally strong magnets are brought near to each other. If the earth's magnetic field is ignored, the magnetic field lines between the poles would look like

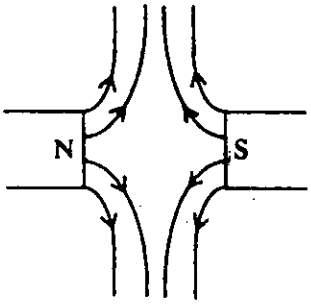
(A)



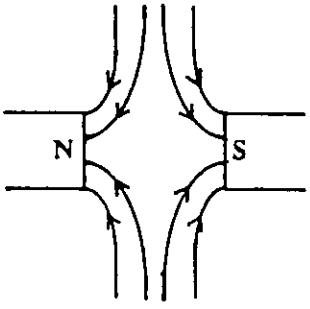
(B)



(C)



(D)

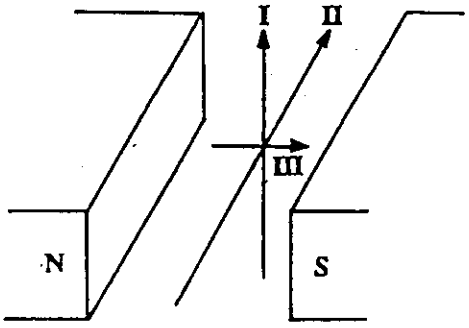


50. An electromagnet consists of insulated wire wrapped around an iron core.

It works because

(A) iron is a good electrical conductor
(B) a magnetic field is produced inside the coil
(C) an electric field is produced inside the coil
(D) iron is always magnetised

51.



The figure above shows two permanent magnets and three wires carrying current in the directions indicated. On which wire(s) will a force be exerted?

(A) I only
(B) II only
(C) I and II only
(D) I, II and III

52. Which of the following make use of the magnetic field generated by an electric current?

I. d.c. motor
II. Moving coil/loudspeaker
III. Electric iron

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

53. A conductor, rotating in a uniform magnetic field, induces maximum instantaneous current when the conductor cuts the magnetic field lines at

(A) 30°
(B) 45°
(C) 90°
(D) 180°

54. An electricity company supplies a.c. rather than d.c. to the consumer. This is because

(A) its generators cannot produce d.c.
(B) most electrical appliances cannot run on d.c.
(C) a.c. can be generated at a higher voltage than d.c.
(D) a.c. can be stepped up to a higher voltage whereas d.c. cannot

55. The Rutherford model of the atom suggests that an atom consists of a

(A) solid mass of protons and electrons
(B) nucleus of protons only with orbiting electrons
(C) nucleus of equal numbers of neutrons and electrons with orbiting protons
(D) nucleus of protons and neutrons with orbiting electrons

Item 56 refers to the following table.

Nuclei	Mass No.	Neutron Number
P	16	8
Q	13	9
R	18	10
S	21	11

56. Which pair of nuclei are isotopes?

(A) P and Q
(B) Q and R
(C) P and R
(D) Q and S

57. Which of the following electromagnetic radiations is produced only by a change in a nucleus?

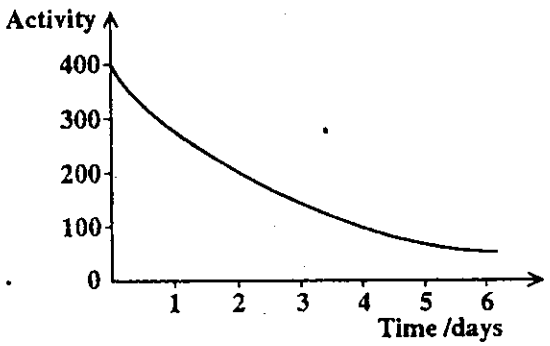
(A) Ultra-violet radiation
(B) Infra-red radiation
(C) Gamma radiation
(D) Radio waves

58. The element cobalt is represented by the expression $^{60}_{27}Co$.

This means that its neutron number is

(A) 27
(B) 33
(C) 60
(D) 87

59.



The activity of a radioactive substance was measured at suitable intervals over a period of days and its radioactive decay curve plotted. The half life is

(A) 1 day
(B) 2 days
(C) 3 days
(D) 4 days

60. Which of the following scientists discovered that the nucleus also contained neutrons?

(A) Niels Bohr
(B) James Chadwick
(C) Marie Curie
(D) Joseph Thompson

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

AFFIX SEAL HERE

CANDIDATE – PLEASE NOTE!

You must sign below and return this booklet with the Answer Sheet. Failure to do so may result in disqualification.

Signature

FORM TP 23119

TEST CODE **002401**

JUNE 2003

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 1/4 hours

30 MAY 2003 (a.m.)

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. In addition to this test booklet, you should have an answer sheet.
2. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
3. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

The SI unit of length is the

(A) newton
(B) metre
(C) kilogram
(D) second

Sample Answer

Ⓐ ● Ⓒ Ⓓ

The best answer to this item is "metre" so answer space (B) has been shaded.

4. If you want to change your answer, be sure to erase your old answer completely and fill in your new choice.
5. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, omit it and go on to the next one. You can come back to the harder item later. Your score will be the total number of correct answers.
6. Figures are not necessarily drawn to scale.
7. You may do any rough work in this booklet.
8. The use of non-programmable calculators is allowed.
9. This test consists of 60 items. You will have 75 minutes to answer them.
10. Do not be concerned that the answer sheet provides spaces for more answers than there are items in this test.

AFFIX SEAL HERE

23119

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

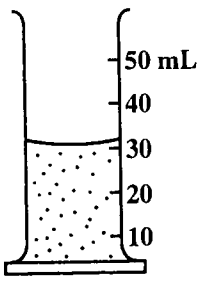
1. The unit of electrical resistance may be expressed as

(A) $1\ \Omega = 1\ VA^{-1}$
(B) $1\ \Omega = 1\ AV$
(C) $1\ \Omega = 1\ AV^{-1}$
(D) $1\ \Omega = 1\ WA^{-1}$

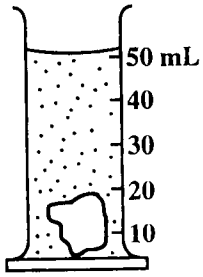
2. Which of the following is NOT a fundamental quantity?

(A) Temperature
(B) Heat energy
(C) Length
(D) Time

3.



100 g
Figure 1



160 g
Figure 2

Figure 1 shows a measuring cylinder containing a fixed volume of liquid. Figure 2 shows a solid body submerged in the liquid. In each case, the total mass of the container and its contents is indicated. The density of the solid is

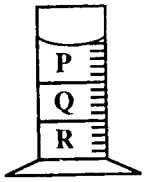
(A) $0.30\ g\ mL^{-1}$
(B) $0.33\ g\ mL^{-1}$
(C) $3.00\ g\ mL^{-1}$
(D) $3.20\ g\ mL^{-1}$

4. Which of the following is suitable for measuring the diameter of a human hair?

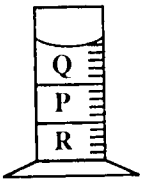
(A) Tape measure
(B) Vernier calipers
(C) Micrometer screw gauge
(D) Metre rule

5. Three immiscible liquids P, Q and R have densities which differ. Q is denser than P but less dense than R. Which of the following diagrams shows how the liquids settle in the measuring cylinder?

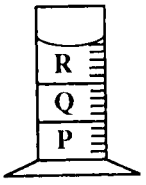
(A)



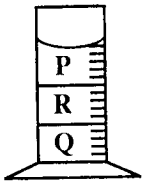
(B)



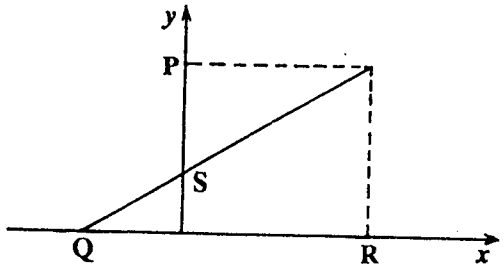
(C)



(D)



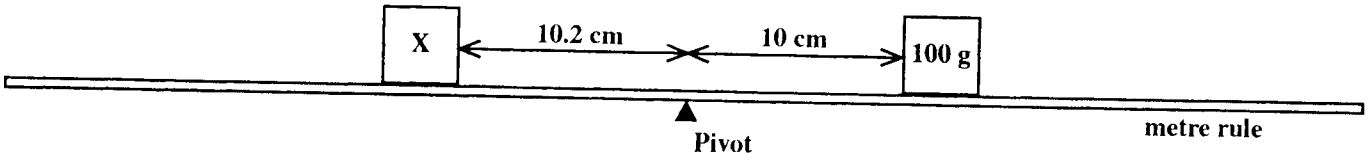
Item 6 refers to the diagram below.



6. When $x = 0$, the value of y is

(A) Q
(B) S
(C) P
(D) P/R

7.



The diagram above represents a 100 g mass which can be balanced by placing a mass X at the position shown. If Mass X is to be used to balance the 100 g, it should be

(A) less than 100 g
(B) equal to 100 g
(C) a little greater than 100 g
(D) about 200 g

---

8. Which of the following is NOT true about the moment of a force?

(A) It is measured in units called newton-metres.
(B) It is the amount of force needed to keep a body turning.
(C) It is the turning effect that a force has when it acts on a body.
(D) It is the product of the force and the perpendicular distance of its line of action from a point.

9. A stable well-designed racing car must have a

(A) low centre of gravity
(B) very large mass
(C) very high drag (air-resistance)
(D) long front

GO ON TO THE NEXT PAGE

10. Which of the following is NOT a vector quantity?

(A) Displacement
(B) Acceleration
(C) Density
(D) Momentum

11. Which of the following can be used to find the speed of an object?

(A) $\frac{\text{Change in velocity}}{\text{Time taken}}$

(B) $\frac{\text{Change in displacement}}{\text{Time taken}}$

(C) $\frac{\text{Distance travelled}}{\text{Time taken}}$

(D) Distance travelled x Time taken

12. When two bodies collide, momentum is conserved. This means that the

(A) kinetic energy before impact is equal to that after impact
(B) momentum of each body is unchanged after impact
(C) algebraic sum of the velocities before impact is equal to the sum of the velocities after impact
(D) total momentum of the bodies before impact is equal to the total momentum of the bodies after impact

13. A book of weight 12 N is resting on a table. The force that the table exerts on the book is

(A) 0 N
(B) greater than 0 N but less than 12 N
(C) 12 N
(D) greater than 12 N

14. An object is removed from the ground and placed on a shelf. Which of its properties would you expect to change?

(A) Mass
(B) Volume
(C) Potential energy
(D) Kinetic energy

15. The kinetic energy of a body of mass, m, and velocity, v, is

(A) $\frac{m}{v}$

(B) mv

(C) mv^2

(D) $\frac{mv^2}{2}$

16. A liquid is contained in a beaker. It is true to say that the pressure

(A) is greatest at the bottom of the liquid
(B) is greatest at the surface of the liquid
(C) is the same at all levels in the liquid
(D) exerted by the liquid is the same as atmospheric pressure

17. Which of the following units is used to measure the force per unit area on a surface?

(A) The newton (N)
(B) The watt (W)
(C) The joule (J)
(D) The pascal (Pa)

GO ON TO THE NEXT PAGE

18. Which of the following is longitudinal in nature?

(A) Infrared rays
(B) Light rays
(C) Sound waves
(D) Water waves

19. Which of the following is responsible for the glasshouse effect?

(A) Microwaves
(B) Ultraviolet rays
(C) Light rays
(D) Infrared rays

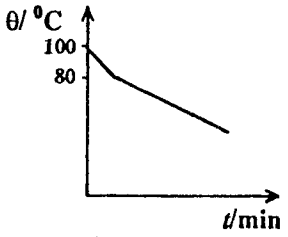
20. Which of the following is correct?

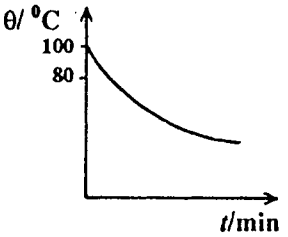
(A) $T/K = \theta/°C = 273$
(B) $T/K = \theta/°C + 273$
(C) $T/K = 273\ \theta/°C$
(D) $273\ T/K = \theta/°C$

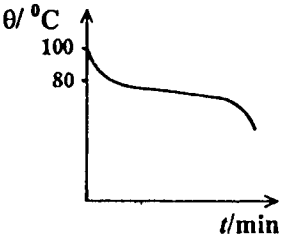
21. The specific heat capacity of a material is the energy required to

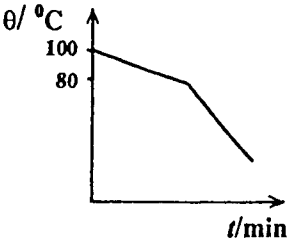
(A) melt 1 kg of the material with no change of temperature
(B) change the temperature of the material by 1 K
(C) change 1 kg of the liquid material to 1 kg of gas without a change in temperature
(D) change the temperature of 1 kg of the material by 1 K

22. Some molten naphthalene at 100°C is allowed to cool down at room temperature. If naphthalene has a melting point of 80°C, which of the following BEST represents the cooling curve?

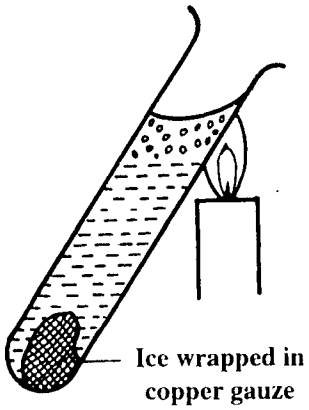
(A)


(B)


(C)


(D)


23.



The figure above shows a piece of ice wrapped in copper gauze and submerged in a glass test tube of water. The water when heated at the top boils long before the ice is melted. The MAIN reason for this is that

(A) the test tube is a poor conductor of heat
(B) copper is a good conductor of heat
(C) ice is less dense than water
(D) water is a poor conductor of heat

24. An electric kettle full of water is plugged into the mains. The process by which heat travels through the water is

(A) electrification
(B) evaporation
(C) convection
(D) radiation

25. When a gas is heated in a closed container at a constant volume, the pressure of the gas rises. Which of the following statements concerning this fact is/are TRUE?

I. The pressure rises because the gas molecules strike the walls for the container with greater momentum.
II. The pressure rises because the gas molecules now collide with the walls of the container more frequently.
III. The pressure rises because the forces between the gas molecules are larger at higher temperatures.

(A) I only
(B) I and II only
(C) II and III only
(D) I, II and III

26. A flask contains air under pressure. Some of the air is let out slowly over a period of 10 s. When the flask is closed the

(A) pressure of the air in the flask will have increased
(B) volume of air in the flask will have decreased
(C) temperature in the flask will have increased
(D) number of molecules striking the wall per second will have decreased

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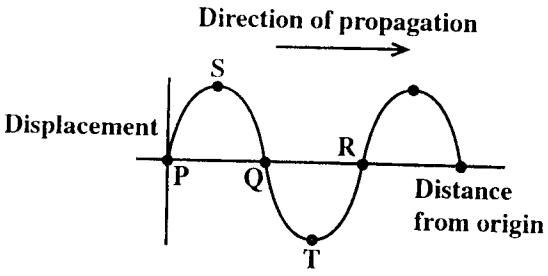
27.

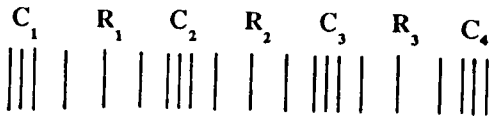


Which of the following statement(s) about the wave shown in the diagram above is/are TRUE?

I. Points P, Q and R are in phase.
II. Points S and T are out of phase.
III. The wavelength of the wave is the distance PR.

(A) I only
(B) II only
(C) I and II only
(D) II and III only

28.



The diagram above represents a longitudinal wave where, C and R represent compressions and rarefactions respectively. If λ is the wavelength, the distance between C_1 and R_2 is

(A) $\frac{1}{2}\lambda$

(B) $1\frac{1}{2}\lambda$

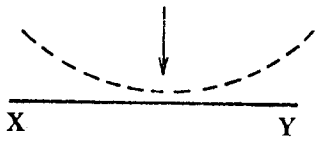
(C) 1λ

(D) 2λ

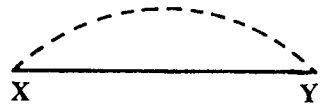
29. Plane water waves which travel from deep water to shallow water

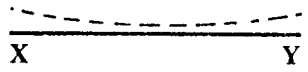
(A) are diffracted
(B) increase their speed
(C) undergo a change in frequency
(D) undergo a change in wavelength

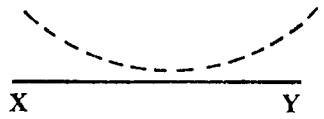
30.

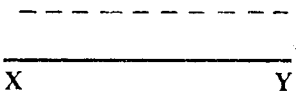


The figure above shows a wavefront about to reach a reflecting surface XY. Which of the following would represent the wavefront after reflection?

(A) 

(B) 

(C) 

(D) 

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31. Which of the following statements about sound is NOT correct?

(A) Sound is transmitted as transverse waves.
(B) Sound may be produced by vibrating systems.
(C) Sound does not travel through a vacuum.
(D) Sound travels more slowly than light.

32. Which of the following types of radiation is responsible for an atom of $^{14}_{6}C$ changing into an atom of $^{14}_{7}N$?

(A) α
(B) β
(C) γ
(D) Infrared

33. The sharp edges of shadows suggest that light

(A) has a wave nature
(B) is a form of energy
(C) travels in straight lines
(D) travels very quickly

34. The table below lists the refractive indices of four different materials

Material	Refractive Index
Air	1.0
Ice	1.3
Perspex	1.5
Diamond	2.4

In which medium would the light waves have the slowest speed?

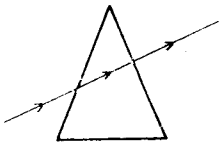
(A) Air
(B) Ice
(C) Perspex
(D) Diamond

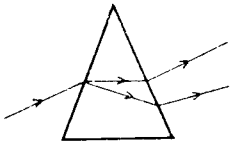
35. Which of the following would be true of the image of an object placed at the bottom of a tank of water and viewed vertically from above?

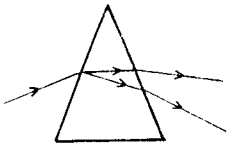
I. It is virtual.
II. It is diminished.
III. It is nearer to the eye than the object.

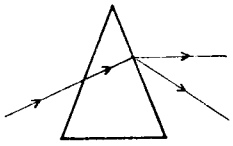
(A) I only
(B) I and II only
(C) I and III only
(D) II and III only

36. Which of the diagrams BEST represents the passage of a beam of white light through a triangular glass prism?

(A) 

(B) 

(C) 

(D) 

37. The image on the film of a camera is usually

(A) inverted, diminished, real
(B) inverted, diminished, virtual
(C) upright, diminished, real
(D) upright, magnified, real

GO ON TO THE NEXT PAGE

38. For which of the following object distances will a convex lens of focal length 18 cm produce a real image?

I. 15 cm
II. 36 cm
III. 54 cm

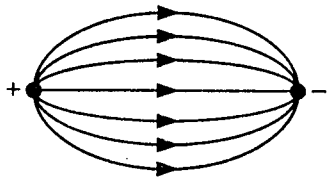
(A) I only
(B) I and II only
(C) II and III only
(D) I, II and III

39. A plastic rod, P, is rubbed with cloth, Q. P becomes positively charged. This is because

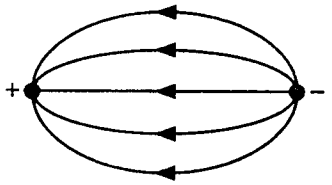
(A) protons flowed from Q to P
(B) protons flowed from P to Q
(C) electrons flowed from Q to P
(D) electrons flowed from P to Q

40. Which of the following diagrams represents the electric field existing between two oppositely charged point charges?

(A)

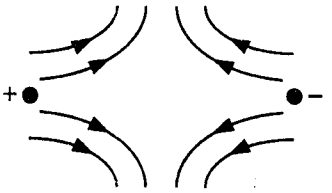


(B)



(C)

(D)



41. The current in a wire is one ampere if a charge of

(A) 10 coulombs flows through it for 10 seconds
(B) 1 coulomb flows through it in 10 seconds
(C) 10 coulombs flow through it in 1 second
(D) 100 coulombs flows through it in 10 seconds

42. Which of the following formulae (in which the symbols have their usual meaning) is a mathematical expression of Ohm's Law?

(A) $V = IR$
(B) $P = VI$
(C) $Q = It$
(D) $E = Pt$

43. A beam of light passes from one medium to another of greater refractive index. When it refracts the

(A) frequency changes
(B) wavelength changes
(C) speed increases
(D) beam bends away from the normal

44. The refractive index of a transparent medium with a critical angle, c, for light travelling from the medium to air is

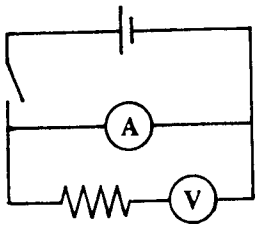
(A) $\frac{1}{c}$

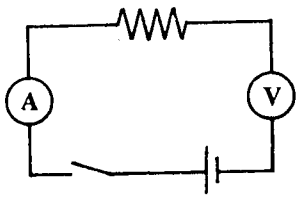
(B) $\frac{90°}{\sin c}$

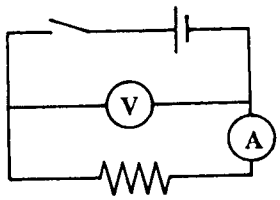
(C) $\frac{\sin 90°}{\sin c}$

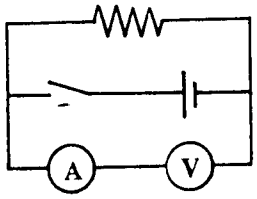
(D) $\sin c$

45. A student requires a circuit to measure the resistance of a resistor. Which of the circuits below is correctly connected?

(A)


(B)


(C)


(D)


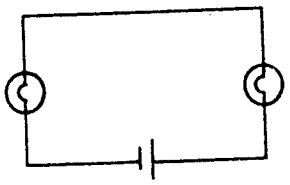
46. When a large current passes through a fuse, which of the following is the sequence of events?

(A) Wire gets hot → wire melts → current is cut off

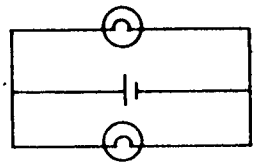
(B) Wire gets hot → current is cut off → wire melts

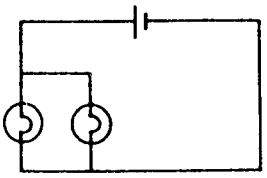
(C) Wire melts → current is cut off → wire gets hot

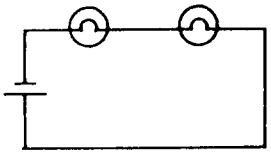
(D) Wire melts → wire gets hot → current is cut off

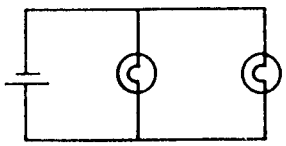
47.


The diagram above shows an electrical circuit with a cell and two filament bulbs. Which of the following circuits is electrically the same as the circuit above?

(A)


(B)


(C)


(D)


48. Rectification can BEST be done by using a

(A) transformer
(B) capacitor
(C) transistor
(D) diode

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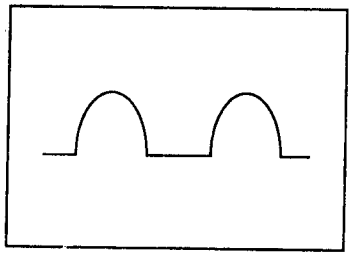
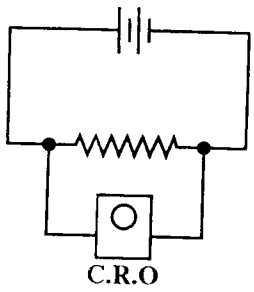
49.

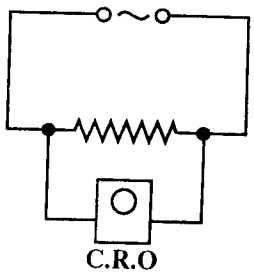


Which of the circuits below could produce the trace on the oscilloscope screen shown in the diagram above when the ends of the resistor are connected to the Y plates?

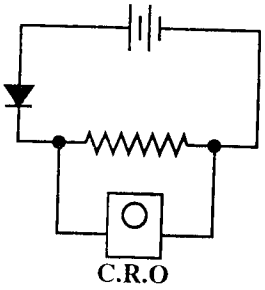
(A)



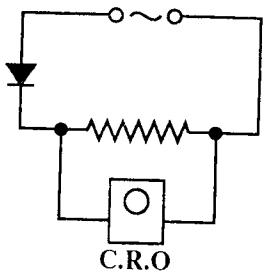
(B)



(C)



(D)



50. Steel is NOT suitable for use in an electro-magnet because it

(A) is too difficult to magnetise
(B) retains magnetism too well
(C) loses its magnetism too easily
(D) contains too many domains

51. Which of the following CANNOT be deflected by a magnetic field?

(A) Alpha particles
(B) Beta particles
(C) Gamma rays
(D) Electrons

52. Which of the following are definitions of the term 'half-life' of radioactive nuclide?

I. The time taken for the activity of any given sample to fall to half its original value
II. The time taken for half the nuclei present in any given sample to decay
III. Half the average number of disintegrations per second

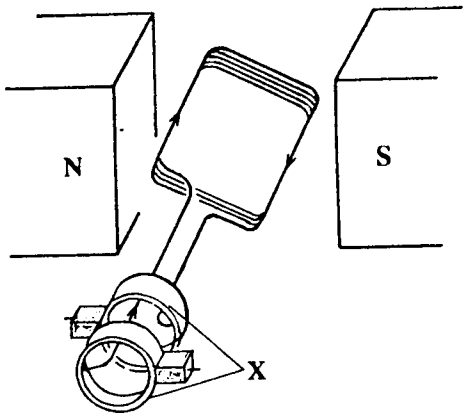
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

53. Which of the following persons is associated with nuclear energy?

(A) Thompson
(B) Bohr
(C) Chadwick
(D) Einstein

GO ON TO THE NEXT PAGE

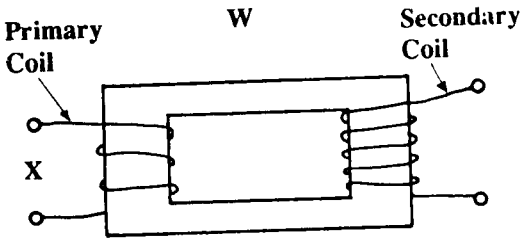
Item 54 refers to the following diagram of a simple a.c. generator.



54. The parts labelled X in the diagram are known as the

(A) coil
(B) armature
(C) slip rings
(D) commutator

Item 55 refers to the following diagram.



55. Appropriate labels for W and X would be

	W	X
(A)	step-down transformer	a.c. input
(B)	step-down transformer	d.c. input
(C)	step-up transformer	a.c. input
(D)	step-up transformer	d.c. input

56. A conductor, rotating in a uniform magnetic field, induces maximum instantaneous current when the conductor cuts the magnetic field lines at

(A) 30°
(B) 45°
(C) 90°
(D) 180°

57. The Rutherford model of the atom suggests that an atom consists of a

(A) solid mass of protons and electrons
(B) nucleus of protons only with orbiting electrons
(C) nucleus of equal numbers of neutrons and electrons with orbiting protons
(D) nucleus of protons and neutrons with orbiting electrons

58. According to the Rutherford-Bohr model of a neutral, stable atom, if n = number of neutrons, p = number of protons and e = number of electrons in the atom, then for all elements

(A) $n = e$
(B) $p = e$
(C) $n + e = p$
(D) $n + p = e$

59. Which of the following is NOT affected by an electric field?

(A) Alpha particle
(B) Beta particle
(C) Neutron
(D) Electron

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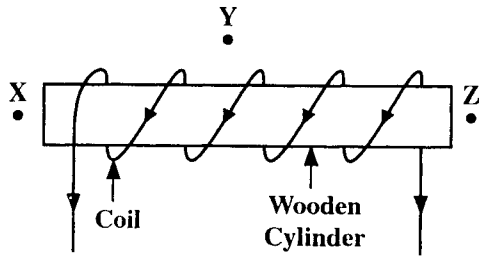
Item 60 refers to the following diagram of a coil carrying a current and wrapped around a wooden cylinder.



60. Which row of the table below shows the magnetic field directions at X, Y and Z?

	X	Y	Z
A	←	→	←
B	←	←	→
C	→	←	←
D	→	←	→

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

AFFIX SEAL HERE

CANDIDATE – PLEASE NOTE!

You must sign below and return this booklet with the Answer Sheet. Failure to do so may result in disqualification.

Signature

FORMTP 2004123

TEST CODE 01238020

MAY/JUNE 2004

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

PHYSICS

Paper 01 – General Proficiency

75 minutes

07 JUNE 2004 (a.m.)

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. In addition to this test booklet, you should have an answer sheet.
2. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
3. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

The SI unit of length is the

(A) newton
(B) metre
(C) kilogram
(D) second

Sample Answer

Ⓐ ● Ⓒ Ⓓ

The best answer to this item is "metre" so answer space (B) has been shaded.

4. If you want to change your answer, be sure to erase your old answer completely and fill in your new choice.
5. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, omit it and go on to the next one. You can come back to the harder item later. Your score will be the total number of correct answers.
6. Figures are not necessarily drawn to scale.
7. You may do any rough work in this booklet.
8. The use of non-programmable calculators is allowed.
9. This test consists of 60 items. You will have 75 minutes to answer them.
10. Do not be concerned that the answer sheet provides spaces for more answers than there are items in this test.

AFFIX SEAL HERE

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

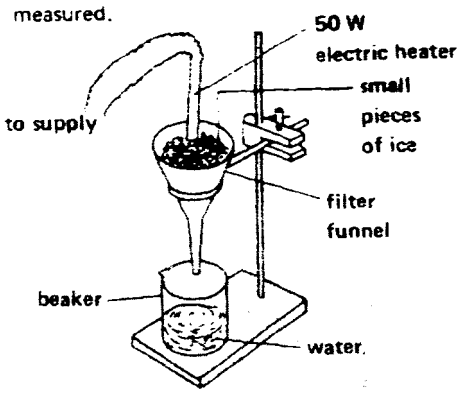
1. The unit of electrical resistance may be **expressed** as

(A) $1\Omega = 1\ V.A^{-1}$
(B) $1\Omega = 1\ A.V$
(C) $1\Omega = I\ A.V^{-1}$
(D) $1\Omega = 1\ W.A^{-1}$

2. 1 gram is equal to

(A) 10 milligrams
(B) 100 milligrams
(C) 1 000 milligrams
(D) 10000 milligrams

3. By switching on the heater in the following apparatus for a known time and weighing the water collected in the beaker, the specific latent heat of fusion of ice can be measured



Why is this method very inaccurate when used in the Caribbean?

(A) The heater is not powerful enough to melt the ice.
(B) The ice would melt, even if the heater were not turned on.
(C) The temperature of the ice is 30°C instead of 0^0C.
(D) Water would be evaporating from the open beaker.

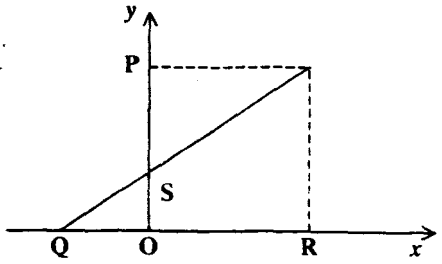
4. Which of the following units is the unit of momentum?

(A) $kg\ s^{-1}$
(B) $kg\ m\ s^{-1}$
(C) $kg\ m\ s^{-2}$
(D) N m

5. Which of the following quantities is dimensionless?

(A) Density
(B) Mass
(C) Relative Density
(D) Volume

Item **6** refers to the diagram below.



6. For any point (x, y) on the line QS, when x = 0, the value of y is

(A) OQ
(B) OS
(C) OP
(D) OP/OR

7. An object of mass, *m*, is attached to a spring balance and its weight, *w*, recorded. What will be the result if the object is taken to the moon and weighed there?

(A) Mass = *m*; weight greater than *w*
(B) Mass = *m*: weight less than *w*
(C) Mass greater than *m*; weight = *w*
(D) Mass less than *m*; weight = *w*

8. Which of the following quantities will be constant, if a constant net force is applied to a body?

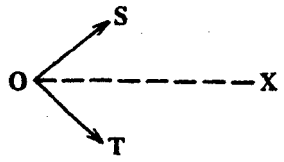
(A) Velocity
(B) Kinetic energy
(C) Momentum
(D) Acceleration

9.A stable well designed racing car must have a

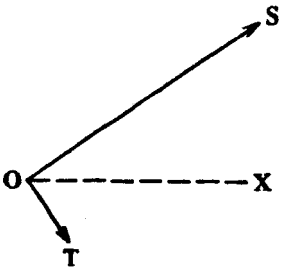
(A) low centre of gravity
(B) narrow wheel base
(C) sun roof
(D) long front

10. The diagrams below, drawn to scale, represent two forces S and T acting at O. In which of the following diagrams is the result-ant in the direction, OX?

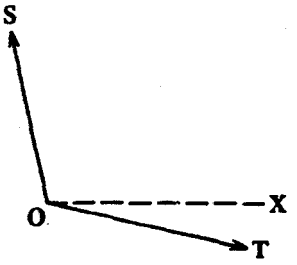
(A)



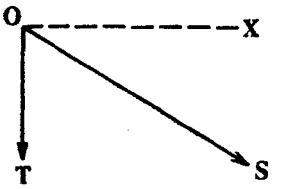
(B)



(C)



(D)



11. Which of the following formulae could be used to find the average speed of an object?

(A) $\frac{\text{Change } \textit{in} \text{ velocity}}{\text{Time taken}}$

(B) $\frac{\text{Change in displacement}}{\text{Time taken}}$

(C) $\frac{\text{Distance travelled}}{\text{Time taken}}$

((D) Distance travelled × Time taken

12. Which of the following measuring devices is suitable for measuring the diameter of a human hair?

(A) Tape measure
(B) Vernier calipers
(C) Micrometer screw gauge
(D) Metre rule

13. When two bodies collide, momentum is conserved. This means that the

(A) kinetic energy before impact is equal to that after impact
(B) momentum of each body is unchanged
(C) algebraic sum of the velocities be-fore impact is equal to the sum of the velocities after impact
(D) total momentum of the bodies be-fore impact is equal to the total momentum of the bodies after impact

14. Power can be defined as

(A) force x distance moved

(B) $\frac{\text{force}}{\text{time}}$

(C) $\frac{\text{work done}}{\text{time}}$

(D) work done x time

15. An *object* is removed from the ground and placed on a shelf. Which of its properties would you expect to change?

(A) Mass
(B) Volume
(C) Potential energy
(D) Kinetic energy

16. Pressure, P, in a liquid can be calculated from the formula

$P = \rho gh$

Which sets of units below will give the pressure in the SI unit?

	ρ	g	h
(A)	g cm $^{-3}$	m s $^{-2}$	mm
(B)	kg m $^{-3}$	Nkg $^{-1}$	m
(C)	g cm^{-3}	N kg $^{-1}$	m
((D)	kg m $^{-3}$	cm s $^{-1}$	cm

17. A bubble of gas rises to the surface of a soft drink. This is because the

(A) upthrust on the bubble is greater than the weight of the bubble
(B) upthrust on the bubble is greater than the weight of water it displaces
(C) weight of water displaced by the bubble is less than the weight of the bubble
(D) density of the gas is greater than the density of the drink

18. A glass bulb is filled with a gas at a temperature *of 293* K. If the initial pressure of the gas is *P*. what will it be when the temperature increases *to 360* K?

(A) $\frac{293}{360} \times P$

(B) $\frac{360}{293} \times P$

(C) $\frac{293}{360} \times \frac{1}{P}$

(D) $\frac{360}{293} \times \frac{1}{P}$

19. Boyle's law for a gas can be tested experimentally, provided which of the following is/are maintained constant?

I. Temperature
II. Pressure
III. Density
IV. Mass

(A) III only
(B) I and II only
(C) I and IV only
(D) I, II and III only

20. Which of the following is the MOST suit-able range for a clinical thermometer?

(A) 0°C to 44 ^{0}C
(B) -10 °C to 110 ^{0}C
(C) 35 °C to 100 ^{0}C
(D) 35°C to 44 ^{0}C

21. The specific heat capacity of a material is the energy required to

(A) melt 1 kg of the material with no change of temperature
(B) change the temperature of the material by 1 K
(C) change 1 kg of the liquid material to 1 kg of gas without a change in temperature
(D) change the temperature of 1 kg of the material by 1 K

22. The specific latent heat of vaporization of water is the energy required to change 1 kg of water at

(A) 0 °C to steam at 100 °C
(B) 99.9 °C to steam at 100.1 °C
(C) 100 °C to steam at 100 °C
(D) 0°C to ice at 0°C

23. Which of the following statements concerning the radiation of heat is true?

I. Radiation can only take place in a material medium.
II. A good absorber is also a good emitter of radiation.
III. Dark dull surfaces are better emitters than shiny ones.

(A) III only
(B) I and II only
(C) I and III only
(D) II and III only

24. An electric kettle full of water is plugged into the mains. The process by which heat travels through the water is

(A) electrification
(B) evaporation
(C) convection
(D) radiation

25. There are NO attractive forces between the molecules in a

(A) liquid and gas
(B) solid and a liquid
(C) liquid
(D) gas

26. In a Brownian motion experiment with a smoke cell, the fast random motion of the smoke particles which is observed is due to the

(A) collision of smoke particles with air molecules in the cell
(B) bombardment of one smoke particle by other smoke particles
(C) regular vibration of the smoke particles
(D) collision of the smoke particles with the walls of the container

27. Which of the following is the correct relation between the wavelength A., speed *v*, and frequency f, of a wave?

(A) $\lambda = fv$

(B) $f = \frac{\lambda}{v}$

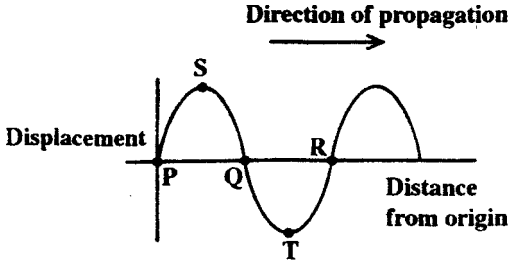
(C) $f = \frac{v}{\lambda}$

(D) $\lambda = \frac{f}{v}$

28. The spreading of a wave into the region behind an obstruction is called

(A) diffraction
(B) refraction
(C) superposition
(D) interference

29.



Which of the following statements about the wave shown in the diagram above is/ are true:

I. Points P, Q and R are in phase.
II. Points S and T are out of phase.
III. The wavelength of the wave is the distance PR.

(A) I only
(B) II only
(C) I and II only
(D) II and III only

30. If sounds of differing frequencies are played on a piano, in which of the following characteristics would a change be detected?

(A) Loudness
(B) Speed
(C) Pitch
(D) Wavelength

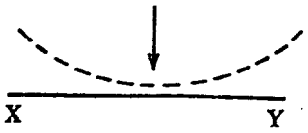
31. An explosion causes the emission of the following types of radiation.

I. Light
II. Sound
III. Infra-red

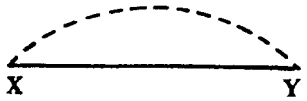
Which of these will be received first by a person some distance away?

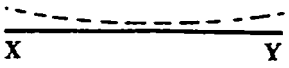
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

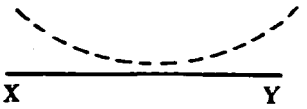
32.

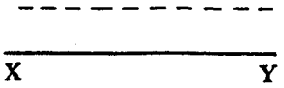


The figure above shows a wave-front about to reach a reflecting surface XY. Which of the following would represent the wave-front after reflection?

(A)


(B)


(C)


(D)


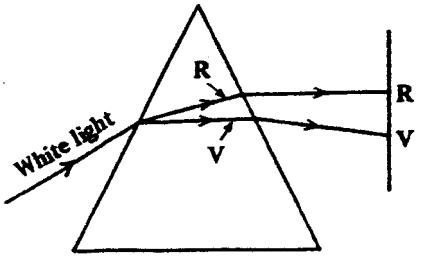
33. The sharp edges of shadows suggest that light

(A) has a wave nature
(B) is a form of energy
(C) travels in straight lines
(D) travels very quickly

34. The specific latent heat of fusion of water is 340 kJ kg^{-1} . This means that when 10 kg of water freezes

(A) 34 kJ of heat is absorbed
(B) 34 kJ of heat is given out
(C) 3 400 kJ of heat is absorbed
(D) 3 400 kJ of heat is given out

35.



The diagram above shows a ray of white light being dispersed by a prism to form a visible spectrum. Which of the following makes this possible.

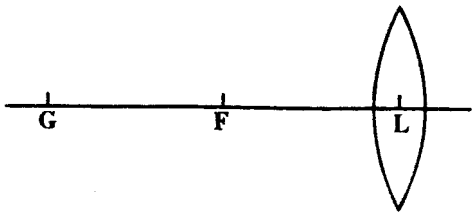
(A) The colour violet has the shorter wavelength, hence refracts more than colour red.
(B) The colour red has the longer wavelength, hence refracts more than colour violet.
(C) The colour violet has the longer wavelength, hence refracts more than colour red.
(D) The colour red has the shorter wavelength, hence refracts more than colour violet.

36. Which of the following statements would be true of the image of an object placed at the bottom of a tank of water and viewed vertically from above?

I. It is virtual.
II. It is diminished.
III. It is nearer to the eye than the object.

(A) III only
(B) I and only
(C) I and III only
(D) II and III only

37.



The above diagram represents a thin converging lens, L, with a principal axis GL. FL is the focal length of the lens and GF = FL. Where should an object be placed so as to produce a virtual magnified image?

(A) At G
(B) To the left of G
(C) Between F and G
(D) Between L and F

38. Which of the following would be true of the image formed by the lens of a camera?

I. It is virtual.
II. It is real.
III. It is diminished.
IV. It is upright

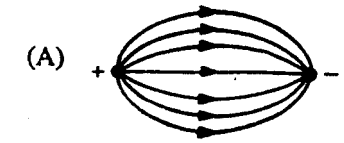
(A) I only
(B) II and III only
(C) I and IV only
(D) IV only

39. A glass rod is rubbed with a piece of silk and becomes positively charged. The glass rod became charged by

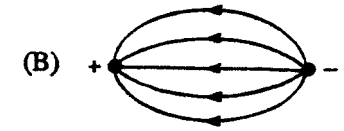
(A) gaining protons
(B) losing protons
(C) gaining electrons
(D) losing electrons

40. Which of the following diagrams represents the electric field existing between two oppositely charged point charges?

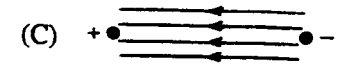
(A)



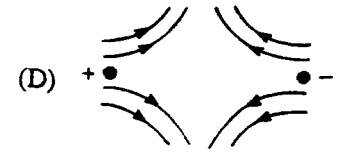
(B)

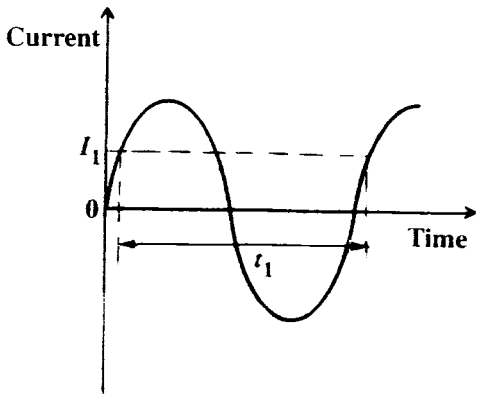


(C)



(D)





The graph above shows the variation of alternating current with time. The value frequency of this current is

(A) t_1

(B) $1/t_1$

(C) I_1

(D) $1/I_1$

42. Which of the following could NOT be a unit of current?

(A) $W\ V^{-1}$
(B) $V\ \Omega^{-1}$
(C) Cs^{-1}
(D) $C\ s$

43. Which of the following equations CANNOT be used to determine the power dissipated in a resistor?

(A) . $P = I^2 R$

(B) $P = V/ R^2$

(C) $P = VI$

(D) $P= R/ V^2$

44. The refractive index of a transparent medium with a critical angle, c, for light travelling from the medium to air is

(A) $\frac{1}{c}$

(B) $\frac{90^0}{\sin c}$

(C) $\frac{\sin 90}{\sin c}$

((D) $\sin c$

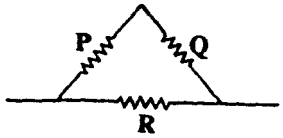
45. In domestic installation systems, which of the following should be placed in the live wire?

I. Switches
II. Circuit breakers
III. Fuses

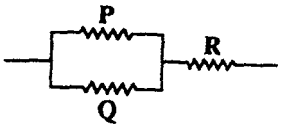
(A) I only
(B) III only
(C) II and III only
(D) I, II and III

46. In which of the following diagrams are resistors P and Q in series with each other and parallel with R?

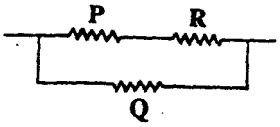
(A)



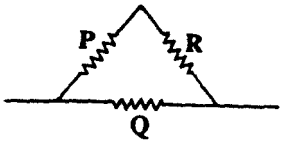
(B)



(C)



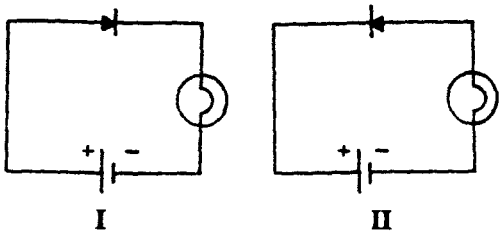
(D)



47. When a large current passes through a fuse. which of the following is the sequence of events?

(A) Wire gets hot –> wire melts --> current is cut off
(B) Wire gets hot –> current is cut off ->wire melts
(C) Wire melts -> current is cut off ---> wire gets hot
(D) Wire melts –> wire gets hot ---> current is cut off

48.



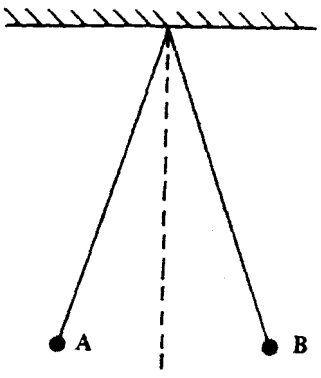
A simple experiment was conducted using the circuit diagrams shown above. The same components were used and the bulb was lit to normal brightness in each case.

Which of the following statements would be correct?

I. The bulb is defective.
II. The battery is defective.
III. The diode is defective.

(A) I only
(B) III only
(C) I and II only
(D) II and III only

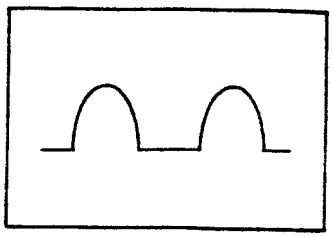
49.



Two light, aluminium spheres A and B are suspended by insulating threads. If they come to rest as shown in the diagram, the force keeping them apart is

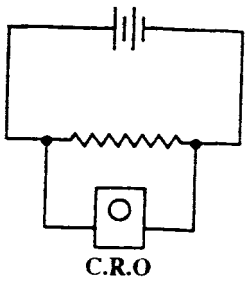
(A) gravitational
(B) electrostatic
(C) magnetic
(D) centripetal

50.

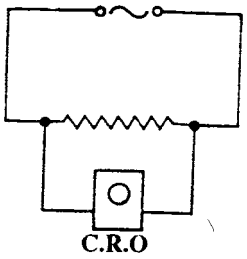


Which of the circuits below could produce the trace on the oscilloscope screen shown in the diagram above when the ends of the resistor are connected to the Y plates?

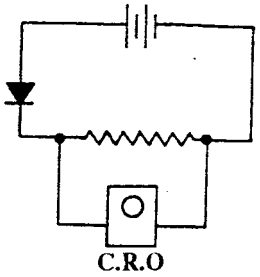
(A)



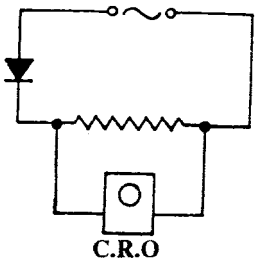
(B)



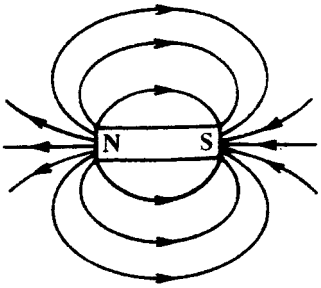
(C)



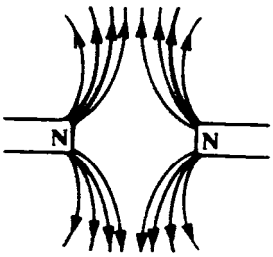
(D)



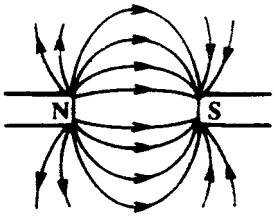
51. The diagrams below show the magnetic field lines plotted by a student.



I



II



III

Which of the following are correct?

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

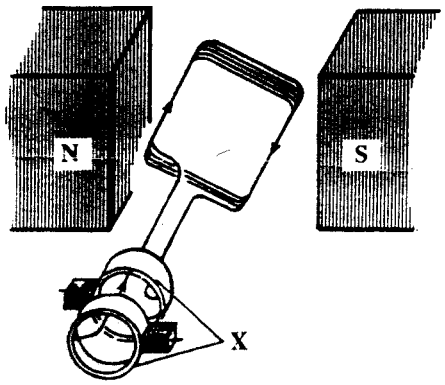
52. Which of the following statements about alternating current is true?

(A) It can be **changed** into direct cur-rent by a transformer.
(B) It can be rectified by using a semi-conductor diode.
(C) It can be used to recharge a battery.
(D) It is used to transmit electrical energy because of its high frequency.

53. A wire carrying a current in a magnetic field may experience a force. Which of the following devices does NOT depend on this force?

(A) Loudspeaker
(B) Electric motor
(C) Moving coil galvanometer
(D) Electromagnet

Item **54** refers to the following diagram.



5 4 , The parts labelled X in the diagram are known as the

(A) brushes
(B) commutator
(C) armature
(D) coil

55. The Rutherford model of the atom suggests that an atom consists of a

(A) solid mass of protons and electrons
(B) nucleus of protons only with orbiting electrons
(C) nucleus of equal numbers of neutrons and electrons with orbiting protons
(D) nucleus of protons and neutrons with orbiting electrons

56. The number of neutrons present in the nucleus of the nuclide $^{222}Rn^{86}$ is

(A) 86
(B) 136
(C) 222
(D) 308

57. Which of the following is NOT affected by an electric field?

(A) Alpha particle
(B) Beta particle
(C) Neutron
(D) Electron

58. Which of the following scientists discovered radium?

(A) Marie Curie
(B) Isaac Newton
(C) Albert Einstein
(D) J. J. Thompson

59. Which of the following CANNOT be deflected by a magnetic field?

(A) Alpha particles
(B) Beta particles
(C) Gamma rays
(D) Electrons

60. Which of the following scientists would you associate with nuclear energy?

(A) Thompson
(B) Bohr
(C) Chadwick
(D) Einstein

AFFIX SEAL HERE

CANDIDATE – PLEASE NOTE!

You must sign below and return this booklet with the Answer Sheet. Failure to do so may result in disqualification.

Signature:

TEST CODE **01238010**

FORM TP2005118

MAY/JUNE 2005

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

PHYSICS

Paper 01 – General Proficiency

75 minutes

06 JUNE 2005 (a.m.)

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. In addition to this test booklet, you should have an answer sheet.
2. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
3. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

The SI unit of length is the

(A) newton
(B) metre
(C) kilogram
(D) second

Sample Answer

Ⓐ ● Ⓒ Ⓓ

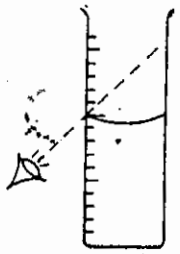
The best answer to this item is "metre" so answer space (B) has been shaded.

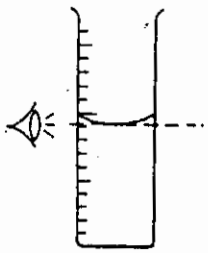
4. If you want to change your answer, be sure to erase your old answer completely and fill in your new choice.
5. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, omit it and go on to the next one. You can come back to the harder item later. Your score will be the total number of correct answers.
6. Figures are not necessarily drawn to scale.
7. You may do any rough work in this booklet.
8. The use of non-programmable calculators is allowed.
9. This test consists of 60 items. You will have 75 minutes to answer them.
10. Do not be concerned that the answer sheet provides spaces for more answers than there are items in this test.

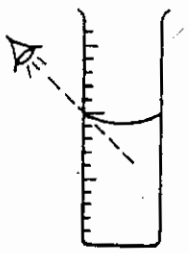
AFFIX SEAL HERE

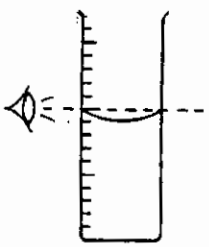
DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. Which of the diagrams below indicates the correct way of taking the reading of the volume of the liquid in a measuring cylinder?

I 

II 

III 

IV 

(A) I
(B) II
(C) III
(D) IV

2. The unit of electrical resistance may be expressed as

(A) $1\Omega = 1\ V.A^{-1}$
(B) $1\Omega = 1\ A.V$
(C) $1\Omega = 1\ A.V^{-1}$
(D) $1\Omega = 1\ W.A^{-1}$

3. A student sets up a simple pendulum and finds that the period is 1.7 s. To obtain a period nearer to one second, he should

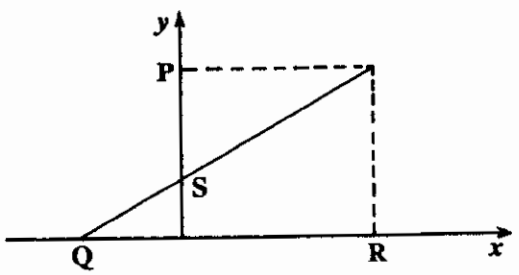
(A) use a heavier bob
(B) use a lighter bob
(C) lengthen the pendulum
(D) shorten the pendulum

4. The instrument MOST suitable for measuring the external diameter of a test tube is a

(A) micrometer screw gauge
(B) vernier calipers
(C) metre rule
(D) set square

5. 1 gram is equal to

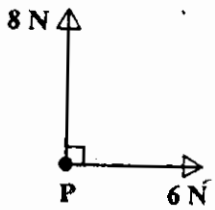
(A) 10 milligrams
(B) 100 milligrams
(C) 1 000 milligrams
(D) 10 000 milligrams

6. 

When $x = 0$, the value of y is

(A) Q
(B) S
(C) P
(D) P/R

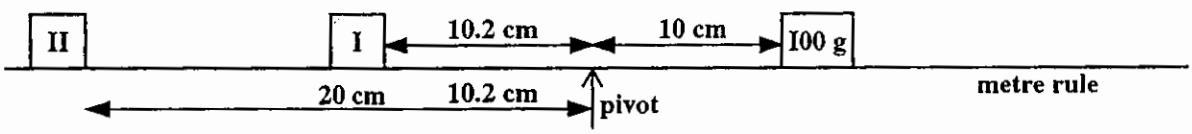
7.



The diagram above shows two forces of magnitudes 6 N and 8 N acting on a particle P. The resultant force acting on P is of magnitude

(A) 2 N
(B) 10 N
(C) 14 N
(D) 100 N

8.



The diagram above represents a 100 g mass which can be balanced by placing mass at I in the position shown. If Mass I is to be used to balance the 100 g, it should be

(A) less than 100 g
(B) 100 g
(C) a little greater than 100 g
(D) about 200 g

---

9. Which of the following is NOT a fundamental quantity?

(A) Mass
(B) Length
(C) Area
(D) Time

10. Which of the following is NOT a vector quantity?

(A) Displacement
(B) Acceleration
(C) Density
(D) Momentum

11. The slope of a velocity-time graph is a measure of

(A) distance
(B) acceleration
(C) instantaneous velocity
(D) average velocity

12. The mass of an astronaut is 70 kg when he is on the moon. When he returns to earth his approximate weight will be

(A) 70 kg
(B) 420 kg
(C) 70 N
(D) 700 N

13. *"When body A exerts a force on body B, body B exerts an equal and opposite force on body A."*

This principle is attributable to which of the following scientists?

(A) Aristotle
(B) Einstein
(C) Galileo
(D) Newton

14. An object is removed from the ground and placed on a shelf. Which of its properties would you expect to change?

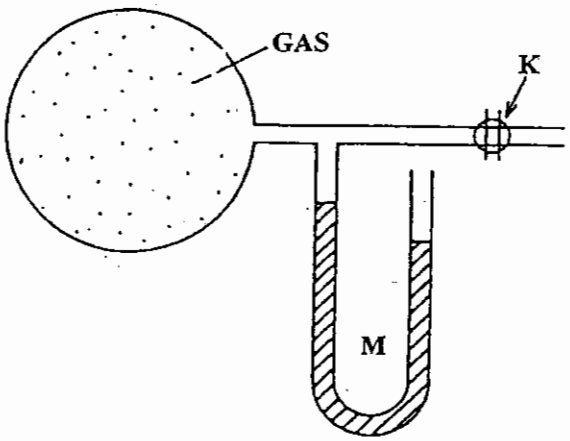
(A) Mass
(B) Volume
(C) Potential energy
(D) Kinetic energy

15. The rate of which of the following determines the power of a machine?

I. Doing work
II. Converting energy
III. Changing temperature

(A) I only
(B) III only
(C) I and II only
(D) I, II and III

16. The globe shown in the diagram below contains a gas whose pressure is measured with a manometer, M.



Which of the following statements is/are correct?

I. The pressure of the gas is less than that of the atmosphere.
II. For a small pressure difference, mercury may be used in the manometer for an accurate reading of the gas pressure.
III. In order to bring the two menisci in the manometer to the same level one could open the stopcock, K.

(A) I only
(B) II only
(C) I and II only
(D) I and III only

17. The height of liquid in a vessel is h and its density ρ. If the atmospheric pressure is X and the acceleration due to gravity is g, what is the pressure on the base of the vessel? (All quantities are in S.I. units.)

(A) $X + h\rho$
(B) $(X + h)\ \rho g$
(C) $X + h\rho g$
(D) $(X + h\rho)g$

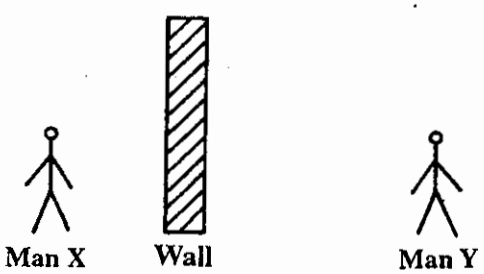
18. Which of the following would be responsible for the glass-house effect?

(A) Infra-red rays
(B) Light rays
(C) Sound waves
(D) Water waves

19. Which of the units below is used to measure the force per unit area on a surface?

(A) The newton (N)
(B) The watt (W)
(C) The joule (J)
(D) The pascal (Pa)

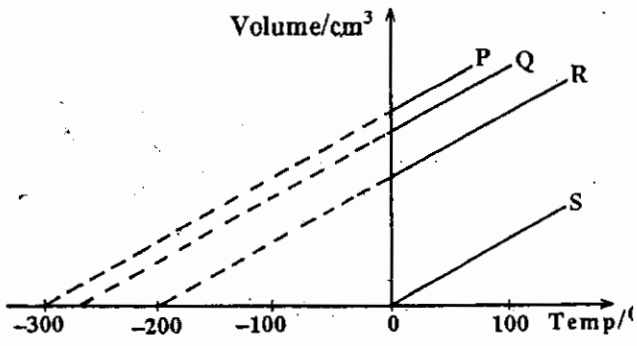
20.



Man X can hear man Y shouting but he cannot see him mainly because sound

(A) is a longitudinal wave, and therefore does not travel in straight lines
(B) has a greater amplitude, and therefore passes around obstacles whereas light does not
(C) has a slower speed, and therefore has more time to pass around obstacles than light does
(D) has a longer wavelength, and therefore diffracts around obstacles more than light does

21.



Which of the graphs above shows how the volume of a fixed mass of gas varies with temperature at constant pressure?

(A) P
(B) Q
(C) R
(D) S

22. Which of the following formulae gives the efficiency of a machine?

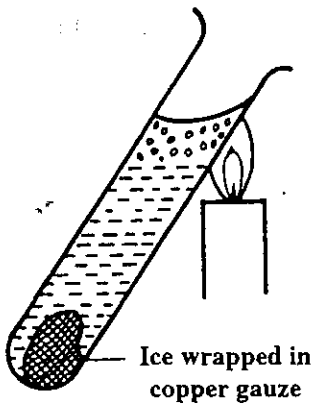
(A) $\frac{\text{Load x Distance moved by Effort}}{\text{Effort x Distance moved by Load}} \times \frac{100\%}{1}$

(B) $\frac{\text{Load x Distance moved by Load}}{\text{Effort x Distance moved by Effort}} \times \frac{100\%}{1}$

(C) $\frac{\text{Effort x Distance moved by Effort}}{\text{Load x Distance moved by Load}} \times \frac{100\%}{1}$

(D) $\frac{\text{Effort x Distance moved by Load}}{\text{Load x Distance moved by Effort}} \times \frac{100\%}{1}$

23.



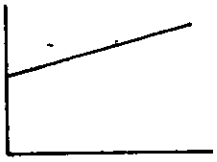
The figure above shows a piece of ice wrapped in copper gauze and submerged in a glass test tube of water. The water, when heated at the top, boils long before the ice is melted. The MAIN reason for this is that

(A) the test tube is a poor conductor of heat
(B) copper is a good conductor of heat
(C) ice is less dense than water
(D) water is a poor conductor of heat

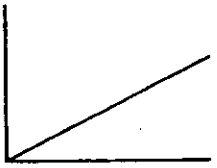
24. Which of the following graphs is obtained if the volume of a fixed mass of gas, at a constant pressure, is plotted against its Kelvin temperature?

(A)

(B)



(C)



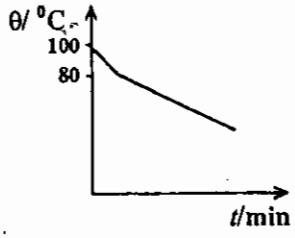
(D)

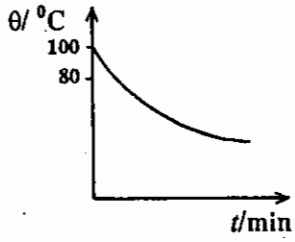
25. A flask contains air under pressure. Some of the air is let out slowly over a period of 10 s. When the flask is closed the

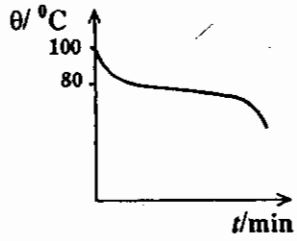
(A) pressure of the air in the flask will have increased
(B) volume of air in the flask will have decreased
(C) temperature in the flask will have increased
(D) number of molecules striking the wall per second will have decreased

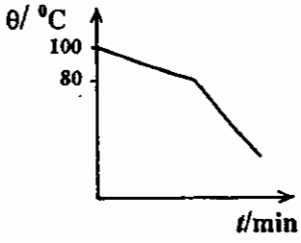
GO ON TO THE NEXT PAGE

26. Some molten naphthalene at 100°C is allowed to cool down at room temperature. If naphthalene has a melting point of 80°C, which of the following BEST represents the cooling curve?

(A)


(B)


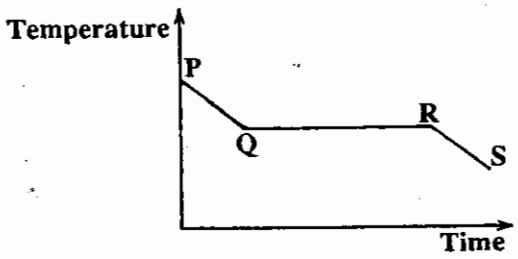
(C)


(D)


27. Which of the following waves travel only as longitudinal waves?

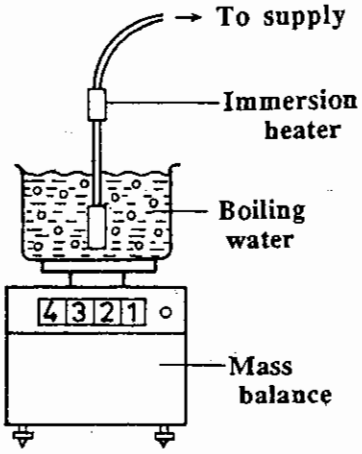
I. Sound waves
II. Radio waves
III. Water waves

(A) I only
(B) II only
(C) II and III only
(D) I, II and III

28.


The graph above, arising from an experiment on change of phase, shows that solidification started at Q. During which of the stages is the substance in the liquid phase?

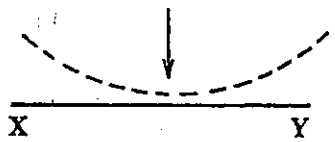
(A) At P only
(B) Between Q and R
(C) Between R and S
(D) Between P and Q

29.


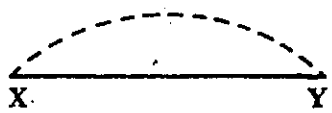
Some water in a container (as shown above) is brought to its boiling point by an immersion heater. A watch is then started and the time, t, to boil off a mass, m, of water is found. If the heater has a power, P, the specific latent heat of vaporisation is

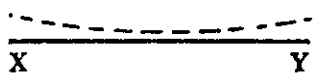
(A) $\frac{Pt}{m}$
(B) $\frac{P}{tm}$
(C) $\frac{m}{Pt}$
(D) Pmt

30.

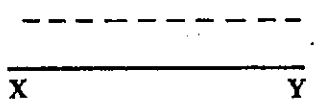


The figure above shows a wavefront about to reach a reflecting surface XY. Which of the following diagrams would represent the wavefront after reflection?

(A)


(B)


(C)


(D)


31. The note from a drum is louder when it is struck harder because the sound waves produced have a greater

(A) amplitude
(B) frequency
(C) wavelength
(D) velocity

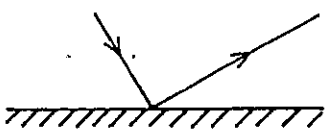
32. Compared with Xrays, radio waves

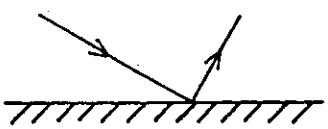
(A) have a longer wavelength
(B) have a higher frequency
(C) travel faster in air
(D) pass through a sheet of steel more easily

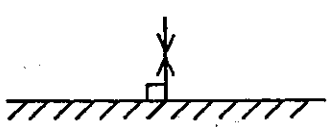
33. The sharp edges of shadows suggest that light

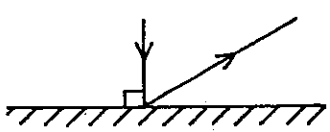
(A) has a wave nature
(B) is a form of energy
(C) travels in straight lines
(D) travels very quickly

34. Which of the following diagrams MOST clearly shows the path of a ray of light when it strikes a plane mirror?

(A)


(B)


(C)


(D)


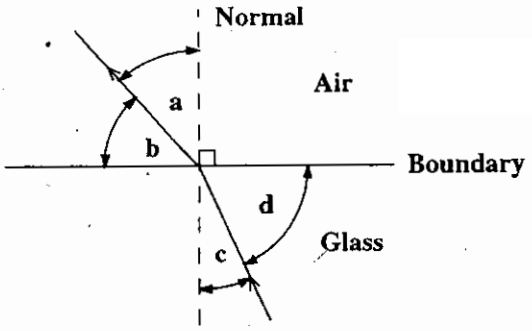
35. In a projector the object is 5 cm from the lens, while the screen is 500 cm from the lens on the other side. What is the magnification?

(A) 50
(B) 100
(C) 250
(D) 500

36. When heat is supplied at equal rates to equal masses of water and of cooking oil, the cooking oil attains a higher temperature than water in the same time. This is because

(A) water has a higher specific latent heat
(B) water has a higher specific heat capacity
(C) oil is a better conductor of heat
(D) water is a better conductor of heat

37.



The diagram above represents a ray of light passing from glass to air. The refractive index of glass can be determined by calculating

(A) $\frac{\sin b}{\sin d}$

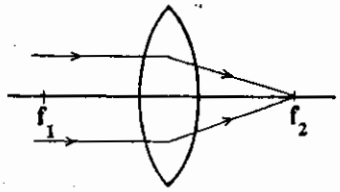
(B) $\frac{\sin a}{\sin c}$

(C) $\frac{\sin c}{\sin a}$

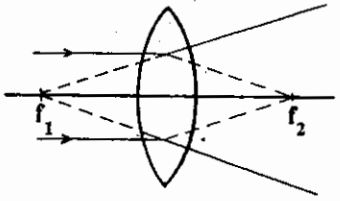
(D) $\frac{\sin b}{\sin c}$

38.

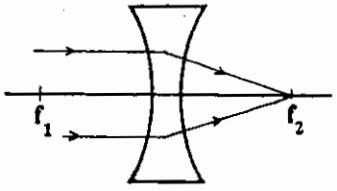
I.



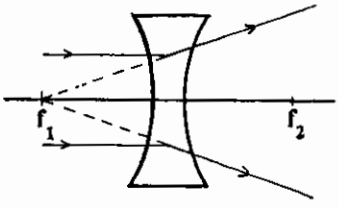
II.



III.



IV.



Which of the ray diagrams shown above are correct?

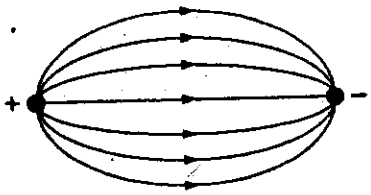
(A) II and III only
(B) II and IV only
(C) I and III only
(D) I and IV only

39. Which of the following actions is NOT one of the ways in which the strength of the magnetic field near a solenoid (long coil) carrying a current can be increased?

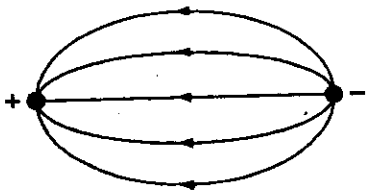
(A) Increasing the resistance of the coil
(B) Increasing the current in the coil
(C) Increasing the number of turns per unit length of the coil
(D) Placing a soft iron core inside the coil

40. Which of the following diagrams represents the electric field existing between two oppositely charged point charges?

(A)

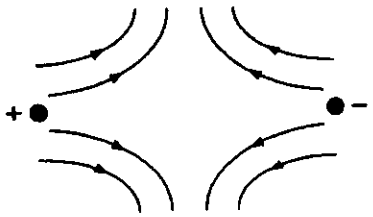


(B)



(C)

(D)



41. Which of the following equations is NOT correct?

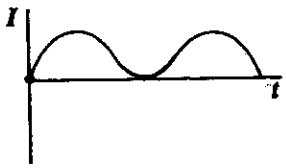
(A) 1 C = 1 A x 1 s
(B) 1 V = 1 A x 1 Ω
(C) 1 J = 1 C x 1 V
(D) 1 W = 1 V x 1 C

42. A current I flows for a time t between two points at a potential difference of V. The power P being delivered is equal to

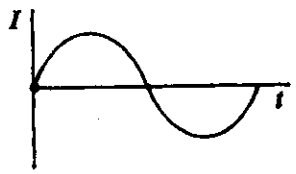
(A) IV/t
(B) IVt
(C) IV
(D) It

43. Which of the following current-time graphs would represent direct current?

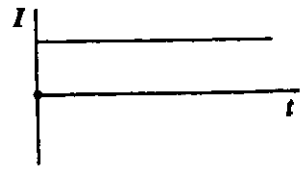
I



II



III

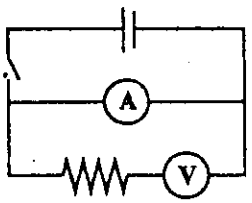


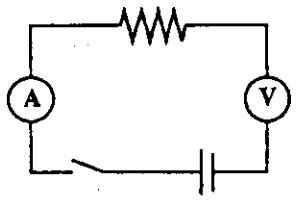
(A) II only
(B) III only
(C) I and III only
(D) I, II and III

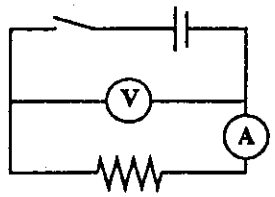
44. A vibrator on a ripple tank sends waves over the surface of the water. The vibrator is now adjusted so that the number of waves created each second is doubled. The waves would now

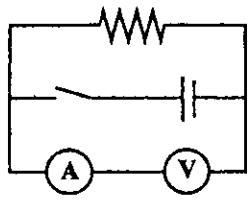
(A) travel at half the original speed
(B) travel at twice the original speed
(C) have twice the original wavelength
(D) have half the original wavelength

45. A student requires a circuit to measure the resistance of a resistor. Which of the circuits below is correctly connected?

(A)


(B)


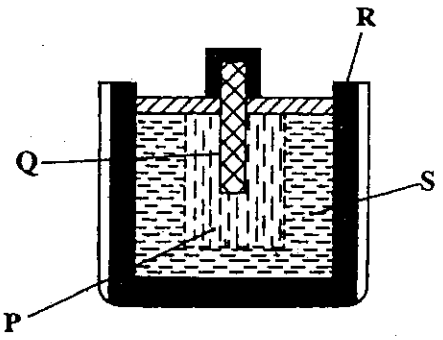
(C)


(D)


46. An ammeter has a very low resistance so that it can be placed

(A) in parallel with a component and not affect the circuit
(B) in series with a component and not affect the circuit
(C) in parallel with a component and the ammeter does not heat up
(D) in series with a component and the ammeter does not heat up

Item 47 refers to the diagram below of the cross-section of a dry cell.

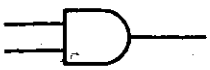


47. Which of the following is correct?

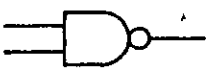
(A) Q is carbon, R is zinc.
(B) P is copper oxide, Q is carbon.
(C) R is iron, S is ammonium chloride.
(D) S is sulphuric acid, P is manganese dioxide.

Item 48 refers to the following symbols.

I. 

II. 

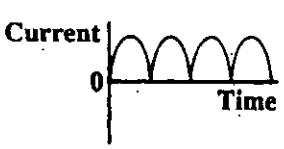
III. 

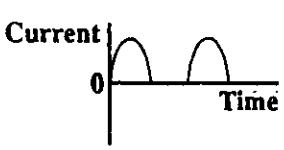
IV. 

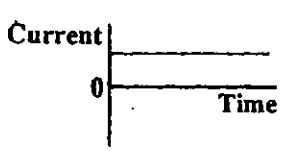
48. Which of the symbols represents the AND gate?

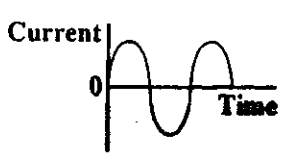
(A) I
(B) II
(C) III
(D) IV

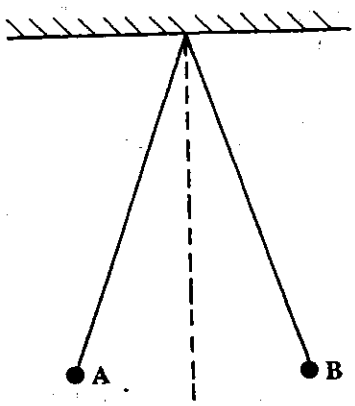
49. The following graphs show four ways in which the current in a resistor may vary with time. Which graph BEST represents the current in the resistor when connected in series with a diode and a source of alternating current?

(A) 

(B) 

(C) 

(D) 

50. 

Two light, aluminium spheres A and B are suspended by insulating threads. If they come to rest as shown in the diagram, the force keeping them apart is

(A) gravitational force
(B) electrostatic force
(C) magnetic force
(D) centripetal force

51. The radioactive decay of an isotope of lead is represented by the equation

$$^{214}_{82}\text{Pb} \longrightarrow {}^{a}_{b}\text{Bi} + {}^{0}_{-1}\text{e}$$

The values of a and b are respectively

	a	b
(A)	214	81
(B)	214	83
(C)	215	82
(D)	215	83

52. Which of the following are definitions of the term 'half-life' of radioactive nuclide?

I. The time taken for the activity of any give sample to fall to half its original value.

II. The time taken for half the nuclei present in any given sample to decay.

III. Half the average number of disintegrations per second.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

53. Which of the following is an isotope of ${}^{12}_{6}X$?

(A) ${}^{6}_{3}X$

(B) ${}^{13}_{6}X$

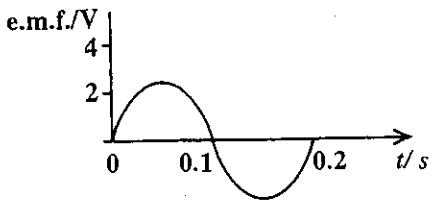
(C) ${}^{12}_{10}X$

(D) ${}^{3}_{1}X$

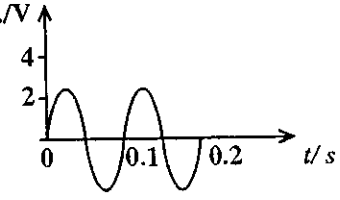
54. An isotope of zinc has a nuclide which can be represented as ${}^{64}_{30}Zn$. The number of electrons in a neutral zinc atom is

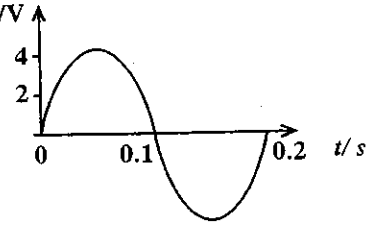
(A) 30
(B) 34
(C) 64
(D) 94

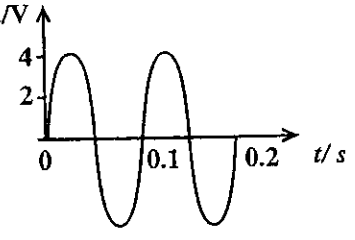
55. The graph below shows how the e.m.f. at the output of an a.c. generator varies with time.

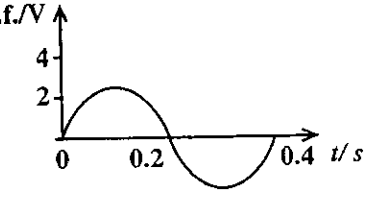


If the frequency of this waveform is doubled which of the following graphs is produced?

(A)


(B)


(C)


(D)


56. In which of the following devices is a commutator used?

(A) Transformers
(B) a.c. generators
(C) d.c. motors
(D) Moving coil microphones

57. The Rutherford model of the atom suggests that an atom consists of a

(A) solid mass of protons and electrons
(B) nucleus of protons only with orbiting electrons
(C) nucleus of equal numbers of neutrons and electrons with orbiting protons
(D) nucleus of protons and neutrons with orbiting electrons

58. It is possible to write the symbol for a certain particle x as ${}^{1}_{0}x$. This particle is a/an

(A) electron
(B) neutron
(C) proton
(D) alpha particle

59. A neutral atom of Argon contains 18 protons and 20 neutrons. Which of the following statements concerning the atom is/are true?

I. Its mass (nucleon) number is 38.
II. It has 20 electrons in orbit about the nucleus.
III. It is an isotope of the nuclide which has a mass (nucleon) number of 40 and an atomic (proton) number of 18.

(A) I only
(B) I and II only
(C) I and III only
(D) I, II and III

60. Radiation coming from a radioactive source was deflected by a magnetic field and it was stopped by a few millimetres of air. The radiation was

(A) neutrons
(B) gamma rays
(C) beta-particles
(D) alpha-particles

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

1. The base unit of temperature of the S.I. system is the

(A) degree Celsius
(B) degree Fahrenheit
(C) Kelvin
(D) degree centigrade

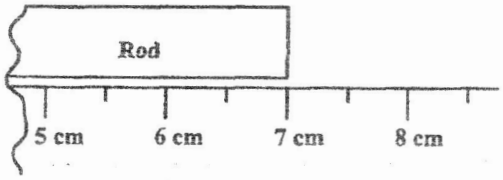
2. If force = mass x acceleration, the unit of force could be written

(A) $kg^{-1} m s^2$
(B) $kg m^{-1} s^2$
(C) $kg m^{-1} s^2$
(D) $kg m s^{-2}$

3. Which of the following measurements has three significant figures?

(A) 0.0293 kg
(B) 0.94 A
(C) 5.321 V
(D) 10.42 m

4.



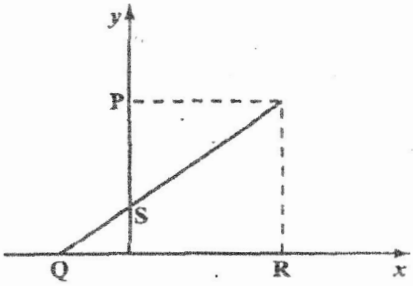
The diagram above shows a rod and a centimetre rule measuring its length. The left end of the rod (not shown) is at the zero mark of the rule. The length of the rod should be written as

(A) 7 cm
(B) 7.0 cm
(C) 7.00 cm
(D) 6.97 cm

5. Which of the following remains unchanged with an increase in temperature?

(A) Density
(B) Mass
(C) Relative Density
(D) Volume

Item 6 refers to the diagram below.



6. When $x = 0$, the value of y is

(A) Q
(B) S
(C) P
(D) P/R

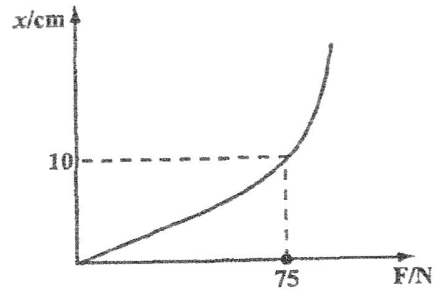
7. Which of the following will be constant, if a constant net force is applied to a body?

(A) Velocity
(B) Kinetic energy
(C) Momentum
(D) Acceleration

8. The newton-metre is the unit used to measure

(A) force
(B) momentum
(C) moment of a force
(D) power

9.

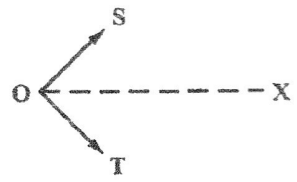


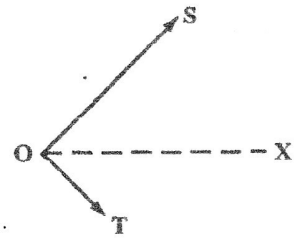
The diagram above shows a simple force (F)/extension (x) graph for a light spring. Which of the following statements would be true?

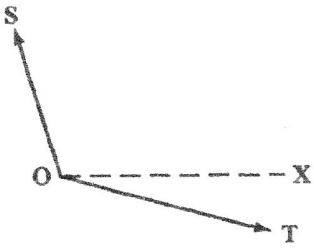
I. The elastic limit of the spring was exceeded.
II. The spring obeyed Hooke's law over its entire extension.
III. The force per unit extension in the elastic region was 7.5 N cm^{-1}.

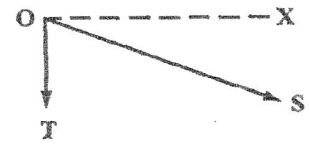
(A) I only
(B) I and III only
(C) II and III only
(D) I, II and III

10. The diagrams below, drawn to scale, represent two forces, S and T, acting at O. In which of the following is the resultant in the direction, OX?

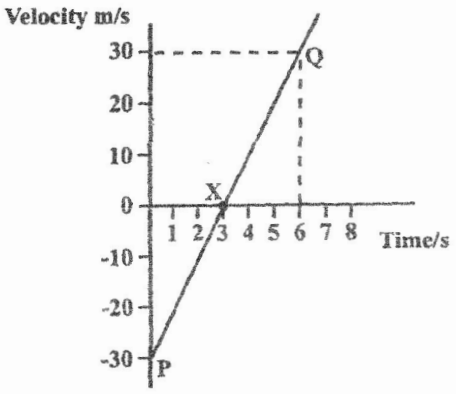
(A)


(B)


(C)


(D)


Item 11 refers to the following velocity-time graph which shows a ball being thrown vertically upwards from the ground.



11. The point, X, on the graph shows when the ball is

(A) at its highest point above the ground
(B) at rest on the ground
(C) just about to be thrown upwards
(D) on its way downwards

12. A falling raindrop reaches a constant speed when

(A) there is no net force acting on it
(B) the pull of the earth on the raindrop is equal to the weight of the raindrop
(C) the upthrust due to the air is at a minimum
(D) the air surrounding the raindrop becomes saturated with water vapour

13. If an object is moving along a surface with a constant acceleration, the net force acting on the object is

(A) zero
(B) constant
(C) increasing
(D) decreasing

14. A glass marble, X, moving with a speed of 6 m s^{-1}, collides 'headon' with an identical stationary glass marble, Y. What is the velocity of Y after collision, assuming that X is brought to rest?

(A) zero
(B) 3 m s^{-1}
(C) 6 m s^{-1}
(D) 12 m s^{-1}

15. The rate of which of the following will determine the power of a machine?

I. Doing work
II. Converting energy
III. Changing temperature

(A) I only
(B) III only
(C) I and II only
(D) I, II and III

16. Which of the following implements is/are designed to take advantage of a large moment provided by a relatively small force?

I. Claw hammer
II. Crowbar
III. Pair of tweezers
IV. Pair of wire cutters

(A) III only
(B) I and IV only
(C) I, II and III only
(D) I, II and IV only

17. The upthrust experienced by a solid immersed in a liquid is equal to the

(A) mass of the solid
(B) volume of the liquid displaced
(C) weight of the liquid displaced
(D) density of the liquid

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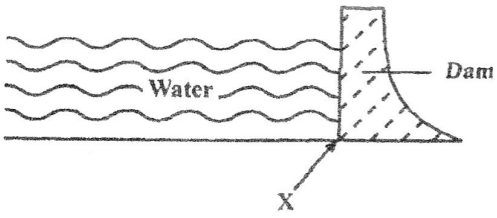
18.



The diagram above shows a hydroelectric dam. The pressure on the dam at point **X** depends on the

(A) depth of the water
(B) volume of water held by the dam
(C) mass of water held back by the dam
(D) length of the reservoir

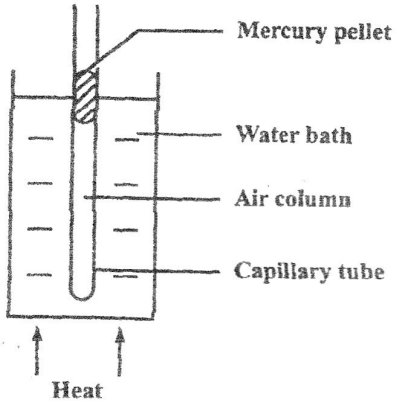
19. A bubble of gas rises to the surface of a soft drink. This is because the

(A) upthrust on the bubble is greater than the weight of the bubble
(B) upthrust on the bubble is greater than the weight of water is displaces
(C) weight of water displaced by the bubble is less than the weight of the bubble
(D) density of the gas is greater than the density of the drink

20. Which of the following is the MOST suitable range for a clinical thermometer?

(A) 0 °C to 44 °C
(B) 10 °C to 110 °C
(C) 35 °C to 100 °C
(D) 35 °C to 44 °C

21.



The diagram above shows an air column trapped in a capillary tube by a mercury pellet. When the temperature of the water bath is raised, what happens to the volume and pressure of the trapped air?

(A) Volume increases, pressure remains constant.
(B) Volume increases, pressure increases.
(C) Volume remains constant, pressure remains constant.
(D) Volume remains constant, pressure increases.

22. The heat capacity of a body depends on

(A) its mass and the specific heat capacity of the material
(B) its mass and the temperature change the body undergoes
(C) the density and temperature of the material
(D) the density and expansivity of the material

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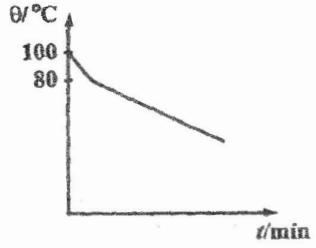
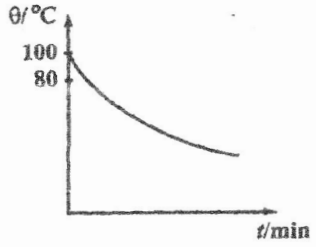
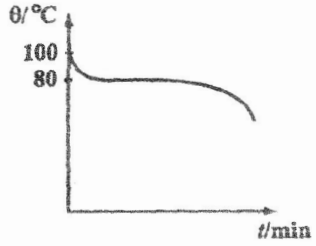
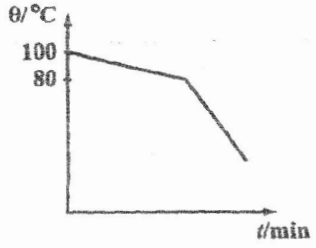
23. Some molten naphthalene at 100°C is allowed to cool down at room temperature. If naphthalene has a melting point of 80°C, which of the following BEST represents the cooling curve?

(A)


(B)


(C)


(D)


24. The specific latent heat of vapourization of water is the energy required to change 1 kg of water at

(A) 0 °C to steam at 100 °C
(B) 99.9 °C to steam at 100.1 °C
(C) 100 °C to steam at 100 °C
(D) 0 °C to ice at 0 °C

25. An electric kettle full of water is plugged into the electrical mains supply. The process by which heat travels through the water is

(A) electrification
(B) evaporation
(C) convection
(D) radiation

26. In which of the following is conduction the main method of energy transfer?

(A) Food heated in a microwave oven
(B) Energy transferred from the sun to earth
(C) Food being cooked on a barbecue
(D) Food being cooked in a pot on an electric stove

27. Which of the following phenomena are exhibited by light waves?

I. Refraction
II. Diffraction
III. Interference

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

28. Which of the following is the correct relation between the wavelength, λ, speed, υ, and frequency, f, of a wave?

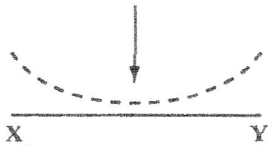
(A) $\lambda = f\upsilon$

(B) $f = \frac{\lambda}{\upsilon}$

(C) $f = \frac{\upsilon}{\lambda}$

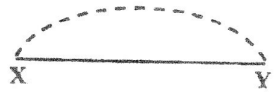
(D) $\lambda = \frac{f}{\upsilon}$

29.



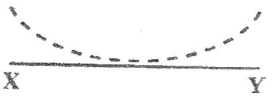
The figure above shows a wavefront about to reach a reflecting surface XY. Which of the following would represent the wavefront after reflection?

(A)

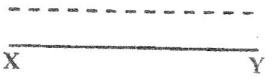


(B)

(C)



(D)



30. Whenever there is complete destructive interference between two coherent wave trains, the waves must be

(A) in phase
(B) out of phase by half of a wavelength
(C) out of phase by one wavelength
(D) out of phase by a quarter of a wavelength

31. Which of the following statements about sound is NOT correct?

(A) Sound is transmitted as transverse waves.
(B) Sound may be produced by vibrating systems.
(C) Sound does not travel through a vacuum.
(D) Sound travels more slowly than light.

32. In which of the following are the electromagnetic waves written in order of increasing frequency, starting with the lowest?

(A) Xrays, ultraviolet, infrared, radio
(B) Xrays, infrared, ultraviolet, radio
(C) Radio, xrays, infrared, ultraviolet
(D) Radio, infrared, ultraviolet, xrays

33. Which of the following is the reason why the diffraction of light is NOT usually observed?

(A) Its wavelength is too small.
(B) Its frequency is too high.
(C) Its speed is too high.
(D) Its wavelength is too large.

34. Upon which of the following would the position of an image formed by a plane mirror depend?

I. Distance of the observer from the mirror
II. Distance of the object from the mirror
III. Angle at which the image is viewed

(A) I only
(B) II only
(C) II and III only
(D) I, II and III

35.

The above diagram represents a thin converging lens, L, with a principal axis GL. FL is the focal length of the lens and GF = FL. Where should an object be placed so as to produce a virtual magnified image?

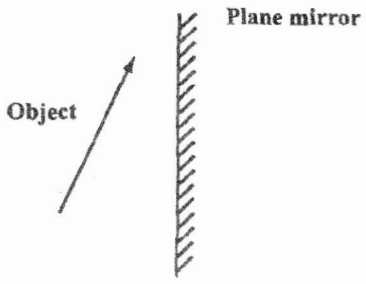
(A) At G
(B) To the left of G
(C) Between F and G
(D) Between L and F

36. Which of the following can produce a diminished virtual image of a real object?

I. A plane mirror
II. A diverging lens
III. A converging lens

(A) I only
(B) II only
(C) II and III only
(D) I, II and III

37.



The diagram above represents an object placed in front of a plane mirror. Which of the following BEST represents the image produced by the plane mirror?

(A)

(B)

(C)

(D)

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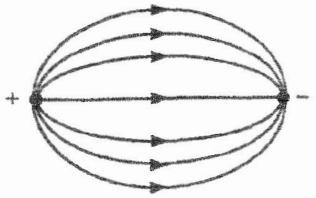
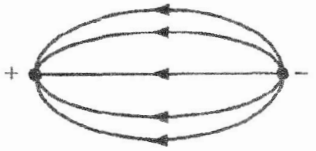
38. Which of the following diagrams represents the electric field existing between two oppositely charged point charges?

(A)

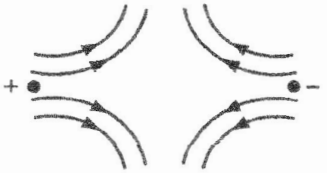


(B)



(C)

(D)



39. Which of the following is NOT one of the ways in which the strength of the magnetic field near a solenoid (long coil) carrying a current can be increased?

(A) Increasing the resistance of the coil
(B) Increasing the current in the coil
(C) Increasing the number of turns per unit length of the coil
(D) Placing a soft iron core inside the coil

40. Which of the following relationships between electrical quantities is correct?

(A) $V = P I$

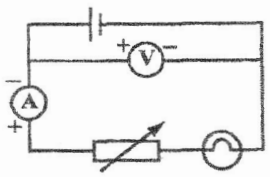
(B) $R = V I$

(C) $Q = \frac{E}{V}$

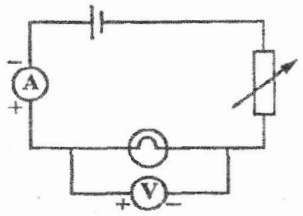
(D) $E = V I$

41. The circuit diagrams below show four different ways in which an ammeter, a variable resistor, a voltmeter and a filament lamp may be connected to a d.c. supply. The polarities of the meters are marked. In which circuit would the meters give readings which would enable you to determine the resistance of the filament lamp?

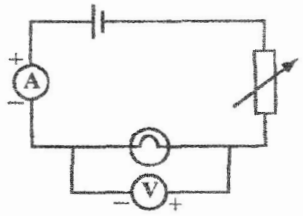
(A)



(B)



(C)



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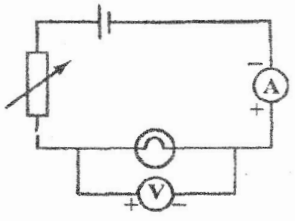

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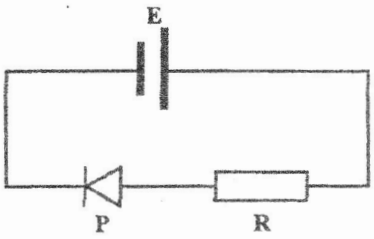
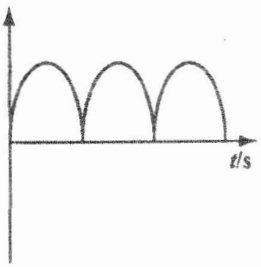
42.

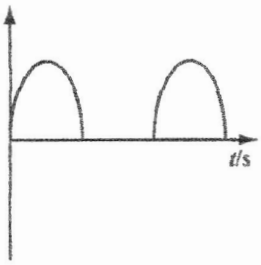


The figure above shows a cell E, a diode P and a resistor, R, connected in series. The current through R is BEST illustrated by which of the following graphs?

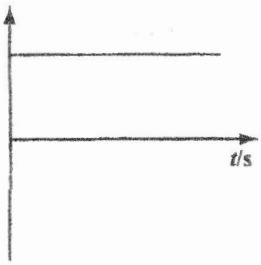
(A)



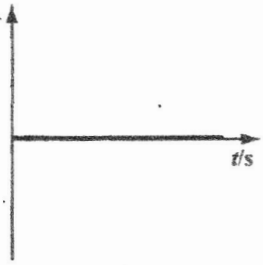
(B)



(C)



(D)



43. The refractive index of a transparent medium with a critical angle, c, for light travelling from the medium to air is

(A) $\frac{1}{c}$

(B) $\frac{90°}{\sin c}$

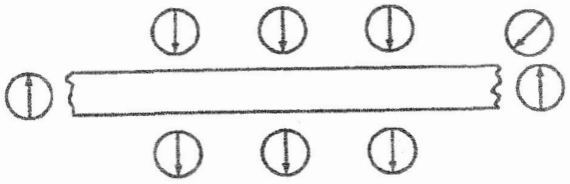
(C) $\frac{\sin 90°}{\sin c}$

(D) $\sin c$

44. Which of the following appliances would require the fuse with the largest rating?

(A) A kettle marked 1 500 W, 120 V
(B) A freezer marked 400 W, 120 V
(C) An iron marked 1 000 W, 240 V
(D) A stove marked 10 000 W, 240 V

45.



In the diagram above, a piece of rubber magnet from a refrigerator is surrounded by plotting compasses. The rubber magnet has

(A) poles at the ends
(B) poles at the centre
(C) poles at the sides
(D) no poles

46. Steel is NOT suitable for use in an electromagnet because it

(A) is too difficult to magnetise
(B) retains magnetism too well
(C) loses its magnetism too easily
(D) contains too many domains

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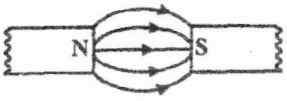
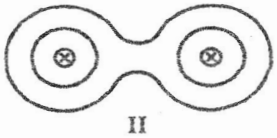
47.



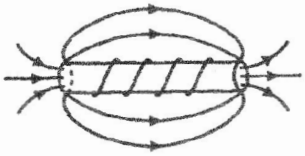
I

Two permanent magnets



II

Parallel wires carrying equal currents in the same direction *into* the paper



III

Current flowing in a solenoid

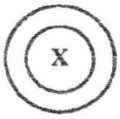
Which of the diagrams above correctly illustrate(s) the magnetic fields created as shown?

(A) I only
(B) I and II only
(C) II and III only
(D) I, II and III

48. *Rectification can BEST be done by using a*

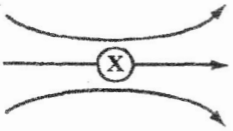
(A) transformer
(B) capacitor
(C) transistor
(D) diode

49. The diagram below represents a straight wire carrying a current into the plane of the paper.

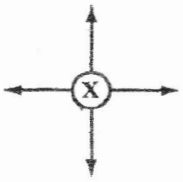


Which of the following diagrams BEST represents the magnetic field around the wire?

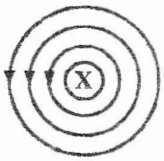
(A)



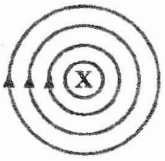
(B)

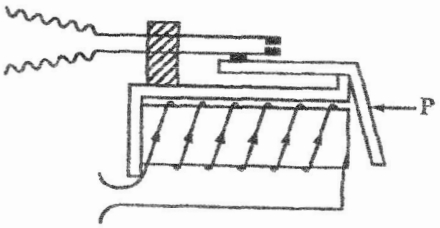


(C)



(D)

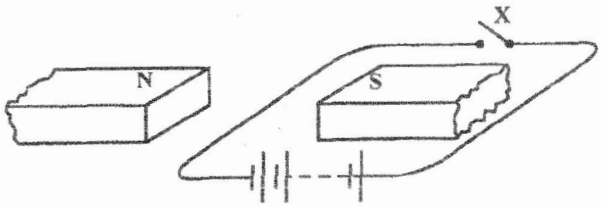




50. The diagram above shows a typical relay. The part, labelled P, must be made of

(A) iron
(B) copper
(C) plastic
(D) brass

51.



A flexible wire lies horizontal between the poles of a strong magnet as shown in the diagram above. When the switch, X, is closed the wire moves

(A) downwards
(B) upwards
(C) towards the north pole
(D) towards the south pole

52. It is possible to induce a voltage in a wire coil by the use of a

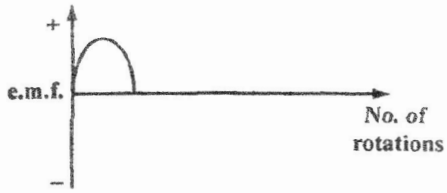
(A) steady magnetic field
(B) positively charged rod
(C) negatively charged rod
(D) changing magnetic field

53. Which of the following statements about alternating current is true?

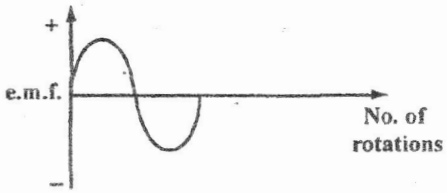
(A) It can be changed into direct current by a transformer.
(B) It can be rectified by using a semiconductor diode.
(C) It can be used to recharge a battery.
(D) It is used to transmit electrical energy because of its high frequency.

54. For a simple a.c. generator, which of the following graphs will be produced by two complete rotations of the armature?

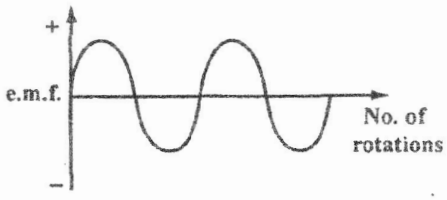
(A)



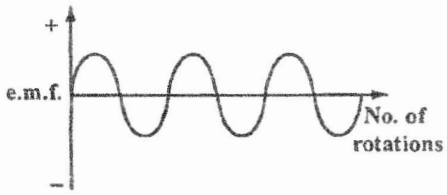
(B)



(C)



(D)



55. No practical transformer is 100% efficient. Which of the following cause energy losses?

I. The resistance of the coils of wire
II. Magnetization and demagnetization of the core
III. Eddy currents in the core

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

GO ON TO THE NEXT PAGE

56. The basic constituents of all matter are

(A) protons, neutrons, electrons
(B) solids, liquids, gases
(C) elements, compounds, mixtures
(D) α, ß, Υ radiations

57. Which of the following is NOT affected by an electric field?

(A) Alpha particle
(B) Beta particle
(C) Neutron
(D) Electron

58. Which of the following would be possible symbols for an isotope of nuclide represented by ${}^{A}_{Z}X$?

I. ${}^{A-2}_{Z}X$

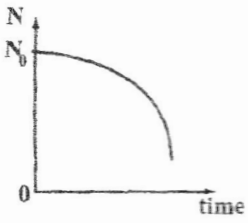
II. ${}^{A}_{Z-2}X$

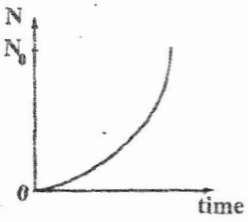
III. ${}^{A+2}_{Z}X$

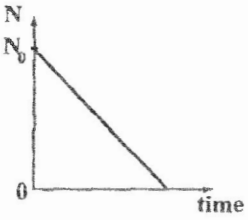
(A) I only
(B) II only
(C) III only
(D) I and III only

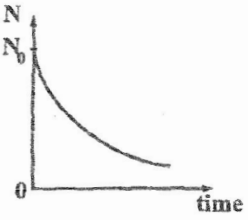
59. The number of radioactive nuclei present in *sample at time* $t = 0$ *is* N_o.

Which of the following graphs BEST represents the variation with time of the number, N, of undecayed nuclei present?

(A)


(B)


(C)


(D)


60. Which of the following scientists discovered the relationship $E = mc^2$?

(A) Marie Curie
(B) Isaac Newton
(C) Albert Einstein
(D) J. J. Thompson

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

AFFIX SEAL HERE

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TEST CODE **01238010**

FORM TP 2007116

MAY/JUNE 2007

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

PHYSICS

Paper 01 – General Proficiency

75 minutes

28 MAY 2007 (a.m.)

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. In addition to this test booklet, you should have an answer sheet.
2. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
3. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

   Sample Item

   The SI unit of length is the

   (A) newton
   (B) metre
   (C) kilogram
   (D) second

   Sample Answer

   Ⓐ ● Ⓒ Ⓓ

   The best answer to this item is "metre" so answer space (B) has been shaded.
4. If you want to change your answer, be sure to erase your old answer completely and fill in your new choice.
5. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, omit it and go on to the next one. You can come back to the harder item later. Your score will be the total number of correct answers.
6. Figures are not necessarily drawn to scale.
7. You may do any rough work in this booklet.
8. The use of non-programmable calculators is allowed.
9. This test consists of 60 items. You will have 75 minutes to answer them.
10. Do not be concerned that the answer sheet provides spaces for more answers than there are items in this test.

AFFIX SEAL HERE

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. Which of the following is an SI base unit?

(A) Ampere
(B) Volt
(C) Ohm
(D) Coulomb

2. To measure the external diameter of a measuring cylinder most accurately one should use a

(A) tape measure
(B) metre rule
(C) length of string
(D) pair of vernier callipers

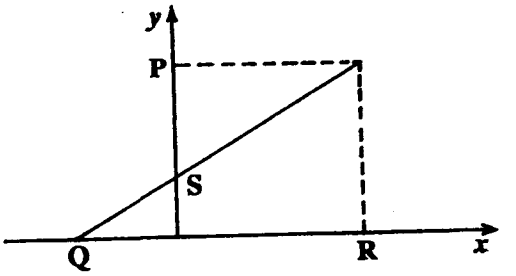
3. When used in front of a unit the prefix 'mega' means

(A) 10^{6}
(B) 10^{3}
(C) 10^{-3}
(D) 10^{-6}

4. Which of the following is true about the period of a simple pendulum?

(A) It increases with the length of the pendulum
(B) It is dependent on the mass of the bob
(C) It changes with the volume of the bob
(D) It decreases with decreasing amplitude

Item 5 refers to the diagram below.



5. When $x = 0$, the value of y is

(A) Q
(B) S
(C) P
(D) P/R

6. Which of the following is a fundamental quantity?

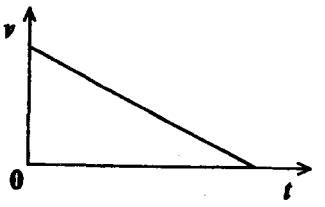
(A) Density
(B) Mass
(C) Relative density
(D) Volume

7. Which of the following is NOT a derived quantity?

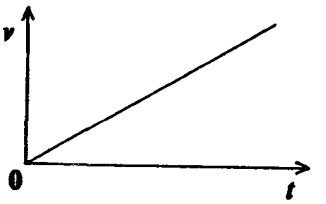
(A) Energy
(B) Force
(C) Charge
(D) Current

8. A coconut falls from a tree. Which of the velocity/time graphs below BEST represents its motion, if air resistance is neglected?

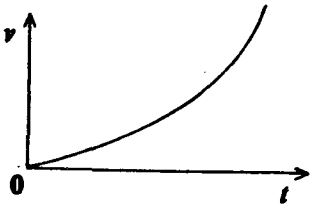
(A)



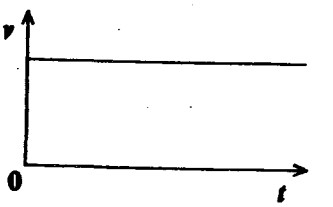
(B)



(C)



(D)



9. A bus, with luggage loaded on top, is more likely to tip over when rounding a corner than the same bus without the luggage. The reason for this is that the luggage

(A) increases the weight of the bus
(B) raises the centre of gravity of the bus
(C) lowers the centre of gravity of the bus
(D) increases the momentum of the bus

10. An example of a vector quantity is

(A) electrical resistance
(B) heat capacity
(C) density
(D) displacement

11. On which of the following does the pressure at a point in a liquid depend?

I. Density of the liquid
II. Depth from the surface
III. Area of the cross-section of the container

(A) I only
(B) III only
(C) I and II only
(D) I, II and III

12. Which of the following is the unit of momentum?

(A) $m\ s^{-1}$
(B) $kg\ m\ s^{-1}$
(C) $kg\ m\ s^{-2}$
(D) $N\ s$

13. To which of the following types of energy does a car, travelling on a level road, convert its kinetic energy when it slows down and stops, using its brakes?

I. Thermal
II. Potential
III. Gravitational

(A) I only
(B) II only
(C) I and II only
(D) I and III only

GO ON TO THE NEXT PAGE

14. A single force, which can replace and have the same effect as two or more forces acting together, is known as the

(A) resultant
(B) equilibrant
(C) moment
(D) vector

15. A balloon full of hydrogen accelerates upwards in air. Which of the following statements would be true?

I. The hydrogen has no weight.
II. The hydrogen exerts a resultant upward force on the balloon.
III. The weight of air displaced is greater than the weight of the hydrogen-filled balloon.

(A) I only
(B) II only
(C) III only
(D) II and III only

16. The rate of which of the following determines the power of a machine?

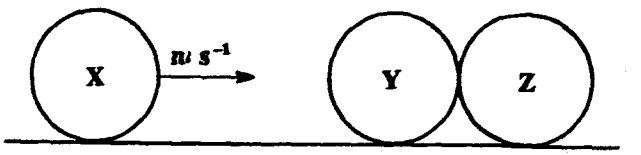
I. Doing work
II. Converting energy
III. Changing temperature

(A) I only
(B) III only
(C) I and II only
(D) I, II and III

17. The rate of which of the following is NOT true about the moment of a force?

(A) It is measured in units of newtonmetres.
(B) It is the amount of force needed to keep a body turning.
(C) It is the turning effect that a force has when it acts on a body.
(D) It is the product of a force and the perpendicular distance of its line of action from a point.

Item 18 refers to the following diagram



18. X, Y and Z are three balls of equal mass whose centres lie in a straight line. Y and Z are touching one another. X, travelling with a velocity of v m s^{-1}, hits on Y. Assuming that the spheres are perfectly elastic, the resultant motion after impact will be that

(A) X, Y and Z all move on together, with velocity v m s^{-1}

(B) X and Y both remain stationary while Z moves on with a velocity of v m s^{-1}

(C) X, Y and Z remain stationary

(D) X remains stationary while Y and Z move on together, with velocity of v m s^{-1}

19. Which of the following BEST explains Brownian motion of smoke particles in air?

(A) The intense beam of light causes the smoke particles to vibrate.
(B) Smoke particles are colliding with each other.
(C) Convection currents of air cause the vibration of smoke particles.
(D) The air molecules are moving and colliding with the smoke particles.

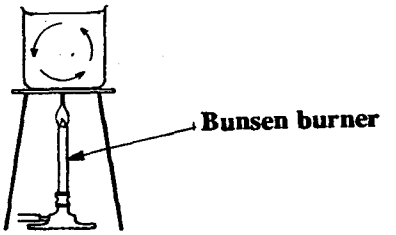
20. In the pressure law, which of the following would be true?

I. Ratio of pressure to Kelvin temperature is constant.
II. Volume is constant.
III. Pressure is constant.

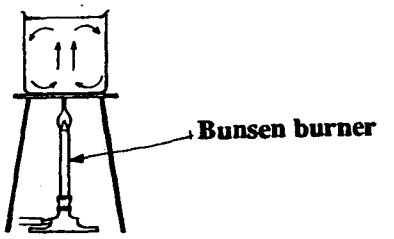
(A) I only
(B) III only
(C) I and II only
(D) I, II and III

21. Which of the following diagrams BEST illustrates convection currents in a liquid?

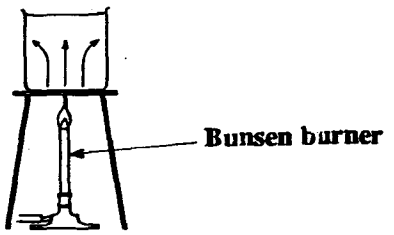
(A)



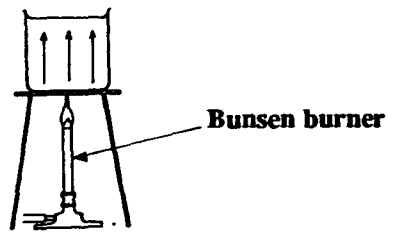
(B)



(C)



(D)



22. In a thermocouple thermometer, which thermometric property is used?

(A) Variation of electrical resistance
(B) Expansion of metals
(C) Emission of electrons from a hot metal surface
(D) Production of a current at the junction of unlike metals

23. A gas is much easier to compress than a solid or liquid because the gas molecules

(A) are very numerous
(B) are arranged randomly
(C) are moving very rapidly
(D) have no forces between them

24. Which of the following would be the unit of the heat capacity of an object?

(A) J
(B) $J\ kg^{-1}$
(C) $J\ K^{-1}$
(D) $J\ kg^{-1}\ K^{-1}$

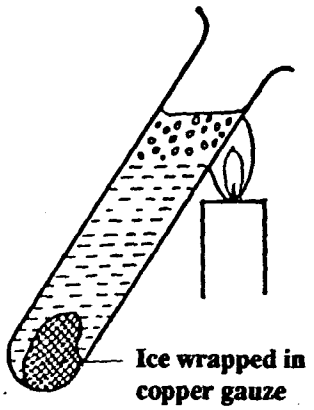
25. Which of the following is true of evaporation?

(A) It occurs throughout a liquid at no definite temperature.
(B) It occurs at the surface of a liquid at no definite temperature.
(C) It occurs at the surface of a liquid at a definite temperature.
(D) It occurs throughout a liquid at a definite temperature.

26. When the volume of fixed mass of a gas is reduced at a constant temperature, the average speed of the molecules

(A) remains the same as the temperature does not change
(B) increases as the molecules have less space in which to move
(C) increases as the molecules hit each other more often
(D) decreases as the molecules have less space in which to move

27.



The figure above shows a piece of ice wrapped in copper gauze and submerged in a glass test tube of water. The water, when heated at the top, boils long before the ice is melted. The MAIN reason for this is that

(A) the test tube is a poor conductor of heat
(B) copper is a good conductor of heat
(C) ice is less dense that water
(D) water is a poor conductor of heat

28. Which of the following scientists provided the evidence which led to the abandoning of the caloric theory of heat?

I. Newton
II. Boyle
III. Rumford

(A) III only
(B) II only
(C) I and III only
(D) II and III only

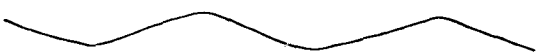
29. Which of the following statements would be true?

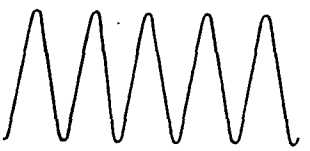
I. Thermal radiation is an electromagnetic radiation.
II. Blue light has a longer wave-length than infrared radiation.
III. The velocity of X-rays is the same as the velocity of light.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

30.

The figure above shows the profile of a water wave. Using the same scale, which diagram below represents a wave TWICE the frequency and HALF the amplitude in the same tank of water?

(A) 

(B) 

(C) 

(D) 

31. In a longitudinal wave, the particles

(A) remain stationary
(B) move forward with the speed of the wave
(C) move backwards and forwards parallel to the direction of travel of the wave
(D) move from side to side, perpendicular to the direction of travel of the wave

32. Plane water waves which travel from deep water to shallow water

(A) are diffracted
(B) increase their speed
(C) undergo a change in frequency
(D) undergo a change in wave-length

33. Which of the following statements would be true?

I. A note of frequency 512 Hz has a higher pitch than one of frequency 256 Hz.
II. A high pitched note travels faster than a low pitched note.
III. If the pitch of a note is increased then the periodic time of the vibrations is also increased.

(A) I only
(B) I and II only
(C) I and III only
(D) II and III only

34. Which of the following statements about waves is true?

(A) Only transverse waves undergo reflection.
(B) Longitudinal waves do not undergo refraction, but may be reflected.
(C) Diffraction can only take place with light waves.
(D) All waves undergo reflection, refraction and diffraction.

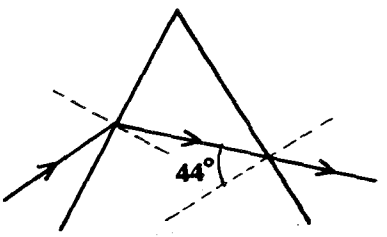
GO ON TO THE NEXT PAGE

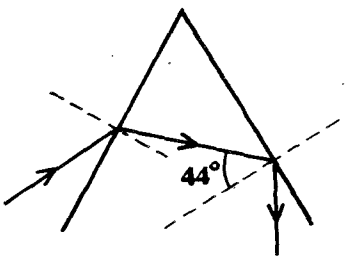
35. Which of the following would be true about the image formed by a plane mirror?

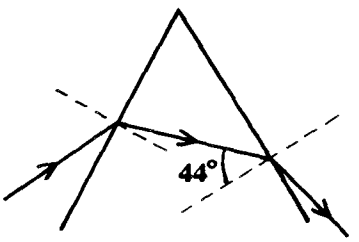
I. It is virtual.
II. It is laterally inverted.
III. It is magnified.

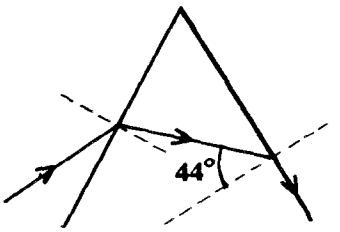
(A) I only
(B) I and II only
(C) II and III only
(D) I, II and III

36. The critical angle of glass is 42°. Which of the following diagrams correctly shows the path of a ray of light through a triangular glass prism?

(A)


(B)


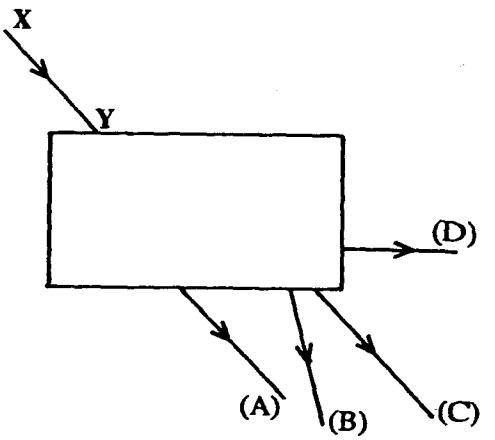
(C)


(D)


37. The image on the film of a camera is usually

(A) inverted, diminished, real
(B) inverted, diminished, virtual
(C) upright, diminished, real
(D) upright, magnified, real

38. A ray, XY, enters a rectangular glass block as shown in the diagram below. Along which direction will the ray emerge?



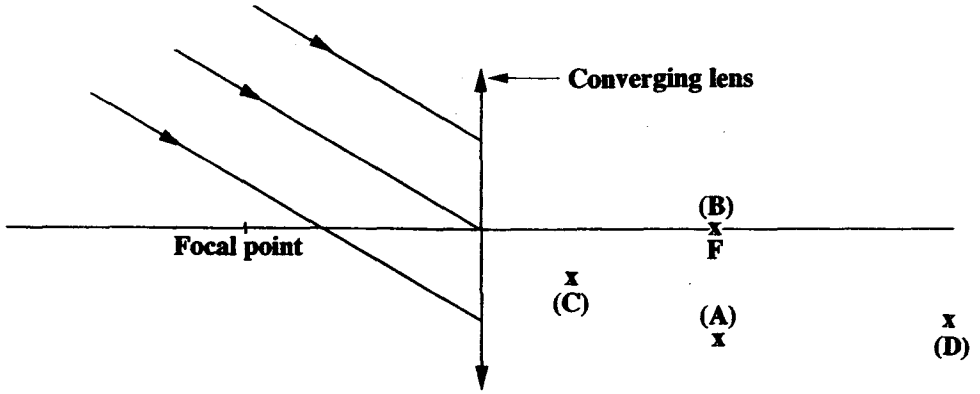
39. When looking into a periscope the image seen is

(A) upside down
(B) virtual
(C) laterally inverted
(D) larger than the object

40. In the human eye, most refraction occurs at the

(A) air/cornea boundary
(B) aqueous humour/lens boundary
(C) aqueous humour/cornea boundary
(D) retina

41.



In the diagram above, the incident rays of light are parallel. Where will the image of the object be formed?

---

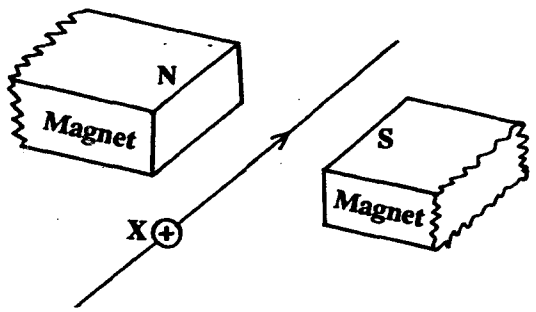
42. Which of the following gives the correct international colour code for wiring a plug?

	LIVE	NEUTRAL	EARTH
(A)	Brown	Blue	Green/yellow
(B)	Red	Blue	Green
(C)	Blue	Green/yellow	Brown
(D)	Green	Brown	Blue

43. The force on a current-carrying conductor in a magnetic field could be doubled by

(A) halving the field strength
(B) reducing the current by a factor of two
(C) increasing the current by a factor of two
(D) doubling the diameter of the conductor

44.



A positively charged particle, X, is moving at high speed in the direction indicated in the diagram above. In which direction will the magnetic field deflect the particle?

(A) Upward
(B) To the left
(C) Downward
(D) To the right

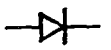
45. A plastic rod, P, is rubbed with cloth, Q. P becomes positively charged. This is because

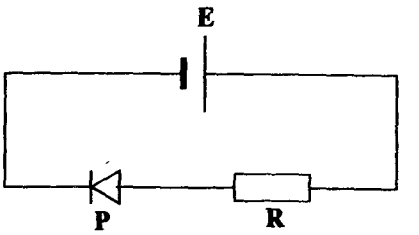
(A) protons flowed from Q to P
(B) protons flowed from P to Q
(C) electrons flowed from Q to P
(D) electrons flowed from P to Q

46. A fuse is used in a circuit to

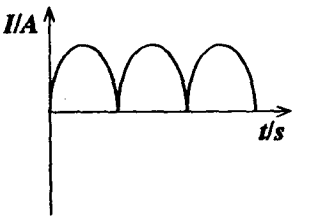
(A) reduce the effect of the battery
(B) prevent the flow of excessive current
(C) bridge a gap in the circuit
(D) act as an insulator

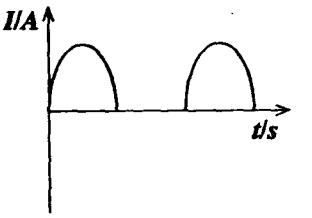
47. Which of the following circuit symbols represents a fuse?

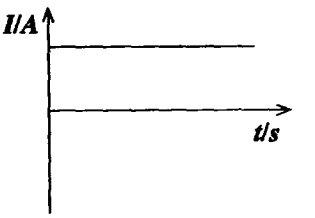
(A) 
(B) 
(C) 
(D) 

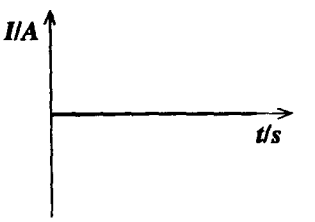
48. 

The figure above shows a cell, E, a diode, P, and a resistor, R, connected in series. The current through R is BEST illustrated by which of the following graphs?

(A) 

(B) 

(C) 

(D) 

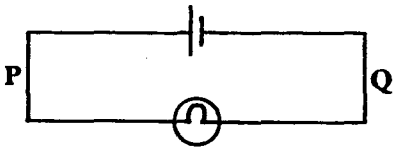
49. Which of the following is MOST suitable for the core of an electro-magnet?

(A) Copper
(B) Steel
(C) Carbon
(D) Soft iron

50. Rectification can BEST be done by using a

(A) transformer
(B) capacitor
(C) transistor
(D) diode

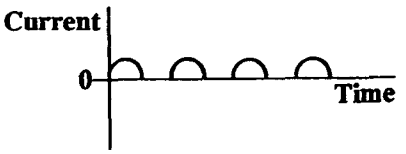
Item 51 refers to the following diagram.

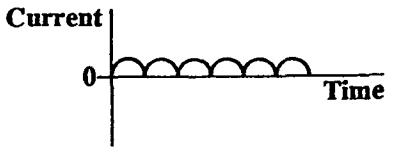


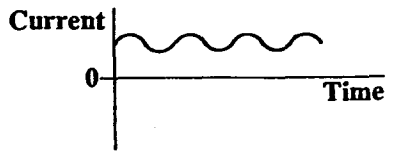
51. The current in wire P is 0.9 A. The current in wire Q is

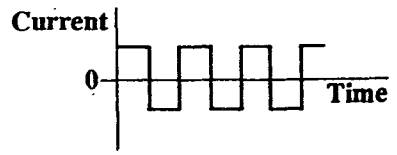
(A) 0 A
(B) 0.8 A
(C) 0.9 A
(D) 1.0 A

52. Which of the following graphs illustrates an ALTERNATING current?

(A)


(B)


(C)


(D)


53. An electromagnet consists of insulated wire wrapped around an iron core.
It works because

(A) iron is a good electrical conductor
(B) a magnetic field is produced inside the coil
(C) an electric field is produced inside the coil
(D) iron is always magnetised

54. The electric power supplied to homes and to factories is alternating rather than direct because

(A) the use of a.c. reduces electrical hazards
(B) a.c. voltages can be stepped up or down using a transformer
(C) a.c. enables a wider variety of appliances to be used
(D) a.c. power lines are less likely to be struck by lightning than d.c. power lines

55. $^{14}_{6}C$ (Carbon 14) decays in accordance with the equation $^{14}_{6}C \rightarrow {}^{14}_{7}N + X$. The emission X is a/an

(A) beta particle
(B) proton
(C) alpha particle
(D) gamma ray

GO ON TO THE NEXT PAGE

56. Which of the following would be possible symbols for an isotope of nuclide presented by ${}^{A}_{Z}X$?

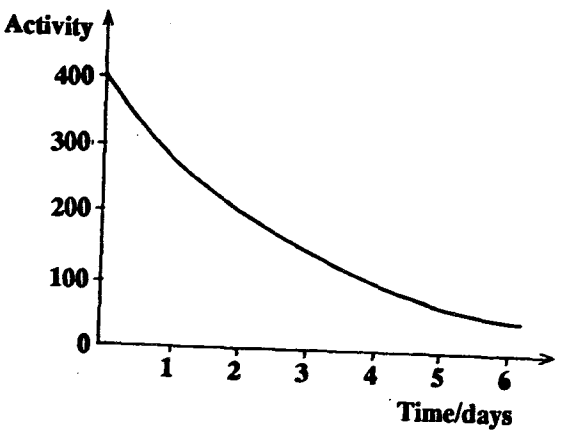
I. ${}^{A-2}_{Z}X$

II. ${}^{A}_{Z-2}X$

III. ${}^{A+2}_{Z}X$

(A) I only
(B) III only
(C) II only
(D) I and III only

57.



The activity of a radioactive substance was measured at suitable intervals over a period of days and its radioactive decay curve plotted. The half life, in days, is

(A) 1
(B) 2
(C) 3
(D) 4

58. Radioactivity takes place in an atom as a result of

(A) nuclear instability
(B) a chemical reaction
(C) exposure to excess heat
(D) excess stress on the atom

59. Several different types of emissions were directed at right angles to a magnetic field, and emerged undeflected. The emissions consisted of

(A) an electron beam
(B) alpha-particles
(C) beta-particles
(D) gamma-rays

60. Which of the following statements about a proton is NOT correct?

(A) It is a hydrogen atom minus an electron.
(B) It has the same mass as that of an electron.
(C) It has a mass about 2 000 times that of an electron.
(D) It has a charge equal in size but opposite in sign to that of an electron.

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

1. The symbol for the unit for the moment of a force is

(A) N
(B) N m
(C) kg m s^{-1}
(D) m s^{-2}

2. If force = mass x acceleration, the unit of force could be written

(A) kg^{-1} m s^2
(B) kg m^{-1} s^2
(C) kg^{-1} m^{-1} s^2
(D) kg m s^{-2}

3. 3.1415926 expressed to TWO significant figures is

(A) 3.1
(B) 3.14
(C) 3.2
(D) 31

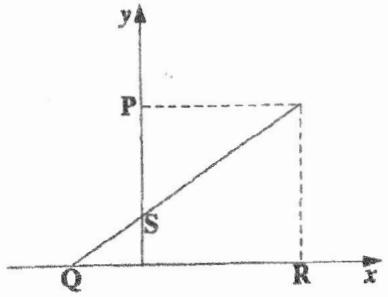
4. An object of mass, *m*, is attached to a spring balance and its weight, *w*, recorded. What will be the result if the object is taken to the moon and weighed there?

(A) Mass = *m*; weight greater than *w*
(B) Mass = *m*; weight less than *w*
(C) Mass greater than *m*; weight = *w*
(D) Mass less than *m*; weight = *w*

5. Which of the following has NO units?

(A) Velocity
(B) Relative density
(C) Energy
(D) Momentum

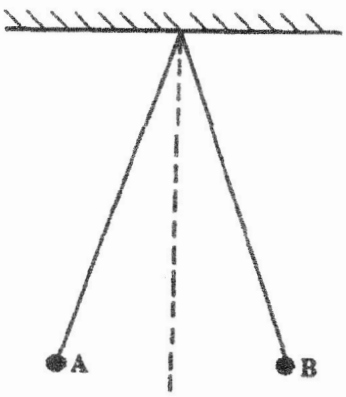
Item 6 refers to the diagram below.



6. When $x = 0$, the value of y is

(A) Q
(B) S
(C) P
(D) P/R

Item 7 refers to the following diagram which shows two higher aluminium spheres A and B suspended by insulating threads.



7. If the spheres come to rest as shown in the diagram, the force keeping them apart is the

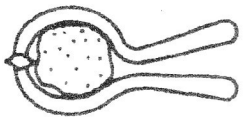
(A) gravitational force
(B) electrostatic force
(C) magnetic force
(D) centripetal force

8. Which of the following is NOT a way in which the centre of gravity of a body may be defined?

(A) The point at which the pull of gravity appears to act
(B) The point through which the resultant force of gravity always passes
(C) The point where the whole weight of the body is concentrated
(D) The point of application of the resultant force due to the earth's attraction

Item 9 refers to the following diagrams which depict some simple machines.

I

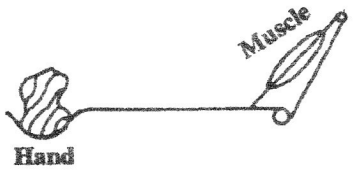


Nut cracker

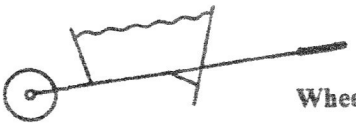
II

Tweezers used for pulling out hair

III



IV



Wheelbarrow

9. In which of these machines would the effort applied be LESS than the load?

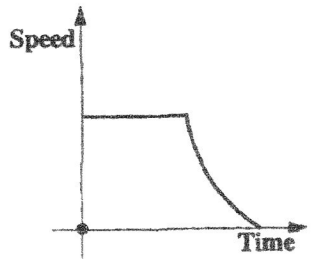
(A) I and II only
(B) I and IV only
(C) II and III only
(D) II and IV only

10. A scalar quantity has

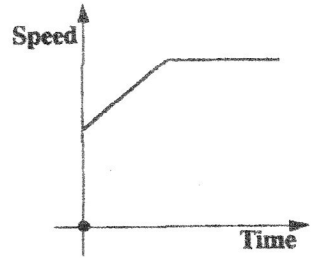
(A) magnitude only
(B) direction only
(C) magnitude and direction
(D) weight only

11. A body initially moving at a constant speed is brought to rest at a uniform rate. Which of the speed/time graphs below indicates the motion of the body?

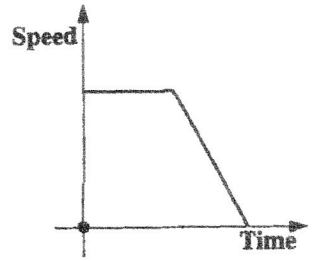
(A)



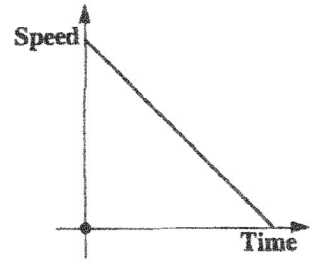
(B)



(C)



(D)



12. Two smooth spheres, A and B, collide head-on. Which of the following statements is/are true?

I. The momentum of A is the same after collision as it was before.
II. The momentum of B is the same after collision as it was before.
III. The total momentum of A and B is the same after collision as it was before.

(A) I only
(B) III only
(C) II and III only
(D) I, II and III

13. A car is moving on a circular track with constant speed. Which of the following statements about the car would be true?

I. It is experiencing a force towards the centre of the circle.
II. It is moving with uniform velocity.
III. It has an acceleration.

(A) I only
(B) I and III only
(C) II and III only
(D) I, II and III

14. A glass marble, X, moving with a speed of 6 ms^{-1}, collides head-on with an identical stationary glass marble, Y. What is the velocity of Y after collision assuming that X is brought to rest?

(A) 0 ms^{-1}
(B) 3 ms^{-1}
(C) 6 ms^{-1}
(D) 12 ms^{-1}

15. In which of the following is the quantity CORRECTLY paired with its unit?

	Quantity	Unit
(A)	Mass	Newton
(B)	Moment of force	Newton per metre
(C)	Energy	Newton metre
(D)	Work done	Newton per metre

16. Which of the following gives the efficiency of a machine?

(A) $\frac{\text{Load x Distance moved by Effort}}{\text{Effort x Distance moved by Load}} \times \frac{100\%}{1}$

(B) $\frac{\text{Load x Distance moved by Load}}{\text{Effort x Distance moved by Effort}} \times \frac{100\%}{1}$

(C) $\frac{\text{Effort x Distance moved by Effort}}{\text{Load x Distance moved by Load}} \times \frac{100\%}{1}$

(D) $\frac{\text{Effort x Distance moved by Load}}{\text{Load x Distance moved by Effort}} \times \frac{100\%}{1}$

17. A large heavy parcel is tied with a string. It is less painful for a person to pick up the parcel if a cloth is wrapped around the string. This is because the cloth

(A) exerts less force on the fingers
(B) reduces the tension in the string
(C) makes the parcel lighter
(D) reduces the pressure on the fingers

18. A piece of string is tied onto a small stone and the stone is then suspended, totally immersed, in water. The tension in the string will be

(A) zero
(B) equal to the weight of the stone
(C) less than the weight of the stone
(D) more than the weight of the stone

19. A solid object, X, floats in mercury and sinks in water. A solid object, Y, floats in both mercury and water.

Which of the following statements is true about X and Y?

(A) X is less dense than Y.
(B) X and Y are both denser than water.
(C) X and Y are both denser than mercury.
(D) X is more dense than Y.

20. Absolute zero is the temperature at which

(A) air changes to a liquid
(B) a gas would exert no pressure
(C) all substances contract to zero volume
(D) gas molecules move at a constant speed

21. A pressure of a fixed mass of gas is P and its volume is V. What is the new volume if the pressure is increased to $2P$ at constant temperatures?

(A) $\frac{V}{2}$

(B) $\frac{V}{4}$

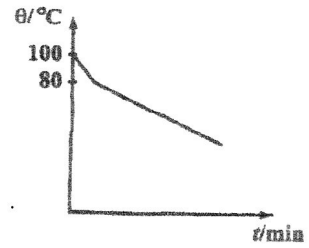
(C) V

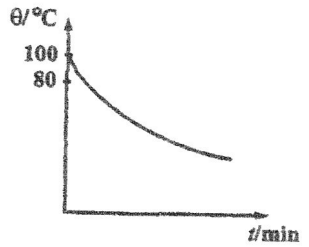
(D) $2V$

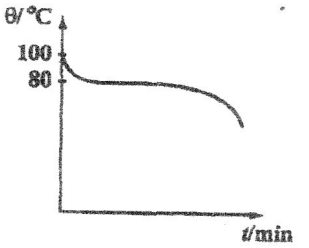
22. The heat capacity of a body depends on

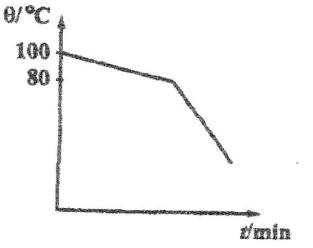
(A) its mass and the specific heat capacity of the material
(B) its mass and the temperature change the body undergoes
(C) the density and temperature of the material
(D) the density and expansivity of the material

23. Some molten naphthalene at 100 °C is allowed to cool down to room temperature. If naphthalene has a melting point of 80 °C which of the following BEST represents the cooling curve?

(A)


(B)


(C)


(D)


24. The specific latent heat of vapourization of water is the energy required to change 1 kg of water at

(A) 0 °C to steam at 100 °C
(B) 99.9 °C to steam at 100.1 °C
(C) 100 °C to steam at 100 °C
(D) 0 °C to ice at 0 °C

25. Which of the following are reasons why a hot liquid, placed in a double-walled vacuum flask, retains its heat for a long time?

I. Evacuated space between the double walls reduces the loss of heat by conduction.
II. Silver inner walls reduce the loss of heat by radiation.
III. The silvered outer wall helps to absorb heat from the surroundings.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

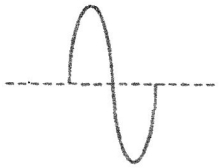
26. In which of the following is conduction the MAIN method of energy transfer?

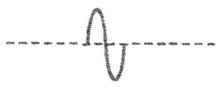
(A) Food heated in a microwave oven
(B) Energy transferred from the sun to earth
(C) Food being cooked on a barbecue
(D) Food being cooked in a pot on an electric stove

27. Which of the following waves has the GREATEST amplitude?

(A) 

(B) 

(C) 

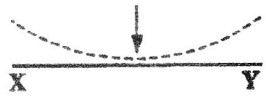
(D) 

28. Which of the following would be the basic difference between a transverse mechanical wave and a longitudinal mechanical wave?

I. Medium through which they travel
II. Direction of vibration of particles in medium
III. Wavelength

(A) I only
(B) II only
(C) I and II only
(D) II and III only

Item 29 refers to the following diagram which shows a wave front about to reach a reflecting surface XY.

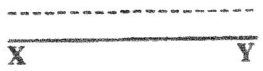


29. Which of the following diagrams would represent the wave front after reflection?

(A) 

(B) 

(C) 

(D) 

30. The wavelength of a wave is changed during

(A) diffraction
(B) reflection
(C) refraction
(D) interference

31. An echo is quieter than the original sound that produced it. This shows that, compared to the original sound, the echo has a

(A) smaller amplitude
(B) shorter wavelength
(C) lower frequency
(D) slower speed

32. The following are types of radiation in the electromagnetic spectrum. Which of the following could have a wavelength which is more than 1 m?

(A) Radio
(B) Infrared
(C) Ultraviolet
(D) X-rays

33. Diffraction is NOT normally observed with light because

(A) the wavelength is very large
(B) the light is not bright enough
(C) the wavelength is very small
(D) light is a transverse wave

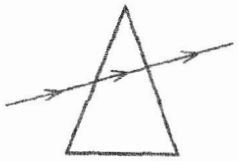
34. Upon which of the following would the position of an image formed by a plane mirror depend?

I. Distance of the observer from the mirror
II. Distance of the object from the mirror
III. Angle at which the image is viewed

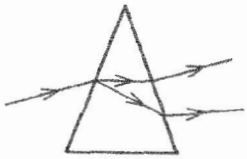
(A) I only
(B) II only
(C) II and III only
(D) I, II and III

35. Which of the diagrams BEST represents t passage of a beam of white light through triangular glass prism?

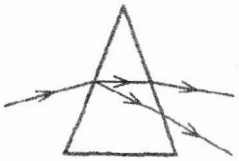
(A)



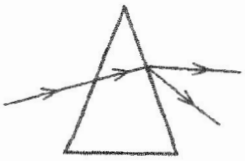
(B)



(C)



(D)

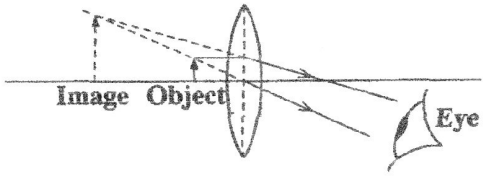


36. Which of the following statements are true of a diverging lens?

I. It is thinner at the centre than at the edge.
II. It can form only inverted images.
III. It can form only real images.
IV. It can form only diminished images.

(A) I and III only
(B) I and IV only
(C) II and IV only
(D) I, II and III only

Item 37 refers to the following diagram.



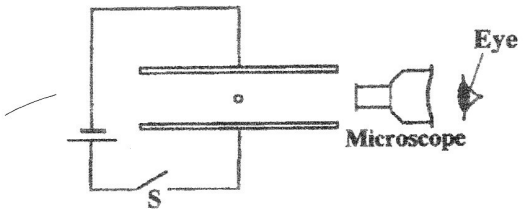
37. The diagram above shows the formation of an image by a

(A) lens camera
(B) pinhole camera
(C) telescope
(D) magnifying glass

38. A positively charged rod, made of Material X, is brought near to a rod made of Material Y, which is also positively charged. These rods would

(A) attract each other
(B) have no effect on each other
(C) repel each other
(D) cause each other to lose charge

Item 39 refers to the diagram below which shows a small negatively charged dust particle midway between two plates and observed with a microscope.



39. Which of the following arrows CORRECTLY indicates the path taken by the dust particle when the switch, S, is closed?

(A) $\rightarrow$
(B) $\leftarrow$
(C) $\uparrow$
(D) $\downarrow$

40. Which of the following relationships between electrical quantities is correct?

(A) $V = P\,I$

(B) $R = V\,I$

(C) $Q = \frac{E}{V}$

(D) $E = V\,I$

41. Which of the following could NOT be a unit of current?

(A) $W\,V^{-1}$
(B) $V\,\Omega^{-1}$
(C) $C\,s^{-1}$
(D) $C\,s$

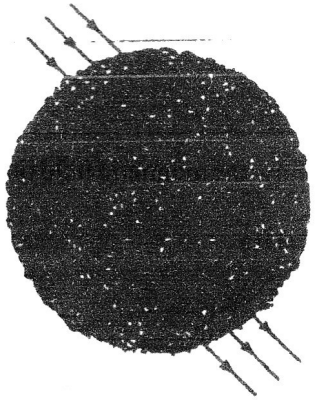
42. An electric current in a metal consists of a flow of

(A) neutrons
(B) protons
(C) electrons
(D) ions

43. A beam of light passes from one medium to another of greater refractive index. When it refracts the

(A) frequency changes
(B) wavelength changes
(C) speed increases
(D) beam bends away from the normal

44. A parallel beam of light is incident on a glass object placed in the shaded area of the diagram below.



Which of the following could have caused this lateral displacement?

(A) Rectangular block
(B) Triangular prism
(C) Diverging lens
(D) Converging lens

45. Which of the following is true of a secondary cell?

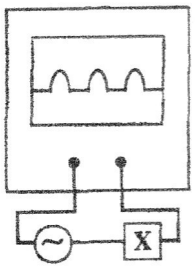
(A) It is formed by connecting two or more primary cells.
(B) It can be recharged by passing a direct current in the same direction as it delivers current.
(C) It can be recharged by passing a direct current in the opposite direction to which it delivers current.
(D) It can be recharged by 'topping'.

46. Which two of the following simple pendulums would you expect to have the same period?

Pendulum 1: mass m, length l
Pendulum 2: mass m, length $2l$
Pendulum 3: mass $3m$, length l
Pendulum 4: mass $3m$, length $6l$

(A) 1 and 2
(B) 1 and 3
(C) 2 and 4
(D) 3 and 4

Item 47 refers to the the diagram below which shows the trace on the screen of an oscilloscope wired to an a.c. supply and a device X.



47. X is probably a

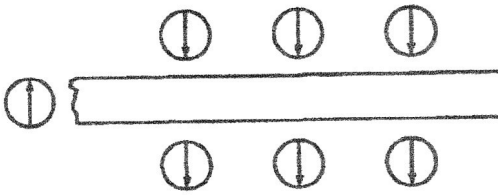
(A) diode
(B) resistor
(C) solenoid
(D) transformer

48. In domestic installation systems, which of the following devices should be placed in the live wire?

I. Switches
II. Circuit breakers
III. Fuses

(A) I only
(B) III only
(C) II and III only
(D) I, II and III

Item 49 refers to the following diagram which shows a piece of rubber magnet from a refrigerator, surrounded by plotting compasses.



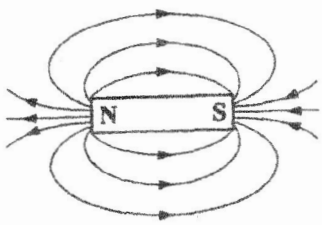
49. The rubber magnet has

(A) poles at the ends
(B) poles at the centre
(C) poles at the sides
(D) no poles

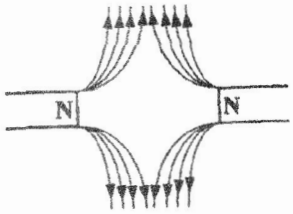
50. Which of the following is MOST suitable for the core of an electromagnet?

(A) Copper
(B) Steel
(C) Carbon
(D) Soft iron

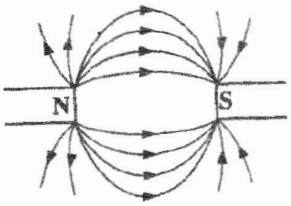
Item **51** refers to the diagrams below which show the magnetic field lines plotted by a student.



I



II



III

51. Which of the following combinations are correct?

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

---

52. Which of the following make use of the magnetic field generated by an electric current?

I. d.c. motor
II. Moving-coil galvanometer
III. Electric iron

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

53. Which of the following statements about alternating current is true?

(A) It can be changed into direct current by a transformer.
(B) It can be rectified by using a semiconductor diode.
(C) It can be used to recharge a battery.
(D) It is used to transmit electrical energy because of its high frequency.

54. A wire carrying a current in a magnetic field may experience a force. Which of the following devices does NOT depend on this force?

(A) Loudspeaker
(B) Electric motor
(C) Moving-coil galvanometer
(D) Electromagnet

55. The electric power supplied to homes and to factories is alternating rather than direct because

(A) the use of a.c. reduces electrical hazards
(B) the use of a.c. reduces transmission losses
(C) a.c. enables a wider variety of appliances to be used
(D) a.c. power lines are less likely to be struck by lightning than d.c. power lines

56. With whom would you associate the composition of the nucleus?

(A) Thompson
(B) Bohr
(C) Chadwick
(D) Einstein

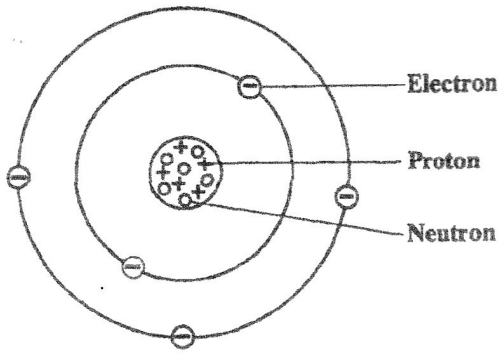
57. Which of the following is NOT affected by an electric field?

(A) Alpha particle
(B) Beta particle
(C) Neutron
(D) Electron

58. Which of the following is FOUR times the mass of a proton?

(A) Alpha particle
(B) Beta particle
(C) Electron
(D) Neutron

59. The diagram below shows the shell model of an atom.

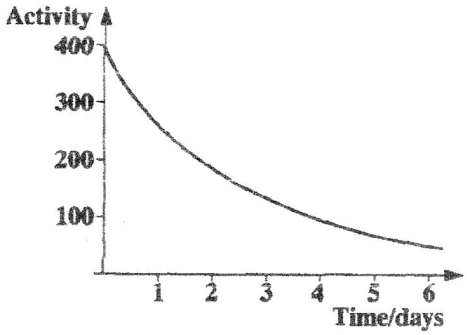


Which of the following statements is/are correct?

I. The mass (nucleon) number is 11.
II. The atomic (proton) number is 5.
III. The atom shown in the diagram is positively charged.

(A) I only
(B) II only
(C) I and II only
(D) I, II and III

Item 60 refers to the following information. The activity of a radioactive substance was measured at suitable intervals over a period of days and its radioactive decay curve plotted.



60. The half-life is

(A) 1 day
(B) 2 days
(C) 3 days
(D) 4 days

June 2009.

1. Which of the following is an SI base unit?

(A) Ampere
(B) Volt
(C) Ohm
(D) Coulomb

2. 3.1415926 expressed to TWO significant figures is

(A) 3.1
(B) 3.14
(C) 3.2
(D) 31

3. When used in front of a unit the prefix 'mega' means

(A) 10^{-6}
(B) 10^{-3}
(C) 10^{3}
(D) 10^{6}

4. The time period of a simple pendulum vibrating with a small amplitude depends on the

(A) mass of the pendulum bob
(B) amplitude of the oscillation
(C) length of the pendulum
(D) force with which the pendulum is set into motion

5. A slice of bread is squeezed into a little ball. Which quantity does NOT change?

(A) Mass
(B) Volume
(C) Density
(D) Width

6. The relative density of brass is 8.4. Which of the following is the BEST statement that can be made?

(A) Brass is heavier than water.
(B) Water is heavier than brass.
(C) 100 cm^3 of brass is heavier than 100 cm^3 of water.
(D) 100 cm^3 of water is heavier than 100 cm^3 of brass.

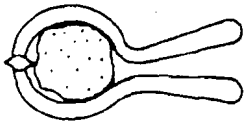
7. The force which keeps the moon in orbit is

(A) magnetic
(B) centrifugal
(C) reactive
(D) gravitational

8. Which of the following, when displaced, is seen to be in neutral equilibrium?

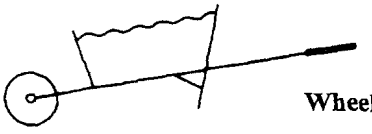
(A) A heavy weight suspended on a string
(B) A pencil balanced on its point
(C) A beam of a balance in use
(D) A cone resting on a slanted edge

Item 9 refers to the following diagrams which depict some simple machines.

I  **Nut cracker**

II  **hair** **Tweezer used for pulling out hair**

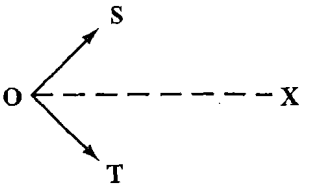
III  **Human forearm**

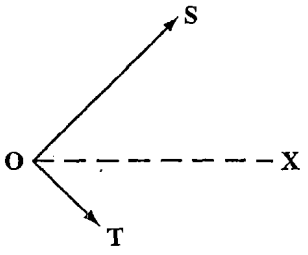
IV  **Wheel barrow**

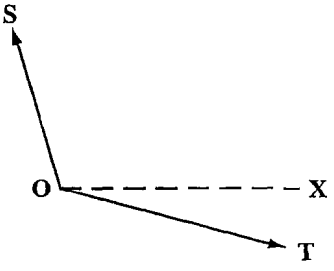
9. In which of these machines would the effort applied be LESS than the load?

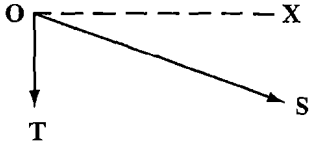
(A) I and II only
(B) I and IV only
(C) II and III only
(D) II and IV only

10. The diagrams below, drawn to scale, represent two forces S and T acting at O. In which of the following is the resultant in the direction, OX?

(A) 

(B) 

(C) 

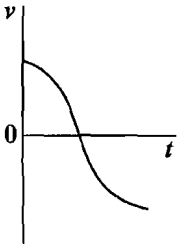
(D) 

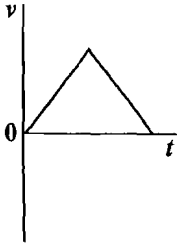
11. On which of the following does the pressure at a point in a liquid depend?

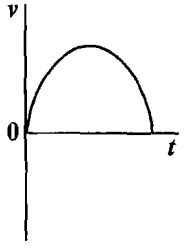
I. Density of the liquid
II. Depth from the surface
III. Area of the cross-section of the container

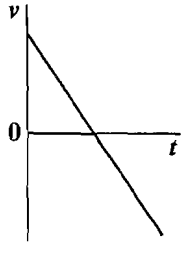
(A) I only
(B) III only
(C) I and II only
(D) I, II and III

12. Which of the following speed-time graphs could represent the motion of a cricket ball which is thrown vertically upwards and caught by the thrower?

(A)


(B)


(C)


(D)


13. A glass marble, X, moving with a speed of 6 ms^{-1}, collides 'head on' with an identical stationary glass marble, Y. What is the velocity of Y after collision assuming that X is brought to rest?

(A) 0 ms^{-1}
(B) 3 ms^{-1}
(C) 6 ms^{-1}
(D) 12 ms^{-1}

14. When an object is floating on a liquid, which of the following would be true?

I. The object weighs the same as the volume of water displaced.
II. The upthrust on the object is slightly greater than the weight of the object.
III. The average density of the object is just equal to that of the liquid.

(A) I only
(B) III only
(C) I and II only
(D) I, II and III

15. A book of weight 12 N is resting on a table. The force that the table exerts on the book is

(A) 0 N
(B) 12 N
(C) greater than 12 N
(D) greater than 0 N but less than 12 N

16. A particle moving with constant speed in a uniform circular path, has a

(A) constant velocity
(B) constant acceleration along the radius of its path
(C) variable acceleration
(D) constant acceleration tangential to its path

17. Which of the following is NOT true about the moment of a force?

(A) It is measured in units called newton metres.
(B) It is the amount of force needed to keep a body turning.
(C) It is the turning effect that a force has when it acts on a body.
(D) It is the product of the force and the perpendicular distance of its line of action from a point.

18. Which of the following is/are renewable source(s) of energy?

I. Solar energy
II. Wind energy
III. Geothermal energy

(A) I only
(B) I and III only
(C) II and III only
(D) I, II and III

19. Which of the following implements is/are designed to take advantage of a large moment provided by a relatively small force?

I. Claw hammer
II. Crowbar
III. Pair of tweezers
IV. Pair of wire cutters

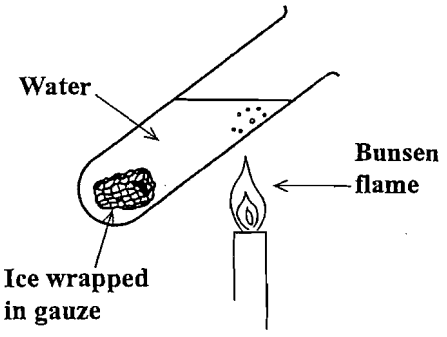
(A) III only
(B) I and IV only
(C) I, II and III only
(D) I, II and IV only

20. Which of the following would be characteristic features of a clinical thermometer?

I. Narrow constriction in the tube just above the bulb
II. Limited range of temperatures
III. Large bore to make the mercury more visible

(A) I only
(B) I and II only
(C) I and III only
(D) I, II and III

Item 21 refers to the diagram below which shows water boiling at the top of a glass test tube while a piece of ice remains unmelted at the bottom.



21. Which of the following is a reason for this occurrence?

(A) Water is a poor conductor of heat.
(B) Gauze is a poor conductor of heat.
(C) Water is a good conductor of heat.
(D) Glass is a good conductor of heat.

22. Which of the following types of radiation is responsible for an atom of $^{14}_{6}C$ changing into an atom of $^{14}_{7}N$?

(A) α
(B) β
(C) γ
(D) n

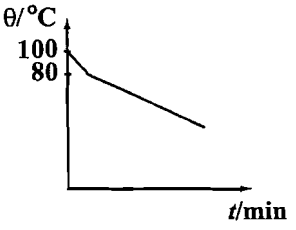
23. A flask contains air under pressure. Some of the air is let out slowly over a period of 10 seconds. When the flask is closed the

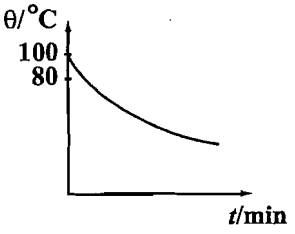
(A) pressure of the air in the flask will have increased
(B) volume of air in the flask will have decreased
(C) temperature in the flask will have increased
(D) number of molecules striking the wall per second will have decreased

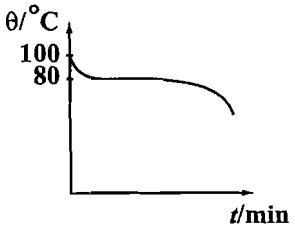
24. The heat capacity of a body depends on

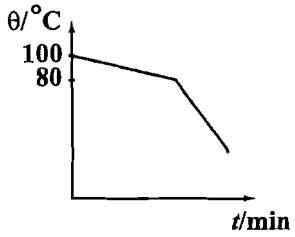
(A) its mass and the specific heat capacity of the material
(B) its mass and the temperature change the body undergoes
(C) the density and temperature of the material
(D) the density and expansivity of the material

25. Some molten naphthalene at 100 °C is allowed to cool down at room temperature. If naphthalene has a melting point of 80 °C, which of the following BEST represents the cooling curve?

(A)


(B)


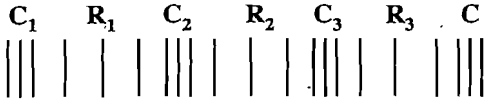
(C)


(D)


26. An electric kettle full of water is plugged into the mains. The process by which heat travels through the water is

(A) electrification
(B) evaporation
(C) convection
(D) radiation

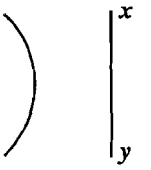
Item 27 refers to the following diagram which shows a longitudinal wave, where, C and R represent compressions and rarefractions respectively.



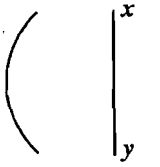
27. If λ = wavelength, the distance between C_1 and R_2 is

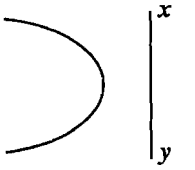
(A) $\frac{1}{2}\lambda$
(B) 1λ
(C) $1\frac{1}{2}\lambda$
(D) 2λ

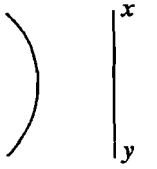
Item 28 refers to the following diagram.

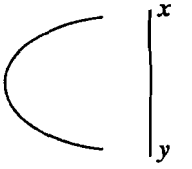


28. The circular wavefront shown above is progressing towards the reflecting surface *xy*. Which of the diagrams below correctly shows the shape of the wavefront after reflection?

(A) 

(B) 

(C) 

(D) 

29. Which of the following statements about sound waves, water waves and electromagnetic waves is NOT correct?

(A) They all transmit energy from the source to the surroundings.
(B) They are all examples of transverse waves.
(C) They all undergo reflection, refraction and diffraction.
(D) They all have different speeds of propagation.

30. In which of the following are the electromagnetic waves written in order of INCREASING frequency, starting with the lowest?

(A) X-rays, ultraviolet, infrared, radio
(B) X-rays, infrared, ultraviolet, radio
(C) Radio, x-rays, infrared, ultraviolet
(D) Radio, infrared, ultraviolet, x-rays

31. Which of the following demonstrates the straight line propagation of light?

(A) The spreading of light when it passes through a narrow opening
(B) The dispersion of light by a prism
(C) A parallel beam of light coming to a point focus after reflection from a spherical mirror
(D) The operation of the pinhole camera

32. The image formed in a plane mirror is

(A) real and upright
(B) real and inverted (upside down)
(C) virtual and upright
(D) virtual and inverted (upside down)

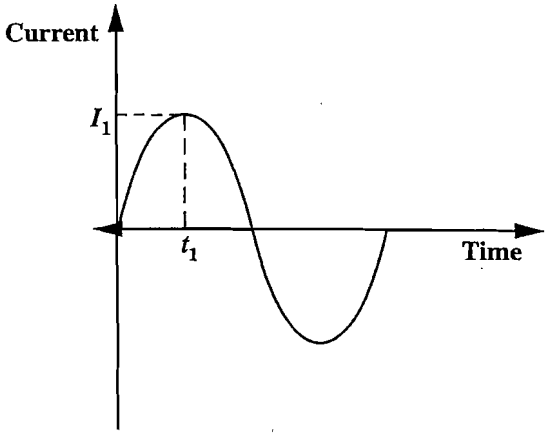
33. A ray of light in air strikes a glass block at an angle of incidence of 0°. The light will be

(A) undeviated
(B) totally reflected
(C) refracted at 90° to normal
(D) refracted at an unknown angle

34. Which of the following statements about waves is true?

(A) Only transverse waves undergo reflection.
(B) All waves undergo reflection, refraction and diffraction.
(C) Diffraction can only take place with light waves.
(D) Longitudinal waves do not undergo reflection, but may be reflected.

Item 38 refers to the graph below which shows the variation of alternating current with time.



38. The value of the current I_1 at time t_1 is called the

(A) sinusoidal value
(B) peak value
(C) root mean square value
(D) average value

39. Which of the following equations CANNOT be used to determine the power dissipated in a resistor?

(A) $P = I^2R$

(B) $P = \frac{V^2}{R}$

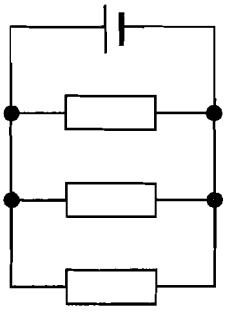
(C) $P = VI$

(D) $P = \frac{R}{V^2}$

40. Which of the following statements is true of a secondary cell?

(A) It is formed by connecting two or more primary cells.
(B) It can be recharged by passing a direct current in the opposite direction to which it delivers current.
(C) It can be recharged by passing a direct current in the same direction as it delivers current.
(D) It can be recharged by 'topping up' with dilute sulphuric acid.

Item 41 refers to the diagram below which shows a battery connected across three resistors connected in parallel.



41. It is ALWAYS true that the

(A) potential difference is the same across each resistor
(B) current is the same in each resistor
(C) applied voltage is proportional to the net resistance
(D) voltage across a given resistance is dependent on the value of the resistors

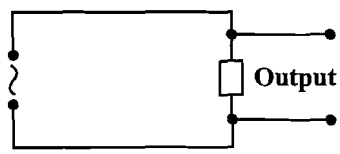
42. Which of the following gives the correct colour code for electrical wiring?

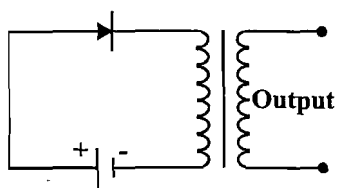
	LIVE	NEUTRAL	EARTH
(A)	Brown	Blue	Green/ yellow
(B)	Red	Blue	Green
(C)	Blue	Green/yellow	Brown
(D)	Green	Brown	Blue

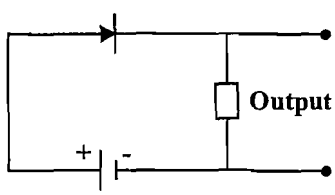
43. The resistance of an IDEAL ammeter is assumed to be

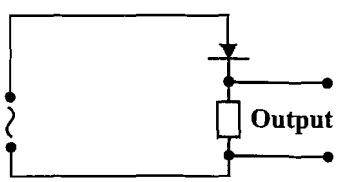
(A) zero
(B) 0.1 ohm
(C) 1 to 2 ohm
(D) infinite

44. Which of the following circuits can be used for half-wave rectification?

(A)


(B)


(C)


(D)


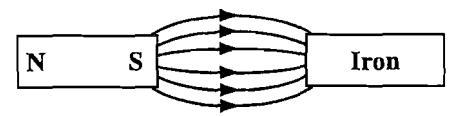
45. A suspended bar magnet, after swinging freely, always settles

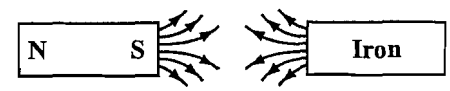
(A) with its poles pointing the same way
(B) with its N pole pointing geographic south
(C) perpendicular to the Earth's magnetic field
(D) opposite to the direction from which it started

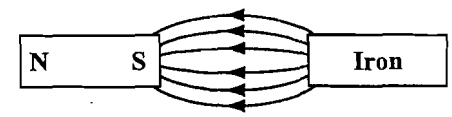
46. Magnetic induction occurs when

(A) a N pole attracts a S pole
(B) iron nails near a magnet become magnetised
(C) a magnet is suspended and points in the NS direction
(D) an electroscope is charged

47. Which of the following shows the magnetic field between a bar magnet and a piece of iron?

(A)


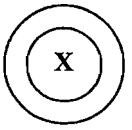
(B)


(C)


(D)

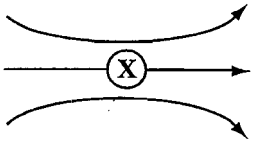

GO ON TO THE NEXT PAGE

Item **48** refers to the diagram below which represents a straight wire carrying a current into the plane of the paper.

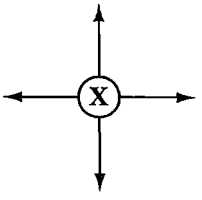


48. Which of the following diagrams BEST represents the magnetic field around the wire?

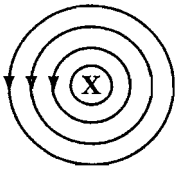
(A)



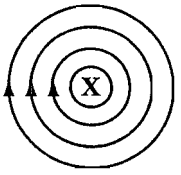
(B)



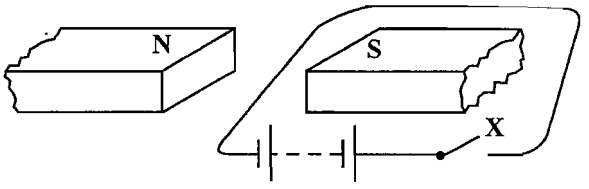
(C)



(D)



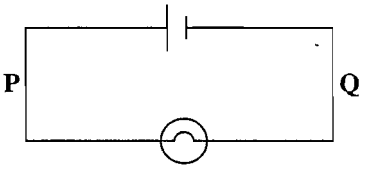
Item **49** refers to the following diagram.



49. The flexible wire shown in the diagram above is loosely supported in the strong magnetic field. When the switch, X, is closed the wire moves

(A) downwards
(B) upwards
(C) towards the north pole
(D) towards the south pole

Item **50** refers to the following diagram.



50. The current in wire P is 0.9 A. The current in wire Q is

(A) 0 A
(B) 0.8 A
(C) 0.9 A
(D) 1.0 A

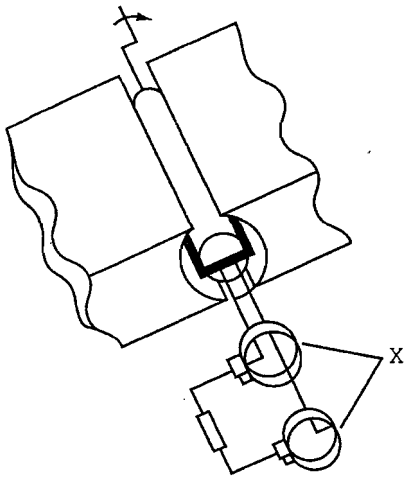
51. A conductor, rotating in a uniform magnetic field, induces maximum instantaneous current when the conductor cuts the magnetic field lines at

(A) 30°
(B) 45°
(C) 90°
(D) 180°

52. The device for changing the voltage of an alternative supply is called a

(A) transformer
(B) transducer
(C) transistor
(D) transposer

Item 53 refers to the following diagram of a simple a.c. generator.



53. The parts labelled X in the diagram are known as the

(A) coils
(B) armatures
(C) slip rings
(D) commutators

54. In the scattering experiment conducted by Geiger and Marsden, some of the apha particles were deflected. The explanation for this phenomenon is that

(A) electrons have a small mass
(B) electrons have a small charge
(C) the metal foil was only a few atoms thick
(D) the nuclear charge and mass are concentrated in a small volume

Item 55 refers to the following table.

Nuclei	Atomic Mass	Neutron Number
P	16	8
Q	13	9
R	18	10
S	21	11

55. Which pair of nuclei are isotopes?

(A) P and Q
(B) Q and R
(C) P and R
(D) Q and S

56. When alpha particles, beta particles and gamma rays from a radioactive source are subjected to a transverse magnetic field, which of them would NOT be deviated from their original path?

I. Alpha
II. Beta
III. Gamma

(A) II only
(B) III only
(C) I and II only
(D) II and III only

57. Which of the following equations for nuclear reactions is correct?

(A) $^{226}_{88}\text{Ra} \rightarrow {}^{222}_{86}\text{Rn} + \beta$ - particle

(B) $^{14}_{6}\text{C} \rightarrow {}^{15}_{7}\text{N} + \beta$ - particle

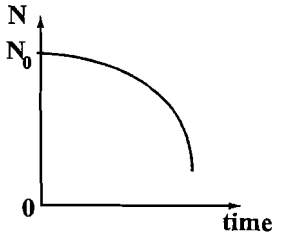
(C) $^{226}_{88}\text{Ra} \rightarrow {}^{222}_{86}\text{Rn} + \alpha$ - particle

(D) $^{14}_{6}\text{C} \rightarrow {}^{15}_{7}\text{N} + \alpha$ - particle

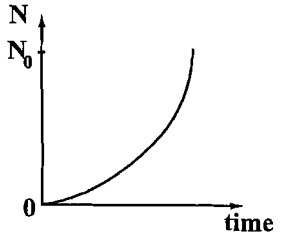
58. N_0 radioactive nuclei are present in a sample at time t = 0.

Which of the following graphs BEST represents the variation with time of the number, N, of undecayed nuclei present?

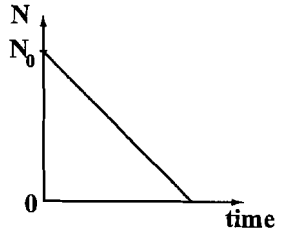
(A)



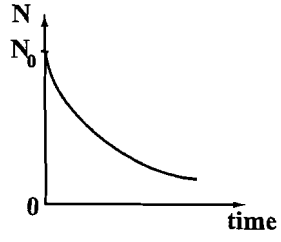
(B)



(C)



(D)



59. Which of the following are definitions of the term 'half-life' of radioactive nuclide?

I. The time taken for the activity of any give sample to fall to half its original value.

II. The time taken for half the nuclei present in any given sample to decay.

III. Half the average number of disintegrations per second.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

60. In the equation $\Delta E = \Delta mc^2$

(A) c = speed of light, Δm = mass of atom
(B) c = speed of light, Δm = mass lost
(C) c = specific heat capacity of substance, Δm = mass lost
(D) c = specific heat capacity of substance, Δm = mass of substance

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

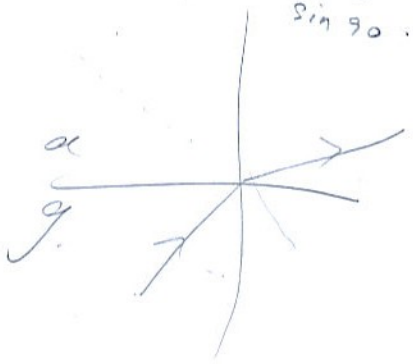
2010.

$_1n_2 = \frac{\sin i}{\sin r}$

$g n_a = \frac{\sin c}{\sin r} \Rightarrow \frac{\sin c}{\sin 90}$.

$g n_a = \sin c$

$a n_g = \frac{1}{\sin c}$



1. Which of the following groups of quantities contains one which is NOT an S.I. base quantity?

(A) Mass, length, time
(B) Current, temperature, length
(C) Volume, temperature, time
(D) Time, mass, temperature

2. 3.1415926 expressed to TWO significant figures is

(A) 3.1
(B) 3.14
(C) 3.2
(D) 31

3. The symbol for the unit of the moment of a force is

(A) N
(B) N m
(C) kg m^{-1} s^{-2}
(D) kg m s^{-2}

4. The unit of electrical resistance is expressed as

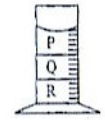
(A) 1 Ω = 1 $V.A^{-1}$
(B) 1 Ω = 1 A.V
(C) 1 Ω = 1 $A.V^{-1}$
(D) 1 Ω = 1 $W.A^{-1}$

5. The time period of a simple pendulum oscillating with a small amplitude depends on the

(A) mass of the pendulum bob
(B) amplitude of the oscillation
(C) length of the pendulum
(D) force with which the pendulum is set into motion

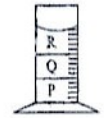
6. Three immiscible liquids P, Q and R have different densities. Q is denser than P but less dense than R. Which of the following diagrams shows how the liquids settle in the measuring cylinder?

(A)

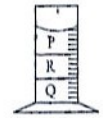


(B)

(C)



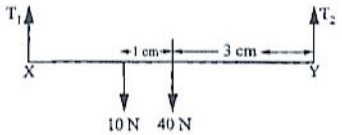
(D)



7. A bus with luggage loaded on top is more likely to tip over when rounding a corner than the same bus without the luggage. The reason for this is that the luggage

(A) increases the weight of the bus
(B) raises the centre of gravity of the bus
(C) lowers the centre of gravity of the bus
(D) increases the momentum of the bus

Item 8 refers to the following diagram.



8. A uniform rod XY of weight 40 N is held in equilibrium, horizontally, as shown in the diagram above. Which of the following is true?

(A) $T_1 < T_2$

(B) $T_1 \leq T_2$

(C) $T_1 = T_2$

(D) $T_1 > T_2$

9. Which of the following is used to calculate the efficiency of a machine?

(A) $\frac{\text{Load x Distance moved by Effort}}{\text{Effort x Distance moved by Load}} \times \frac{100\%}{1}$

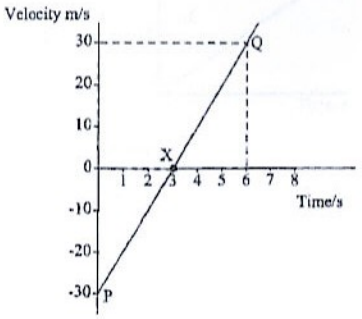
(B) $\frac{\text{Load x Distance moved by Load}}{\text{Effort x Distance moved by Effort}} \times \frac{100\%}{1}$

(C) $\frac{\text{Effort x Distance moved by Effort}}{\text{Load x Distance moved by Load}} \times \frac{100\%}{1}$

(D) $\frac{\text{Effort x Distance moved by Load}}{\text{Load x Distance moved by Effort}} \times \frac{100\%}{1}$

Items 10 – 11 refer to the following velocity-time graph which shows a ball being thrown vertically upwards from the ground.

Downward motion is assumed to be positive.



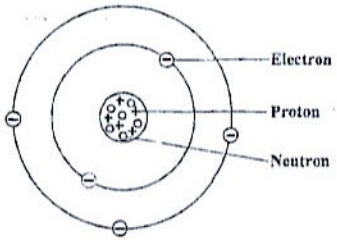
10. The point, X, on the graph shows when the ball is

(A) at its highest point above the ground
(B) at rest on the ground
(C) just about to be thrown upwards
(D) on its way halfway downwards

11. The gradient of the line, PQ, represents the

(A) distance the ball has covered
(B) displacement of the ball from the ground
(C) acceleration of the ball as it moves
(D) velocity of the ball for its entire flight

59. The diagram below shows the shell model of an atom.

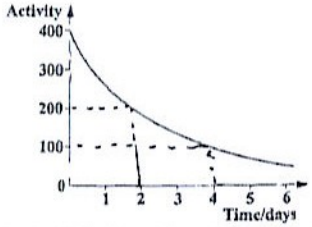


Which of the following statements is/are correct?

I. The mass (nucleon) number is 11.
II. The atomic (proton) number is 5.
III. The atom shown in the diagram is positively charged.

(A) I only
(B) II only
(C) I and II only
(D) I, II and III

Item 60 refers to the following information.
The activity of a radioactive substance was measured at suitable intervals over a period of days and its radioactive decay curve plotted as shown below.



60. The half-life of the radioactive substance is approximately

(A) 1 day
(B) 2 days
(C) 3 days
(D) 4 days

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

55. Which of the following are definitions for the term 'half-life' of a radioactive nuclide?

I. The time taken for the activity of any give sample to fall to half its original value.
II. The time taken for half the nuclei present in any given sample to decay.
III. Half the average number of disintegrations per second.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

56. Radioactivity takes place in an atom as a result of

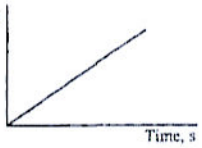
(A) nuclear instability
(B) a chemical reaction
(C) exposure to excess heat
(D) excess stress on the atom

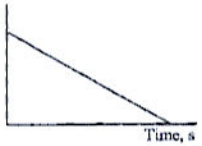
57. Which of the following statements about radioactive decay are correct?

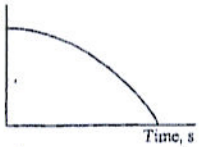
I. It is dependent on conditions external to the nucleus.
II. It is a random process.
III. It is due to changes in the nuclei of atoms.

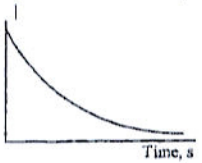
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

58. Which of the following graphs shows how the activity of a radioactive source varies with time?

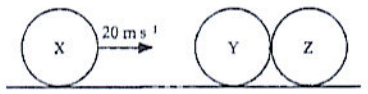
(A)


(B)


(C)


(D)


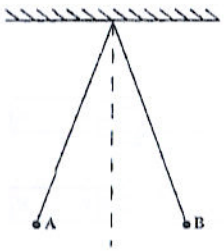
Item 12 refers to the following diagram



12. X, Y and Z are three billiard balls of equal mass whose centres lie in a straight line. Y and Z are touching each other and are stationary. X, travelling with a velocity of 20 m s^{-1}, impinges on Y. Assuming that the spheres are perfectly elastic, the resultant motion after impact is

(A) X, Y and Z all move on together, each with a velocity of 10 m s^{-1}
(B) X and Y remain stationary while Z moves on with a velocity of 20 m s^{-1}
(C) X, Y and Z remain stationary
(D) X remains stationary while Y and Z move on together each with a velocity of 10 m s^{-1}

Item 13 refers to the following diagram which shows two positively charged spheres A and B suspended by insulating threads.



13. If the spheres come to rest as shown in the diagram, the force keeping them apart is the

(A) electrostatic force
(B) gravitational force
(C) magnetic force
(D) centripetal force

14. Which of the following tools is/are designed to take advantage of a large moment provided by a relatively small force?

I. Claw hammer
II. Crowbar
III. Pair of tweezers
IV. Pair of wire cutters

(A) III only
(B) I and IV only
(C) I, II and III only
(D) I, II and IV only

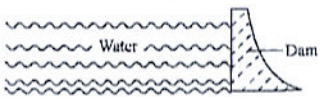
15. Which of the following is a unit of work?

(A) kg m s^{-2}
(B) N m^{-2}
(C) N m
(D) J s^{-1}

16. When a car is moving at a constant speed the energy changes occurring are

(A) chemical energy to kinetic energy
(B) chemical energy to potential energy
(C) kinetic energy to potential energy
(D) chemical energy to nuclear energy

Item 17 refers to the following diagram which shows a dam.



17. The pressure on the dam at the bottom of the reservoir depends on the

(A) depth of the water
(B) volume of water held by the dam
(C) mass of water held back by the dam
(D) length of the reservoir

18. A piece of string is tied onto a small stone and the stone is then suspended, totally immersed, in water. The tension in the string will be

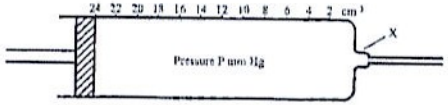
(A) zero
(B) equal to the weight of the stone
(C) less than the weight of the stone
(D) more than the weight of the stone

19. A solid object when placed in a beaker of water just sinks to the bottom. Which of the following should be done to make the object float?

I. Cutting off part of the object
II. Dissolving a lot of salt in the water
III. Carrying the beaker up to the top of a high mountain

(A) I only
(B) II only
(C) I and II only
(D) II and III only

Item 20 refers to the following diagram.



20. 24 cm³ of air at a pressure P mm Hg are trapped in the syringe which is blocked at X. The piston is forced to the 8 cm³ mark. The new pressure in terms of P is

(Assume constant temperature)

(A) P/3
(B) 3 P
(C) 8 P
(D) 24 P

21. In the pressure law which of the following would be true?

I. Ratio of pressure to Kelvin temperature is constant.
II. Volume is constant.
III. Pressure is constant.

(A) I only
(B) III only
(C) I and II only
(D) I, II and III

22. Which of the following are characteristic features of a clinical thermometer?

I. Narrow constriction in the tube just above the bulb
II. Limited range of temperatures
III. Large bore to make the mercury more visible

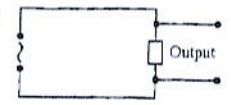
(A) I only
(B) I and II only
(C) I and III only
(D) I, II and III

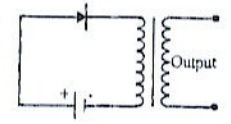
23. Which of the following are reasons why a hot liquid, placed in a double-walled vacuum flask, retains its heat for a long time?

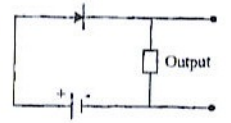
I. Evacuated space between the double walls reduces the loss of heat by conduction.
II. Silver inner walls reduce the loss of heat by radiation.
III. The silvered outer wall helps to absorb heat from the surroundings.

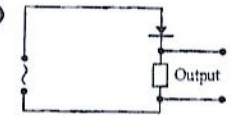
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

48. Which of the following circuits can be used for half-wave rectification?

(A)


(B)


(C)


(D)


49. Which of the following shows the magnetic field between a bar magnet and a piece of iron?

(A)


(B)


(C)


(D)

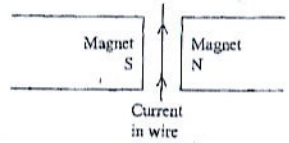

50. Which of the following is the MOST suitable material for the core of an electromagnet?

(A) Copper
(B) Steel
(C) Carbon
(D) Soft iron

51. When a wire is moved across a magnetic field, an e.m.f. is induced because the

(A) magnetic fields interact
(B) magnetic flux is cut by the wire
(C) electric fields interact
(D) lines of force behave like stretched elastic

Item 52 refers to the following diagram.



52. The wire in the diagram will move

(A) towards N
(B) towards S
(C) into the paper
(D) out of the paper

53. The nucleus of an atom contains protons and neutrons of

(A) approximately equal mass
(B) greatly differing masses
(C) opposite charge
(D) the same charge

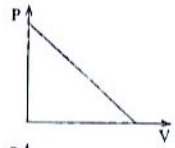
54. Isotopes of the an element have

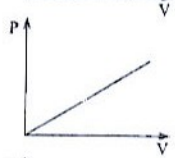
(A) different atomic numbers
(B) same mass numbers
(C) atoms with the same number of protons
(D) atoms with different numbers of electrons

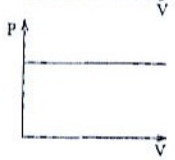
24. Which of the following is longitudinal in nature?

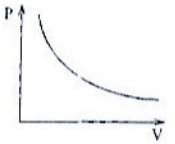
(A) infrared rays
(B) Light rays
(C) Sound waves
(D) Water waves

25. Which of the following graphs illustrates the variation of pressure (P) with volume (V) for a gas obeying Boyle's Law?

(A)


(B)


(C)


(D)


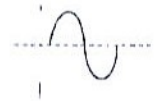
26. A gas is much easier to compress than a solid or liquid because the gas molecules

(A) are very numerous
(B) are arranged randomly
(C) are moving very rapidly
(D) have no forces between them

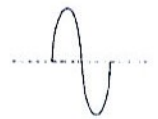
27. A fixed mass of gas at constant temperature is compressed. The molecules of the gas will

(A) hit the sides of the container more often
(B) have more kinetic energy
(C) move more slowly
(D) have more momentum

28. Which of the following waves has the GREATEST amplitude?

(A)


(B)


(C)


(D)


41. Which of the following relationships between the electrical quantities is correct?

(A) $V = PI$
(B) $R = VI$
(C) $Q = \frac{E}{V}$
(D) $E = VI$

42. The speed of light is highest when it passes through

(A) water
(B) air
(C) glass
(D) a vacuum

43. Total internal reflection in a medium occurs only when the angle of incidence

(A) equals 90°
(B) equals the angle of refraction
(C) is greater than the critical angle
(D) is less than the critical angle

44. The refractive index of a transparent medium with a critical angle, c, for light travelling from the medium to air is

(A) $\frac{1}{c}$
(B) $\frac{90}{\sin c}$
(C) $\frac{\sin 90}{\sin c}$
(D) $\sin c$

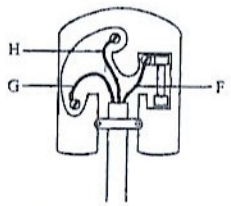
45. Magnetic induction occurs when

(A) a N pole attracts a S pole
(B) iron nails near a magnet become magnetised
(C) a magnet is suspended and points in the NS direction
(D) an electroscope is charged

46. Which of the following characteristics concerning ammeters is correct?

	Resistance	Circuit connection
(A)	Low	in series
(B)	Low	in parallel
(C)	High	in parallel
(D)	High	in series

Item 47 refers to the following diagram.



47. The diagram above shows the inside of a three-pin electric plug. The wires are labelled, F, G and H. Which of the following is true?

I. H is the earth wire with insulation colour, green/yellow.
II. F is the neutral wire with insulation colour, blue.
III. G is the live wire with insulation colour, brown.

(A) I only
(B) I and II only
(C) II and III only
(D) I, II and III

1. Which of the following is a fundamental quantity?

(A) Density
(B) Mass
(C) Relative Density
(D) Volume

2. Which of the following quantities has the same value as 6 μC?

(A) 6×10^{6} C
(B) 6×10^{3} C
(C) 6×10^{-3} C
(D) 6×10^{-6} C

3. When used in front of a unit the prefix 'mega' means

(A) 10^{+6}
(B) 10^{+3}
(C) 10^{-3}
(D) 10^{-6}

4. 3.1415926 expressed to two significant figures is

(A) 3.1
(B) 3.14
(C) 3.2
(D) 31

5. A slice of bread is squeezed into a little ball. Which quantity does NOT change?

(A) Volume
(B) Mass
(C) Density
(D) Width

6. A boy measured the height of the laboratory table with a metre rule. Which of the following is MOST likely to be correct?

(A) 0.00895 m
(B) 0.0895 m
(C) 0.895 m
(D) 8.95 m

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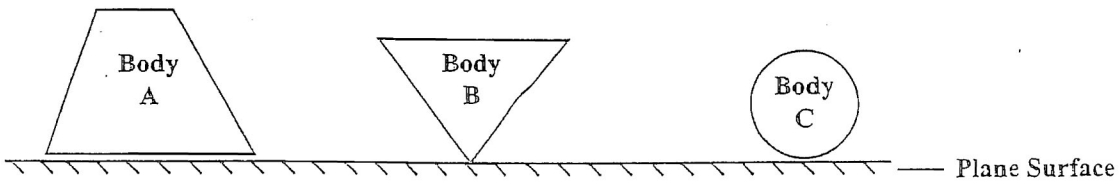
7. In relation to the diagrams below, which of the following statements is/are correct?



I. Body A is in neutral equilibrium.
II. Body B is in unstable equilibrium.
III. Body C is in stable equilibrium.

(A) II only
(B) I and II only
(C) II and III only
(D) I, II and III

8. What is the unit of the moment of a force?

(A) N
(B) N m
(C) $N\ m^{-1}$
(D) $N\ m^{-2}$

9. Which of the following is a vector physical quantity?

(A) Speed
(B) Energy
(C) Mass
(D) Displacement

10. A scalar quantity has

(A) magnitude only
(B) direction only
(C) magnitude and direction
(D) weight only

11. Which of the following expressions could be used to find the speed of an object?

(A) $\frac{\text{Change in velocity}}{\text{Time taken}}$

(B) $\frac{\text{Change in displacement}}{\text{Time taken}}$

(C) $\frac{\text{Distance travelled}}{\text{Time taken}}$

(D) Distance travelled x Time taken

12. Which of the following is a unit of work?

(A) $kg\ m\ s^{-2}$
(B) $N\ m^{-2}$
(C) N m
(D) $J\ s^{-1}$

---

13. A hydroelectric power station uses a renewable source of energy, X. This energy raises water to the top of a mountain so that it has gravitational potential energy. As the water runs down the mountain, it turns a turbine which converts Y energy into Z energy. Which set of answers for X, Y and Z is correct?

	X	Y	Z
(A)	Electrical	potential	kinetic
(B)	Solar	kinetic	electrical
(C)	Geothermal	potential	electrical
(D)	Chemical	kinetic	electrical

---

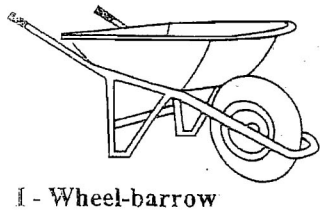
14 Power can be measured in

(A) J
(B) N m
(C) $kg\ m^{-3}$
(D) $J\ s^{-1}$

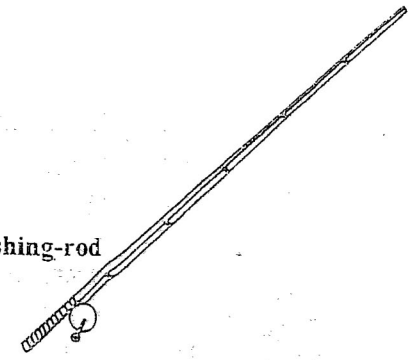
15. A book of weight 12 N is resting on a table. The force that the table exerts on the book is

(A) zero N
(B) greater than zero N but less than 12 N
(C) 12 N
(D) greater than 12 N

Item 16 refers to the diagrams below which show some simple machines.



I - Wheel-barrow



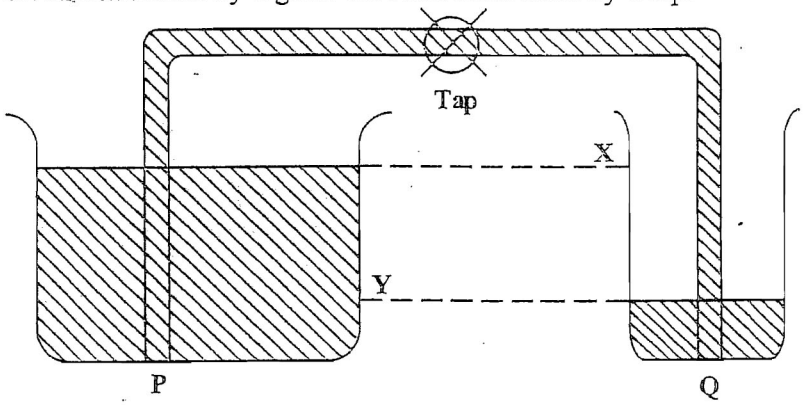
II - Fishing-rod

III - Garden fork

16. When in use, in which of the machines is the effort or applied force LESS than the load or resistance?

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

Item 17 refers to the diagram below which shows two different size containers with water at different levels connected by a glass tube and controlled by a tap.



17. When the tap is opened, water will flow from container P to container Q until

(A) the level of Q is at X
(B) container P is empty
(C) the level of P is at Y
(D) the water levels of P and Q are equal

18. Which of the following is/are renewable source of energy?

I. Solar radiation
II. Wind energy
III. Geothermal energy

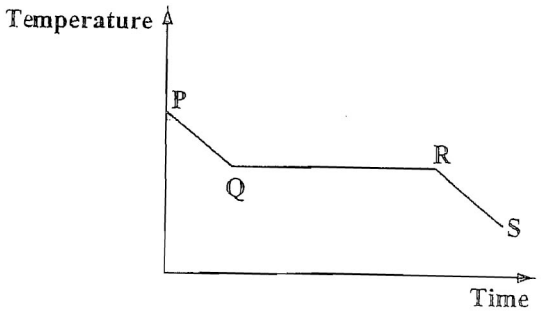
(A) I only
(B) I and II only
(C) I and III only
(D) I, II and III

19. A solid object, X, floats in mercury and sinks in water. A solid object, Y, floats in both mercury and water.

Which of the following is true about X and Y?

(A) X is less dense than Y.
(B) X is more dense than Y.
(C) X and Y are both denser than mercury.
(D) X and Y are both denser than water.

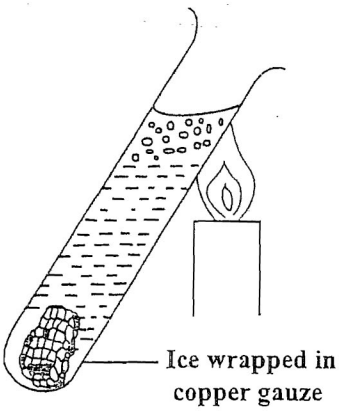
Item 20 refers to the following graph.



20. The graph shows the results of an experiment on change of phase. Solidification starts at Q. During which of the stages is the substance in the liquid phase?

(A) At P only
(B) Between Q and R
(C) Between R and S
(D) Between P and Q

Item 21 refers to the figure below, which shows a piece of ice wrapped in copper gauze and submerged in a glass test tube of water.



21. The water when heated at the top boils long before the ice is melted. The MAIN reason for this is that

(A) the test tube is a poor conductor of heat
(B) copper is a good conductor of heat
(C) water is a poor conductor of heat
(D) ice is less dense than water

22. Which of the following (types of radiation) is responsible for an atom of $^{14}_{6}C$ changing into an atom of $^{14}_{7}N$?

(A) Alpha
(B) Beta
(C) Gamma
(D) Neutron

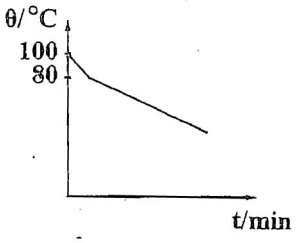
23. A flask contains air under pressure. Some of the air is let out slowly over a period of 10 seconds. When the flask is closed the

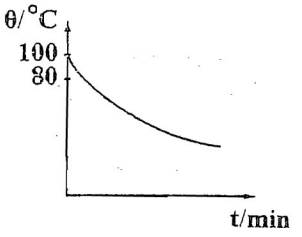
(A) pressure of the air in the flask will have increased
(B) volume of air in the flask will have decreased
(C) temperature in the flask will have increased
(D) number of molecules striking the wall per second will have decreased

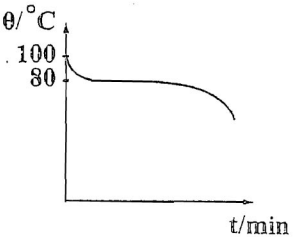
24. In which of the following is conduction the MAIN method of energy transfer?

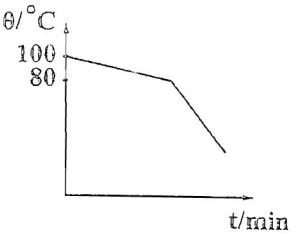
(A) Food heated in a microwave oven.
(B) Energy transferred from the sun to earth.
(C) Food being cooked on a barbecue grill.
(D) Food being cooked in a pot on an electric stove.

25. Some molten naphthalene at 100 °C is allowed to cool down to room temperature. If naphthalene has a melting point of 80 °C, which of the following graphs BEST represents the cooling curve?

(A)


(B)


(C)


(D)


26. The specific latent heat of vapourization of water is the energy required to change 1 kg of water at

(A) 0 °C to ice at 0 °C
(B) 99.9 °C to steam at 100.1 °C
(C) 100 °C to steam at 100 °C
(D) 0 °C to steam at 100 °C

27. A metal of mass, m, requires energy, E, to raise its temperature from T_1 to T_2. The specific heat capacity of the metal will be given by

(A) $\frac{E}{mT_2}$

(B) $\frac{Em}{(T_1 - T_2)}$

(C) $\frac{E}{m(T_1 - T_2)}$

(D) $\frac{E}{m(T_2 - T_1)}$

28. Which of the following statements BEST explains Brownian motion of smoke particles in air?

(A) The air molecules are moving and colliding with the smoke particles.
(B) Smoke particles are colliding with each other.
(C) Convection currents of air cause the vibration of smoke particles.
(D) The intense beam of light causes the smoke particles to vibrate.

29. Which of the following would be the basic difference between a transverse mechanical wave and a longitudinal mechanical wave?

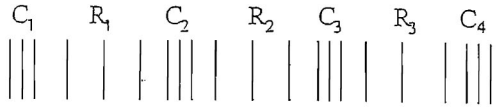
I. Medium through which they travel
II. Direction of vibration of particles in medium
III. Wavelength

(A) I only
(B) II only
(C) I and II only
(D) II and III only

30. In which of the following groups are the electromagnetic waves written in order of increasing frequency, starting with the lowest?

(A) X-rays, ultraviolet, infrared, radio
(B) X-rays, infrared, ultraviolet, radio
(C) Radio, x-rays, infrared, ultraviolet
(D) Radio, infrared, ultraviolet, x-rays

Item 31 refers to the diagram below which shows a longitudinal wave where C and R represent compressions and rarefractions respectively.



31. If λ = wavelength, the distance between C_1 and R_2 is

(A) $\frac{1}{2}\lambda$
(B) 1λ
(C) $1\frac{1}{2}\lambda$
(D) 2λ

32. Which of the statements about sound is NOT correct?

(A) Sound is transmitted as transverse waves.
(B) Sound may be produced by vibrating systems.
(C) Sound does not travel through a vacuum.
(D) Sound travels slower than light.

33. A ray of light in air strikes a glass block at an angle of incidence of 0°. The light will be

(A) undeviated
(B) totally reflected
(C) refracted at 90° to normal
(D) refracted at an unknown angle

34. In a longitudinal wave, the particles

(A) remain stationary
(B) move forward with the speed of the wave
(C) move backwards and forwards parallel to the direction of travel of the wave
(D) move from side to side, perpendicular to the direction of travel of the wave

35. In a projector the slide is 5 cm from the lens, while the screen is 500 cm from the lens on the other side. What is the magnification?

(A) 50
(B) 100
(C) 250
(D) 500

36. An eye can see the image of an object which is placed in front of a plane mirror because

(A) light from the object passes through the mirror
(B) the image is real
(C) light from the person's eye travels in a straight line
(D) light from the object is reflected off the mirror to the eye

37. For which of the following object distances will a convex lens of focal length 18 cm produce a real image?

I. 15 cm
II. 36 cm
III. 54 cm

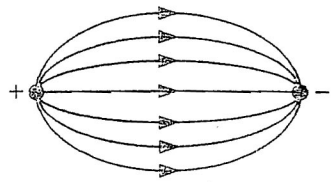
(A) I only
(B) I and II only
(C) II and III only
(D) I, II and III

38. Which of the following units is the SMALLEST quantity?

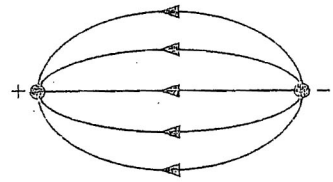
(A) 1 microampere
(B) 1 milliampere
(C) 10^{-5} ampere
(D) 10^{5} ampere

39. Which of the following diagrams represents the electric field existing between two oppositely charged point charges?

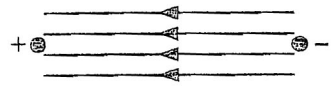
(A)



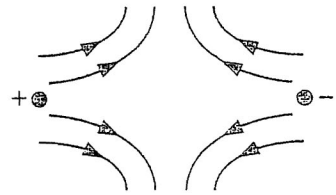
(B)



(C)



(D)



40. Which of the following relationships between electrical quantities is correct?

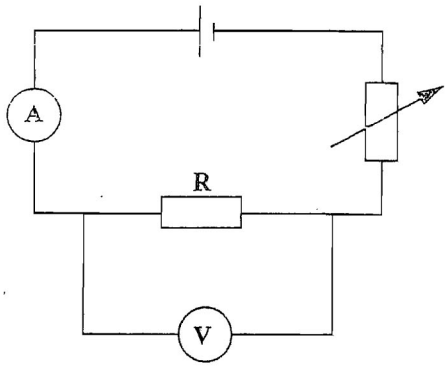
(A) $V = P I$

(B) $R = V I$

(C) $Q = \frac{E}{V}$

(D) $E = VI$

Item 41 refers to the circuit below where the ammeter reads 0.4 A and the voltmeter reads 0.6 V.



41. What is the resistance of R?

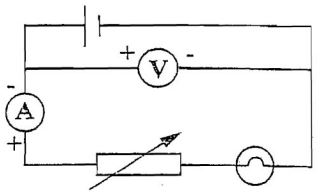
(A) 15 Ω
(B) 1.5 Ω
(C) 0.67 Ω
(D) 0.24 Ω

42. Which of the following gives the correct colour code for electrical wiring?

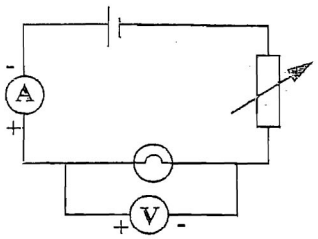
	LIVE	NEUTRAL	EARTH
(A)	Brown	Blue	Green/yellow
(B)	Red	Blue	Green
(C)	Blue	Green/yellow	Brown
(D)	Green	Brown	Blue

43. In which of the circuits below would the meters give readings which would enable you to determine the resistance of the filament lamp?

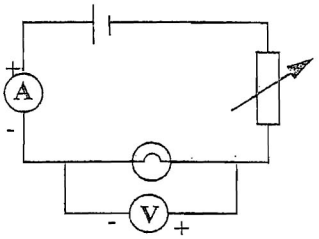
(A)



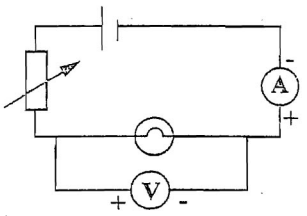
(B)



(C)



(D)



44. The electric current supplied to homes and to factories is alternating (a.c) rather than direct (d.c.) because

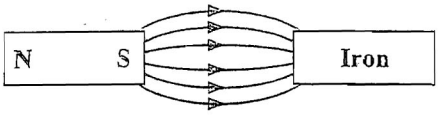
(A) the use of a.c. reduces electrical hazards
(B) the use of a.c. reduces transmission losses
(C) a.c. enables a wider variety of appliances to be used
(D) a.c. power lines are less likely to be struck by lightning than d.c. power lines

45. Magnetic induction occurs when

(A) a N pole attracts a S pole
(B) a magnet is suspended and points in the N S direction
(C) iron nails near a magnet become magnetised
(D) an electroscope is charged

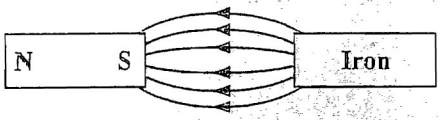
46. Which of the following diagrams shows the magnetic field between a bar magnet and a piece of iron?

(A)

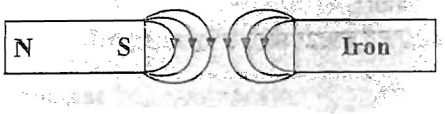


(B)

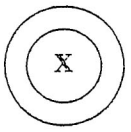
(C)



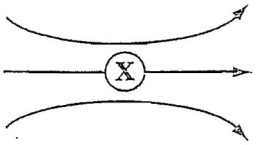
(D)

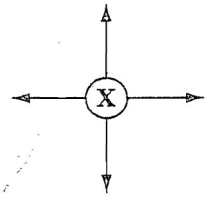


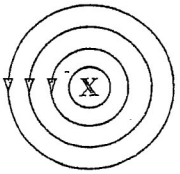
Item 47 refers to the diagram below which represents a straight wire carrying a current into the plane of the paper.

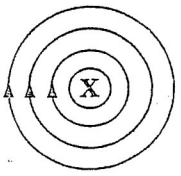


47. Which of the following diagrams BEST represents the magnetic field around the wire?

(A)


(B)


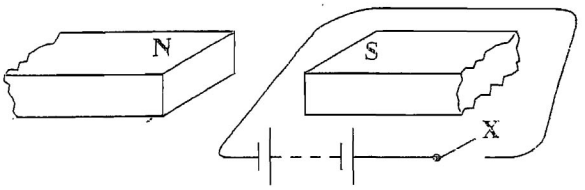
(C)


(D)


48. A plastic rod, P, is rubbed with cloth, Q. P becomes positively charged. This is because

(A) protons flowed from Q to P
(B) protons flowed from P to Q
(C) electrons flowed from Q to P
(D) electrons flowed from P to Q

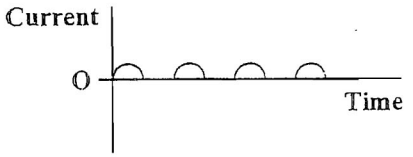
Item 49 refers to the diagram below which shows flexible wire loosely supported in a strong magnetic field.

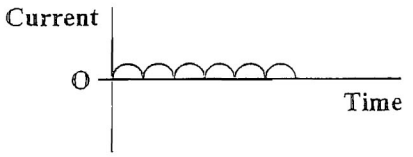


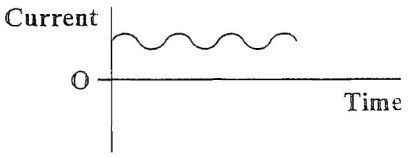
49. When the switch, X, is closed the wire moves

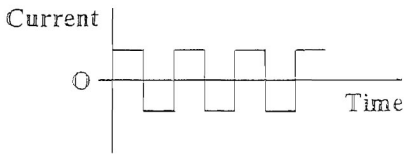
(A) downwards
(B) upwards
(C) towards the north pole
(D) towards the south pole

50. Which of the following graphs illustrates an ALTERNATING current?

(A)


(B)


(C)


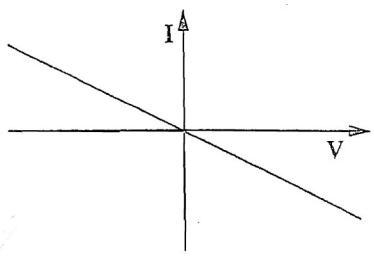
(D)


51. A conductor, rotating in a uniform magnetic field, induces maximum instantaneous current when the conductor cuts the magnetic field lines at

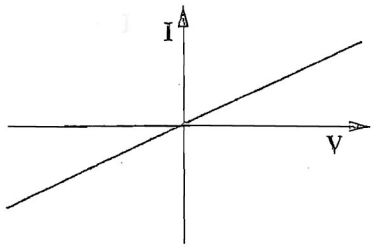
(A) 30°
(B) 45°
(C) 90°
(D) 180°

52. Which of the following graphs is a representation of the current/p.d. relationship for a metallic conductor at a constant temperature?

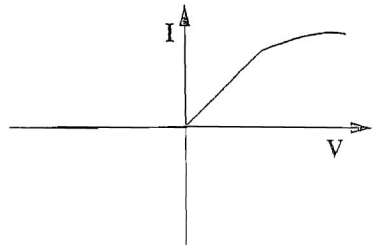
(A)



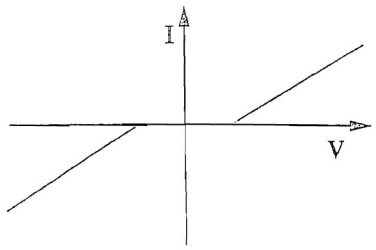
(B)



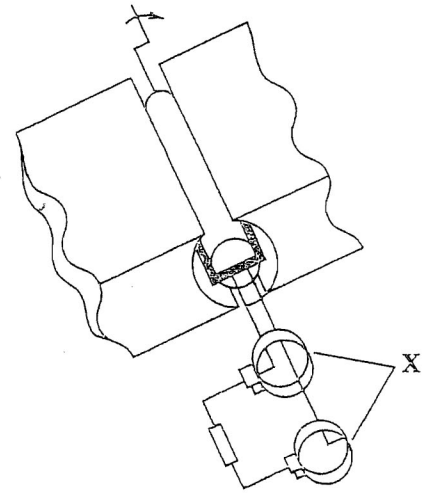
(C)



(D)



Item 53 refers to the following diagram of a simple a.c. generator.



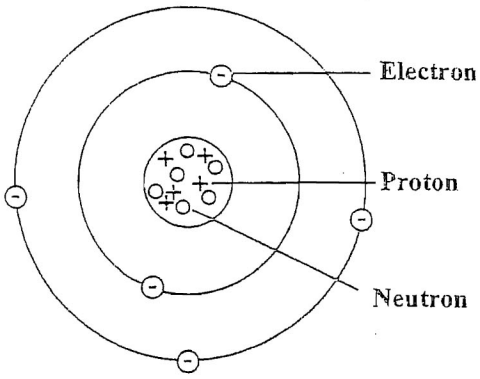
53. The parts labelled X in the diagram are known as the

(A) coils
(B) armatures
(C) slip rings
(D) commutators

54. Rectification can BEST be done by using a

(A) transformer
(B) capacitor
(C) transistor
(D) diode

Item 55 refers to the diagram below which shows the shell model of an atom.



55. Which of the following statements is/are correct?

I. The mass (nucleon) number is 11.
II. The atomic (proton) number is 5.
III. The atom shown in the diagram is positively charged.

(A) I only
(B) II only
(C) I and II only
(D) I, II and III

56. According to the Rutherford Bohr model of a neutral, stable atom, if n = number of neutrons, p = number of protons and e = number of electrons in the atom, then for all elements

(A) $n = e$
(B) $p = e$
(C) $n + e = p$
(D) $n + p = e$

57. An isotope of zinc has a nuclide which can be represented as ${}^{64}_{30}Zn$. The number of electrons in a neutral atom is

(A) 30
(B) 34
(C) 64
(D) 94

58. Which of the following would be possible symbols for an isotope of a nucleus represented by ${}^{A}_{Z}X$?

I. ${}^{A-2}_{Z}X$

II. ${}^{A}_{Z-2}X$

III. ${}^{A+2}_{Z}X$

(A) I only
(B) II only
(C) III only
(D) I and III only

59. Which of the following are definitions of the term 'half-life' of radioactive nuclide?

I. The time taken for the activity of any give sample to fall to half its original value.
II. The time taken for half the nuclei present in any given sample to decay.
III. Half the average number of disintegrations per second.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

60. In the equation $\Delta E = \Delta mc^2$,

(A) c = speed of light, Δm = mass of atom
(B) c = speed of light, Δm = mass lost
(C) c = specific heat capacity of substance, Δm = mass lost
(D) c = specific heat capacity of substance, Δm = mass of substance

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

CANDIDATE – PLEASE NOTE!

PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.

_____

TEST CODE 01238010

FORM TP 2012102

MAY/JUNE 2012

CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

PHYSICS

Paper 01 – General Proficiency

75 minutes

04 JUNE 2011 (a.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 75 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

   Sample Item

   The SI unit of length is the

   (A) newton
   (B) metre
   (C) kilogram
   (D) second

   Sample Answer

   The best answer to this item is "metre" so answer space (B) has been shaded.
5. If you want to change your answer, erase it completely before you fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to this item later. Your score will be the total number of correct answers.
7. Figures are not necessarily drawn to scale.
8. You may do any rough work in this booklet.
9. You may use a silent, non-programmable calculator to answer items.

1. When used in front of a unit the prefix 'mega' means

(A) 10^{-6}
(B) 10^{-3}
(C) 10^{3}
(D) 10^{6}

2. 3.1415926 expressed as TWO significant figures is

(A) 3.1
(B) 3.14
(C) 3.2
(D) 31

3. If force = mass × acceleration, the unit of force could be written

(A) $kg^{-1}\ m\ s^{2}$
(B) $kg\ m^{-1}\ s^{2}$
(C) $kg\ m^{-1}\ s^{-2}$
(D) $kg\ m\ s^{-2}$

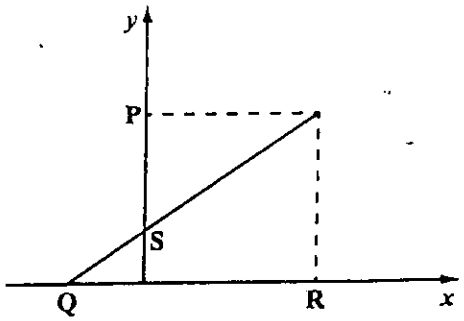
4. The unit of electrical resistance is expressed as

(A) $1\ \Omega = 1\ VA^{-1}$
(B) $1\ \Omega = 1\ AV$
(C) $1\ \Omega = 1\ AV^{-1}$
(D) $1\ \Omega = 1\ WA^{-1}$

5. The time period of a simple pendulum oscillating with a small amplitude depends on the

(A) mass of the pendulum bob
(B) amplitude of the oscillation
(C) length of the pendulum
(D) force with which the pendulum is set into motion

Item 6 refers to the following diagram.



6. When $x = 0$, the value of y is

(A) Q
(B) S
(C) P
(D) P/R

7. Which of the following will be constant, if a constant net force is applied to a body?

(A) Velocity
(B) Kinetic energy
(C) Momentum
(D) Acceleration

8. The newton-metre is the unit used to measure

(A) force
(B) momentum
(C) moment of a force
(D) power

9. Which of the following expressions is used to calculate the efficiency of a machine?

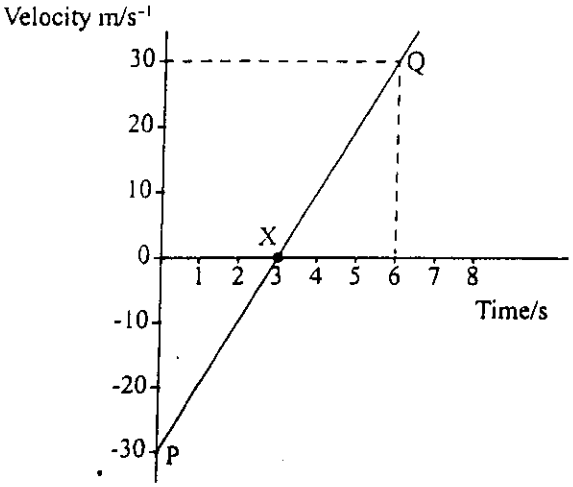
(A) $\dfrac{\text{Load} \times \text{Distance moved by Effort}}{\text{Effort} \times \text{Distance moved by Load}} \times \dfrac{100}{1}$

(B) $\dfrac{\text{Load} \times \text{Distance moved by Load}}{\text{Effort} \times \text{Distance moved by Effort}} \times \dfrac{100}{1}$

(C) $\dfrac{\text{Effort} \times \text{Distance moved by Effort}}{\text{Load} \times \text{Distance moved by Load}} \times \dfrac{100}{1}$

(D) $\dfrac{\text{Effort} \times \text{Distance moved by Load}}{\text{Load} \times \text{Distance moved by Effort}} \times \dfrac{100}{1}$

Items 10–11 refer to the following velocity-time graph which shows a ball being thrown vertically upwards from the ground.



10. The point, X, on the graph shows when the ball is

(A) at its highest point above the ground
(B) at rest on the ground
(C) just about to be thrown upwards
(D) on its way downwards

11. The gradient of the line, PQ, represents the

(A) distance the ball has covered
(B) displacement of the ball from the ground
(C) acceleration of the ball
(D) velocity of the ball for its entire flight

12. A falling raindrop reaches a constant speed when

(A) there is no net force acting on it
(B) the pull of the earth on the raindrop is equal to the weight of the raindrop
(C) the upthrust due to the air is at a minimum
(D) the air surrounding the raindrop becomes saturated with water vapour

13. If an object is moving along a surface with a constant acceleration, the net force acting on the object is

(A) zero
(B) constant
(C) increasing
(D) decreasing

14. A glass marble, X, moving with a speed of 6 m s^{-1}, collides 'head on' with an identical stationary glass marble, Y. What is the velocity of Y after collision assuming that X is brought to rest?

(A) 0 m s^{-1}
(B) 3 m s^{-1}
(C) 6 m s^{-1}
(D) 12 m s^{-1}

15. The rate of which of the following will determine the power of a machine?

I. Doing work
II. Converting energy
III. Changing temperature

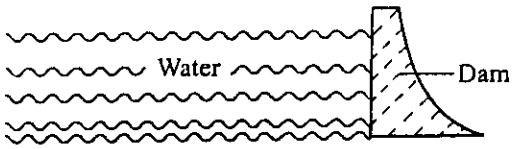
(A) I only
(B) III only
(C) I and II only
(D) I, II and III

16. Which of the following implements are designed to take advantage of a large moment provided by a relatively small force?

I. Claw hammer
II. Crowbar
III. Pair of tweezers
IV. Pair of wire cutters

(A) I and IV only
(B) III and IV only
(C) I, II and III only
(D) I, II and IV only

Item 17 refers to the diagram below.



17. The diagram above shows a dam. The pressure on the dam at the bottom of the reservoir depends on the

(A) depth of the water
(B) volume of water held by the dam
(C) mass of water held back by the dam
(D) length of the reservoir

18. A piece of string is tied onto a small stone and the stone is then suspended, totally immersed, in water. The tension in the string will be

(A) zero
(B) equal to the weight of the stone
(C) less than the weight of the stone
(D) more than the weight of the stone

19. A bubble of gas rises to the surface of a soft drink. This is because the

(A) upthrust on the bubble is greater than the weight of the bubble
(B) upthrust on the bubble is greater than the weight of water it displaces
(C) weight of water displaced by the bubble is less than the weight of the bubble
(D) density of the gas is greater than the density of the drink

20. Which of the following is the MOST suitable range for a clinical thermometer?

(A) 0 °C to 44 °C
(B) −10 °C to 110 °C
(C) 35 °C to 100 °C
(D) 35 °C to 44 °C

21. In which of the following is conduction the main method of energy transfer?

(A) Food heated in a microwave oven
(B) Energy transferred from the sun to earth
(C) Food being cooked on a barbecue
(D) Food being cooked in a pot on an electric stove

22. Which of the following are characteristic features of a clinical thermometer?

I. Narrow constriction in the tube just above the bulb
II. Limited range of temperatures
III. Large bore to make the mercury more visible

(A) I only
(B) I and II only
(C) I and III only
(D) I, II and III

23. Which of the following are reasons why a hot liquid, placed in a double-walled vacuum flask, retains its heat for a long time?

I. Evacuated space between the double walls reduces the loss of heat by conduction.
II. Silver inner walls reduce the loss of heat by radiation.
III. The silvered outer wall helps to absorb heat from the surroundings.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

24. The specific heat capacity of a substance is defined as the quantity of thermal energy

(A) the substance can hold
(B) 1 kg of the substance can hold
(C) required to raise the temperature of the substance by 1 degree Celsius
(D) required to raise the temperature of 1 kg of the substance by 1 degree Celsius

25. An electric kettle full of water is plugged into the electrical mains. The process by which heat travels through the water is

(A) electrification
(B) evaporation
(C) convection
(D) radiation

26. When heating a substance a point is reached where no further change in temperature is observed. The most likely reason for this would be that the

(A) heater is supplying less heat
(B) substance is losing heat to the atmosphere
(C) substance needs to be stirred less frequently
(D) substance is changing state

27. Which of the following phenomena are exhibited by light waves?

I. Refraction
II. Diffraction
III. Interference

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

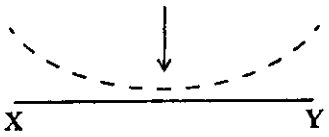
28. Whenever there is complete destructive interference between two coherent wave trains, the waves must be

(A) in phase
(B) out of phase by half of a wavelength
(C) out of phase by one wavelength
(D) out of phase by a quarter of a wavelength

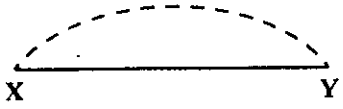
29. Which of the following is the correct relation between the wavelength, λ, speed, υ, and frequency, f, of a wave?

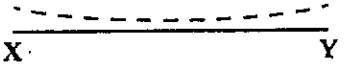
(A) $\lambda f \upsilon = 0$
(B) $f = \frac{\lambda}{\upsilon}$
(C) $f = \frac{\upsilon}{\lambda}$
(D) $\lambda = \frac{f}{\upsilon}$

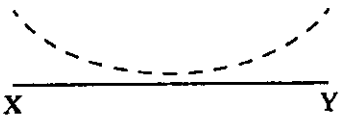
Item 30 refers to the following diagram showing a wave front about to reach a reflecting surface XY..

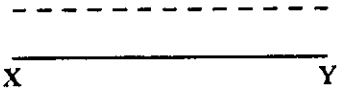


30. Which of the following would represent the wave front after reflection?

(A)


(B)


(C)


(D)


31. Which of the following statements about sound is NOT correct?

(A) Sound is transmitted as transverse waves.
(B) Sound may be produced by vibrating systems.
(C) Sound does not travel through a vacuum.
(D) Sound travels more slowly than light.

32. In which of the following are th electromagnetic waves written in order increasing frequency, **starting with th lowest**?

(A) X rays, ultra violet, infra red, radi
(B) X rays, infra red, ultra violet, radi
(C) Radio, X rays, infra red, ultra viol
(D) Radio, infra red, ultra violet, X ray

33. Which of the following statements provide a reason why the diffraction of light is NO usually observed?

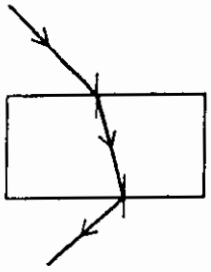
(A) Its wavelength is too small.
(B) Its frequency is too high.
(C) Its speed is too high.
(D) Its wavelength is too large.

34. On which of the following would the positio of an image formed by a plane mirror depend

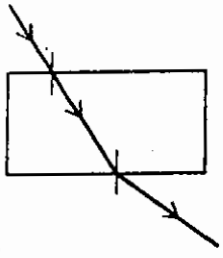
(A) Distance of the observer from th mirror
(B) Distance of the object from th mirror
(C) Angle at which the image is viewe
(D) Angle at which the object is viewe

35. Which diagram best shows the path taken by the ray of light through the rectangular block?

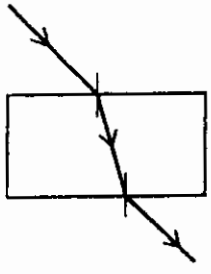
(A)



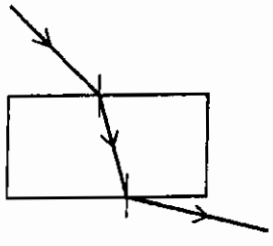
(B)



(C)



(D)

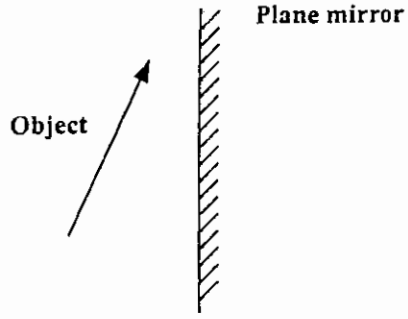


36. Which of the following can produce a diminished virtual image of a real object?

I. A plane mirror
II. A diverging lens
III. A converging lens

(A) I only
(B) II only
(C) II and III only
(D) I, II and III

Item 37 refers to the following diagram which shows an object placed in front of a plane mirror.



37. Which of the following images BEST represents the position of the object produced by the plane mirror?

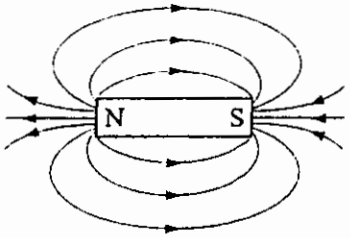
(A)

(B)

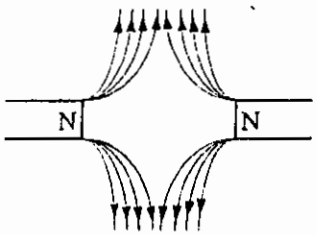
(C)

(D)

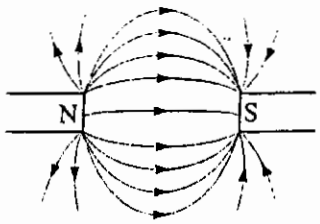
Item 38 refers to the diagrams below which show the magnetic field lines plotted by a student.



I



II



III

38. In which of the following diagrams are the magnetic field lines plotted correctly?

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

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39. Which of the following is NOT one of the ways in which the strength of the magnetic field near a solenoid (long coil) carrying a current can be increased?

(A) Increasing the resistance of the coil
(B) Increasing the current in the coil
(C) Increasing the number of turns per unit length of the coil
(D) Placing a soft iron core inside the coil

40. Which of the following relationships between electrical quantities is correct?

(A) $V = P I$

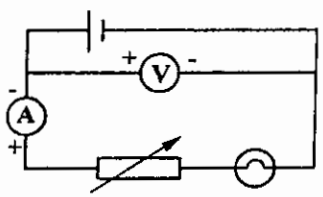
(B) $R = V I$

(C) $Q = \frac{E}{V}$

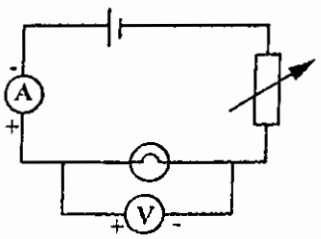
(D) $E = V I$

41. In which of the circuits below would the Meters give readings which would enable a student to determine the resistance of the filament lamp?

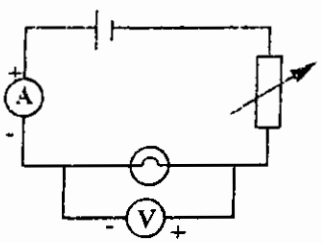
(A)



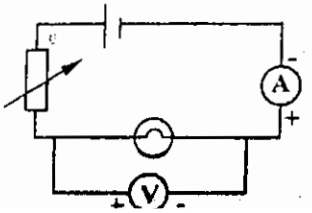
(B)



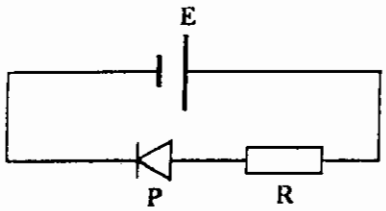
(C)



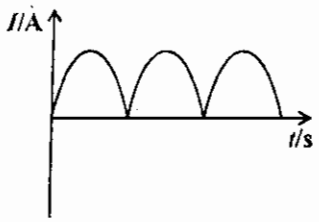
(D)

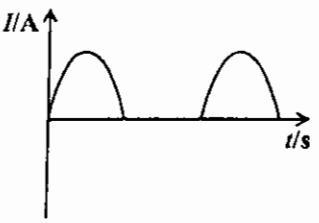


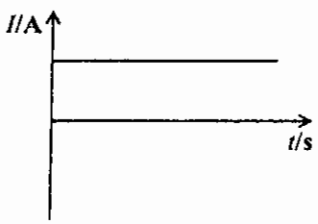
Item 42 refers to the following diagram which shows a cell E, a diode P and a resistor R connected in series.

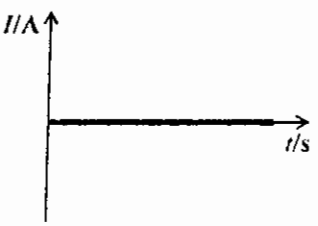


42. The current through R is BEST illustrated by which of the following graphs?

(A)


(B)


(C)


(D)


43. Total internal reflection in a medium occurs only when the angle of incidence

(A) equals 90°
(B) equals the angle of refraction
(C) is greater than the critical angle
(D) is less than the critical angle

44. The refractive index of a transparent medium with a critical angle, c, for light travelling from the medium to air is

(A) $\frac{1}{c}$

(B) $\frac{90^\circ}{\sin c}$

(C) $\frac{\sin 90^\circ}{\sin c}$

(D) $\sin c$

45. Magnetic induction occurs when

(A) a N pole attracts a S pole
(B) iron nails near a magnet become magnetized
(C) a magnet is suspended and points in the N-S direction
(D) an electroscope is charged

46. Which of the following characteristics concerning ammeters is correct?

	Resistance	Circuit connection
(A)	Low	in series
(B)	Low	in parallel
(C)	High	in parallel
(D)	High	in series

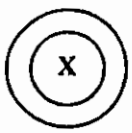
47. When a large current passes through a fuse, which of the following is the correct sequence of events?

(A) Wire gets hot → wire melts → current is cut off
(B) Wire gets hot → current is cut off → wire melts
(C) Wire melts → current is cut off → wire gets hot
(D) Wire melts → wire gets hot → current is cut off

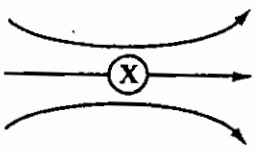
48. Rectification can BEST be done by using a

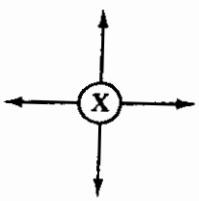
(A) transformer
(B) diode
(C) transistor
(D) capacitor

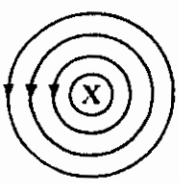
Item 49 refers to the diagram below which represents a straight wire carrying a current into the plane of the paper.

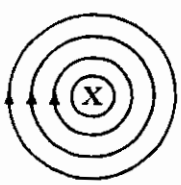


49. Which of the following diagrams BEST represents the magnetic field around the wire?

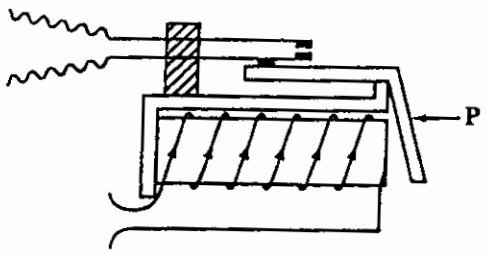
(A)


(B)


(C)


(D)


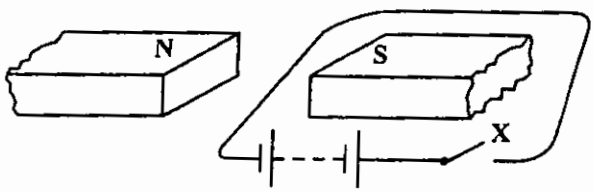
Item 50 refers to the following diagram showing a typical relay.



50. The part, labelled P, must be made of

(A) iron
(B) copper
(C) plastic
(D) brass

Item 51 refers to the diagram below which shows flexible wire loosely supported in a strong magnetic field.



51. When the switch, X, is closed the wire moves

(A) downwards
(B) upwards
(C) towards the north pole
(D) towards the south pole

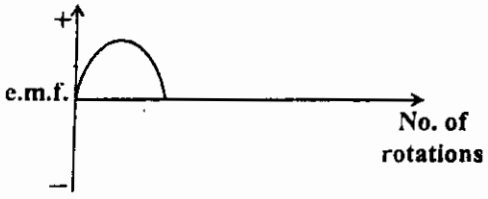
52. It is possible to induce a voltage in a wire coil by the use of a

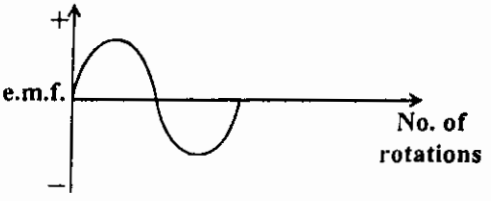
(A) steady magnetic field
(B) positively charged rod
(C) negatively charged rod
(D) changing magnetic field

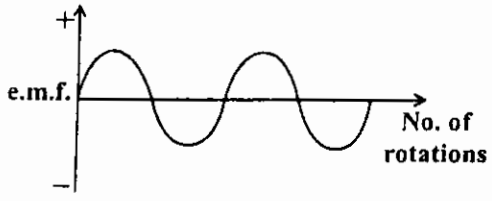
53. Which of the following statements about alternating current is true?

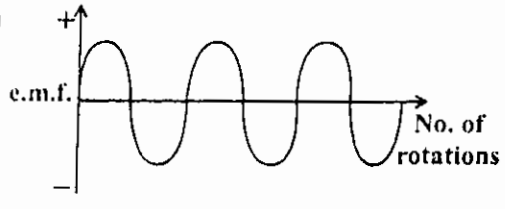
(A) It can be changed into direct current by a transformer.
(B) It can be rectified by using a semiconductor diode.
(C) It can be used to recharge a battery.
(D) It is used to transmit electrical energy because of its high frequency.

54. For a simple a.c. generator, which of the following graphs will be produced by two complete rotations of the armature?

(A)


(B)


(C)


(D)


55. No practical transformer is 100% efficient. Which of the following cause energy losses?

I. The resistance of the coils of wire
II. Magnetization and demagnetization of the core
III. Eddy currents in the core

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

56. Radioactivity takes place in an atom as a result of

(A) nuclear instability
(B) a chemical reaction
(C) exposure to excess heat
(D) excess stress on the atom

57. Which of the following statements about radioactive decay are correct?

I. It is dependent on conditions external to the nucleus.
II. It is a random process.
III. It is due to changes in the nuclei of atoms.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

58. Which of the following would be possible symbols for an isotope of nuclide presented by ${}^{A}_{z}X$?

I. ${}^{A-2}_{z}X$

II. ${}^{A}_{z-2}X$

III. ${}^{A+2}_{z}X$

(A) I only
(B) II only
(C) III only
(D) I and III only

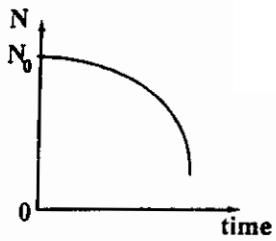
59. Which of the following scientists discovered the relationship $E = mc^2$?

(A) Marie Curie
(B) Isaac Newton
(C) Albert Einstein
(D) J. J. Thompson

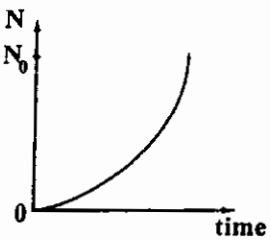
60. N_0 radioactive nuclei are present in a sample at time t = 0.

Which of the following graphs BEST represents the variation with time of the number, N, of undecayed nuclei present?

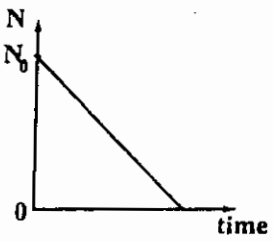
(A)



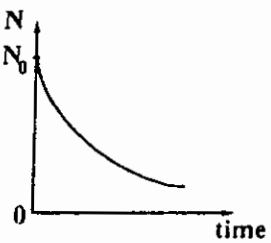
(B)



(C)

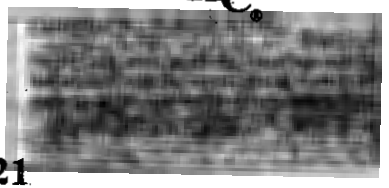


(D)



END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.



TEST CODE **01238010**

FORM TP 2013021

JANUARY 2013

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

17 JANUARY 2013 (p.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

   Sample Item

   The SI unit of length is the

   (A) newton
   (B) metre
   (C) kilogram
   (D) second

   Sample Answer

   Ⓐ ● Ⓒ Ⓓ

5. The best answer to this item is "metre" so answer space (B) has been shaded.

   If you want to change your answer, erase it completely before you fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to this item later. Your score will be the total number of correct answers.
7. You may do any rough work in this booklet.
8. Figures are not necessarily drawn to scale.
9. You may use a silent, non-programmable calculator to answer items.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. A physical quantity which is NOT one of the fundamental quantities is

(A) mass
(B) time
(C) current
(D) density

2. 0.0000357 N expressed in standard form is

(A) 3.57×10^{-5} N
(B) 3.75×10^{4} N
(C) 3.75×10^{-4} N
(D) 3.75×10^{5} N

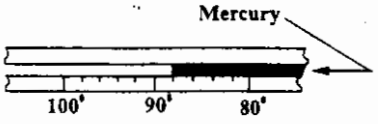
3. The period of a simple pendulum is MOST affected by the

(A) length of the string
(B) amplitude of the oscillation
(C) mass of the bob
(D) force used to start it

4. Which of the following is suitable for measuring the diameter of a human hair?

(A) Tape measure
(B) Vernier caliper
(C) Micrometer screw gauge
(D) Metre rule

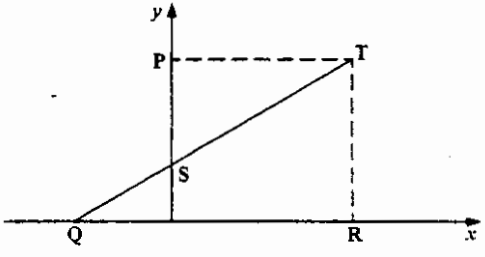
Item 5 refers to the following diagram which shows the section of a thermometer.



5. What is the reading shown?

(A) 88°
(B) 89°
(C) 91°
(D) 92°

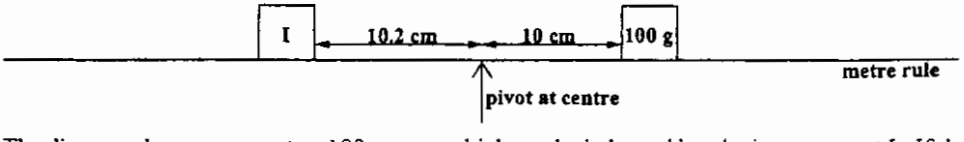
Item 6 refers to the graph below which shows a relationship represented by the straight line passing through QT.



6. For this relationship, when x = 0, the value of y is

(A) Q
(B) S
(C) P
(D) R

Item 7 refers to the diagram below.



7. The diagram above represents a 100 g mass which can be balanced by placing a mass at I. If the mass at I is to be used to balance the 100 g, it should be

(A) less than 100 g
(B) 100 g
(C) a little greater than 100 g
(D) about 200 g

8. It is NOT true that the moment of a force is

(A) measured in units called newton metres
(B) the amount of force needed to keep a body turning
(C) the turning effect that a force has when it acts on a body
(D) the product of the force and the perpendicular distance of its line of action from a point

9. In an experiment to locate the centre of mass of a sheet of cardboard, a plumb line (string with a small mass on the end) is used. The plumb line is used to

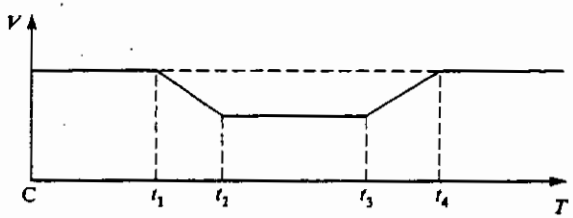
(A) check that the apparatus is vertical
(B) check that the cardboard is swinging freely
(C) show which points are vertically below the pivot
(D) measure the width of the cardboard

---

10. Which of the following is a vector physical quantity?

(A) Speed
(B) Energy
(C) Mass
(D) Displacement

Item 11 refers to the following diagram which shows a velocity/time graph for a moving object.



11. Which of the following statements about the object is/are true?

I. It returns to its starting point.
II. It has zero acceleration between times t_2 and t_3.
III. Its velocity at t_4 is the same as its initial velocity.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

12. Two smooth spheres, A and B, collide head on. Which of the following statements is/are true?

I. The momentum of A is the same after collision as it was before.
II. The momentum of B is the same after collision as it was before.
III. The total momentum of A and B is the same after collision as it was before.

(A) I only
(B) III only
(C) II and III only
(D) I, II and III

13. Which of the following is NOT a vector quantity?

(A) Displacement
(B) Density
(C) Acceleration
(D) Momentum

14. Which of the following are renewable sources of energy?

I. Solar energy
II. Wind energy
III. Geothermal energy

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

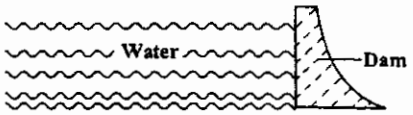
15. An ice cube sinks in liquid A but floats in liquid B. Which of the following statements is true?

(A) The upthrust is less in A than in B.
(B) The upthrust is greater in A than in B.
(C) The weight of the ice is less in A than in B.
(D) The weight of the ice is greater in A than in B.

16. A piece of string is tied onto a small stone and the stone is then suspended, totally immersed, in water. The tension in the string will be

(A) zero
(B) equal to the weight of the stone
(C) less than the weight of the stone
(D) more than the weight of the stone

Item 17 refers to the following diagram of a dam.



17. The diagram above shows a dam. The pressure on the dam at the bottom of the reservoir depends on the

(A) depth of the water
(B) volume of water held by the dam
(C) mass of water held back by the dam
(D) length of the reservoir

18. Which of the following tools is/are designed to take advantage of a large moment provided by a relatively small force?

I. Claw hammer
II. Crowbar
III. Pair of tweezers
IV. Pair of wire cutters

(A) III only
(B) I and IV only
(C) I, II and III only
(D) I, II and IV only

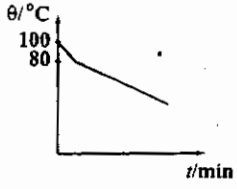
19. The temperature on a warm day in the Caribbean is about

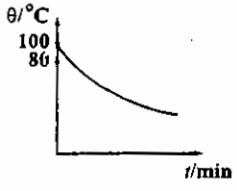
(A) 32 K
(B) 240 K
(C) 273 K
(D) 305 K

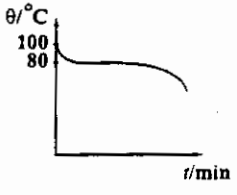
20. Which of the following is MOST likely to account for the fact that pot handles are usually made of wood or plastic?

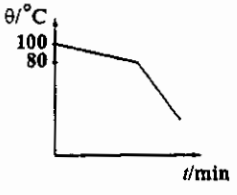
(A) Conduction
(B) Convection
(C) Radiation
(D) Evaporation

21. Some molten naphthalene at 100 °C is allowed to cool down to room temperature. If naphthalene has a melting point of 80 °C, which of the following graphs BEST represents the cooling curve?

(A)


(B)


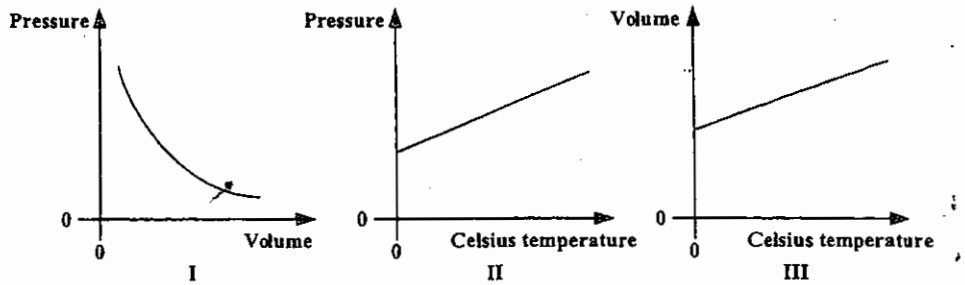
(C)


(D)


22. Which of the following does NOT describe a process which is an example of evaporation?

(A) A slice of bread left in the open air becomes dry.
(B) The cooling effect of sweating in animals.
(C) The rapid disappearance of ether if exposed to the air.
(D) A loaded copper wire put around a block of ice gradually cuts through the ice.

Item 23 refers to the following diagrams which show how the pressure, the volume and the temperature of a fixed mass of dry gas, are inter-related.



23. Which of the graphs can be used to establish the kelvin temperature scale?

(A) II only
(B) I and II only
(C) II and III only
(D) I, II and III

---

24. The specific latent heat of vapourization of water is the energy required to change 1 kg of water at

(A) 0 °C to steam at 100 °C
(B) 0 °C to ice at 0 °C
(C) 99.9 °C to steam at 100.1 °C
(D) 100 °C to steam at 100 °C

25. An electric kettle full of water is plugged into the mains. The process by which heat travels through the water is

(A) electrification
(B) convection
(C) evaporation
(D) radiation

26. A detector of thermal energy is placed an equal distance in turn from each of four faces of a hollow metal cube full of water. The reading on the detector is GREATEST when the detector is turned towards the face which is

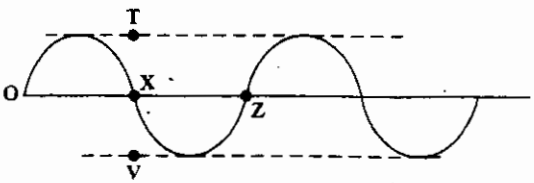
(A) painted silver
(B) painted dull black
(C) painted shiny white
(D) highly polished

27. Which of the following waves travel only longitudinally?

I. Sound waves
II. Radio waves
III. Water waves

(A) I only
(B) II only
(C) II and III only
(D) I, II and III

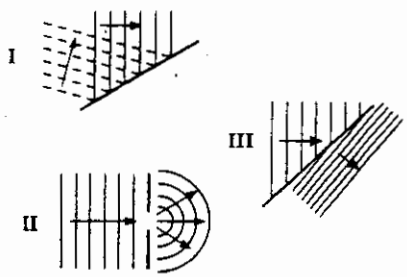
Item 28 refers to the following diagram which represents a wave travelling to the right.



28. The amplitude of the wave is the distance

(A) OX
(B) OZ
(C) TV
(D) TX

29. Which of the following diagrams could represent diffraction of water waves in a ripple tank?



(A) I only
(B) II only
(C) I and II only
(D) II and III only

Item 30 refers to the table below which lists the refractive indices for light of four different materials.

Material	Refractive Index
Air	1.0
Ice	1.3
Perspex	1.5
Diamond	2.4

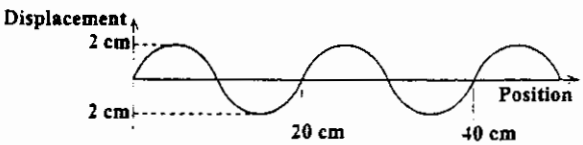
30. In which medium would the light waves have the SLOWEST speed?

(A) Air
(B) Ice
(C) Perspex
(D) Diamond

31. Young's double slit experiment demonstrates that light

(A) has a particle nature
(B) is a wave motion
(C) travels in a straight line
(D) produces sharp images

Item 32 refers to the diagram below which shows an instantaneous profile of a wave travelling across a water surface.



32. From the information given, the frequency is

(A) $\frac{1}{20}$ Hz
(B) 10 Hz
(C) 20 Hz
(D) unknown

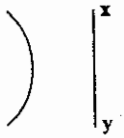
33. If a converging lens is used as a magnifying glass, the image formed is

(A) real, inverted, diminished
(B) real, erect, diminished
(C) virtual, inverted, magnified
(D) virtual, erect, magnified

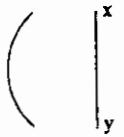
34. Which row in the table below correctly compares X rays and visible light?

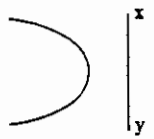
	X- rays	Visible Light
(A)	Particles	Waves
(B)	High frequency	Low frequency
(C)	Long wavelength	Short wavelength
(D)	Carry less energy	Carry more energy

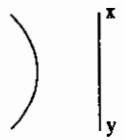
Item 35 refers to the following diagram.

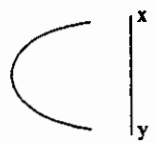


35. The circular wavefront shown above is progressing towards the reflecting surface xy. Which of the diagrams below correctly shows the shape of the wavefront after reflection?

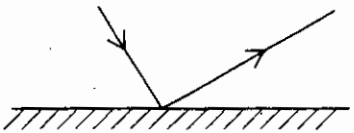
(A)


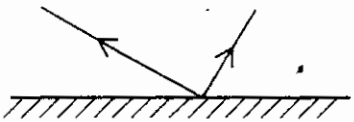
(B)


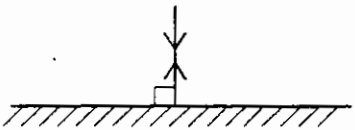
(C)


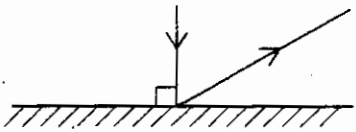
(D)


36. Which of the following diagrams MOST clearly shows the path of a ray of light when it strikes a plane mirror?

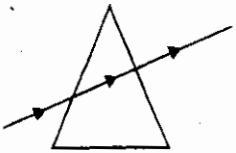
(A) 

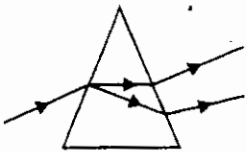
(B) 

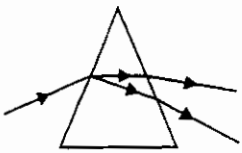
(C) 

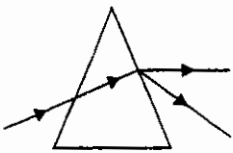
(D) 

37. Which of the following diagrams BEST represents the passage of a beam of white light through a triangular glass prism?

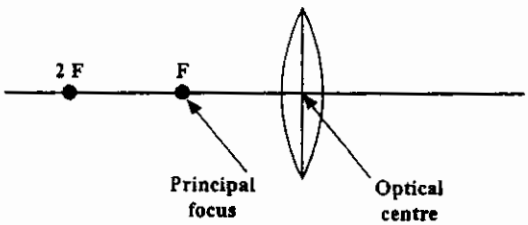
(A) 

(B) 

(C) 

(D) 

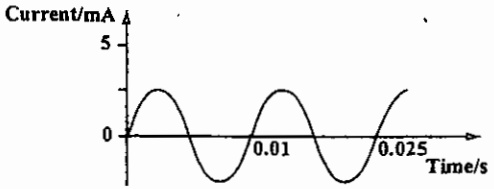
Item 38 refers to the diagram below.



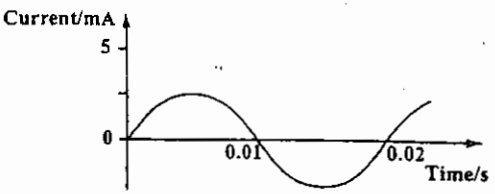
38. With reference to the diagram above, a real image is produced with a converging lens when the object is located

(A) between the optical centre and F
(B) between F and infinity
(C) at F only
(D) at 2F only

Item 39 refers to the graphs below which represent two alternating currents.



I



II

39. Which of the following combinations correctly identifies these currents?

	Current with greater frequency	Current with greater peak value
(A)	I	II
(B)	II	Neither
(C)	Neither	I
(D)	I	Neither

---

40. Which of the following statements about insulators is/are true?

I. In an insulator all electrons are bound firmly to their atoms.
II. In an insulator many electrons can move freely from atom to atom.
III. An insulator cannot be charged by rubbing.
IV. A good insulator retains the charge better than a conductor.

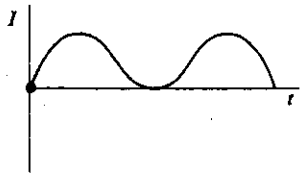
(A) I only
(B) I and II only
(C) II and III only
(D) II and IV

41. The current in a wire is one ampere if a charge of

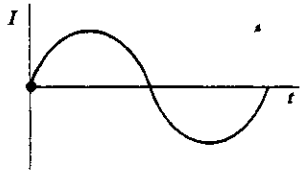
(A) 10 coulombs flows through it in 10 seconds
(B) 1 coulomb flows through it in 1 second
(C) 10 coulombs flow through it in 1 second
(D) 100 coulombs flows through it in 10 seconds

Item 42 refers to the following current-time graphs.

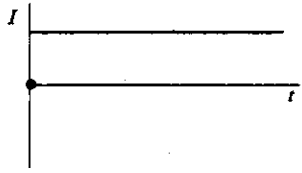
I.



II.



III.



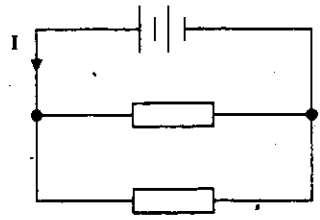
42. Which of the graphs above represent(s) direct current?

(A) II only
(B) III only
(C) I and III only
(D) I, II and III

43. Which of the following statements about alternating current is true?

(A) It can be changed into direct current by a transformer.
(B) It can be rectified by using a semiconductor diode.
(C) It can be used to recharge a battery.
(D) It is used to transmit electrical energy because of its high frequency.

Item 44 refers to the diagram below.



44. In the parallel circuit shown above, ALL of the current, I, supplied by the battery

(A) goes through each of the resistors
(B) goes through the largest resistor only
(C) goes through the smallest resistor only
(D) equals the sum of the currents in the two resistors

45. Which of the following relationships gives a correct value for the combined resistance R_T of resistors R1, R2, and R3 connected in parallel?

(A) $R_T = R_1 + R_2 + R_3$

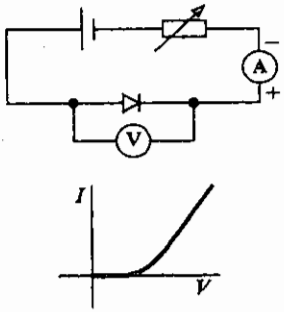
(B) $R_T = \dfrac{R_1 R_2 R_3}{R_1 + R_2 + R_3}$

(C) $R_T = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \dfrac{1}{R_3}$

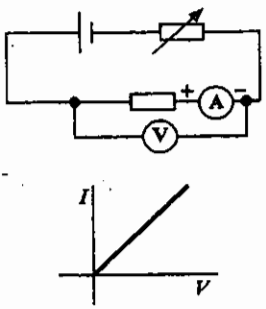
(D) $\dfrac{1}{R_T} = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \dfrac{1}{R_3}$

46. In I, II and III below, which graph could have been obtained from measurements made using the circuit above it?

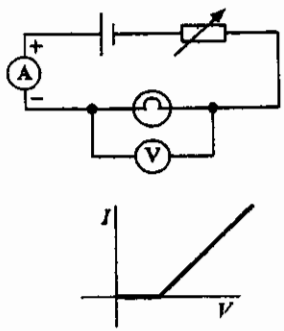
I



II

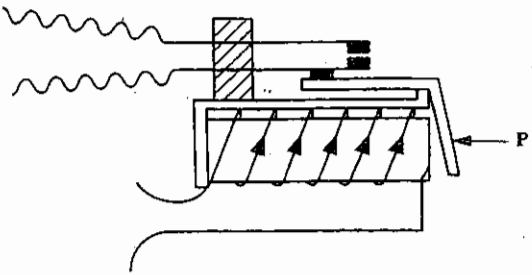


III



(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

Item 47 refers to the following diagram.



47. The diagram above shows a typical relay. The part, labelled P, must be made of

(A) brass
(B) iron
(C) plastic
(D) copper

48. Which of the following formulae (in which the symbols have their usual meaning) is a mathematical expression of Ohm's Law?

(A) V = IR
(B) P = VI
(C) Q = IT
(D) E = PT

49. Rectification can BEST be done by using a

(A) transformer
(B) capacitor
(C) transistor
(D) diode

50. Magnetic induction occurs when

(A) a N pole attracts a S pole
(B) iron nails near a magnet become magnetized
(C) a magnet is suspended and points in the N S direction
(D) an electroscope is charged

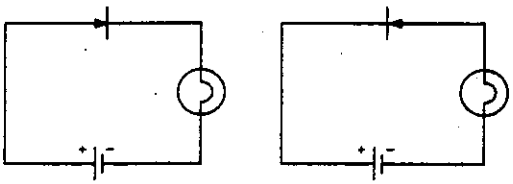
51. The direction of a magnetic field is the direction in which

(A) the S pole of a magnet points when placed in it
(B) the N pole of a magnet points when placed in it
(C) a positive charge moves when placed in it
(D) a negative charge moves when placed in it

52. In which of the following devices is a commutator used?

(A) Transformers
(B) A C generators
(C) D C motors
(D) Moving coil microphones

Item 53 refers to the following circuit diagrams.



I II

53. A simple experiment was conducted using the circuit diagrams shown above. The same components were used and the bulb was lit to normal brightness in each case.

Which of the following components would be defective?

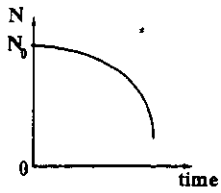
I. The bulb
II. The battery
III. The diode

(A) I only
(B) III only
(C) I and II only
(D) II and III only

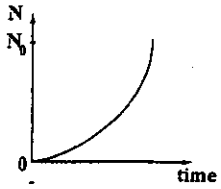
54. No radioactive nuclei are present in a sample at time t = 0.

Which of the following graphs BEST represents the variation with time of the number, N, of undecayed nuclei present?

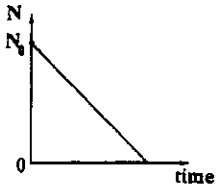
(A)



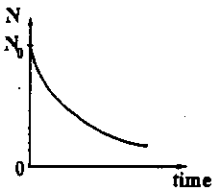
(B)



(C)



(D)



55. Which of the following actions is NOT one of the ways in which the strength of the magnetic field near a solenoid (long coil) carrying a current can be increased?

(A) Increasing the resistance of the coil
(B) Increasing the current in the coil
(C) Increasing the number of turns per unit length of the coil
(D) Placing a soft iron core inside the coil

56. Isotopes of an element differ from each other in that they have a different

(A) number of electrons
(B) number of protons
(C) number of neutrons
(D) atomic number

57. Gamma rays may be stopped by

(A) a sheet of paper
(B) a few millimetres of aluminium
(C) a few centimetres of aluminium
(D) several centimetres of lead

58. Which of the following are definitions of the term 'half-life' of radioactive nuclide?

I. The time taken for the activity of any given sample to fall to half its original value.
II. The time taken for half the nuclei present in any given sample to decay.
III. Half the average number of disintegrations per second.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

59. Which of the following pairs of terms describes two properties of an α-particle?

(A) No charge, very penetrating
(B) Positive charge, very penetrating
(C) Positive charge, not very penetrating
(D) Negative charge, not very penetrating

60. In the equation $\Delta E = \Delta mc^2$

(A) c = speed of light, Δm = mass of atom
(B) c = speed of light, Δm = change in mass
(C) c = specific heat capacity of substance, Δm = change in mass
(D) c = specific heat capacity of substance, Δm = mass of substance

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

CANDIDATE – PLEASE NOTE!

PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.

_____

TEST CODE **01238010**

FORM TP 2014099

MAY/JUNE 2014

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

05 JUNE 2014 (a.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

   Sample Item

   The SI unit of length is the

   (A) newton
   (B) metre
   (C) kilogram
   (D) second

   Sample Answer

   The best answer to this item is "metre" so answer space (B) has been shaded.
5. If you want to change your answer, erase it completely before you fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to this item later. Your score will be the total number of correct answers.
7. Figures are not necessarily drawn to scale.
8. You may do any rough work in this booklet.
9. You may use a silent, non-programmable calculator to answer items.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. When used in front of a unit the prefix, 'mega' means

(A) 10^{-6}
(B) 10^{3}
(C) 10^{3}
(D) 10^{6}

2. If force = mass × acceleration, the unit of force could be written

(A) $kg^{-1}\ m\ s^{2}$
(B) $kg\ m^{-1}\ s^{2}$
(C) $kg\ m^{-1}\ s^{-2}$
(D) $kg\ m\ s^{-2}$

3. The base unit of temperature of the S.I. system is the

(A) Celsius
(B) Fahrenheit
(C) Kelvin
(D) Centigrade

4. Which of the following pairs consist(s) of fundamental quantities?

I. Mass and weight
II. Mass and length
III. Time and current

(A) I only
(B) II only
(C) I and III only
(D) II and III only

5. The time period of a simple pendulum oscillating with a small amplitude depends on the

(A) mass of the pendulum bob
(B) amplitude of the oscillation
(C) length of the pendulum
(D) force with which the pendulum is set into motion

6. Which of the following quantities is defined in terms of SI units?

(A) Current
(B) Charge
(C) Length
(D) Temperature

7. Which of the following measurements has THREE significant figures?

(A) 0.0293 kg
(B) 0.94 A
(C) 5.321 V
(D) 10.42 m

8. The newton-metre is the unit used to measure

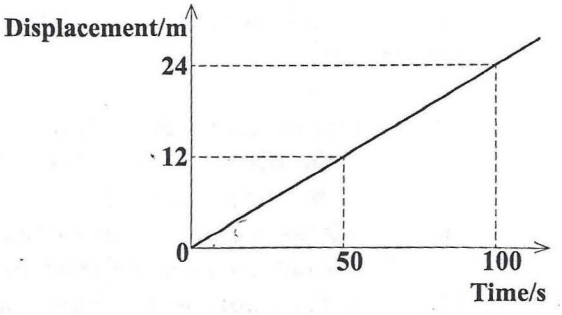
(A) force
(B) power
(C) momentum
(D) moment of a force

9. Two forces of 8 N and 10 N CANNOT give a resultant of

(A) 1 N
(B) 2 N
(C) 9 N
(D) 18 N

GO ON TO THE NEXT PAGE

Item 10 refers to the following graph.



10. The graph above shows how the displacement of a runner from a starting line varies with time. This runner is

(A) not moving
(B) going at a steady speed
(C) going faster and faster
(D) going slower and slower

11. A body moving with a constant acceleration has applied to it

(A) a constant force
(B) a decreasing force
(C) an increasing force
(D) a resultant zero force

12. Two smooth spheres, A and B, collide head on. Which of the following statements is/are TRUE?

I. The momentum of A is the same after collision as it was before.
II. The momentum of B is the same after collision as it was before.
III. The total momentum of A and B is the same after collision as it was before.

(A) I only
(B) III only
(C) II and III only
(D) I, II and III

13. A hydroelectric power station uses a renewable source of energy, X. This energy raises water to the top of a mountain so that it has gravitational potential energy. As the water runs down the mountain, it turns a turbine which converts Y energy into Z energy. Which set of answers for X, Y and Z is correct?

	X	Y	Z
(A)	Electrical	potential	kinetic
(B)	Solar	kinetic	electrical
(C)	Geothermal	potential	electrical
(D)	Chemical	kinetic	electrical

14. A glass marble, X, moving with a speed of 6 m s^{-1}, collides 'head on' with an identical stationary glass marble, Y. What is the velocity of Y after collision assuming that X is brought to rest?

(A) 0 m s^{-1}
(B) 3 m s^{-1}
(C) 6 m s^{-1}
(D) 12 m s^{-1}

15. On which of the following features does the pressure at a point in a liquid depend?

I. Density of the liquid
II. Depth from the surface
III. Area of the cross section of the container

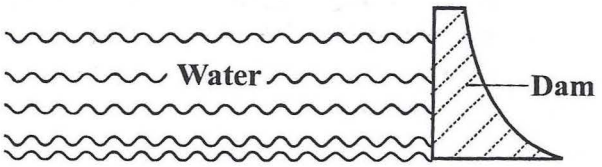
(A) I only
(B) III only
(C) I and II only
(D) I, II and III

16. Which of the following implements are designed to take advantage of a large moment provided by a relatively small force?

I. Claw hammer
II. Crowbar
III. Pair of tweezers
IV. Pair of wire cutters

(A) I and IV only
(B) III and IV only
(C) I, II and III only
(D) I, II and IV only

Item 17 refers to the following diagram which shows a dam.



17. The pressure on the dam at the bottom of the reservoir depends on the

(A) depth of the water
(B) volume of water held by the dam
(C) mass of water held back by the dam
(D) length of the reservoir

18. A piece of string is tied onto a small stone and the stone is then suspended, totally immersed, in water. The tension in the string will be

(A) zero
(B) equal to the weight of the stone
(C) less than the weight of the stone
(D) more than the weight of the stone

19. Which of the following would explain why an ordinary 0–110°C laboratory thermometer is NOT used to measure human body temperature?

I. The reading would change when the thermometer is taken from the patient's mouth.
II. It is not sensitive enough to measure small changes in temperature.
III. It does not have a large enough range.

(A) I only
(B) I and II only
(C) II and III only
(D) I, II and III

20. Which of the following is the MOST suitable range for a clinical thermometer?

(A) 0 °C to 44 °C
(B) –10 °C to 110 °C
(C) 35 °C to 100 °C
(D) 35 °C to 44 °C

21. In which of the following is conduction the MAIN method of energy transfer?

(A) Food heated in a microwave oven
(B) Energy transferred from the sun to earth
(C) Food being cooked on a barbecue grill
(D) Food being cooked in a pot on an electric stove

22. When illuminated smoke is viewed through a microscope, small, bright specks can be seen moving in a jerky haphazard manner. These specks are

(A) atoms
(B) molecules
(C) smoke particles
(D) light particles

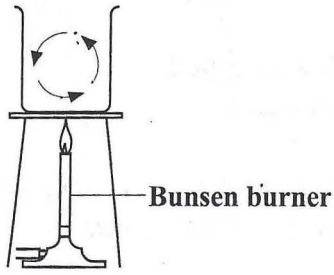
GO ON TO THE NEXT PAGE

23. Most refrigerators are painted white because a white suface is

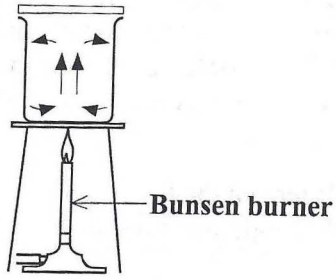
(A) easily cleaned
(B) a good reflector of thermal radiation
(C) a good absorber of radiation
(D) a poor reflector of radiation

24. Which of the following diagrams BEST illustrates convection current in a liquid?

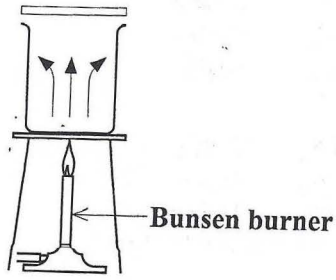
(A)



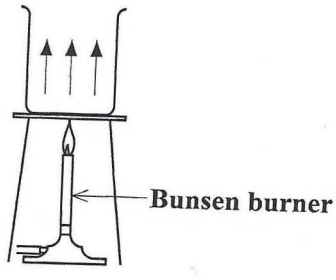
(B)



(C)



(D)



25. The heat from a nearby fire reaches us MAINLY by

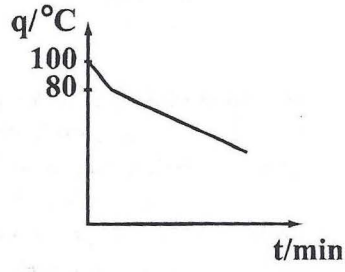
(A) conduction
(B) convection
(C) absorption
(D) radiation

26. A flask contains air under pressure. Some of the air is let out slowly over a period of 10 seconds. When the flask is closed the

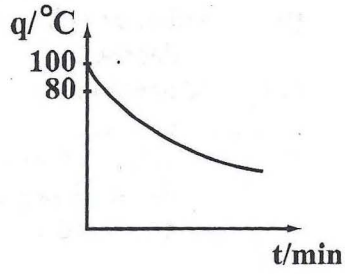
(A) pressure of the air in the flask will have increased
(B) volume of air in the flask will have decreased
(C) temperature in the flask will have increased
(D) number of molecules striking the wall per second will have decreased

27. Some molten naphthalene at 100 °C is allowed to cool down to room temperature. If naphthalene has a melting point of 80 °C, which of the following graphs BEST represents the cooling curve?

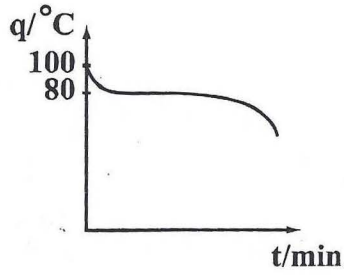
(A)



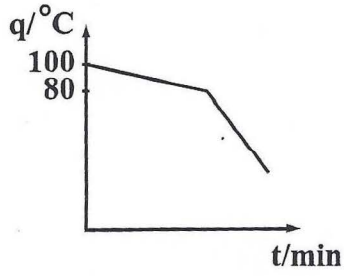
(B)



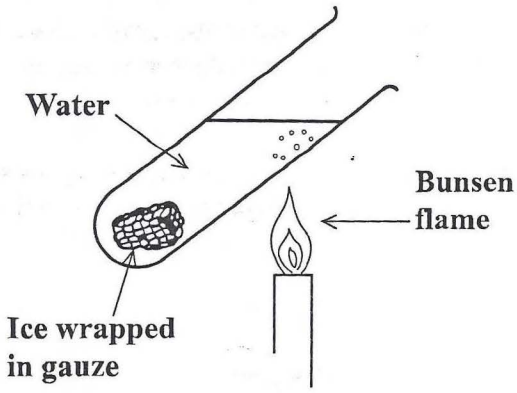
(C)



(D)



Item 28 refers to the diagram below which shows water boiling at the top of a glass test tube while a piece of ice remains unmelted at the bottom.



28. Which of the following statements is the reason for this occurrence?

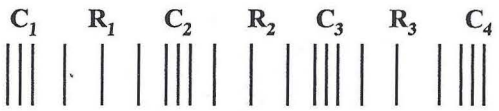
(A) Water is a poor conductor of heat.
(B) Gauze is a poor conductor of heat.
(C) Water is a good conductor of heat.
(D) Glass is a good conductor of heat.

29. Which of the following waves travel(s) only as longitudinal waves?

I. Sound
II. Radio
III. Water

(A) I only
(B) II only
(C) II and III only
(D) I, II and III

Item **30** refers to the following diagram which shows a longitudinal wave, where, C and R represent compressions and rarefractions respectively.



30. If λ = wavelength, the distance between C_1 and R_2 is

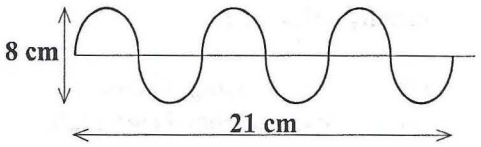
(A) $\frac{1}{2}\lambda$

(B) 1λ

(C) $1\frac{1}{2}\lambda$

(D) 2λ

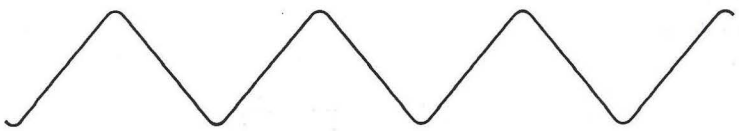
Item **31** refers to the following diagram.



31. The diagram above illustrates the side view of a water wave. The amplitude of the wave is

(A) 4 cm
(B) 7 cm
(C) 8 cm
(D) 21 cm

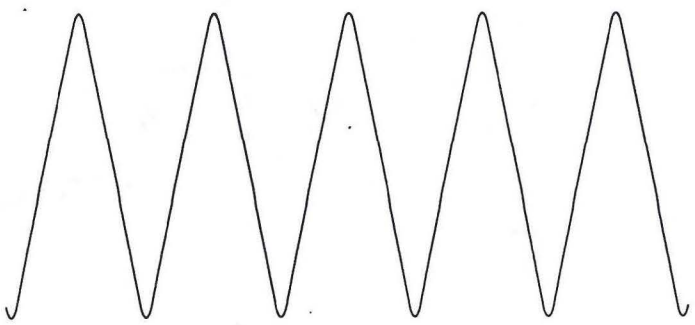
Item **32** refers to the following diagram.



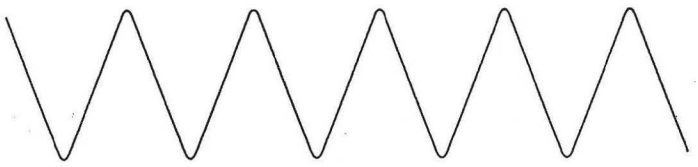
32. The figure above shows the profile of a water wave. Using the same scale, which diagram below represents a wave twice the frequency and half the amplitude in the same tank of water?

(A)

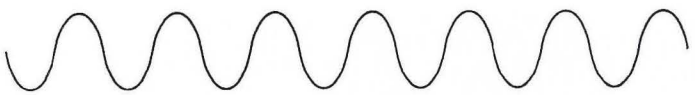
(B)



(C)



(D)



33. Which of the following statements provides a reason why the diffraction of light is NOT usually observed?

(A) Its wavelength is too small.
(B) Its frequency is too high.
(C) Its speed is too high.
(D) Its wavelength is too large.

34. On which of the following would the position of an image formed by a plane mirror depend?

(A) Distance of the observer from the mirror
(B) Distance of the object from the mirror
(C) Angle at which the image is viewed
(D) Angle at which the object is viewed

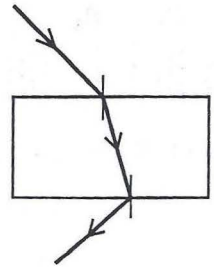
35. Which of the following can produce a diminished virtual image of a real object?

I. A plane mirror
II. A diverging lens
III. A converging lens

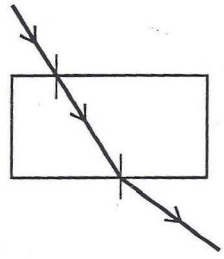
(A) I only
(B) II only
(C) II and III only
(D) I, II and III

36. Which diagram BEST shows the path taken by the ray of light through the rectangular block?

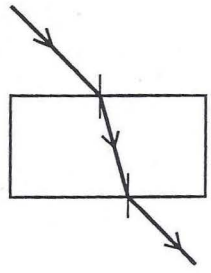
(A)



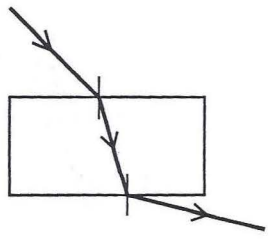
(B)



(C)

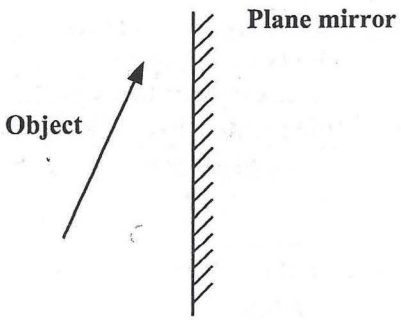


(D)



GO ON TO THE NEXT PAGE

Item 37 refers to the following diagram.



37. The diagram above represents an object placed in front of a plane mirror. Which of the following BEST represents the image produced by the plane mirror?

(A)

(B)

(C)

(D)

38. Which of the following statements about waves is TRUE?

(A) Only transverse waves undergo reflection.
(B) Longitudinal waves do not undergo refraction, but may be reflected.
(C) Diffraction can only take place with light waves.
(D) All waves undergo reflection, refraction and diffraction.

39. An echo is quieter than the original sound that produced it. This shows that, compared to the original sound, the echo has a

(A) smaller amplitude
(B) shorter wavelength
(C) lower frequency
(D) slower speed

40. Which of the following electromagnetic waves has the SHORTEST wavelength?

(A) Gamma rays
(B) Infrared waves
(C) Radio waves
(D) Ultraviolet radiation

41. Which of the following objects can detect X-rays?

(A) Thermometers
(B) Photographic film
(C) Oscilloscopes
(D) Television aerials

42. Which of the following is NOT one of the ways in which the strength of the magnetic field near a solenoid (long coil) carrying a current can be increased?

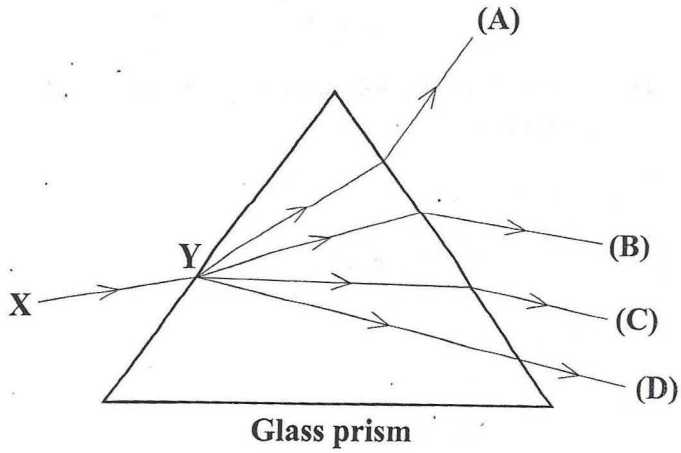
(A) Increasing the resistance of the coil
(B) Increasing the current in the coil
(C) Increasing the number of turns per unit length of the coil
(D) Placing a soft iron core inside the coil

43. Which of the following statements is/are TRUE about the image formed by a plane mirror?

I. It is virtual.
II. It is laterally inverted.
III. It is magnified.

(A) I only
(B) I and II only
(C) II and III only
(D) I, II and III

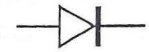
44. Which of the labelled paths, A, B, C or D in the diagram below, is correct for the ray XY?



45. Total internal reflection in glass occurs when

(A) the angle of incidence is 90°
(B) the critical angle is exceeded
(C) all the light is transmitted
(D) the incident ray is perpendicular to the glass boundary

46. Which of the following circuit symbols represents a fuse?

(A) 
(B) 
(C) 
(D) 

47. An ammeter has a very low resistance so that it can be placed

(A) in parallel with a component and not affect the circuit
(B) in series with a component and not affect the circuit
(C) in parallel with a component and the ammeter does not heat up
(D) in series with a component and the ammeter does not heat up

48. Which of the following materials is MOST suitable for the core of an electromagnet?

(A) Copper
(B) Steel
(C) Carbon
(D) Soft iron

49. Which of the following pairs of statements is true for BOTH iron and steel?

	Iron	Steel
(A)	easily magnetised	does not retain its magnetism
(B)	not easily magnetised	retains its magnetism well
(C)	easily magnetised	retains its magnetism well
(D)	not easily magnetised	does not retain its magnetism

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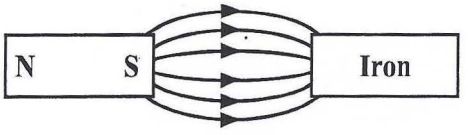
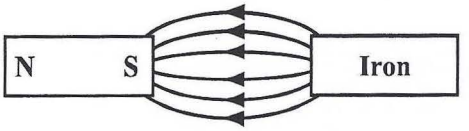
50. Which of the following shows the magnetic field between a bar magnet and a piece of iron?

(A)

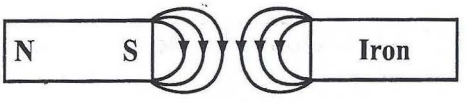


(B)

(C)



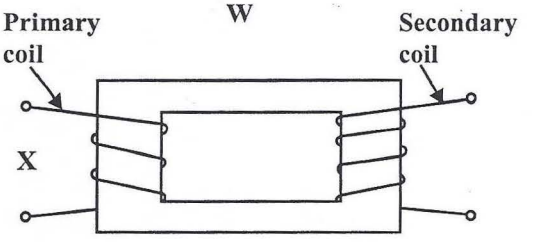
(D)



51. Steel is NOT suitable for use in an electromagnet because it

(A) is too difficult to magnetise
(B) retains magnetism too well
(C) loses its magnetism too easily
(D) contains too many domains

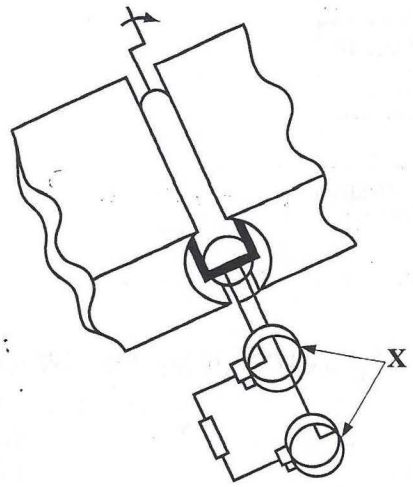
Item 52 refers to the following diagram.



52. Appropriate labels for W and X would be

	W	X
(A)	step-up transformer	a.c. input
(B)	step-up transformer	d.c. input
(C)	step-down transformer	a.c. input
(D)	step-down transformer	d.c. input

Item 53 refers to the following diagram of a simple a.c. generator.



53. The parts labelled X in the diagram are known as the

(A) coils
(B) armatures
(C) commutators
(D) slip rings

54. Which of the following is TRUE when a magnet is moved relative to a coil?

I. The induced current is in the same direction as the charge causing it.
II. The greater the number of turns of coil the smaller the induced e.m.f.
III. The faster the magnet moves relative to the coil the greater the induced e.m.f.
IV. The stronger the magnetic field the greater the induced e.m.f.

(A) I and III only
(B) I and IV only
(C) II and III only
(D) III and IV only

---

55. Which of the following is TRUE for the relative charges on the neutron, proton and the electron?

	Relative charge on neutron	**Relative charge on proton**	**Relative charge on electron**
(A)	0	+1	-1
(B)	+1	0	-1
(C)	+1	-1	0
(D)	0	+1	0

Items **56–57** refer to the following table.

Nuclei	Atomic Mass	Neutron Number
P	16	8
Q	13	9
R	18	10
S	21	11

56. Which element follows $^{7}_{3}Li$ in the Periodic Table?

(A) P
(B) Q
(C) R
(D) S

57. The nuclide $^{234}_{90}Th$ contains

(A) 90 protons and 234 neutrons
(B) 235 protons and 90 neutrons
(C) 90 protons and 144 neutrons
(D) 144 protons and 90 neutrons

58. Which of the following symbols would be possible for an isotope of nuclide presented by $^{A}_{Z}X$?

I. $^{A-2}_{Z}X$

II. $^{A}_{Z-2}X$

III. $^{A+2}_{Z}X$

(A) I only
(B) II only
(C) III only
(D) I and III only

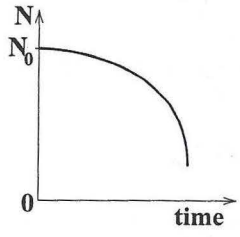
59. Which of the following scientists is associated with the relationship $E = mc^2$?

(A) Marie Curie
(B) Isaac Newton
(C) Albert Einstein
(D) J. J. Thompson

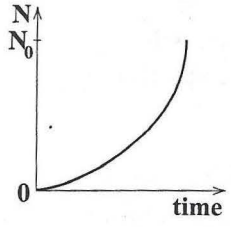
60. N_0 radioactive nuclei are present in a sample at time t = 0.

Which of the following graphs BEST represents the variation with time of the number, N, of undecay nuclei present?

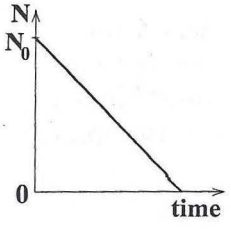
(A)



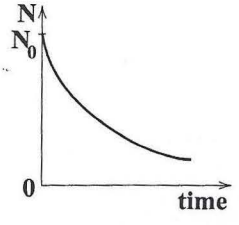
(B)



(C)



(D)



END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

CANDIDATE – PLEASE NOTE!

PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.

_____

TEST CODE **01238010**

FORM TP 2015099

MAY/JUNE 2015

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

04 JUNE 2015 (a.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

   Sample Item

   The SI unit of length is the

   (A) newton
   (B) metre
   (C) kilogram
   (D) second

   Sample Answer

   The best answer to this item is "metre", so (B) has been shaded.
5. If you want to change your answer, erase it completely before you fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to that item later.
7. Figures are not necessarily drawn to scale.
8. You may do any rough work in this booklet.
9. You may use a silent, non-programmable calculator to answer items.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. 0.0000462 N expressed in standard form is

(A) 4.62×10^{-5} N
(B) 4.62×10^{-4} N
(C) 462×10^{-4} N
(D) 4.62×10^{5} N

2. One gram is equal to

(A) 10 milligrams
(B) 100 milligrams
(C) 1 000 milligrams
(D) 10 000 milligrams

3. A 4 kg mass is travelling with a constant speed of 5 m s^{-1}. It is brought to rest in 2 seconds. The average force acting on it to bring it to rest is

(A) 1.6 N
(B) 2.5 N
(C) 10.0 N
(D) 40.0 N

4. Which of the following measurements has three significant figures?

(A) 0.0293 kg
(B) 0.94 A
(C) 5.321 V
(D) 10.42 m

5. Which of the following quantities remain unchanged with an INCREASE in temperature?

(A) Mass
(B) Density
(C) Volume
(D) Relative Density

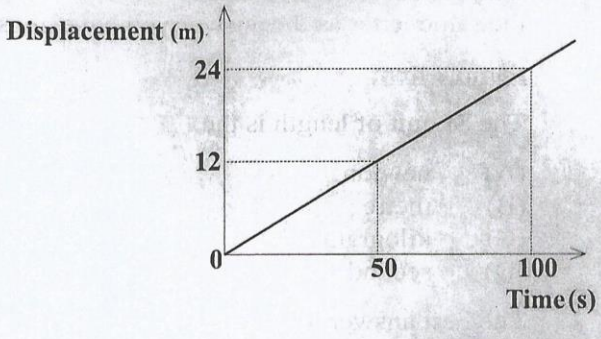
6. A boy measured the height of a laboratory table with a metre rule. Which of the following is MOST likely to be correct?

(A) 0.00895 m
(B) 0.0895 m
(C) 0.895 m
(D) 8.95 m

7. The kinetic energy of a body of mass, m, and velocity, v, is given by

(A) $\frac{m}{v}$
(B) mv
(C) $\frac{mv^2}{2}$
(D) mv^2

Item 8 refers to the following graph.



8. The graph above shows how the displacement of a runner from a starting line varies with time. This runner is

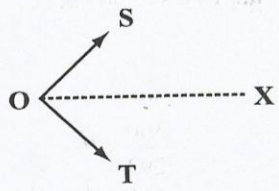
(A) not moving
(B) going at a steady speed
(C) going faster and faster
(D) going slower and slower

9. A falling raindrop reaches a constant speed when

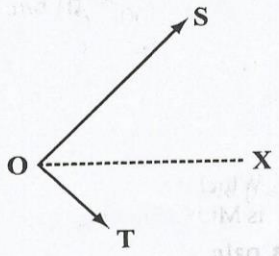
(A) there is no net force acting on it
(B) the upthrust due to the air is at a minimum
(C) the pull of the earth on the raindrop is equal to the weight of the raindrop
(D) the air surrounding the raindrop becomes saturated with water vapour

10. The diagrams below, **drawn to scale**, represent two forces, S and T, acting at O. In which of the following is the resultant in the direction, OX?

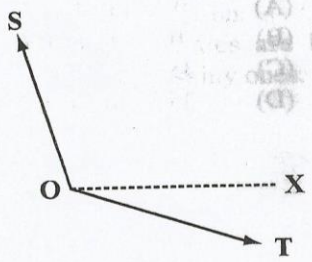
(A)



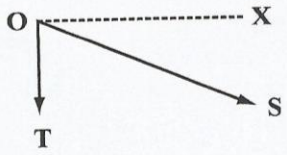
(B)



(C)



(D)



11. When a force F is applied to a spring of original length L, the new length becomes $L+x$. What would be the new length of the spring if a force of $\frac{F}{2}$ was applied instead?

(A) $L+2x$

(B) $2(L+x)$

(C) $L+x$

(D) $L+\frac{x}{2}$

12. Which of the following units is for momentum?

(A) kg s^{-1}
(B) kg m s^{-1}
(C) kg m s^{-2}
(D) N m

13. When two bodies collide momentum is conserved. This means that the

(A) kinetic energy before impact is equal to that after impact
(B) momentum of each body is unchanged
(C) algebraic sum of the velocities before impact is equal to the sum of the velocities after impact
(D) total momentum of the bodies before impact is equal to the total momentum of the bodies after impact

14. Power can be defined as

(A) force × distance moved

(B) $\frac{\text{force}}{\text{time}}$

(C) $\frac{\text{work done}}{\text{time}}$

(D) work done × time

15. An object is removed from the ground and placed on a shelf. Which of its properties is expected to increase?

(A) Mass
(B) Volume
(C) Potential energy
(D) Kinetic energy

16. Pressure in a liquid can be calculated using the formula

$P = \rho gh$

Which sets of units below will give the pressure in the SI unit?

	ρ	g	h
(A)	g cm^{-3}	m s^{-2}	mm
(B)	kg m^{-3}	N kg^{-1}	m
(C)	g cm^{-3}	N kg^{-1}	m
(D)	kg m^{-3}	cm s^{-2}	cm

17. A bubble of gas rises to the surface of a soft drink. This is because the

(A) density of the gas is greater than the density of the drink
(B) upthrust on the bubble is greater than the weight of the bubble
(C) upthrust on the bubble is greater than the weight of water it displaces
(D) weight of the water displaced by the bubble is less than the weight of the bubble

18. Boyle's law for a gas can be tested experimentally, provided which of the following is/are maintained constant?

I. Temperature
II. Pressure
III. Density
IV. Mass

(A) III only
(B) I and II only
(C) I and IV only
(D) I, II and III only

19. A light bulb is filled with a gas at a temperature of 293 K. If the initial pressure of the gas is P, what will it be when the temperature increases to 360 K?

(A) $\frac{393}{360} \times P$

(B) $\frac{360}{293} \times P$

(C) $\frac{293}{360} \times \frac{1}{P}$

(D) $\frac{360}{293} \times \frac{1}{P}$

20. Which of the following ranges of temperature is MOST suitable for a clinical thermometer?

(A) 0 °C to 44 °C
(B) −10 °C to 110 °C
(C) 35 °C to 100 °C
(D) 35 °C to 44 °C

21. The specific heat capacity of a material is the energy required to

(A) melt 1 kg of the material with no change of temperature
(B) change the temperature of the material by 1 K
(C) change 1 kg of the liquid material to 1 kg of gas without a change in temperature
(D) change the temperature of 1 kg of the material by 1 K

22. In the pressure law, which of the following statements is/are true?

I. Ratio of pressure to Kelvin temperature is constant.
II. Volume is constant.
III. Pressure is constant.

(A) I only
(B) III only
(C) I and II only
(D) I, II and III

23. Which of the following statements concerning the radiation of heat is true?

I. Radiation can only take place in a material medium.
II. A good absorber is also a good emitter of radiation.
III. Dark dull surfaces are better emitters than shiny ones.

(A) III only
(B) I and II only
(C) I and III only
(D) II and III only

24. An electric kettle full of water is plugged into the mains. The process by which heat travels through the water is

(A) electrification
(B) convection
(C) evaporation
(D) radiation

25. There are NO attractive forces between the molecules in a

(A) liquid and gas
(B) solid and a liquid
(C) liquid
(D) gas

26. A gas occupies 2 m^3 at 27 °C and at a pressure of 1 atmosphere. At a pressure of 2 atmospheres it occupies a volume of 1 m^3. What is its temperature at this new volume and pressure?

(A) 54.0 °C
(B) 27.0 °C
(C) 6.75 °C
(D) – 198 °C

27. Which of the following is the correct relation between the wavelength, λ, speed, υ, and frequency, f, of a wave?

(A) $\lambda = f\upsilon$

(B) $f = \frac{\lambda}{\upsilon}$

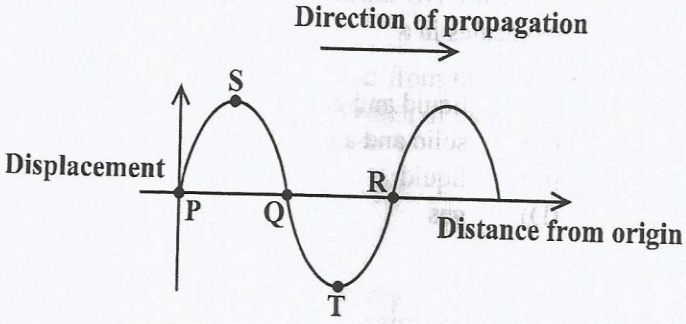
(C) $f = \frac{\upsilon}{\lambda}$

(D) $\lambda = \frac{f}{\upsilon}$

28. Which of the following waves are NOT transverse waves?

(A) Water waves on the sea
(B) Light waves from a street lamp
(C) Sound waves from a guitar string
(D) Radio waves travelling from a satellite

Item 29 refers to the following diagram.

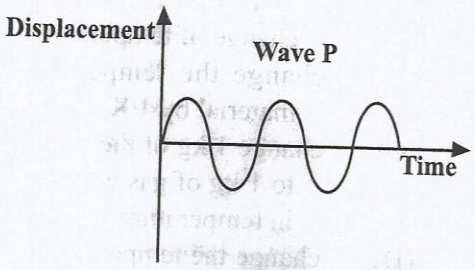


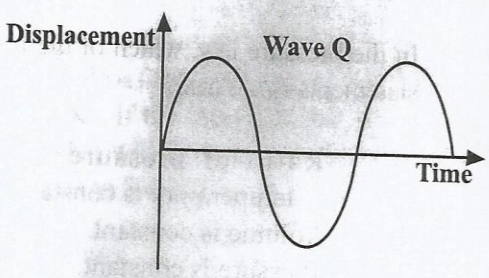
29. Which of the following statements about the wave shown in the diagram above is/are true?

I. Points P, Q and R are in phase.
II. Points S and T are out of phase.
III. The wavelength of the wave is the distance PR.

(A) I only
(B) II only
(C) I and II only
(D) II and III only

Item 30 refers to the following graphs (with axes having the same scales) of two sound waves, P and Q.





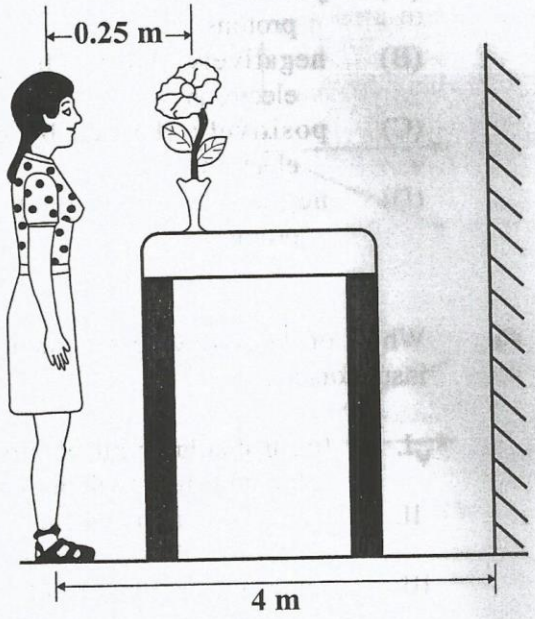
30. Which of the following statements is true?

(A) P is louder than Q but Q has a higher pitch.
(B) P is louder than Q and also has a higher pitch than Q.
(C) Q is louder than P but P has a higher pitch.
(D) Q is louder than P and also has a higher pitch than P.

31. The normal hearing range of a young person is about

(A) 20 Hz to 2 000 Hz
(B) 20 Hz to 20 000 Hz
(C) 200 Hz to 2 000 Hz
(D) 200 Hz to 20 000 Hz

Item 32 refers to the following diagram which shows a lady facing a plane mirror which is 4.0 m away from her..



32. The lady views the image of a vase, which is 0.25 m in front of her. How far from her is the image of the vase?

(A) 3.75 m
(B) 4.25 m
(C) 7.75 m
(D) 8.00 m

33. Which of the following events does NOT suggest that light travels in straight lines?

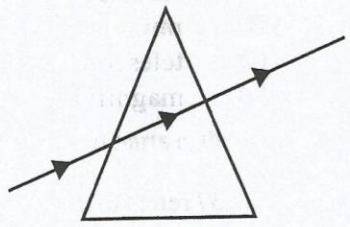
(A) Sunbeams streaming through trees
(B) A rainbow formation in the sky
(C) The formation of shadows
(D) Light from a projector on its way to a screen

34. The specific latent heat of fusion of water is 340 kJ kg^{-1}. This means that when 10 kg of water freezes

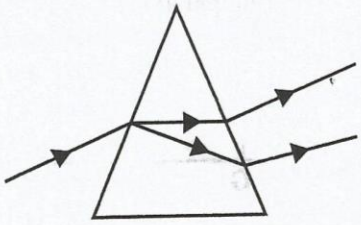
(A) 34 kJ of heat is absorbed
(B) 34 kJ of heat is given out
(C) 3 400 kJ of heat is absorbed
(D) 3 400 kJ of heat is given out

35. Which of the following diagrams BEST represents the passage of a beam of white light through a triangular glass prism?

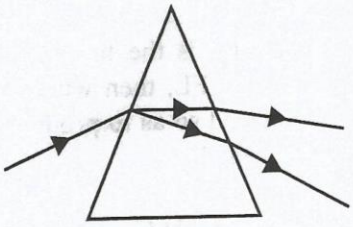
(A)



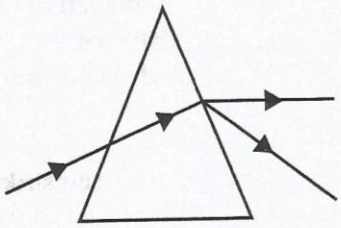
(B)



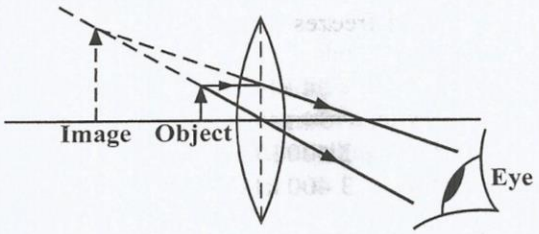
(C)



(D)



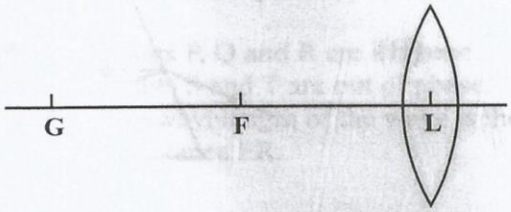
Item **36** refers to the following diagram.



36. The diagram above shows the formation of an image by a

(A) lens camera
(B) pin hole camera
(C) telescope
(D) magnifying glass

Item **37** refers to the following diagram which represents a thin converging lens, L, with a principal axis GL.



37. If FL is the focal length of the lens and GF = FL, then where should an object be placed so as to produce a virtual magnified image?

(A) At G
(B) To the left of G
(C) Between F and G
(D) Between L and F

38. A ray of light in air strikes a glass block at an angle of incidence of 0°. The light will be

(A) undeviated
(B) totally reflected
(C) refracted at 90° to normal
(D) refracted at an unknown angle

39. When a polythene rod is rubbed with a cloth, it becomes

(A) positively charged by gaining protons
(B) negatively charged by gaining electrons
(C) positively charged by gaining electrons
(D) negatively charged by losing protons

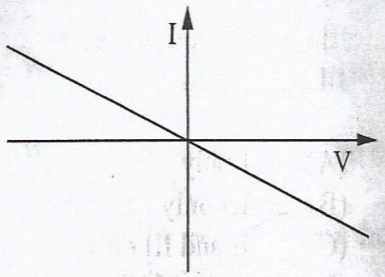
40. Which of the following statements about insulators are true?

I. In an insulator all electrons are bound firmly to their atoms.
II. In an insulator many electrons can move freely from atom to atom.
III. An insulator cannot be charged by rubbing.
IV. A good insulator retains its charge better than a conductor.

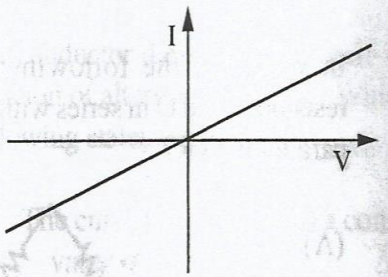
(A) I and IV only
(B) I and II only
(C) II and III only
(D) I, II and III

41. Which of the following diagrams is a representation of the current/potential difference relationship for a metallic conductor at a constant temperature?

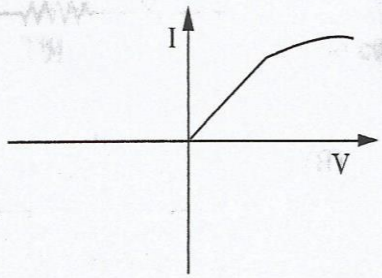
(A)



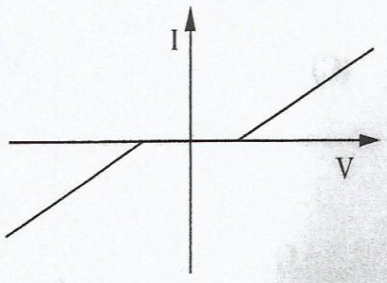
(B)



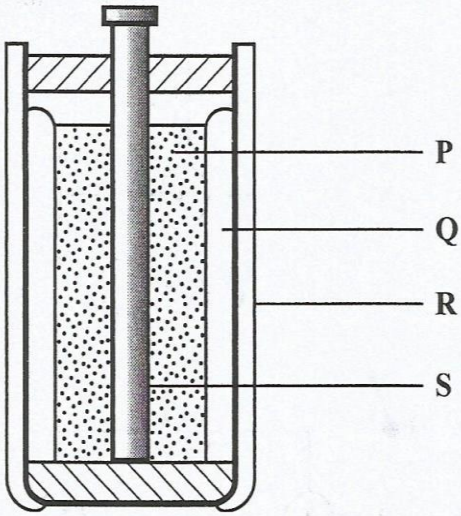
(C)



(D)



Item **42** refers to the following diagram which shows the cross section of a dry cell.

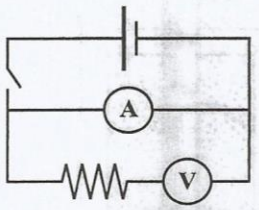


42. Which of the labelled parts is the electrolyte?

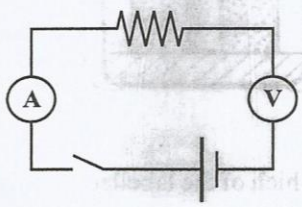
(A) P
(B) Q
(C) R
(D) S

43. A student requires a circuit to measure the resistance of a resistor. Which of the following circuits is correctly connected?

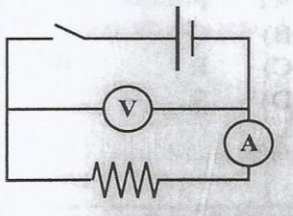
(A)



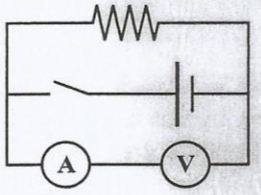
(B)



(C)



(D)



44. The refractive index of a transparent medium with a critical angle, c, for light travelling from the medium to air is

(A) $\frac{1}{c}$

(B) $\frac{90°}{\sin c}$

(C) $\frac{\sin 90°}{\sin c}$

(D) $\sin c$

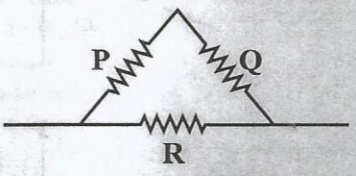
45. In domestic installation systems, which of the following components should be placed in the live wire?

I. Switches
II. Circuit breakers
III. Fuses

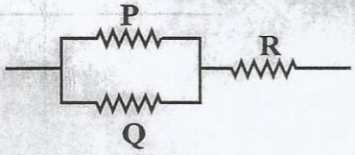
(A) I only
(B) III only
(C) II and III only
(D) I, II and III

46. In which of the following diagrams are resistors P and Q in series with each other and parallel with R?

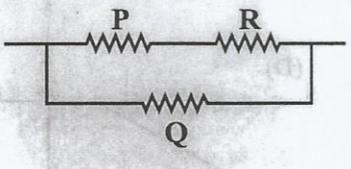
(A)



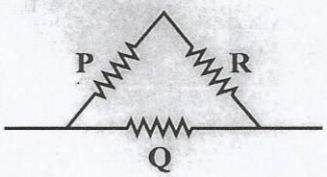
(B)



(C)



(D)



47. When a large current passes through a fuse, which of the following sequence of events is correct?

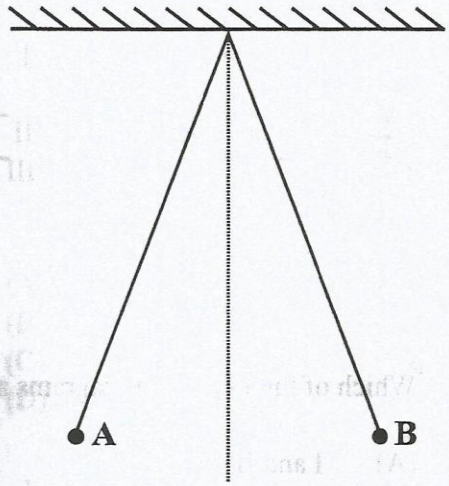
(A) Wire gets hot → wire melts → current is cut off
(B) Wire gets hot → current is cut off → wire melts
(C) Wire melts → current is cut off → wire gets hot
(D) Wire melts → wire gets hot → current is cut off

48. A semi-conductor diode produces half-wave rectification of alternating current. Which of the following statements is true?

I. The current obtained has a constant value.
II. The current obtained flows only in one direction.
III. There are periods when no current flows from the source.

(A) I only
(B) II only
(C) I and III only
(D) II and III only

Item 49 refers to the following diagram.



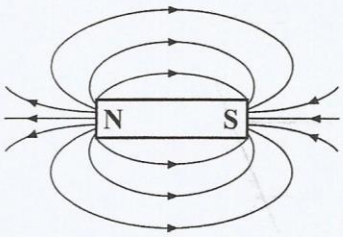
49. Two light aluminium spheres, A and B, are suspended by insulating threads. If they come to rest as shown in the diagram, the force keeping them apart is

(A) gravitational
(B) electrostatic
(C) magnetic
(D) centripetal

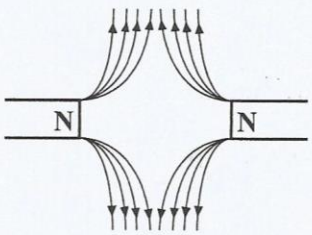
50. Which of the following statements about alternating current is true?

(A) It can be changed into direct current by a transformer.
(B) It can be rectified by using a semiconductor diode.
(C) It can be used to recharge a battery.
(D) It is used to transmit electrical energy because of its high frequency.

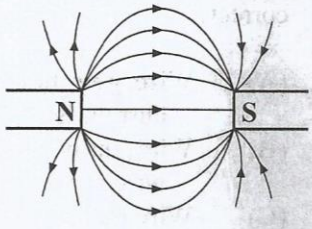
51. The following diagrams show the magnetic field lines plotted by a student.



I



II



III

Which of the following diagrams are correct?

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

---

52. A transformer is used to

(A) alter the voltage
(B) alter the frequency
(C) convert direct current to alternating current
(D) convert alternating current to direct current

53. Rectification can BEST be done by using a

(A) transformer
(B) diode
(C) transistor
(D) capacitor

54. Which of the following is four times the mass of a proton?

(A) Alpha particle
(B) Beta particle
(C) Electron
(D) Neutron

55. J.J. Thompson discovered the electron. Which of the following physicists discovered the proton?

(A) Thompson
(B) Bohr
(C) Chadwick
(D) Rutherford

Items 56–57 refer to the following information.

Nucleus	Neutron Number	Proton Number
P	126	82
Q	126	83
R	125	82
S	146	92

56. Which pair of atomic nuclei are isotopes?

(A) P and Q
(B) Q and R
(C) P and R
(D) Q and S

57. Which two elements could occupy adjacent positions in the periodic table?

(A) P and Q
(B) P and R
(C) Q and S
(D) R and S

58. Which of the following scientists discovered radium?

(A) Marie Curie
(B) Isaac Newton
(C) Albert Einstein
(D) J.J. Thompson

59. Which of the following statements about radioactive decay are correct?

I. It is dependent on conditions external to the nucleus.
II. It is a random process.
III. It is due to changes in the nuclei of atoms.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

60. Which of the following statements concerning an α-particle are true?

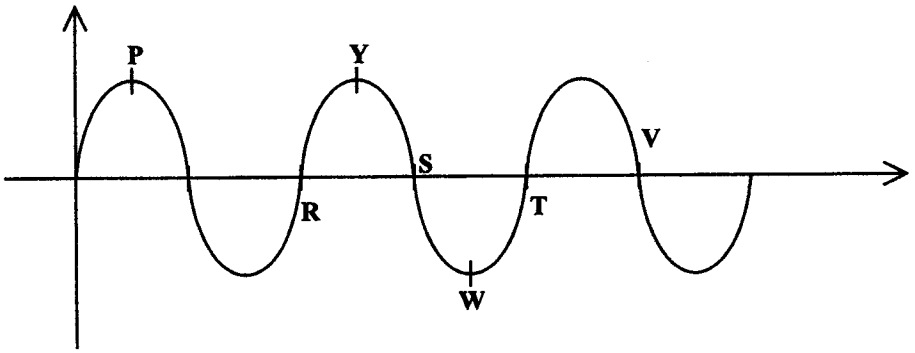
I. It has twice the charge of a proton.
II. It has twice the mass of a proton.
III. It has the same sign charge as a proton.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

Item 1 refers to the following graph.



1. Which of the following pair of points are in phase?

(A) Y, W
(B) P, R
(C) S, V
(D) S, T

---

2. Given that force = mass × acceleration, the unit of force could be written as

(A) $kg^{-1}\ m\ s^{2}$
(B) $kg\ m^{-1}\ s^{2}$
(C) $kg\ m^{-1}\ s^{-2}$
(D) $kg\ m\ s^{-2}$

3. The SI unit of temperature is the

(A) Celsius
(B) Fahrenheit
(C) Kelvin
(D) Centigrade

4. In carrying out an experiment to locate a real image using a converging lens, the object can be placed

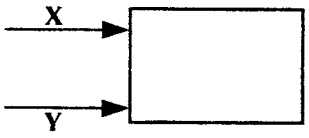
I. between the focal point and the lens
II. at the focal point
III. between the focal point and a point at twice the focal length

(A) I only
(B) I and III only
(C) II and III only
(D) III only

5. The moment of a force may be defined as the

(A) moment in time when a force is first applied to a body
(B) length of time for which a force is applied to a body
(C) product of the force and its perpendicular distance from the turning point to the force
(D) ratio of the force and its perpendicular distance from the turning point

Item 6 refers to the following diagram which shows two forces, X and Y, applied onto an object.



6. What should be the magnitude and direction of a third force which will cause the object to remain stationary?

(A) $X - Y$ to the left
(B) $X + Y$ to the left
(C) $X - Y$ to the right
(D) $X + Y$ to the right

7. When a force F is applied to a spring of original length L the new length becomes $L + x$. What would be the new length of the spring if a force of $\frac{F}{2}$ was applied instead?

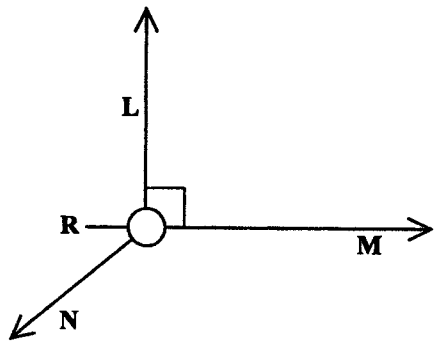
(A) $L + 2x$

(B) $2(L + x)$

(C) $L + x$

(D) $L + \frac{x}{2}$

Item 8 refers to the following diagram which shows three forces of magnitudes L, M and N, all in the **same plane** and applied on a ring.



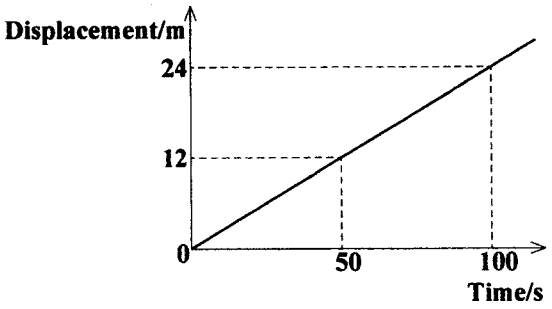
8. Which of the following equations must be TRUE in order for the ring to remain stationary?

(A) $L^2 = M^2 + N^2$
(B) $N^2 = L^2 + M^2$
(C) $N^2 = L^2 - M^2$
(D) $N = L + M$

9. Two forces of 8 N and 10 N CANNOT give a resultant of

(A) 1 N
(B) 2 N
(C) 9 N
(D) 18 N

Item 10 refers to the following graph which shows how the displacement of a runner from a starting line varies with time.



10. From the graph it can be deducted that the runner is

(A) not moving
(B) going at a steady speed
(C) going faster and faster
(D) going slower and slower

11. A block is allowed to fall freely towards the ground. As it falls, its gravitational potential energy

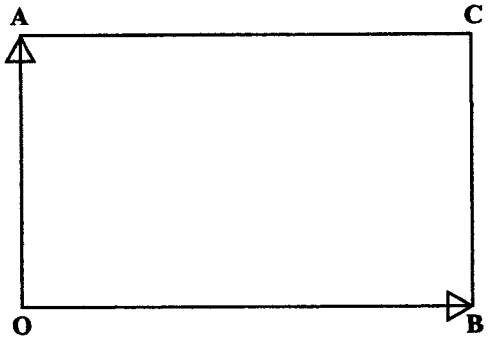
(A) increases
(B) remains constant
(C) is converted to internal energy
(D) is converted to kinetic energy

12. Two smooth spheres, A and B, collide head on. Which of the following statements is/are TRUE?

I. The momentum of A is the same after collision as it was before.
II. The momentum of B is the same after collision as it was before.
III. The total momentum of A and B is the same after collision as it was before.

(A) I only
(B) III only
(C) II and III only
(D) I, II and III

Item 13 refers to the following diagram which shows two vectors of magnitudes a and b represented respectively by $\overrightarrow{OA}$ and $\overrightarrow{OB}$.



13. The vectors act at point O and are directly perpendicular to each other. Which of the following pairs represents BOTH the magnitude and direction of their resultant?

	Magnitude	Direction
(A)	$a^2 + b^2$	$\overrightarrow{OC}$
(B)	$a + b$	$\overrightarrow{CO}$
(C)	$\sqrt{(a^2 + b^2)}$	$\overrightarrow{CO}$
(D)	$\sqrt{(a^2 + b^2)}$	$\overrightarrow{OC}$

14. The height of liquid in a vessel is h and its density ρ. If the atmospheric pressure is X and the acceleration due to gravity is g, what is the pressure on the base of the vessel? (All quantities are in SI units.)

(A) $X + h\rho$
(B) $(X + h)\rho g$
(C) $X + h\rho g$
(D) $(X + h\rho)g$

15. The specific latent heat of vaporization of water is 2.26×10^6 J kg $^{-1}$. When 0.01 kg of water is converted into steam it

(A) absorbs 2.26×10^4 J
(B) gives out 2.26×10^4 J
(C) absorbs 2.26×10^8 J
(D) gives out 2.26×10^8 J

16. A body weighs 60 N on earth. When taken to the moon the body weighs 10 N. Which of the following would be the MAIN reason(s) for this fact?

I. The earth rotates more slowly than the moon.
II. The earth has a larger mass than the moon.
III. On the moon there is no atmosphere.

(A) I only
(B) II only
(C) II and III only
(D) I, II and III

Item 17 refers to the following diagram of a clinical thermometer.

17. What temperature is indicated by the clinical thermometer in the diagram above?

(A) 38.3 °C
(B) 38.6 °C
(C) 38.7 °C
(D) 38.8 °C

18. Under what conditions may we apply the following gas formula to solve problems?

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

I. The mass of gas must be constant.
II. P_1 and P_2 must be measured in mm of mercury.
III. The units of the product P_1 and V_1 must be the same as the units of the product of P_2 and V_2.

(A) I only
(B) II only
(C) I and III only
(D) I, II and III

19. Who was responsible for arriving at the conclusion that measured amounts of electrical and mechanical energy can be converted to proportionate amounts of heat energy?

(A) Joule
(B) Rumford
(C) Coulomb
(D) Newton

20. Which of the following methods is the MOST suitable means of heating a brass bob in order to determine its specific heat capacity by the method of mixtures?

(A) Subjecting it to an open flame for ten minutes
(B) Placing it in contact with an electrical heater for ten minutes
(C) Placing it in a boiling water bath for ten minutes
(D) Subjecting it to an infrared beam for ten minutes

21. The energy required to change the state of a substance was determined to be E_H. If the mass of the substance was DOUBLED, the value of E_H will

(A) be halved
(B) be doubled
(C) be quadrupled
(D) remain constant

22. Which of the following statements is FALSE?

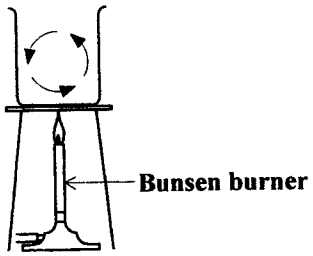
(A) Evaporation occurs at room temperature only.
(B) Evaporation requires heat energy and causes cooling.
(C) Evaporation occurs only at the surface.
(D) In evaporation the faster molecules escape the liquid.

23. Most refrigerators are painted white because a white surface is

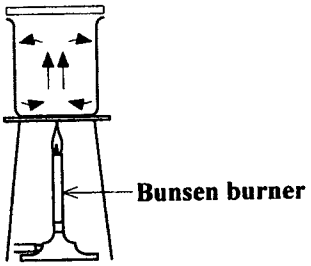
(A) easily cleaned
(B) a good reflector of thermal radiation
(C) a good absorber of radiation
(D) a poor reflector of radiation

24. Which of the following diagrams BEST illustrates convection current in a liquid?

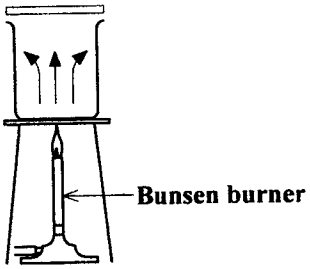
(A)



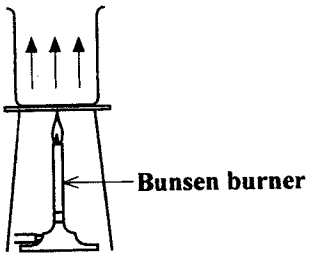
(B)



(C)



(D)



25. The heat from a nearby fire reaches us MAINLY by

(A) conduction
(B) convection
(C) absorption
(D) radiation

26. Which of the following is the POOREST conductor of thermal energy?

(A) Air
(B) Copper
(C) Mercury
(D) Aluminium

27. Which of the following descriptions refer to BOTH a good absorber and a good emitter of thermal (heat) energy?

(A) A polished, concave metal plate
(B) A polished, convex metal plate
(C) A flat, polished metal plate
(D) A flat metal plate, painted black

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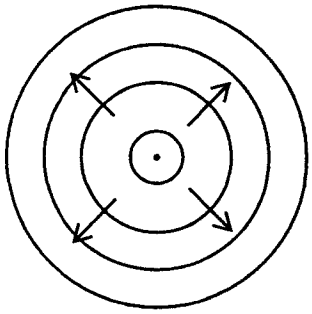
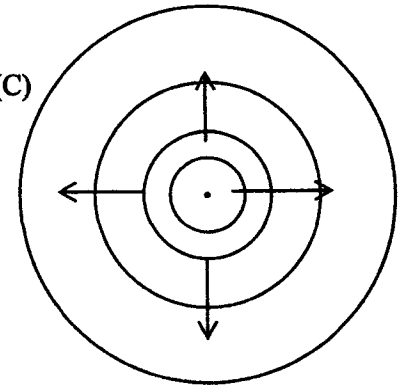
28. Which of the following diagrams BEST represents the wave generated in a ripple tank by a small spherical dipper vibrating at a constant frequency?

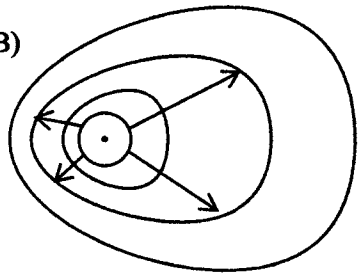
(A)



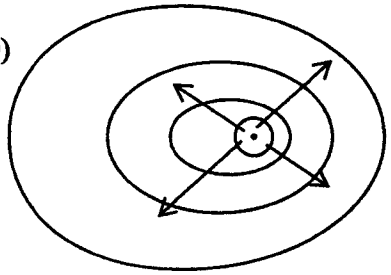
(C)



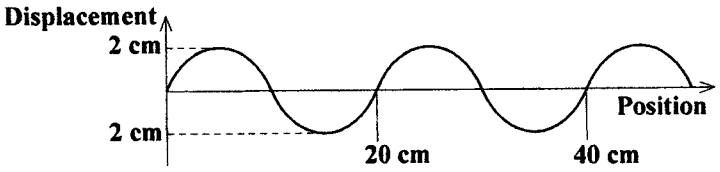
(B)



(D)



Item 29 refers to the following diagram which shows the instantaneous profile of a wave travelling across a water surface.



29. From the information given, the frequency is

(A) $\frac{1}{20}$ Hz

(B) 10 Hz

(C) 20 Hz

(D) unknown

30. The range of frequencies detectable by the normal human ear is

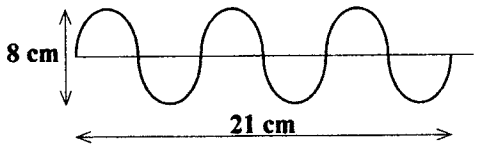
(A) 10 Hz to 100 Hz

(B) 20 Hz to 20 KHz

(C) 10 Hz to 10 KHz

(D) 20 Hz to 2000 KHz

Item 31 refers to the following diagram which illustrates the side view of a water wave.



31. The amplitude of the wave is

(A) 4 cm

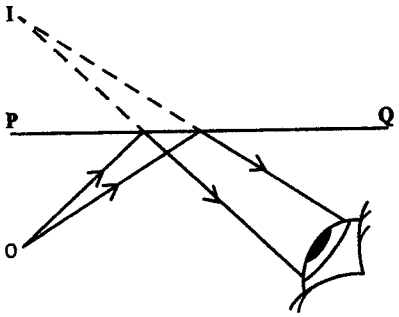
(B) 7 cm

(C) 8 cm

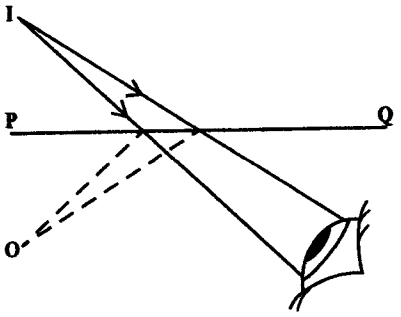
(D) 21 cm

32. An object O is viewed in a plane mirror PQ. Which of the following diagrams correctly shows the formation of the image?

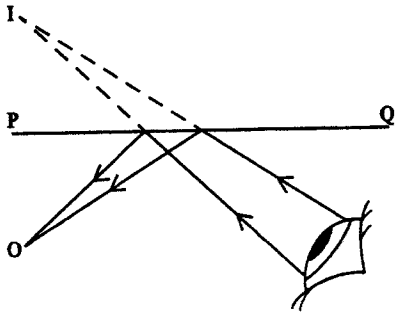
(A)



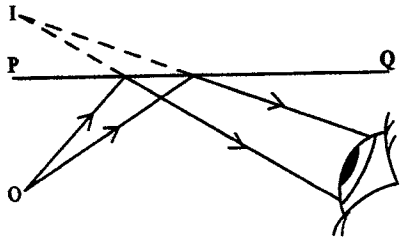
(C)



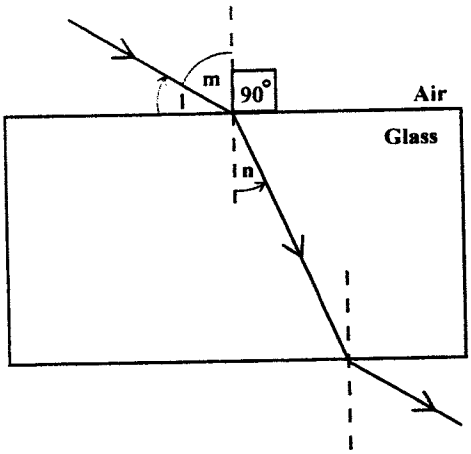
(B)



(D)



Item 33 refers to the following diagram.



33. From the diagram above, the refractive index of glass can be determined from the ratio

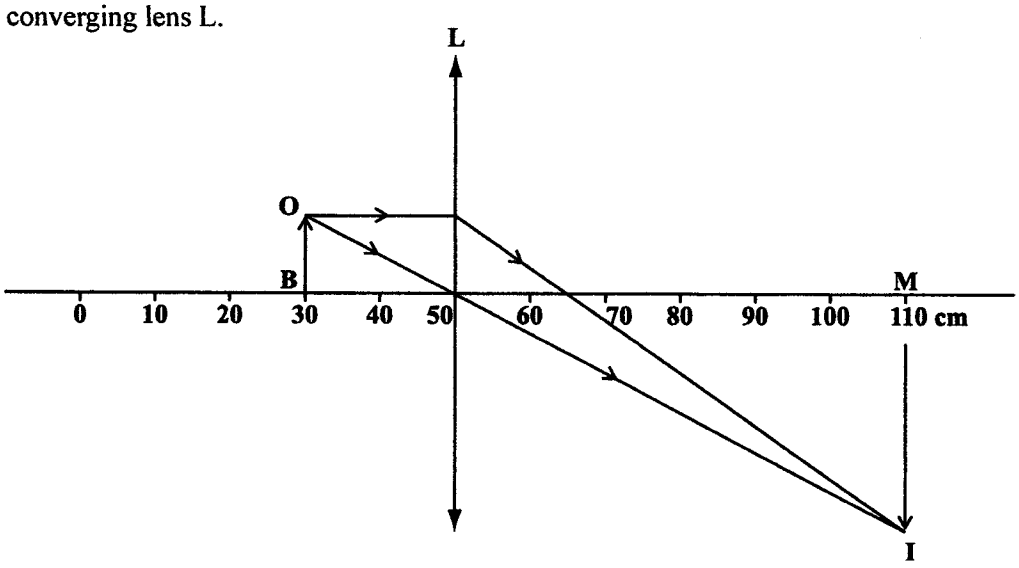
(A) $\frac{\text{Sin m}}{\text{Sin l}}$

(B) $\frac{\text{Sin m}}{\text{Sin n}}$

(C) $\frac{\text{Sin l}}{\text{Sin 90}}$

(D) $\frac{\text{Sin 90}}{\text{Sin n}}$

Item 34 refers to the following diagram which represents an object OB standing on the axis of the converging lens L.



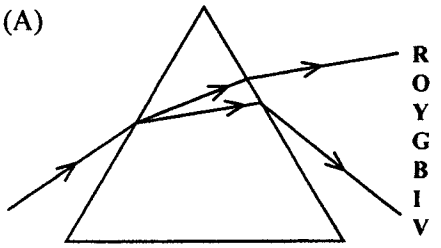
IM represents the image formed. The lens is placed at the 50 cm mark of a scale marked every 10 cm.

34. The focal length of the lens is

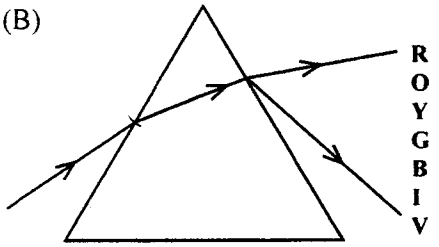
(A) 15 cm
(B) 20 cm
(C) 60 cm
(D) 65 cm

35. A ray of white light enters a transparent glass prism. In which of the following diagrams is the dispersion of light correctly illustrated?

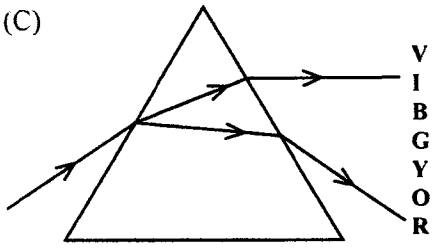
(A)



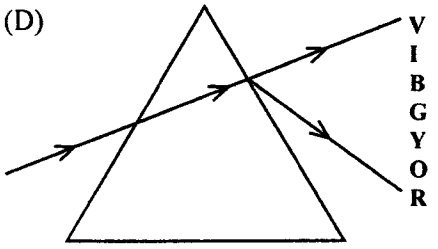
(B)



(C)

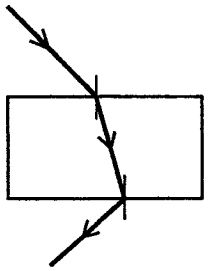


(D)

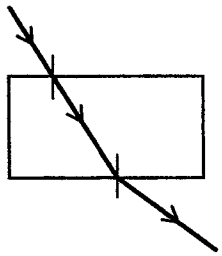


36. Which diagram BEST shows the path taken by a ray of light through a rectangular block?

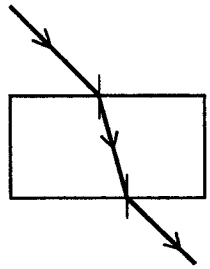
(A)



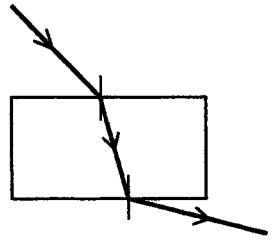
(B)



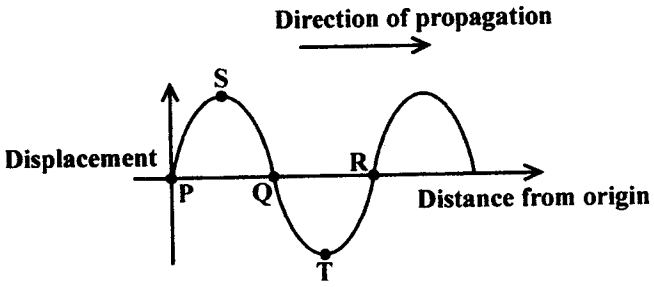
(C)



(D)



Item 37 refers to the following diagram.



37. Which of the following statements about the wave shown in the diagram is/are true?

I. Points P, Q and R are in phase.
II. Points S and T are out of phase.
III. The wavelength of the wave is the distance PR.

(A) I only
(B) II only
(C) I and II only
(D) II and III only

38. In which of the following would a change be detected if sounds of differeing frequencies are played in succession? (Assume amplitude constant.)

(A) Loudness
(B) Speed
(C) Pitch
(D) Timbre

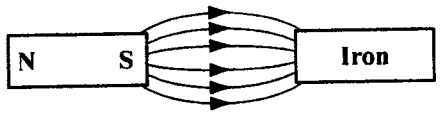
39. Magnetic induction occurs when

(A) an N pole attracts a S pole
(B) iron nails near a magnet become magnetized
(C) a magnet is suspended and points in the NS direction
(D) an electroscope is charged

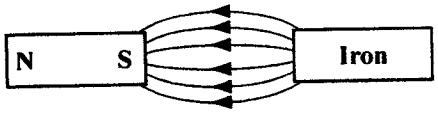
40. Which of the following electromagnetic waves has the SHORTEST wavelength?

(A) Gamma rays
(B) Infrared waves
(C) Radio waves
(D) Ultraviolet radiation

41. Which of the following diagrams shows the magnetic field between a bar magnet and a piece of iron?

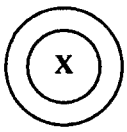
(A) 

(B) 

(C) 

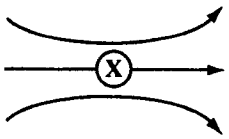
(D) 

Item 42 refers to the following diagram which represents a straight wire carrying a current into the plane of a piece of paper.

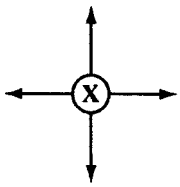


42. Which of the following diagrams BEST represents the magnetic field around the wire?

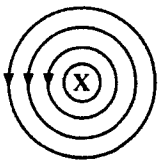
(A)



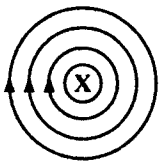
(B)



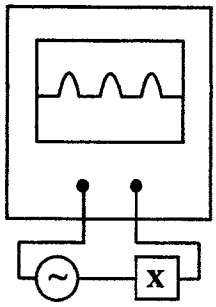
(C)



(D)



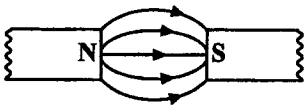
Item 43 refers to the following diagram which shows the trace on the screen of an oscilloscope wired to an a.c. supply and a device **X**.



43. **X** is probably a

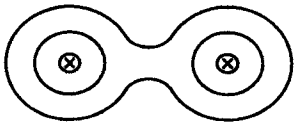
(A) diode
(B) resistor
(C) solenoid
(D) transformer

Item 44 refers to the following diagrams labelled I, II and III.



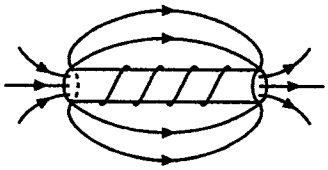
Two permanent magnets

I



Parallel wires carrying equal currents in the same direction into the paper

II



Current flowing in a solenoid

III

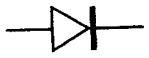
44. Which of the diagrams above correctly show(s) the magnetic fields created?

(A) I only
(B) I and III only
(C) II and III only
(D) I, II and III

45. Which of the following materials is MOST suitable for the core of an electromagnet?

(A) Steel
(B) Copper
(C) Carbon
(D) Soft iron

46. Which of the following circuit symbols represents a fuse?

(A) 

(B) 

(C) 

(D) 

47. An ammeter has a very low resistance so that it can be placed in

(A) parallel with a component and not affect the circuit
(B) series with a component and not affect the circuit
(C) parallel with a component and the ammeter does not heat up
(D) series with a component and the ammeter does not heat up

48. An ideal transformer has a primary to secondary turns ratio of 1:3. An alternating potential difference of 200 V is applied to the primary coil and a resistance of 200 Ω attached to the secondary coil. What is the current in the secondary circuit?

(A) 0.33 A
(B) 1.0 A
(C) 1.5 A
(D) 3.0 A

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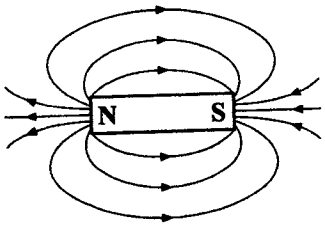
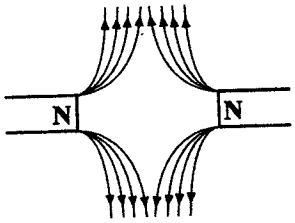
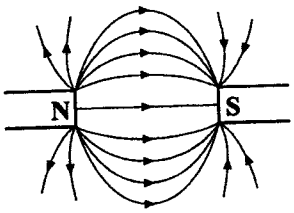
49. The following diagrams labelled I, II and III, show the magnetic field lines plotted by a student.



I



II



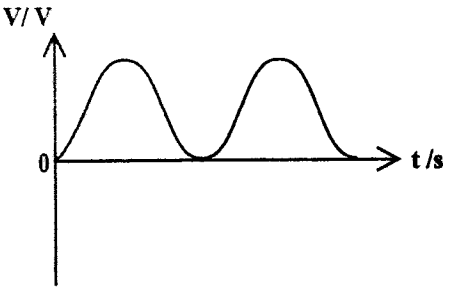
III

Which of the following are correct?

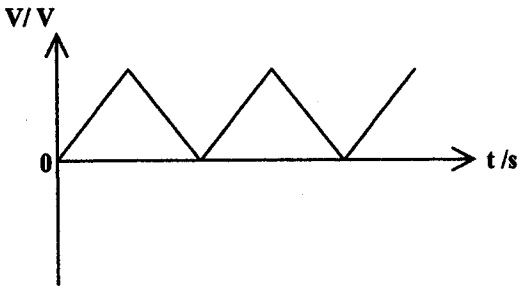
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

50. Which of the following voltage (V) – time (t) graphs BEST represents an a.c. voltage?

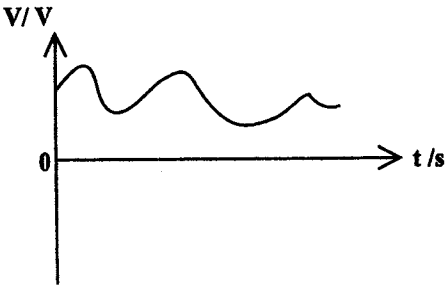
(A)



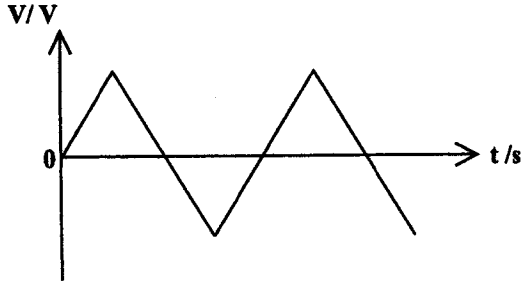
(C)



(B)

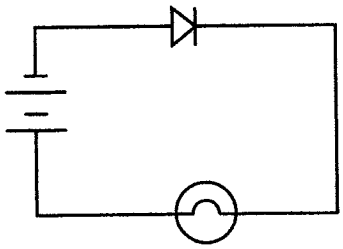


(D)

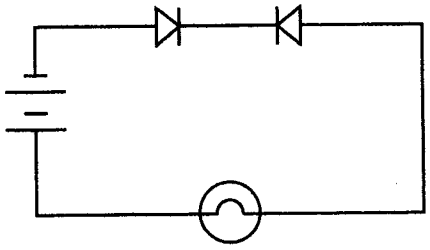


51. In which of the following circuits will the lamp light up?

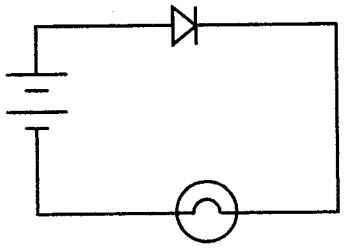
(A)



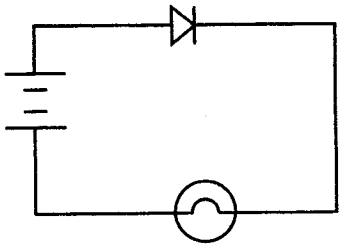
(C)



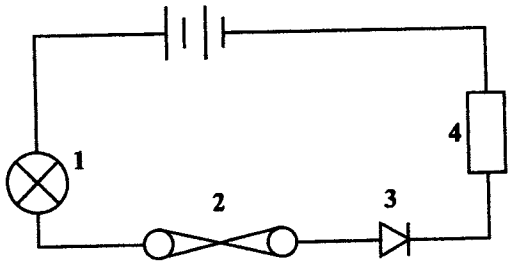
(B)



(D)



Item 52 refers to the following diagram.



52. Which of the following options shows the correct match of the component name and its number?

	Diode	Lamp	Resistor	Fuse
(A)	3	1	4	2
(B)	4	3	1	2
(C)	1	3	4	2
(D)	2	4	3	1

53. Given the following truth table with inputs A and B and output C, which logic gate does it describe?

A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

(A) NAND
(B) NOR
(C) AND
(D) OR

54. In the scattering experiment conducted by Geiger and Marsden, some of the alpha particles were deflected. The explanation for this phenomenon is that

(A) electrons have a small mass
(B) electrons have a small charge
(C) the metal foil was only a few atoms thick
(D) the nuclear charge and mass are concentrated in a small volume

55. Which of the following CANNOT be deflected by a magnetic field?

(A) Alpha particles
(B) Beta particles
(C) Gamma rays
(D) Electrons

56. Which of the following are definitions of the term 'half-life' of a radioactive nuclide?

I. The time taken for the activity of any given sample to fall to half its original value.
II. The time taken for half the nuclei present in any given sample to decay.
III. It is half the average number of disintegrations per second.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

57. The nuclide $^{234}_{90}Th$ contains

(A) 90 protons and 234 neutrons
(B) 235 protons and 90 neutrons
(C) 90 protons and 144 neutrons
(D) 144 protons and 90 neutrons

58. Which of the following statements describe the nature of the three types of emissions from radioactive substances?

I. Alpha radiation is a stream of helium nuclei.
II. Beta radiation is a stream of electrons.
III. Gamma radiation is an electromagnetic radiation of very high frequency.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

59. Which of the following scientists discovered the relationship $E = mc^2$?

(A) Marie Curie
(B) Isaac Newton
(C) Albert Einstein
(D) J J Thompson

60. Which of the following equations for nuclear reactions is correct?

(A) $^{226}_{88}\text{Ra} \rightarrow {}^{222}_{86}\text{Rn} + \beta - \text{particle}$

(B) $^{14}_{6}C \rightarrow {}^{15}_{7}N + \beta - \text{particle}$

(C) $^{226}_{88}\text{Ra} \rightarrow {}^{222}_{86}\text{Rn} + \alpha - \text{particle}$

(D) $^{14}_{6}C \rightarrow {}^{15}_{7}N + \alpha - \text{particle}$

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

CANDIDATE – PLEASE NOTE!

PRINT your name on the line below and return this booklet with the answer sheet. Failure to do so may result in disqualification.

_____

TEST CODE **01238010**

FORM TP 2017021

JANUARY 2017

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

17 JANUARY 2017 (a.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

   Sample Item

   The SI unit of length is the

   (A) newton
   (B) metre
   (C) kilogram
   (D) second

   Sample Answer

   Ⓐ ● Ⓒ Ⓓ

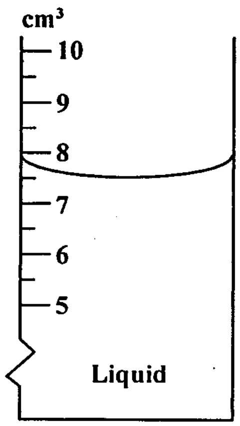
   The best answer to this item is "metre", so (B) has been shaded.
5. If you want to change your answer, erase it completely before you fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to that item later.
7. You may do any rough work in this booklet.
8. Figures are not necessarily drawn to scale.
9. You may use a silent, non-programmable calculator to answer items.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. How many significant figures are in the quantity 25.92 m^3?

(A) 1
(B) 2
(C) 3
(D) 4

Item 2 refers to the following measuring cylinder which is used to determine the volume of a liquid.



2. The volume of the liquid, in cm^3, is

(A) 7.0
(B) 7.5
(C) 7.8
(D) 8.0

3. In carrying out an experiment to locate a real image using a converging lens, the object can be placed

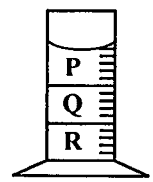
I. between the focal point and the lens
II. at the focal point
III. between the focal point and a point at twice the focal length

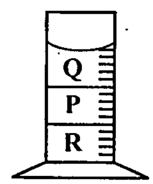
(A) I only
(B) II only
(C) III only
(D) I and III only

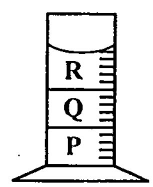
4. Which of the following instruments is suitable for measuring the diameter of a human hair?

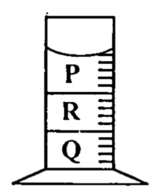
(A) Tape measure
(B) Vernier caliper
(C) Metre rule
(D) Micrometer screw gauge

5. Three immiscible liquids P, Q and R have densities which differ. Q is denser than P but less dense than R. Which of the following diagrams shows how the liquids settle in the measuring cylinder?

(A)


(B)


(C)


(D)


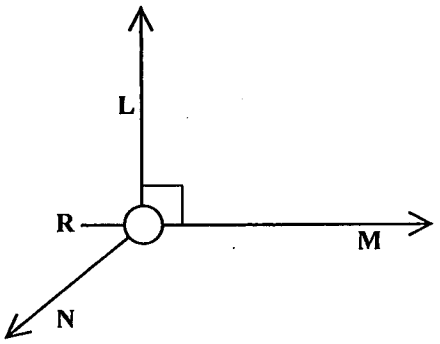
6. The mass of an astronaut is 70 kg when standing on the moon. When he returns to earth his approximate weight will be

(A) 70 kg
(B) 420 kg
(C) 70 N
(D) 700 N

7. When a force F is applied to a spring of original length L, the new length becomes $L + x$. What would be the new length of the spring if a force of $\frac{F}{2}$ was applied instead?

(A) $L + 2x$
(B) $2(L + x)$
(C) $L + x$
(D) $L + \frac{x}{2}$

Item 8 refers to the following diagram which shows three forces of magnitudes L, M and N, all in the same plane and applied on a ring.



8. Which of the following equations must be TRUE in order for the ring to remain stationary?

(A) $N^2 = L^2 + M^2$
(B) $N^2 = L^2 - M^2$
(C) $L^2 = M^2 + N^2$
(D) $N = L + M$

9. Linear momentum is

(A) the product of mass and acceleration
(B) the product of mass and velocity
(C) measured in newton-metres
(D) measured in kilograms per metre

10. Which of the following features must be present in a stable, well-designed racing car?

(A) Low centre of gravity
(B) Narrow wheelbase
(C) Sunroof
(D) Long front

11. Which of the following statements represent ways in which energy may be used MORE efficiently and economically in homes?

I. Washing fewer and larger loads in the washing machine
II. Using a solar water heater instead of an electrical heater
III. Hanging clothes out to dry in the sun instead of using an electric dryer

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

12. When a ball is thrown vertically upwards, and reaches its maximum height, it has

(A) maximum kinetic energy and maximum potential energy
(B) maximum kinetic energy and minimum potential energy
(C) maximum potential energy and minimum kinetic energy
(D) minimum kinetic energy and minimum potential energy

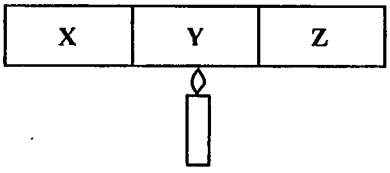
13. A large, heavy parcel is tied with string. It is less painful for a person to pick up the parcel if a cloth is wrapped around the string. This is because the cloth

(A) exerts less force on the fingers
(B) reduces the tension in the string
(C) makes the parcel lighter
(D) reduces the pressure on the fingers

14. The specific latent heat of vaporization of water is 2.26×10^6 J kg^{-1}. When 0.01 kg of water is converted into steam it

(A) absorbs 2.26×10^4 J
(B) gives out 2.26×10^4 J
(C) absorbs 2.26×10^8 J
(D) gives out 2.26×10^8 J

Item 15 refers to the following diagram which shows a copper rod being heated.



15. Which of the following transitions BEST indicates the direction of net energy transfer?

(A) Y → X and Y → Z
(B) Y → Z and X → Z
(C) X → Y and Y → Z
(D) Z → Y and Y → X

16. The heat capacity of a substance is defined as the amount of heat energy

(A) the substance can hold
(B) 1 kg of the substance can hold
(C) required to change the substance to another state
(D) needed to raise the temperature of the substance by 1 degree

17. Under what conditions could the following gas formula be applied to solve problems?

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

I. Mass of gas being constant.
II. The temperatures T_1 and T_2 must be given in Kelvin.
III. P_1 and P_2 must be measured in mm of mercury.
IV. The units of P_1 and V_1 must be the same as those for P_2 and V_2.

(A) I only
(B) I and IV only
(C) I, II and IV only
(D) I, II, III and IV

18. Which scientist was responsible for arriving at the conclusion that measured amounts of electrical and mechanical energy can be converted to proportionate amounts of heat energy?

(A) Joule
(B) Coulomb
(C) Rumford
(D) Newton

19. Which of the following methods is the MOST suitable means of heating a brass bob in order to determine its specific heat capacity by the method of mixtures?

(A) Subjecting it to an open flame for ten minutes
(B) Placing it in contact with an electrical heater for ten minutes
(C) Placing it in a boiling water bath for ten minutes
(D) Subjecting it to an infrared beam for ten minutes

20. A student carries out an experiment to determine the specific heat capacity, c, of a solid using the electrical method. Which of the following equations should be used?

(A) $c = \frac{M\Delta\theta}{PI}$

(B) $c = \frac{F \times D}{M\Delta\theta}$

(C) $c = \frac{IVt}{M\Delta\theta}$

(D) $c = \frac{M\Delta\theta}{IVt}$

21. The energy required to change the state of a substance was determined to be E_H. If the mass of the substance was DOUBLED, the value of E_H will

(A) be halved
(B) be doubled
(C) be quadrupled
(D) remain constant

22. The specific latent heat of vaporization of water is the energy required to change 1 kg of water at

(A) 0 °C to ice at 0 °C
(B) 99.9 °C to steam at 100.1 °C
(C) 100 °C to steam at 100 °C
(D) 0 °C to steam at 100 °C

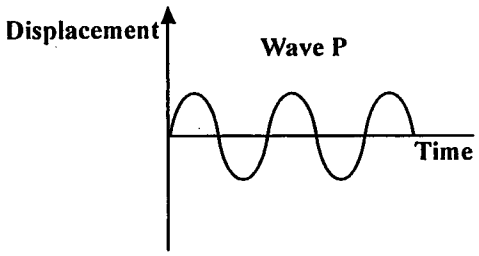
23. The 'glasshouse' effect refers to the glasshouse acting as a heat trap. This is a direct result of

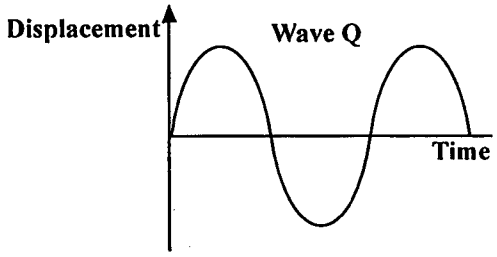
(A) short wavelength infrared rays which are unable to penetrate glass
(B) long wavelength infrared rays which are radiated from the sun and are unable to penetrate glass
(C) short wavelength infrared rays which are radiated from the objects within the glasshouse and are unable to penetrate glass
(D) long wavelength infrared rays which are radiated from the objects within the glasshouse and are unable to penetrate glass

24. The specific latent heat of fusion of water is 340 k J kg^{-1}. This means that when 10 kg of water freezes

(A) 34 kJ of heat is absorbed
(B) 34 kJ of heat is given out
(C) 3 400 kJ of heat is absorbed
(D) 3 400 kJ of heat is given out

Item 25 refers to the following graphs (with axes having the same scales) of two sound waves, P and Q.

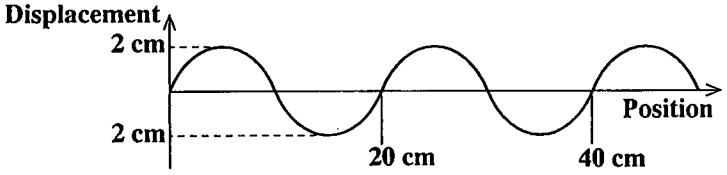




25. Which of the following statements is true?

(A) P is louder than Q but Q has a higher pitch.
(B) P is louder than Q and also has a higher pitch than Q.
(C) Q is louder than P but P has a higher pitch.
(D) Q is louder than P and also has a higher pitch than P.

Item 26 refers to the following diagram which shows an instantaneous profile of a wave travelling across a water surface.

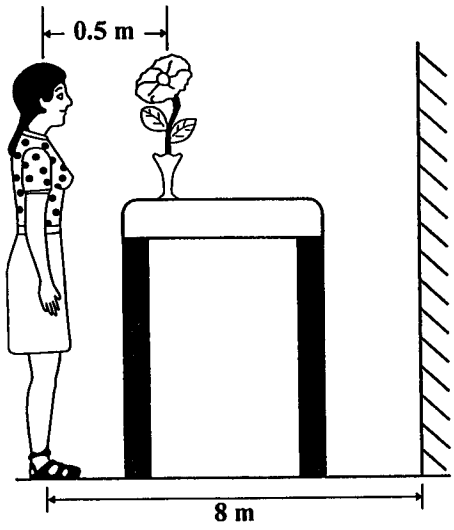


26. From the information given, the frequency is

(A) $\frac{1}{20}$ Hz

(B) 10 Hz
(C) 20 Hz
(D) Unknown

Item 27 refers to the following diagram which shows Pam facing a plane mirror which is 8.0 m away from her.



27. Pam views the image of a vase, which is 0.5 m away from her. How far from Pam is the image of the vase?

(A) 7.5 m
(B) 8.5 m
(C) 15.0 m
(D) 15.5 m

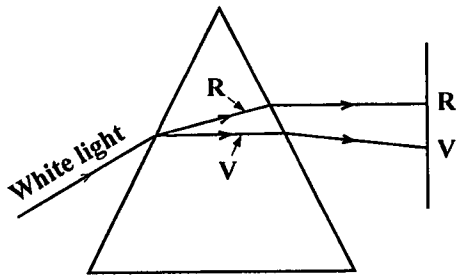
28. An object is placed at the bottom of a tank of water and viewed vertically from above.

Which of the following would be TRUE of the image of the object?

I. It is virtual.
II. It is diminished.
III. It is nearer to the eye than the object.

(A) II only
(B) I and II only
(C) I and III only
(D) II and III only

Item 29 refers to the following diagram which shows a beam of white light being dispersed (R - Red, V - Violet) by a prism to form a visible spectrum.

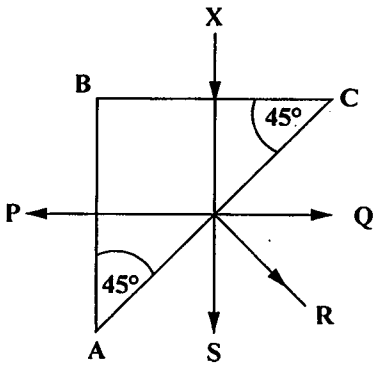


29. Which of the following features make the visible spectrum possible?

I. The colour violet has the shorter wavelength, hence refracts more than colour red.
II. The colour red has the longer wavelength, hence refracts less than colour violet.
III. The colour violet has the longer wavelength, hence refracts more than colour red.
IV. The colour red has the shorter wavelength, hence refracts more than colour violet.

(A) I and II only
(B) I and IV only
(C) II and III only
(D) III and IV only

Item 30 refers to the following diagram of a right-angled triangular glass prism, ABC.



30. The critical angle for glass is 42°. X is a ray of light, perpendicular to BC. The ray of light will emerge in the direction of

(A) P
(B) Q
(C) R
(D) S

31. Which of the following waves requires a medium of transmission?

(A) Radio
(B) Infrared
(C) Light
(D) Sound

32. The refractive index of a transparent medium with a critical angle, c, for light travelling from the medium to air is

(A) $\frac{1}{c}$

(B) $\frac{90°}{\sin c}$

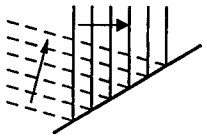
(C) $\frac{\sin 90°}{\sin c}$

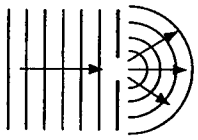
(D) $\sin c$

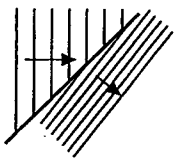
33. A piece of paper was burnt by adjusting the height of a converging lens above the paper until the most concentrated beam of sunlight was obtained. The distance between the lens and the paper was 10 cm. What was the focal length, in cm, of the lens?

(A) 5
(B) 10
(C) 15
(D) 20

34. Which of the following diagrams could represent diffraction of water waves in a ripple tank?

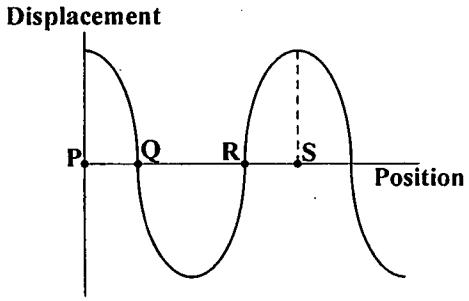
I 

II 

III 

(A) I only
(B) II only
(C) I and II only
(D) II and III only

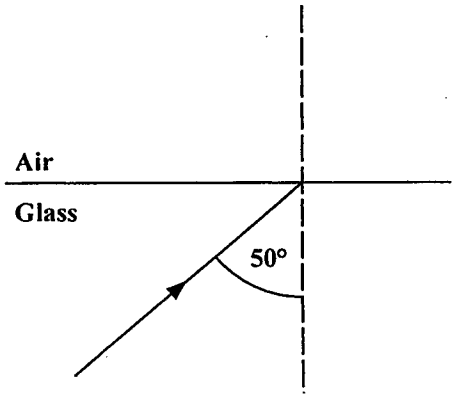
Item 35 refers to the following diagram which shows a transverse wave at a particular instant.



35. The wavelength of the wave is equal to the distance

(A) PQ
(B) PR
(C) PS
(D) QR

Item 36 refers to the following diagram which shows a light ray which is incident at the air–glass interface at an angle of incidence of 50°.



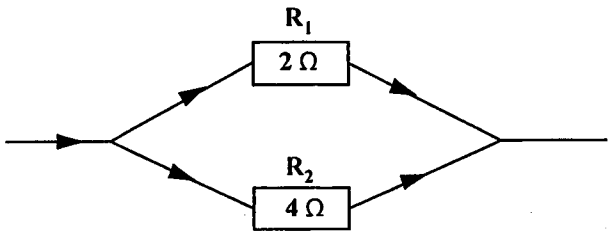
36. If the critical angle for glass is 45°, the light ray will be

(A) reflected
(B) refracted
(C) dispersed
(D) diffracted

37. Which of the following statements is TRUE of a diverging lens?

(A) It is thinner at the centre than at the edge.
(B) It can form only inverted images.
(C) It can form only real images.
(D) It can form only enlarged images.

38. What is the equivalent resistance of the two resistors shown in the following diagram?



(A) 0.5 Ω
(B) 1.3 Ω
(C) 6 Ω
(D) 8 Ω

39. A current I flows for a time t between two points at a potential difference of V. The power P expended is equal to

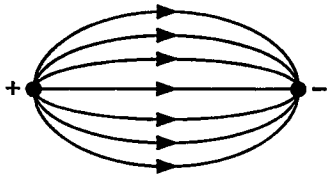
(A) IV/t
(B) IVt
(C) IV
(D) It

40. A glass rod is rubbed with a piece of silk and is positively charged. The glass rod became charged by

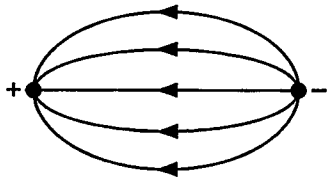
(A) losing protons
(B) losing electrons
(C) gaining protons
(D) gaining electrons

41. Which of the following diagrams represents the electric field existing between two oppositely charged point charges?

(A)

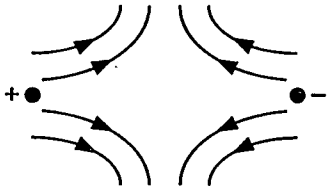


(B)

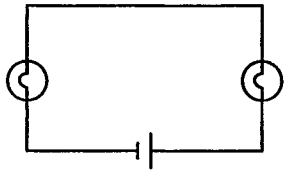


(C)

(D)

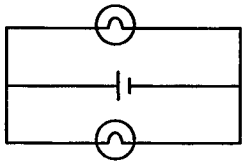


Item 42 refers to the following diagram which shows an electrical circuit with a cell and two filament bulbs.

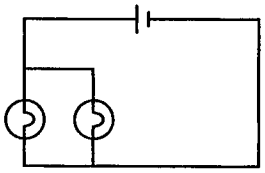


42. Which of the following circuits are electrically the same as the circuit above?

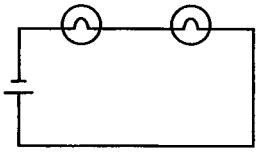
(A)



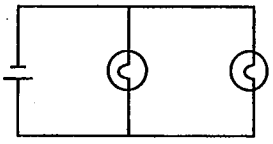
(B)



(C)



(D)



43. The resistance of an IDEAL ammeter is assumed to be

(A) zero
(B) 0.1 ohm
(C) 1 to 2 ohms
(D) infinite

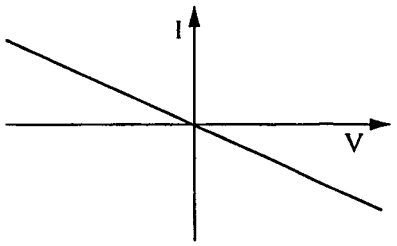
44. Which of the following is NOT one of the ways in which the strength of the magnetic field near a solenoid (long coil) carrying a current can be increased?

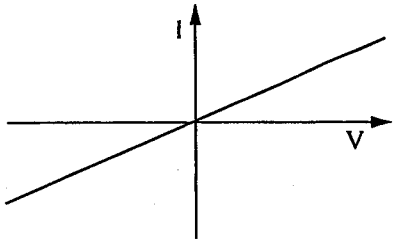
(A) Increasing the resistance of the coil
(B) Increasing the current in the coil
(C) Increasing the number of turns per unit length of the coil
(D) Placing a soft iron core inside the coil

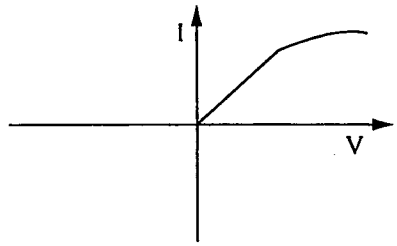
45. Which of the following concerning voltmeters is correct?

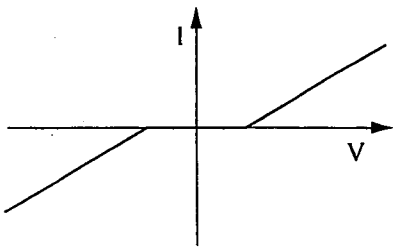
	Resistance of a Voltmeter	**How it is Connected to the Component**
(A)	Low	In parallel
(B)	High	In parallel
(C)	Low	In series
(D)	High	In series

46. Which of the following diagrams represents the current/potential difference relationship for a metallic conductor at a constant temperature?

(A)


(B)


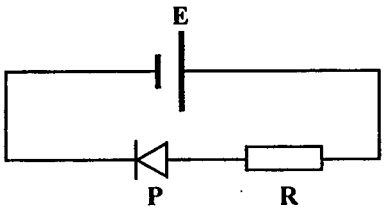
(C)


(D)


47. An ideal transformer has 1200 turns on the primary coil and 600 turns on the secondary coil. If the voltage across the primary is 20 V, the secondary voltage is

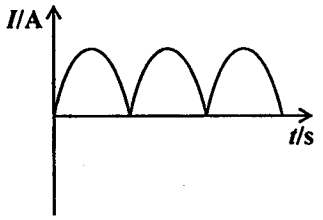
(A) 2 V
(B) 5 V
(C) 10 V
(D) 20 V

Item 48 refers to the following diagram which shows a cell E, a diode P, and a resistor R, connected in series.

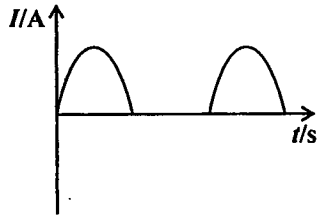


48. Which of the following graphs BEST illustrates the current through R?

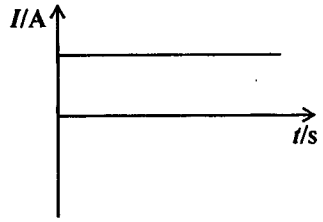
(A)



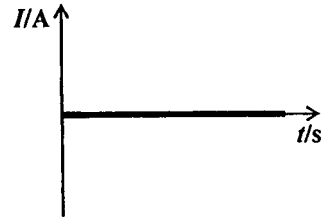
(B)



(C)



(D)



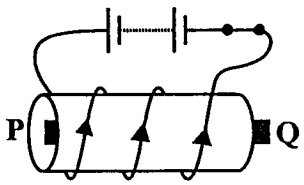
49. Which of the following statements about alternating current is TRUE?

(A) It can be changed into direct current by a transformer.
(B) It can be rectified by using a semiconductor diode.
(C) It can be used to recharge a battery.
(D) It can be used to transmit electrical energy because of its high frequency.

50. Which of the following statements about insulators is NOT true?

(A) In an insulator all electrons are bound firmly to their atoms.
(B) In an insulator many electrons can move freely from atom to atom.
(C) An insulator can be charged by rubbing.
(D) A good insulator retains its charge better than a conductor.

Item 51 refers to the following diagram.



51. An iron rod, PQ, is placed inside a plastic pipe wound with a coil as shown in the diagram and a current is passed. When the current is switched off, the rod is likely to have

(A) positive charge at P, negative charge at Q
(B) negative charge at P, positive charge at Q
(C) N pole at P, S pole at Q
(D) S pole at P, N pole at Q

52. An electromagnet consists of insulated wire wrapped around an iron core.

It works because

(A) iron is always magnetized
(B) iron is a good electrical conductor
(C) a magnetic field is produced inside the coil
(D) an electric field is produced inside the coil

53. The electric power supplied to homes and factories is alternating current (a.c.) rather than direct current (d.c.) because

(A) the use of a.c. reduces electrical hazards
(B) the use of a.c. reduces transmission losses
(C) a.c. enables a wider variety of appliances to be used
(D) a.c. power lines are less likely to be struck by lightning than d.c. power lines

54. Which of the following would be possible symbols for an isotope of a nuclide represented by ${}^{A}_{Z}X$?

(A) ${}^{A-2}_{Z+2}X$

(B) ${}^{A}_{Z-2}X$

(C) ${}^{A-2}_{Z-2}X$

(D) ${}^{A+2}_{Z}X$

55. The nuclide ${}^{234}_{90}\mathrm{Th}$ contains

(A) 90 protons and 234 neutrons
(B) 235 protons and 90 neutrons
(C) 90 protons and 144 neutrons
(D) 144 protons and 90 neutrons

56. Alpha particles, beta particles and gamma rays from a radioactive source are subjected to a transverse magnetic field. Which of them would NOT be deviated from their original path?

I. Alpha
II. Beta
III. Gamma

(A) II only
(B) III only
(C) I and II only
(D) II and III only

57. A radioactive isotope has a half-life of 20 days. How many days will it take for a given sample to have its activity reduced to $\frac{1}{8}$ of its initial value?

(A) 1.2 days
(B) 60 days
(C) 80 days
(D) 320 days

58. Which of the following describes two properties of an α-particle?

(A) No charge, very penetrating
(B) Positive charge, very penetrating
(C) Negative charge, not very penetrating
(D) Positive charge, not very penetrating

59. Sodium 24 decays into Magnesium 24 with the emission of a ß-particle and can be represented by the following equation.

$$^{24}_{11}Na \rightarrow {}^{24}_{12}Mg + \square$$

Which of the following should be placed in the box to complete the equation?

(A) $^{0}_{-1}e$

(B) $^{0}_{1}e$

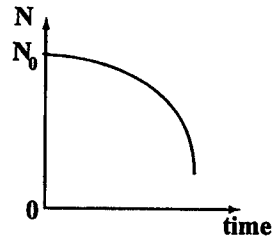
(C) $^{4}_{1}He$

(D) $^{0}_{-1}He$

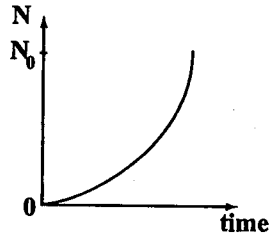
60. No radioactive nuclei are present in a sample at time t = 0.

Which of the following graphs BEST represents the variation with time of the number, N, of undecayed nuclei present?

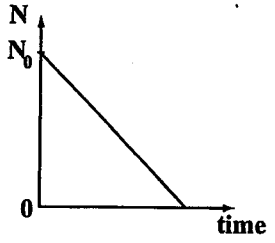
(A)



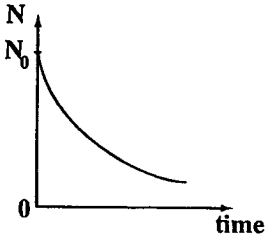
(B)



(C)

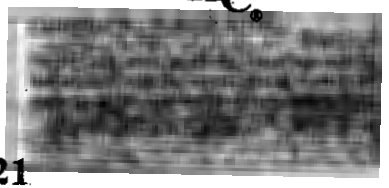


(D)



END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.



TEST CODE **01238010**

FORM TP 2013021

JANUARY 2013

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

17 JANUARY 2013 (p.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

   Sample Item

   The SI unit of length is the

   (A) newton
   (B) metre
   (C) kilogram
   (D) second

   Sample Answer

   Ⓐ ● Ⓒ Ⓓ

5. The best answer to this item is "metre" so answer space (B) has been shaded.

   If you want to change your answer, erase it completely before you fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to this item later. Your score will be the total number of correct answers.
7. You may do any rough work in this booklet.
8. Figures are not necessarily drawn to scale.
9. You may use a silent, non-programmable calculator to answer items.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. A physical quantity which is NOT one of the fundamental quantities is

(A) mass
(B) time
(C) current
(D) density

2. 0.0000357 N expressed in standard form is

(A) 3.57×10^{-5} N
(B) 3.75×10^{4} N
(C) 3.75×10^{-4} N
(D) 3.75×10^{5} N

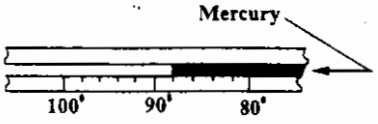
3. The period of a simple pendulum is MOST affected by the

(A) length of the string
(B) amplitude of the oscillation
(C) mass of the bob
(D) force used to start it

4. Which of the following is suitable for measuring the diameter of a human hair?

(A) Tape measure
(B) Vernier caliper
(C) Micrometer screw gauge
(D) Metre rule

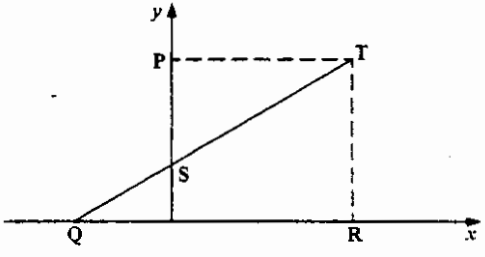
Item 5 refers to the following diagram which shows the section of a thermometer.



5. What is the reading shown?

(A) 88°
(B) 89°
(C) 91°
(D) 92°

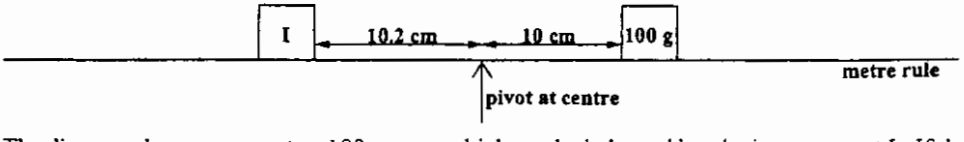
Item 6 refers to the graph below which shows a relationship represented by the straight line passing through QT.



6. For this relationship, when x = 0, the value of y is

(A) Q
(B) S
(C) P
(D) R

Item 7 refers to the diagram below.



7. The diagram above represents a 100 g mass which can be balanced by placing a mass at I. If the mass at I is to be used to balance the 100 g, it should be

(A) less than 100 g
(B) 100 g
(C) a little greater than 100 g
(D) about 200 g

8. It is NOT true that the moment of a force is

(A) measured in units called newton metres
(B) the amount of force needed to keep a body turning
(C) the turning effect that a force has when it acts on a body
(D) the product of the force and the perpendicular distance of its line of action from a point

9. In an experiment to locate the centre of mass of a sheet of cardboard, a plumb line (string with a small mass on the end) is used. The plumb line is used to

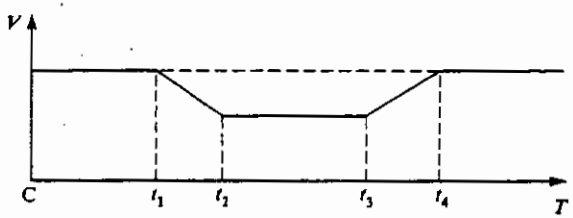
(A) check that the apparatus is vertical
(B) check that the cardboard is swinging freely
(C) show which points are vertically below the pivot
(D) measure the width of the cardboard

---

10. Which of the following is a vector physical quantity?

(A) Speed
(B) Energy
(C) Mass
(D) Displacement

Item 11 refers to the following diagram which shows a velocity/time graph for a moving object.



11. Which of the following statements about the object is/are true?

I. It returns to its starting point.
II. It has zero acceleration between times t_2 and t_3.
III. Its velocity at t_4 is the same as its initial velocity.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

12. Two smooth spheres, A and B, collide head on. Which of the following statements is/are true?

I. The momentum of A is the same after collision as it was before.
II. The momentum of B is the same after collision as it was before.
III. The total momentum of A and B is the same after collision as it was before.

(A) I only
(B) III only
(C) II and III only
(D) I, II and III

13. Which of the following is NOT a vector quantity?

(A) Displacement
(B) Density
(C) Acceleration
(D) Momentum

14. Which of the following are renewable sources of energy?

I. Solar energy
II. Wind energy
III. Geothermal energy

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

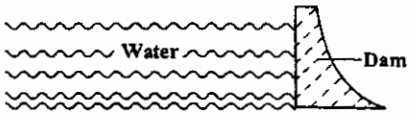
15. An ice cube sinks in liquid A but floats in liquid B. Which of the following statements is true?

(A) The upthrust is less in A than in B.
(B) The upthrust is greater in A than in B.
(C) The weight of the ice is less in A than in B.
(D) The weight of the ice is greater in A than in B.

16. A piece of string is tied onto a small stone and the stone is then suspended, totally immersed, in water. The tension in the string will be

(A) zero
(B) equal to the weight of the stone
(C) less than the weight of the stone
(D) more than the weight of the stone

Item 17 refers to the following diagram of a dam.



17. The diagram above shows a dam. The pressure on the dam at the bottom of the reservoir depends on the

(A) depth of the water
(B) volume of water held by the dam
(C) mass of water held back by the dam
(D) length of the reservoir

18. Which of the following tools is/are designed to take advantage of a large moment provided by a relatively small force?

I. Claw hammer
II. Crowbar
III. Pair of tweezers
IV. Pair of wire cutters

(A) III only
(B) I and IV only
(C) I, II and III only
(D) I, II and IV only

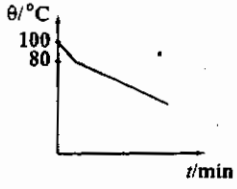
19. The temperature on a warm day in the Caribbean is about

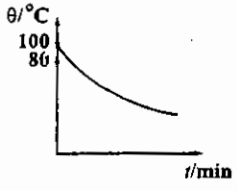
(A) 32 K
(B) 240 K
(C) 273 K
(D) 305 K

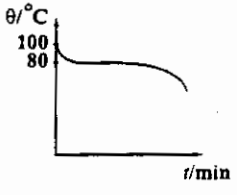
20. Which of the following is MOST likely to account for the fact that pot handles are usually made of wood or plastic?

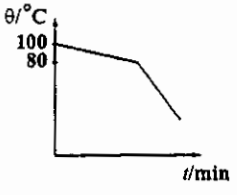
(A) Conduction
(B) Convection
(C) Radiation
(D) Evaporation

21. Some molten naphthalene at 100 °C is allowed to cool down to room temperature. If naphthalene has a melting point of 80 °C, which of the following graphs BEST represents the cooling curve?

(A)


(B)


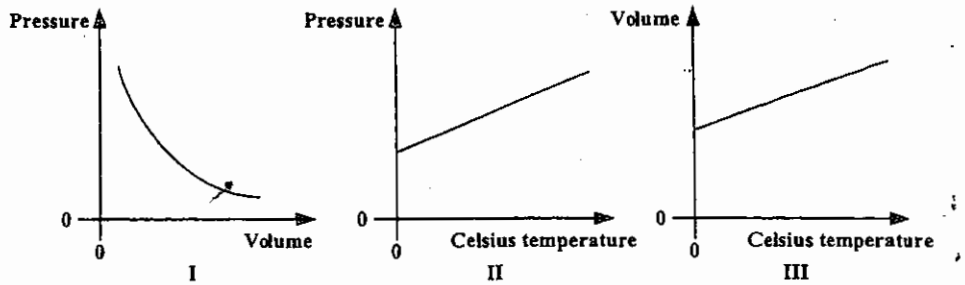
(C)


(D)


22. Which of the following does NOT describe a process which is an example of evaporation?

(A) A slice of bread left in the open air becomes dry.
(B) The cooling effect of sweating in animals.
(C) The rapid disappearance of ether if exposed to the air.
(D) A loaded copper wire put around a block of ice gradually cuts through the ice.

Item 23 refers to the following diagrams which show how the pressure, the volume and the temperature of a fixed mass of dry gas, are inter-related.



23. Which of the graphs can be used to establish the kelvin temperature scale?

(A) II only
(B) I and II only
(C) II and III only
(D) I, II and III

---

24. The specific latent heat of vapourization of water is the energy required to change 1 kg of water at

(A) 0 °C to steam at 100 °C
(B) 0 °C to ice at 0 °C
(C) 99.9 °C to steam at 100.1 °C
(D) 100 °C to steam at 100 °C

25. An electric kettle full of water is plugged into the mains. The process by which heat travels through the water is

(A) electrification
(B) convection
(C) evaporation
(D) radiation

26. A detector of thermal energy is placed an equal distance in turn from each of four faces of a hollow metal cube full of water. The reading on the detector is GREATEST when the detector is turned towards the face which is

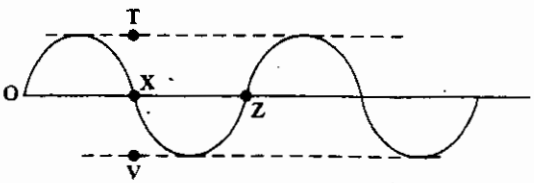
(A) painted silver
(B) painted dull black
(C) painted shiny white
(D) highly polished

27. Which of the following waves travel only longitudinally?

I. Sound waves
II. Radio waves
III. Water waves

(A) I only
(B) II only
(C) II and III only
(D) I, II and III

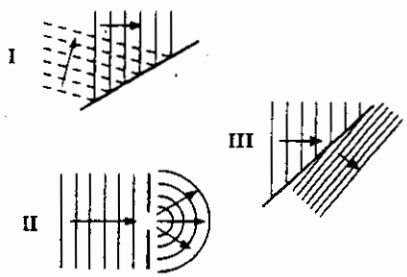
Item 28 refers to the following diagram which represents a wave travelling to the right.



28. The amplitude of the wave is the distance

(A) OX
(B) OZ
(C) TV
(D) TX

29. Which of the following diagrams could represent diffraction of water waves in a ripple tank?



(A) I only
(B) II only
(C) I and II only
(D) II and III only

Item 30 refers to the table below which lists the refractive indices for light of four different materials.

Material	Refractive Index
Air	1.0
Ice	1.3
Perspex	1.5
Diamond	2.4

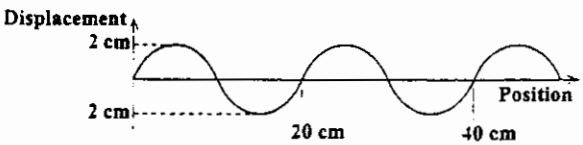
30. In which medium would the light waves have the SLOWEST speed?

(A) Air
(B) Ice
(C) Perspex
(D) Diamond

31. Young's double slit experiment demonstrates that light

(A) has a particle nature
(B) is a wave motion
(C) travels in a straight line
(D) produces sharp images

Item 32 refers to the diagram below which shows an instantaneous profile of a wave travelling across a water surface.



32. From the information given, the frequency is

(A) $\frac{1}{20}$ Hz
(B) 10 Hz
(C) 20 Hz
(D) unknown

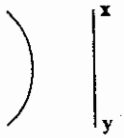
33. If a converging lens is used as a magnifying glass, the image formed is

(A) real, inverted, diminished
(B) real, erect, diminished
(C) virtual, inverted, magnified
(D) virtual, erect, magnified

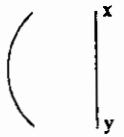
34. Which row in the table below correctly compares X rays and visible light?

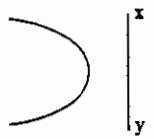
	X- rays	Visible Light
(A)	Particles	Waves
(B)	High frequency	Low frequency
(C)	Long wavelength	Short wavelength
(D)	Carry less energy	Carry more energy

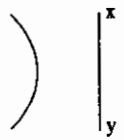
Item 35 refers to the following diagram.

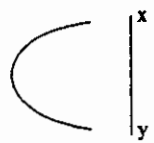


35. The circular wavefront shown above is progressing towards the reflecting surface xy. Which of the diagrams below correctly shows the shape of the wavefront after reflection?

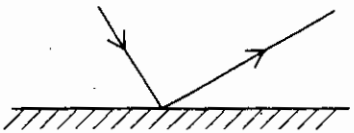
(A)


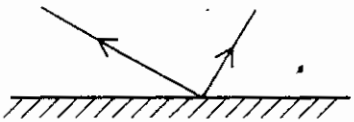
(B)


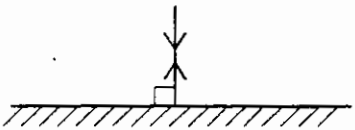
(C)


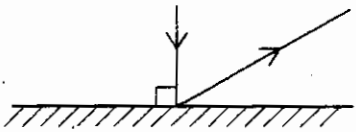
(D)


36. Which of the following diagrams MOST clearly shows the path of a ray of light when it strikes a plane mirror?

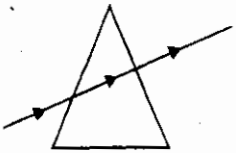
(A) 

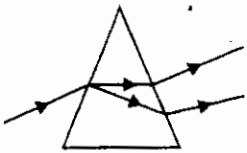
(B) 

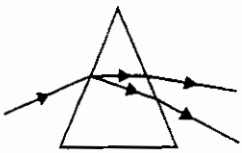
(C) 

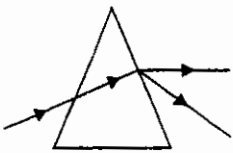
(D) 

37. Which of the following diagrams BEST represents the passage of a beam of white light through a triangular glass prism?

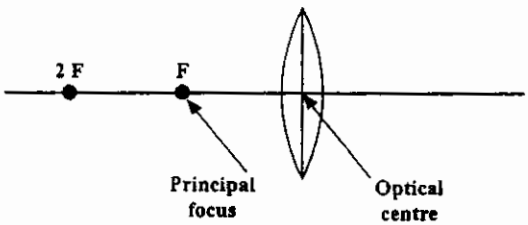
(A) 

(B) 

(C) 

(D) 

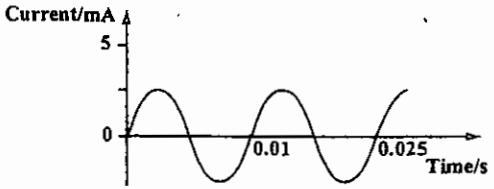
Item 38 refers to the diagram below.



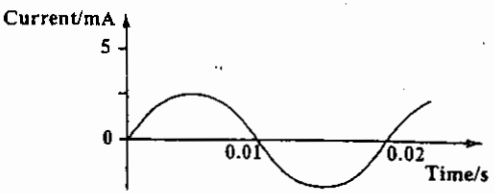
38. With reference to the diagram above, a real image is produced with a converging lens when the object is located

(A) between the optical centre and F
(B) between F and infinity
(C) at F only
(D) at 2F only

Item 39 refers to the graphs below which represent two alternating currents.



I



II

39. Which of the following combinations correctly identifies these currents?

	Current with greater frequency	Current with greater peak value
(A)	I	II
(B)	II	Neither
(C)	Neither	I
(D)	I	Neither

---

40. Which of the following statements about insulators is/are true?

I. In an insulator all electrons are bound firmly to their atoms.
II. In an insulator many electrons can move freely from atom to atom.
III. An insulator cannot be charged by rubbing.
IV. A good insulator retains the charge better than a conductor.

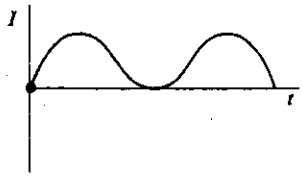
(A) I only
(B) I and II only
(C) II and III only
(D) II and IV

41. The current in a wire is one ampere if a charge of

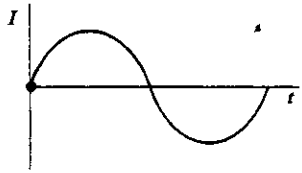
(A) 10 coulombs flows through it in 10 seconds
(B) 1 coulomb flows through it in 1 second
(C) 10 coulombs flow through it in 1 second
(D) 100 coulombs flows through it in 10 seconds

Item 42 refers to the following current-time graphs.

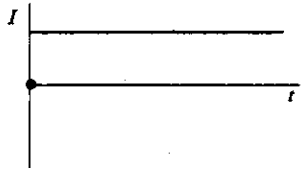
I.



II.



III.



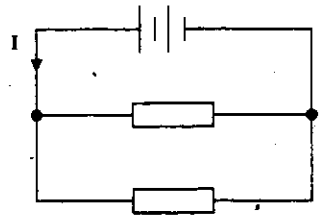
42. Which of the graphs above represent(s) direct current?

(A) II only
(B) III only
(C) I and III only
(D) I, II and III

43. Which of the following statements about alternating current is true?

(A) It can be changed into direct current by a transformer.
(B) It can be rectified by using a semiconductor diode.
(C) It can be used to recharge a battery.
(D) It is used to transmit electrical energy because of its high frequency.

Item 44 refers to the diagram below.



44. In the parallel circuit shown above, ALL of the current, I, supplied by the battery

(A) goes through each of the resistors
(B) goes through the largest resistor only
(C) goes through the smallest resistor only
(D) equals the sum of the currents in the two resistors

45. Which of the following relationships gives a correct value for the combined resistance R_T of resistors R1, R2, and R3 connected in parallel?

(A) $R_T = R_1 + R_2 + R_3$

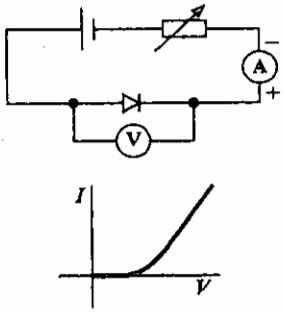
(B) $R_T = \dfrac{R_1 R_2 R_3}{R_1 + R_2 + R_3}$

(C) $R_T = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \dfrac{1}{R_3}$

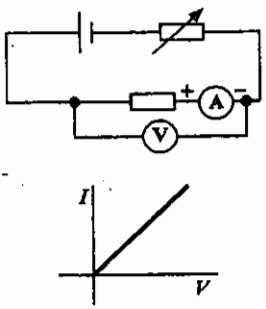
(D) $\dfrac{1}{R_T} = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \dfrac{1}{R_3}$

46. In I, II and III below, which graph could have been obtained from measurements made using the circuit above it?

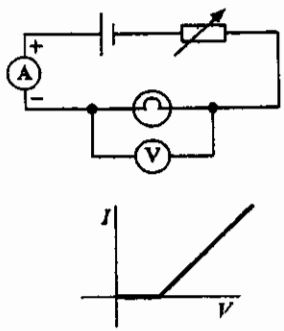
I



II

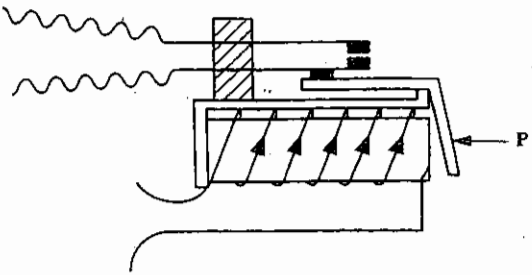


III



(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

Item 47 refers to the following diagram.



47. The diagram above shows a typical relay. The part, labelled P, must be made of

(A) brass
(B) iron
(C) plastic
(D) copper

48. Which of the following formulae (in which the symbols have their usual meaning) is a mathematical expression of Ohm's Law?

(A) V = IR
(B) P = VI
(C) Q = IT
(D) E = PT

49. Rectification can BEST be done by using a

(A) transformer
(B) capacitor
(C) transistor
(D) diode

50. Magnetic induction occurs when

(A) a N pole attracts a S pole
(B) iron nails near a magnet become magnetized
(C) a magnet is suspended and points in the N S direction
(D) an electroscope is charged

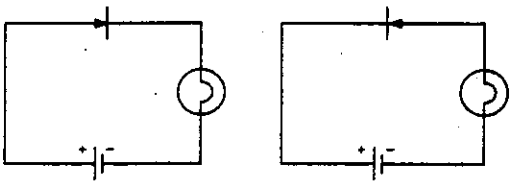
51. The direction of a magnetic field is the direction in which

(A) the S pole of a magnet points when placed in it
(B) the N pole of a magnet points when placed in it
(C) a positive charge moves when placed in it
(D) a negative charge moves when placed in it

52. In which of the following devices is a commutator used?

(A) Transformers
(B) A C generators
(C) D C motors
(D) Moving coil microphones

Item 53 refers to the following circuit diagrams.



I II

53. A simple experiment was conducted using the circuit diagrams shown above. The same components were used and the bulb was lit to normal brightness in each case.

Which of the following components would be defective?

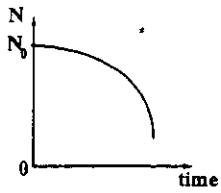
I. The bulb
II. The battery
III. The diode

(A) I only
(B) III only
(C) I and II only
(D) II and III only

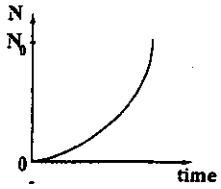
54. No radioactive nuclei are present in a sample at time t = 0.

Which of the following graphs BEST represents the variation with time of the number, N, of undecayed nuclei present?

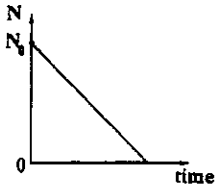
(A)



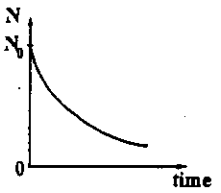
(B)



(C)



(D)



55. Which of the following actions is NOT one of the ways in which the strength of the magnetic field near a solenoid (long coil) carrying a current can be increased?

(A) Increasing the resistance of the coil
(B) Increasing the current in the coil
(C) Increasing the number of turns per unit length of the coil
(D) Placing a soft iron core inside the coil

56. Isotopes of an element differ from each other in that they have a different

(A) number of electrons
(B) number of protons
(C) number of neutrons
(D) atomic number

57. Gamma rays may be stopped by

(A) a sheet of paper
(B) a few millimetres of aluminium
(C) a few centimetres of aluminium
(D) several centimetres of lead

58. Which of the following are definitions of the term 'half-life' of radioactive nuclide?

I. The time taken for the activity of any given sample to fall to half its original value.
II. The time taken for half the nuclei present in any given sample to decay.
III. Half the average number of disintegrations per second.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

59. Which of the following pairs of terms describes two properties of an α-particle?

(A) No charge, very penetrating
(B) Positive charge, very penetrating
(C) Positive charge, not very penetrating
(D) Negative charge, not very penetrating

60. In the equation $\Delta E = \Delta mc^2$

(A) c = speed of light, Δm = mass of atom
(B) c = speed of light, Δm = change in mass
(C) c = specific heat capacity of substance, Δm = change in mass
(D) c = specific heat capacity of substance, Δm = mass of substance

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

CANDIDATE – PLEASE NOTE!

PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.

_____

TEST CODE

FORM TP

MAY/JUNE 2017

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

07 JUNE 2017 (p.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

   Sample Item

   The SI unit of length is the

   (A) metre
   (B) second
   (C) newton
   (D) kilogram

   Sample Answer

   ● Ⓑ Ⓒ Ⓓ

   The best answer to this item is "metre", so (A) has been shaded.
5. If you want to change your answer, erase it completely before you fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to that item later.
7. Figures are not necessarily drawn to scale.
8. You may do any rough work in this booklet.
9. You may use a silent, non-programmable calculator to answer items.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. An ice cube sinks in Liquid A but floats in Liquid B. Which of the following statements is true?

(A) The upthrust is less in Liquid A than in Liquid B.
(B) The upthrust is greater in Liquid A than in Liquid B.
(C) The weight of the ice cube is less in Liquid A than in Liquid B.
(D) The weight of the ice cube is greater in Liquid A than in Liquid B.

2. To measure the external diameter of a measuring cylinder most accurately, one should use a

(A) metre rule
(B) tape measure
(C) length of string
(D) pair of vernier callipers

3. A 4 kg mass is travelling with a constant speed of 5 m s^{-1}. It is brought to rest in 2 seconds. The average force acting on it to bring it to rest is

(A) 1.6 N
(B) 2.5 N
(C) 10.0 N
(D) 40.0 N

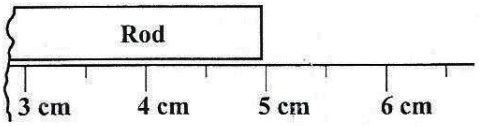
4. Which of the following measurements has three significant figures?

(A) 0.0293 kg
(B) 0.94 A
(C) 5.321 V
(D) 10.42 m

5. Which of the following remains unchanged with an INCREASE in temperature?

(A) Mass
(B) Density
(C) Volume
(D) Relative density

Item 6 refers to the following diagram of a rod and a centimetre rule used to measure the rod's length. The end of the rod (not shown) is at the zero mark on the rule.



6. The length of the rod should be written as

(A) 5 cm
(B) 5.0 cm
(C) 5.00 cm
(D) 4.97 cm

7. When an astronaut is standing on the moon his mass is 70 kg. When he returns to earth his approximate weight will be

(A) 70 kg
(B) 420 kg
(C) 70 N
(D) 700 N

8. An object is removed from the ground and placed on a shelf. Which of the object's properties is expected to increase?

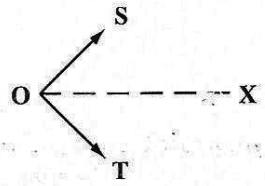
(A) Mass
(B) Volume
(C) Kinetic energy
(D) Potential energy

9. Which of the following features must be present in a stable, well-designed racing car?

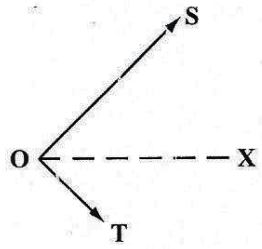
(A) Low centre of gravity
(B) Narrow wheel base
(C) Long front
(D) Sun roof

10. The diagrams below, **drawn to scale**, represent two forces, S and T, acting at O. In which of the following is the resultant in the direction OX?

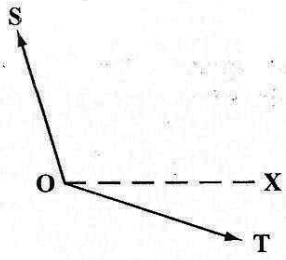
(A)



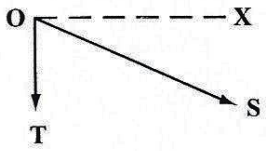
(B)



(C)



(D)



11. Which of the following expressions could be used to determine the speed of an object?

(A) $\frac{\text{Change in velocity}}{\text{Time taken}}$

(B) $\frac{\text{Change in displacement}}{\text{Time taken}}$

(C) $\frac{\text{Distance travelled}}{\text{Time taken}}$

(D) Distance travelled × Time taken

12. Which of the following is the unit of momentum?

(A) $kg\ s^{-1}$
(B) $kg\ m\ s^{-1}$
(C) $kg\ m\ s^{-2}$
(D) N m

13. When two bodies collide momentum is conserved. This means that the

(A) kinetic energy before impact is equal to that after impact
(B) momentum of each body is unchanged
(C) algebraic sum of the velocities before impact is equal to the sum of the velocities after impact
(D) total momentum of the bodies before impact is equal to the total momentum of the bodies after impact

14. Power can be defined as

(A) force × distance moved

(B) $\frac{\text{force}}{\text{time}}$

(C) $\frac{\text{work done}}{\text{time}}$

(D) work done × time

15. The specific latent heat of vaporization of water is the energy required to change 1 kg of water at

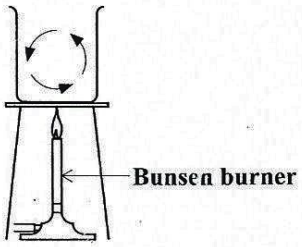
(A) 0 °C to ice at 0 °C
(B) 99.9 °C to steam at 100.1 °C
(C) 100 °C to steam at 100 °C
(D) 0 °C to steam at 100 °C

16. Which of the following is the POOREST conductor of thermal energy?

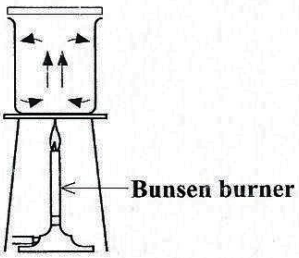
(A) Air
(B) Copper
(C) Mercury
(D) Aluminium

17. Which of the following diagrams BEST illustrates convection current in a liquid?

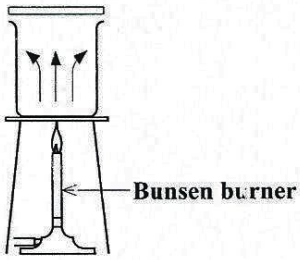
(A)



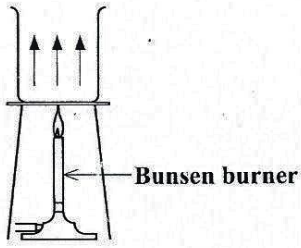
(B)



(C)



(D)



18. Boyle's law for a gas can be tested experimentally, provided which of the following remain constant?

I. Temperature
II. Pressure
III. Mass

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

19. The specific latent heat of fusion of water is 340 kJ kg^{-1}. This means that when 10 kg of water freezes

(A) 34 kJ of heat is absorbed
(B) 34 kJ of heat is given out
(C) 3 400 kJ of heat is absorbed
(D) 3 400 kJ of heat is given out

20. As the temperature of a liquid rises

(A) its density increases
(B) the forces between its molecules increase
(C) the kinetic energy of its molecules increases
(D) the pressure it exerts at the bottom of the container increases

21. The specific heat capacity of a material is the energy required to

(A) melt 1 kg of the material with no change of temperature
(B) change the temperature of the material by 1 K
(C) change 1 kg of the liquid material to 1 kg of gas without a change in temperature
(D) change the temperature of 1 kg of the material by 1 K

22. What is the gain in the gravitational potential energy of a body of weight 200 N, as it rises from a height of 30 m to a height of 35 m above the earth's surface?

(A) 40 J
(B) 100 J
(C) 1000 J
(D) 2000 J

23. Which of the following statements concerning the radiation of heat is/are true?

I. Radiation can only take place in a material medium.
II. A good absorber is also a good emitter of radiation.
III. Dark dull surfaces are better emitters than shiny ones.

(A) III only
(B) I and II only
(C) I and III only
(D) II and III only

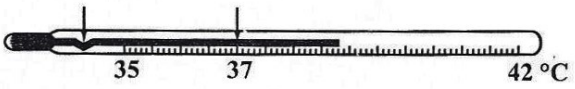
24. An electric kettle full of water is plugged into the mains. The process by which heat travels through the water is

(A) electrification
(B) convection
(C) evaporation
(D) radiation

25. There are little or no attractive forces between the molecules in a

(A) liquid and a gas
(B) solid and a liquid
(C) liquid
(D) gas

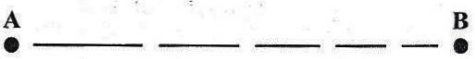
Item 26 refers to the following diagram of a clinical thermometer.



26. What temperature is indicated by the clinical thermometer in the diagram above?

(A) 38.3 °C
(B) 38.6 °C
(C) 38.7 °C
(D) 38.8 °C

Item 27 refers to the following diagram.



27. In using a slinky to demonstrate longitudinal waves moving from Point A to Point B above, the spring is made to vibrate

(A) parallel to AB
(B) perpendicular to AB
(C) at an obtuse angle to AB
(D) at an acute angle to AB

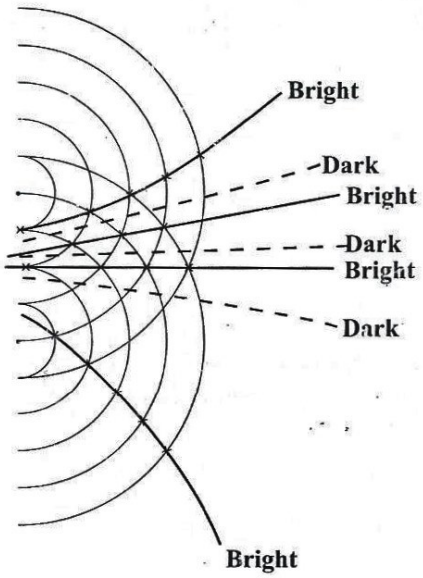
28. Sound waves propagated in a medium consist of

(A) crests followed by troughs
(B) compressions followed by troughs
(C) crests followed by rarefactions
(D) compressions followed by rarefactions

29. Which of the following statements does NOT provide evidence that sound waves can be reflected?

(A) Sound can be heard around a corner in open air.
(B) Speaking tubes can be used for passing messages in ships.
(C) The depth of the ocean can be measured using ultrasound.
(D) Echoes can be heard when a person shouts in a large empty room.

Item 30 refers to the following diagram in which two coherent light sources produce an interference pattern on a screen of bright and dark fringes.



30. The reason for the formation of the bright fringes is that

(A) these positions contain more light energy
(B) the crests are larger than the troughs along these lines
(C) all the crests and troughs are in phase along these points
(D) all the crests and troughs are out of phase along these points

31. Which row in the following table correctly compares X-rays and visible light?

	X-rays	Visible Light
(A)	Particles	Waves
(B)	High frequency	Low frequency
(C)	Long wavelength	Short wavelength
(D)	Carry less energy	Carries more energy

32. Which of the following, in the 20th century, provided evidence that light has a wave nature?

(A) Young's double slit experiment
(B) Newton's prism experiment
(C) Ripple tank experiment
(D) Photoelectric effect

33. Which of the following statements is NOT true of the image formed in a plane mirror?

(A) The image is upright.
(B) The image is laterally inverted.
(C) Rays of light from the object pass through corresponding points on the image.
(D) The image is the same distance behind the mirror as the object is in front.

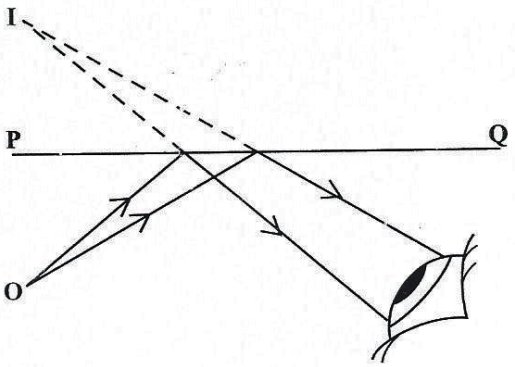
34. Which of the following can produce a diminished virtual image of a real object?

I. A plane mirror
II. A diverging lens
III. A converging lens

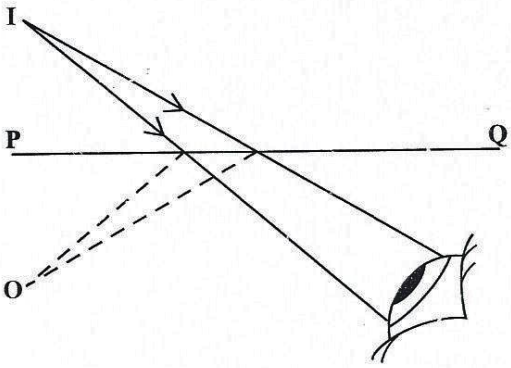
(A) I only
(B) II only
(C) II and III only
(D) I, II and III

35. An object, O, is viewed in a plane mirror, PQ. Which of the following diagrams correctly shows how the image is formed?

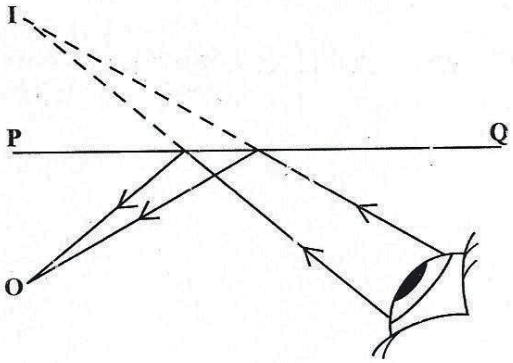
(A)



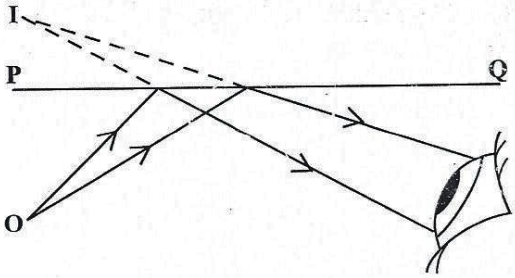
(C)



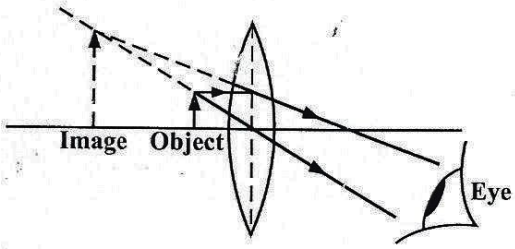
(B)



(D)



Item 36 refers to the following diagram.



36. The diagram above shows the formation of an image by a

(A) lens camera
(B) pinhole camera
(C) telescope
(D) magnifying glass

37. Which of the following statements about sound is NOT correct?

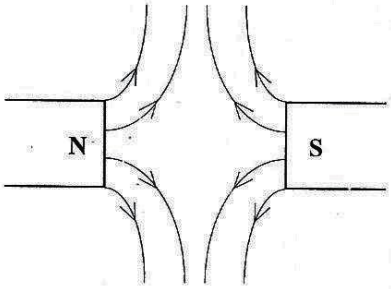
(A) Sound travels more slowly than light.
(B) Sound does not travel through a vacuum.
(C) Sound is transmitted as transverse waves.
(D) Sound may be produced by vibrating systems.

38. A loud high-pitched note results from a wave of

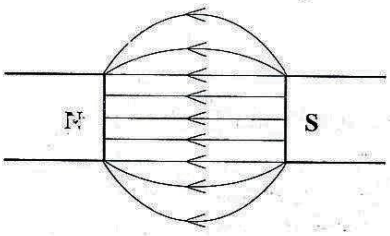
(A) high frequency, small amplitude
(B) high frequency, large amplitude
(C) low frequency, large amplitude
(D) low frequency, small amplitude

39. Which of the following diagrams represents the magnetic field which exists between two opposite magnetic poles?

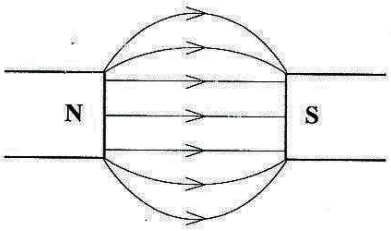
(A)



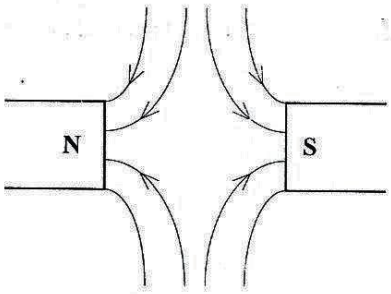
(B)



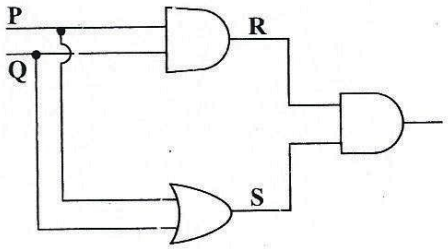
(C)



(D)



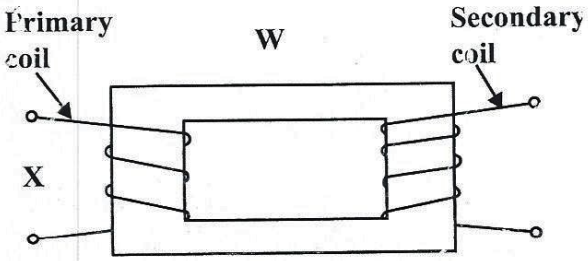
Item **40** refers to the following diagram.



40. What is the output at R and S when a 0 0 input is made at P and Q?

	R	S
(A)	0	0
(B)	1	1
(C)	0	1
(D)	1	0

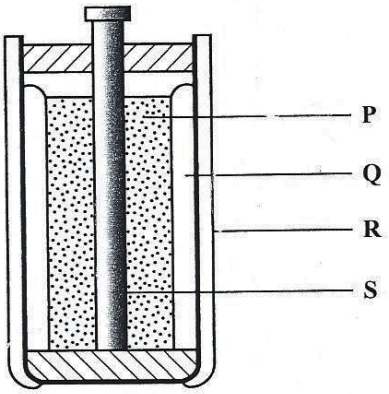
Item **41** refers to the following diagram.



41. Appropriate labels for W and X would be

	W	X
(A)	step-down transformer	a.c. input
(B)	step-down transformer	d.c. input
(C)	step-up transformer	a.c. input
(D)	step-up transformer	d.c. input

Item **42** refers to the following diagram which shows the cross section of a dry cell.



42. Which of the labelled parts is the electrolyte?

(A) P
(B) Q
(C) R
(D) S

43. Which of the following equations CANNOT be used to determine the power dissipated in a resistor?

(A) $P = I^2R$

(B) $P = VI$

(C) $P = \frac{R}{V^2}$

(D) $P = \frac{V^2}{R}$

44. A ray of light leaving air enters glass of refractive index 1.6. The angle of refraction is 27°. What is the sine of the angle of incidence?

(A) $1.6 + \sin 27°$

(B) $\dfrac{1.6}{\sin 27°}$

(C) $1.6 \sin 27°$

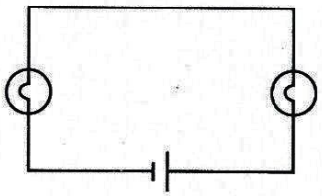
(D) $\dfrac{\sin 27°}{1.6}$

45. In domestic installation systems, which of the following components should be placed in the live wire?

I. Switches
II. Circuit breakers
III. Fuses

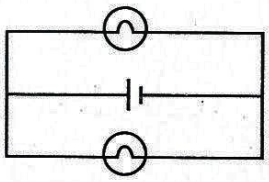
(A) I only
(B) III only
(C) II and III only
(D) I, II and III

Item 46 refers to the following diagram which shows an electric circuit with a cell and two filament bulbs.

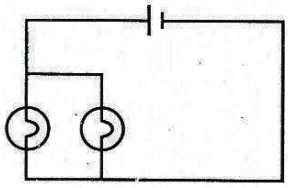


46. Which of the following circuits is electrically the same as the circuit above?

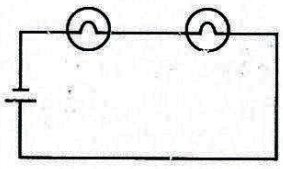
(A)



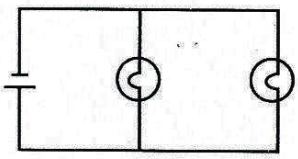
(B)



(C)



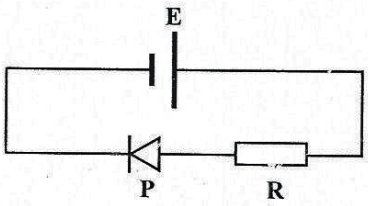
(D)



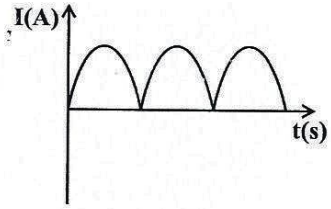
47. When a large current passes through a fuse, which of the following sequence of events is correct?

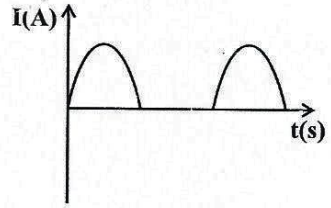
(A) Wire gets hot → current is cut off → wire melts
(B) Wire gets hot → wire melts → current is cut off
(C) Wire melts → current is cut off → wire gets hot
(D) Wire melts → wire gets hot → current is cut off

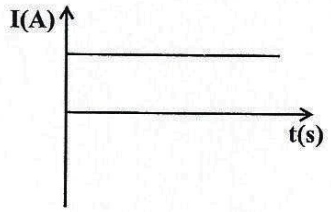
Item 48 refers to the following diagram which shows a cell E, a diode P, and a resistor R, connected in series.

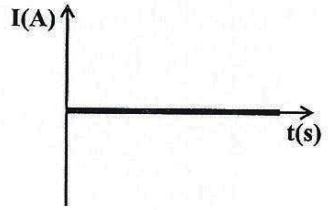


48. Which of the following graphs BEST illustrates the current through R?

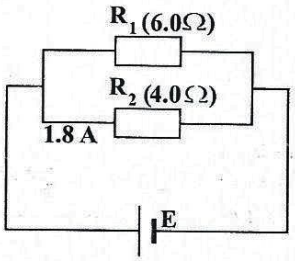
(A)


(B)


(C)


(D)


Item 49 refers to the following diagram which shows two resistors, R_1 of 6.0 Ω and R_2 of 4.0 Ω, in parallel.

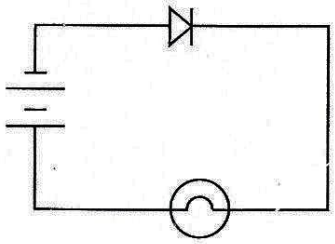


49. What is the current through R_1 if the current through R_2 is 1.8 A as recommended?

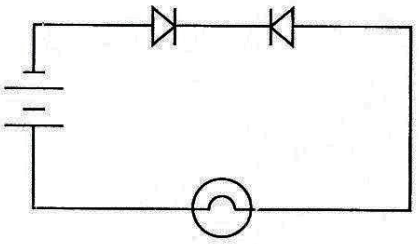
(A) 1.2 A
(B) 1.8 A
(C) 2.7 A
(D) 3.0 A

50. In which of the following circuits will the lamp light up?

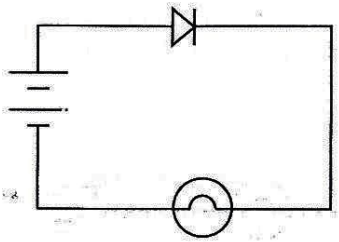
(A)



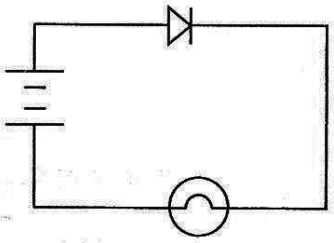
(C)



(B)



(D)



51. Which of the following pairs of statements is true for BOTH iron and steel?

	Iron	**Steel**
(A)	easily magnetised	does not retain its magnetism
(B)	not easily magnetised	retains its magnetism well
(C)	easily magnetised	retains its magnetism well
(D)	not easily magnetised	does not retain its magnetism

52. Which device allows one circuit to switch another circuit on or off without any direct contact between them?

(A) Magnetic relay
(B) Electromagnet
(C) Generator
(D) Motor

53. Which of the following would be possible symbols for an isotope of the nuclide ${}^{A}_{Z}X$?

I. ${}^{A-2}_{Z}X$

II. ${}^{A}_{Z-2}X$

III. ${}^{A+2}_{Z}X$

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

54. ${}^{14}_{6}C$ (Carbon 14) decays in accordance with the equation ${}^{14}_{6}C \rightarrow {}^{14}_{7}N + X$. The emission X is

(A) a proton
(B) a gamma ray
(C) a beta particle
(D) an alpha particle

55. J.J. Thompson discovered the electron. Which of the following physicists discovered the neutron?

(A) Bohr
(B) Thompson
(C) Rutherford
(D) Chadwick

Item **56** refers to the following truth table with inputs A and B and output C.

A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

56. Which of the following logic gates does the truth table above describe?

(A) NAND
(B) NOR
(C) AND
(D) OR

57. In the scattering experiment conducted by Geiger and Marsden, some of the alpha particles were deflected. The explanation for this phenomenon is that

(A) electrons have a small mass
(B) electrons have a small charge
(C) the metal foil was only a few atoms thick
(D) the nuclear charge and mass are concentrated in a small volume

Item **58** refers to the following diagram of a portion of the periodic table.

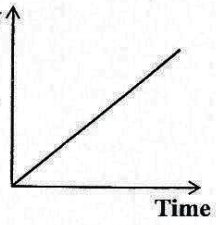
					He
E	**C**	**N**	**O**	**9 F**	**Ne**

58. In the diagram above, Element F has 9 protons. How many protons does Element E have?

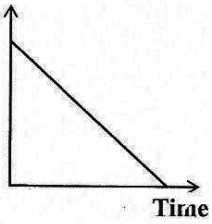
(A) 5
(B) 6
(C) 8
(D) 12

59. Which of the following graphs shows how the activity of a radioactive source varies with time?

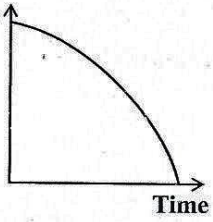
(A)



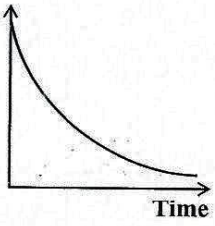
(B)



(C)



(D)



60. Which of the following statements concerning an α–particle are true?

I. It has twice the charge of a proton.
II. It has twice the mass of a proton.
III. It has the same sign charge as a proton.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

CANDIDATE – PLEASE NOTE:
PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.

FORM TP 2018021 TEST CODE 01238010

JANUARY 2018

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

17 JANUARY 2018 (a.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.

In addition to this test booklet, you should have an answer sheet.

Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.

On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

The SI unit of length is the

(A) metre
(B) second
(C) newton
(D) kilogram

Sample Answer

● Ⓑ Ⓒ Ⓓ

The best answer to this item is "metre", so (A) has been shaded.

If you want to change your answer, erase it completely before you fill in your new choice.

When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to that item later.

You may do any rough work in this booklet.

Figures are not necessarily drawn to scale.

You may use a silent, non-programmable calculator to answer items.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. When used in front of a unit the prefix 'mega' means

(A) 10^{-6}
(B) 10^{-3}
(C) 10^{3}
(D) 10^{6}

2. 0.0000462 N expressed in standard form is

(A) 4.62×10^{-5} N
(B) 4.62×10^{4} N
(C) 4.62×10^{-4} N
(D) 4.62×10^{5} N

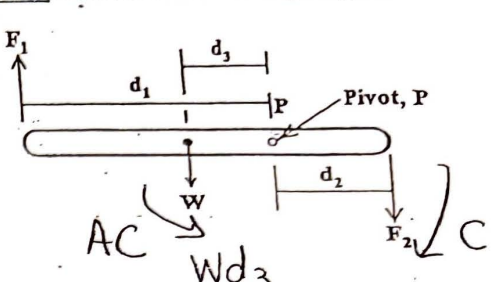
3. One gram is equal to

(A) 10 milligrams
(B) 100 milligrams
(C) 1 000 milligrams
(D) 10 000 milligrams

4. When a student placed her hands close to a television screen, the hair on her hands stood up pointing towards the screen. This is an example of

(A) a nuclear force
(B) an electric force
(C) a magnetic force
(D) a frictional force

Item 5 refers to the following diagram.



5. The diagram shows a non-uniform bar pivoted at P. W indicates the weight of the bar and forces F_1 and F_2 are applied at the positions shown.

The sum of the clockwise moments about P equals

(A) $F_2 d_2$
(B) $F_1 d_1 + W d_3$
(C) $(F_1 + W)(d_1 + d_3)$
(D) $F_1 d_1 + F_2 d_2$

6. Which of the following are examples of alternative sources of energy used in the Caribbean?

I. Nuclear energy
II. Geothermal energy
III. Hydroelectric energy

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

Pressure increases with depth

7. A diving ball is to be used at great depths and so its walls are made thick. The MAIN reason for this is that

A

(A) water pressure increases with depth
(B) the water is much colder at greater depths
(C) a thin-walled vessel would float up to the surface
(D) the density of water is much greater at great depths

8. An object of mass, m, is attached to a spring balance and its weight, w, recorded. What will be the result if the object is taken to the moon where the gravitational field strength is less, and weighed?

A

g on the moon is less than earth

(A) Mass = m; weight less than w
(B) Mass less than m; weight = w
(C) Mass = m; weight greater than w
(D) Mass greater than m; weight = w

9. A hydroelectric power station uses a renewable source of energy, X. This energy raises water to the top of a mountain so that it has gravitational potential energy. As the water runs down the mountain, it turns a turbine which converts Y energy into Z energy. Which set of answers for X, Y and Z is correct?

C

	X	Y	Z
(A)	Electrical	Potential	Kinetic
(B)	Geothermal	Potential	Electrical
(C)	Solar	Kinetic	Electrical
(D)	Chemical	Kinetic	Electrical

Renewable → solar
Motion of Turbine → kinetic
Product → Electrical
g generator

M X Y W Y X

Y less dense X as it float

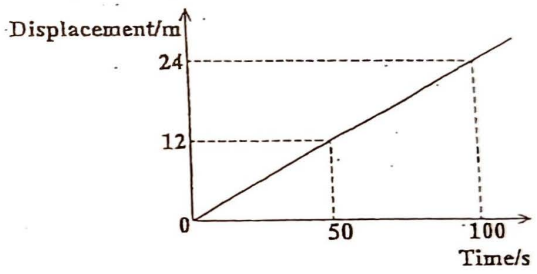
10. A solid object, X, floats in mercury and sinks in water. A solid object, Y, floats in both mercury and water.

Which of the following is true about X and Y?

B

(A) X is less dense than Y.
(B) X is more dense than Y.
(C) X and Y are both denser than water.
(D) X and Y are both denser than mercury.

Item 11 refers to the following graph.



11. The graph above shows how the displacement of a runner from a starting line varies with time. This runner is

(A) not moving
(B) moving faster and faster
(C) moving at a steady speed
(D) moving slower and slower

C – gradient = velocity is constant

↑u u >> w hence rises
↓w

12. A bubble of gas rises to the surface of a soft drink. This is because the

B

(A) density of the gas is greater than the density of the drink
(B) upthrust on the bubble is greater than the weight of the bubble
(C) upthrust on the bubble is greater than the weight of water it displaces
(D) weight of the water displaced by the bubble is less than the weight of the bubble

13. A block is allowed to fall freely towards the ground. As it falls, its gravitational potential energy

D

(A) increases
(B) remains constant
(C) is converted to internal energy
(D) is converted to kinetic energy

vel inc as it falls
GPE → KE

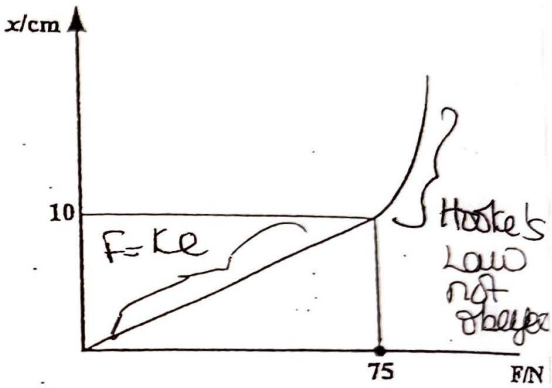
14. Pressure in a liquid can be calculated using the formula $P = \rho gh$.

Which of the following sets of units will give the pressure in the SI unit?

B

	ρ	g	h
(A)	$g\ cm^{-3}$	$m\ s^{-2}$	mm
(B)	$kg\ m^{-3}$	$N\ kg^{-1}$	m
(C)	$g\ cm^{-3}$	$N\ kg^{-1}$	m
(D)	$kg\ m^{-3}$	$cm\ s^{-2}$	cm

Item 15 refers to the following graph of a light spring which shows a simple extension, x, versus force, F.



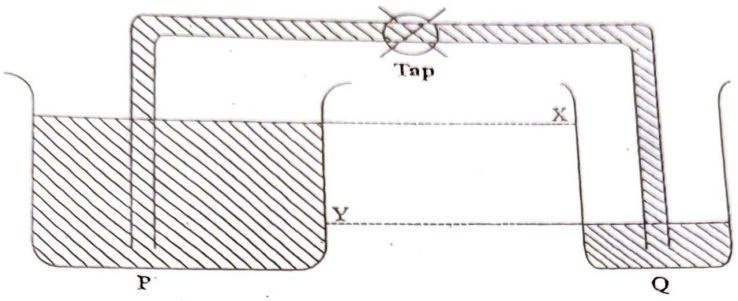
15. Which of the following statements are true?

I. The elastic limit of the spring was exceeded.
II. The spring obeyed Hooke's law over its entire extension.
III. The force per unit extension in the elastic region was 7.5 $N\ cm^{-1}$.

B

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

Item 16 refers to the following diagram which shows two containers of different sizes, with water at different levels connected by a glass tube and controlled by a tap.



16. When the tap is opened, water will flow from P to Q until

(A) container P is empty
D (B) the water level of Q is at X
(C) the water level of P is at Y
(D) the water level of P and Q are equal

Water will flow until the pressure is equalized This occurs at the same depth.

---

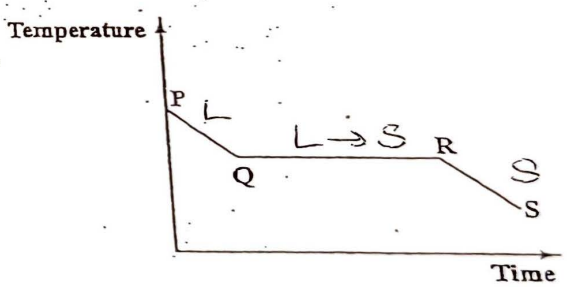
17. Two smooth spheres, A and B, collide head on. Which of the following statements is/ are true?

I. The momentum of A is the same after collision as it was before.
II. The momentum of B is the same after collision as it was before.
III. The total momentum of A and B is the same after collision as it was before.

(A) I only
B (B) III only
(C) II and III only
(D) I, II and III

With certainty only the principle of conservation of momentum is valid

Item 18 refers to the following graph based on an experiment on change of phase.

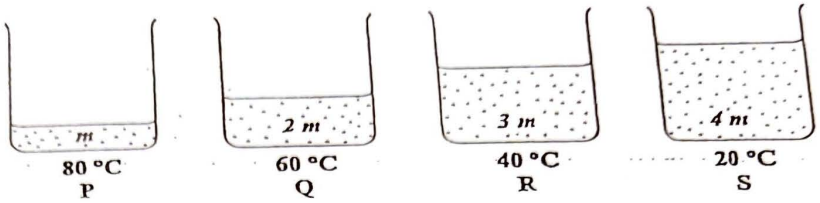


18. The graph shows that solidification started at Q. During which of the stages is the substance in the liquid phase?

(A) At P only
D (B) Between Q and R
(C) Between R and S
(D) Between P and Q

$\frac{3}{2}kT$

Item 19 refers to the following diagrams where P, Q, R and S are identical containers containing water of masses m, $2m$, $3m$ and $4m$ respectively at the temperatures indicated.



19. In which of the containers above is the average kinetic energy of the molecules GREATEST?

A

(A) P
(B) Q
(C) R
(D) S

Avg KE = $\frac{1}{2}mv^2$
greatest vel at highest T

---

20. The specific heat capacity of a substance is defined as the quantity of thermal energy

D

(A) the substance can hold
(B) 1 kg of the substance can hold
(C) required to raise the temperature of the substance by 1 degree Celsius
(D) required to raise the temperature of 1 kg of the substance by 1 degree Celsius

21. In the pressure law, which of the following statements is true?

B

(A) Pressure is constant.
(B) Volume is constant.
(C) The ratio of volume to pressure is constant.
(D) The ratio of volume to temperature is constant.

22. Which of the following is NOT an example of evaporation? L → G

D

(A) The cooling effect of sweating in animals
(B) A slice of bread left in the open air becomes dry
(C) The rapid disappearance of ether if exposed to the air
(D) A copper wire put around a block of ice gradually cuts through the ice

23. Who was responsible for arriving at the conclusion that measured amounts of electrical and mechanical energy can be converted to proportionate amounts of heat energy?

A

(A) Joule → Paddle exp
(B) Newton
(C) Rumford
(D) Coulomb

T+U=W
T<W

$E_h = ml_f$ $l_f = \text{const}$

$2E_H = (2m)\,l_f$

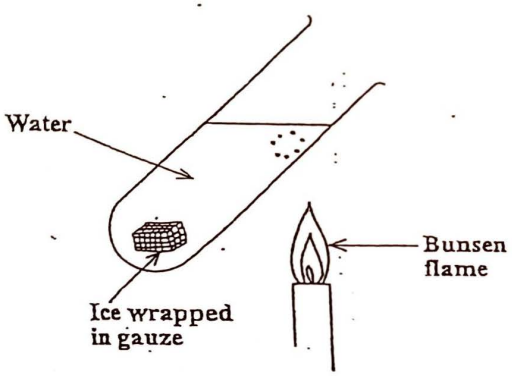
24. A piece of string is tied onto a small stone and the stone is then totally immersed and suspended in water. The tension in the string will be

C
(A) zero
(B) equal to the weight of the stone
(C) less than the weight of the stone
(D) more than the weight of the stone

26. The energy required to change the state of a substance was determined to be E_h. If the mass of the substance was DOUBLED, the value of E_h will be

A
(A) doubled
(B) quadrupled
(C) halved
(D) constant

Item 25 refers to the following diagram which shows water boiling at the top of a glass test tube while a piece of ice remains unmelted at the bottom.

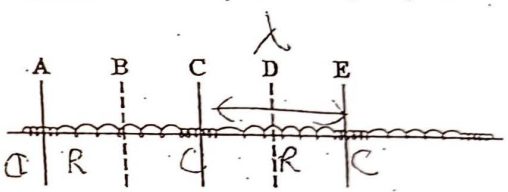


25. Which of the following statements provides the reason for this occurrence?

C
(A) Gauze is a poor conductor of heat.
(B) Water is a good conductor of heat.
(C) Water is a poor conductor of heat.
(D) Glass is a good conductor of heat.

Water will not conduct heat to melt ice

Item 27 refers to the following diagram.



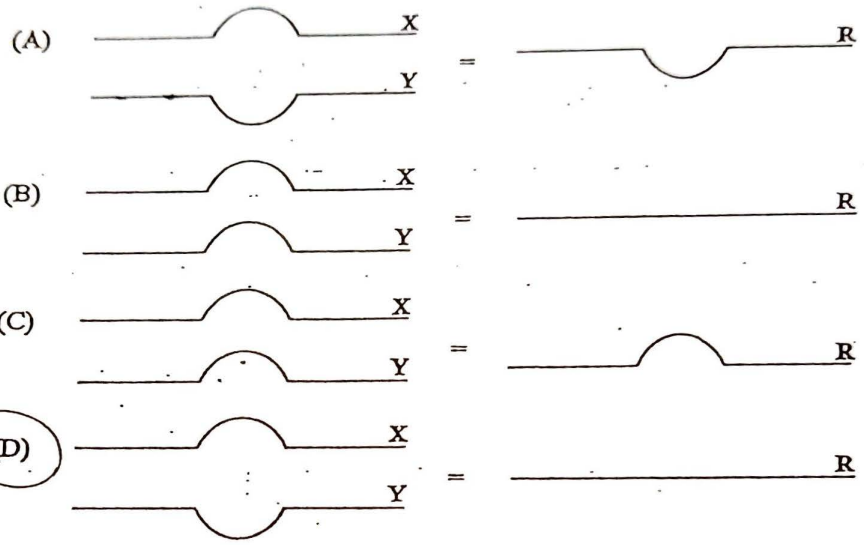
27. The diagram above illustrates a longitudinal wave train produced on a slinky. Which of the following distances represent the wavelength of the vibration?

C
(A) A to B
(B) A to E
(C) C to E
(D) D to E

28. The phenomenon in which a wave bends as it passes the edge of an object is known as

B
(A) refraction
(B) diffraction
(C) rarefraction
(D) interference

29. In the following diagrams, X and Y represent two wave pulses superposing on each other to give a resultant R. Which diagram BEST illustrates the principle of superposition?



Crest + Trough = cancellation of wave.

30. Two types of radiation, L and R, fall on a woman's left and right hands respectively. Her left hand feels hot but does not become suntanned; her right hand does not feel hot but it eventually becomes suntanned.

Radiations L and R are, respectively,

	L	R
(A)	visible light	X-rays
(B)	X-rays	visible light
(C)	ultraviolet	infrared
(D)	infrared	ultraviolet

C

Infrared - emitted by hot objects

UV → used specifically for sun tan.

31. A sand wave of frequency, f, moves with a speed, v. The wavelength of this wave is given by

(A) fv

(B) $\frac{f}{v}$

(C) $\frac{v}{f}$

(D) $\frac{1}{f}$

$V = f\lambda$

32. Which of the following are laws of refraction?

I. $\frac{\sin i}{\sin r}$ = constant

II. Angle of incidence = angle of refraction

III. The incident ray, the refracted ray and the normal at the point of incidence all lie in the same plane

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

B

33. A ray of light leaves air and enters glass of refractive index 1.6. The angle of refraction is 27°. What is the sine of the angle of incidence?

(A) $1.6 + \sin 27°$

(B) $\frac{1.6}{\sin 27°}$

(C) $1.6 \sin 27°$

(D) $\frac{\sin 27°}{1.6}$

C

$$_a n_g = \frac{n_g}{n_a} = \frac{\sin \theta_a}{\sin \theta_g}$$

$$1.6 = \frac{\sin i}{\sin 27°}$$

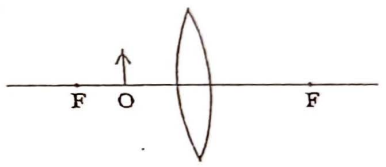
$$\sin i = 1.6 \times \sin 27°$$

34. In each of the following diagrams, F represents the position of the principal focus, and O the position of the object for the given lens. Which arrangement will produce a real image?

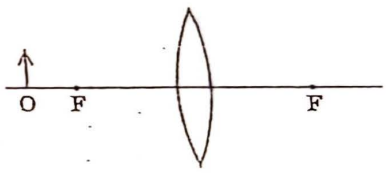
u > f for a convex lens

B

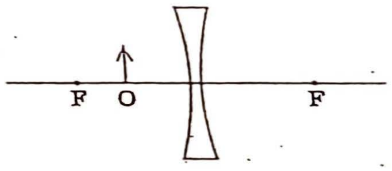
(A)



(B)

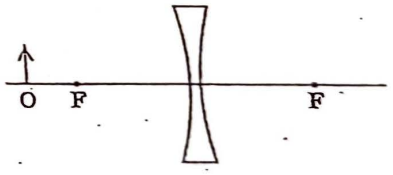


(C)



Concave lens → virtual smaller & upright

(D)



35. Which of the following waves are NOT transverse waves?

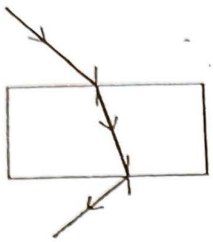
(A) A ripple on a pond
(B) Light waves from a street lamp
(C) Sound waves from a guitar string
(D) Radio waves travelling from a satellite

C

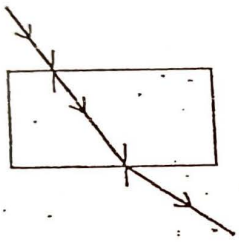
Sound → Long.

36. Which diagram BEST shows the path taken by a ray of light through a rectangular block?

(A)



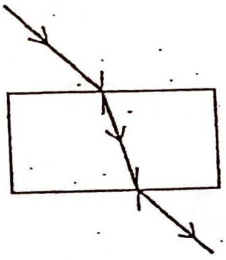
(B)



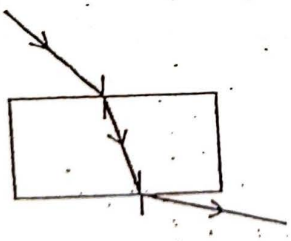
C

angle of i = angle of emergent ray.

(C)



(D)



37. Which of the following combinations of ammeter characteristics is correct?

A

	Resistance of an ammeter	How is it connected to the component?
(A)	Low	In series
(B)	High	In series
(C)	Low	In parellel
(D)	High	In parellel

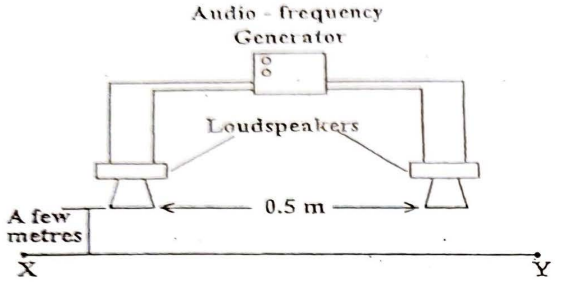
38. In an experiment, the approximate method is used to estimate the focal length of a converging lens. Why is it advised to use a distant object?

B

(A) Rays can be seen better.
(B) Rays are almost parallel.
(C) Rays travel in straight lines.
(D) Rays diverge better at the lens.

Rays emerging from a distant object tend to be parallel

Item 39 refers to the following diagram.



39. Two similar loudspeakers are connected to the same audio-frequency generator and set up as shown. At some points along XY no sound is heard because

(A) the sound waves are diffracted
(B) sound is refracted away from those points
(C) interference of the sound waves takes place
(D) the sound waves are reflected back to the same source

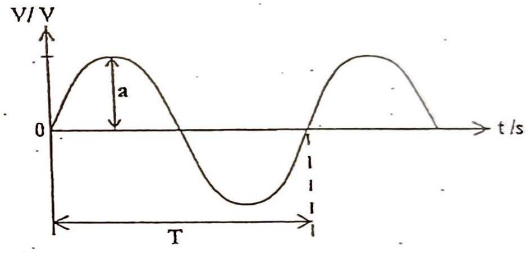
40. The human ear is incapable of hearing a silent dog whistle because

(A) it does not make a noise
(B) the speed of sound is too fast to be detected by the human ear
(C) the frequency of the waves are above the range detected by the human ear
(D) the waves are infrasound with frequencies below that detectable by the human ear

41. When a polythene rod is rubbed with a cloth, it becomes

(A) positively charged by gaining protons
(B) negatively charged by gaining electrons
(C) positively charged by gaining electrons
(D) negatively charged by losing protons

Item 42 refers to the following voltage–time graph.



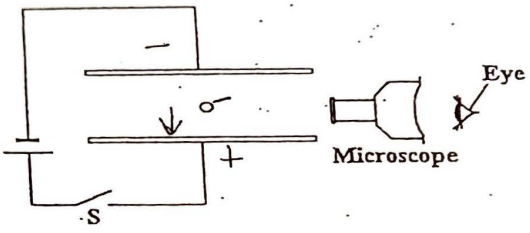
42. The frequency of the voltage–time graph is given by

(A) a
(B) $\frac{1}{a}$
(C) T
(D) $\frac{1}{T}$

43. The BEST material for the core of an electromagnet is

(A) iron
(B) wood
(C) steel
(D) aluminium

Item 44 refers to the following diagram which shows a small negatively charged dust particle midway between two plates and observed with a microscope.



44. Which of the following arrows correctly indicates the direction of the dust particle when the switch, S, is closed?

(A) →
(B) ←
(C) ↑
(D) ↓

45. Which of the following relationships gives a correct value for the combined resistance of resistors R_1, R_2 and R_3 connected in parallel?

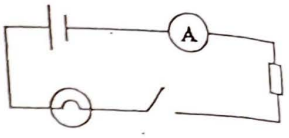
(A) $R_T = R_1 + R_2 + R_3$

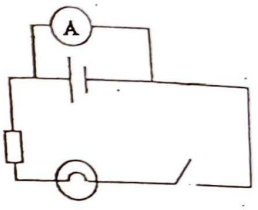
(B) $R_T = \dfrac{R_1 R_2 R_3}{R_1 + R_2 + R_3}$

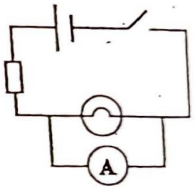
(C) $R_T = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \dfrac{1}{R_3}$

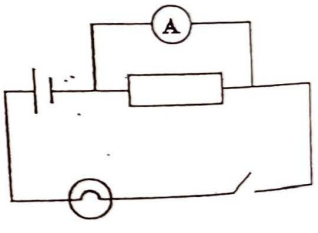
(D) $\dfrac{1}{R_T} = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \dfrac{1}{R_3}$

46. Which of the following illustrates the MOST suitable circuit for measuring the current flowing through a lamp?

(A)


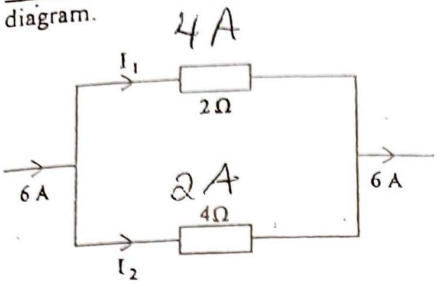
(B)


(C)


(D)


R R Load R
2 : 4 Higher I
I : 4 : 2

Item 47 refers to the following circuit diagram.



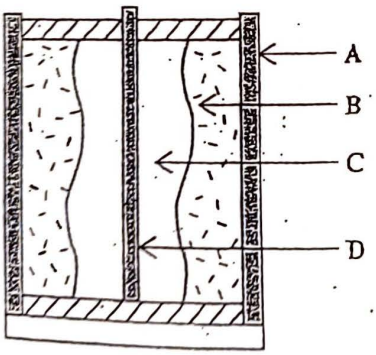
47. Using the information given in the curcuit diagram, which pair of values of I_1 and I_2 is CORRECT?

	I_1	I_2
(A)	1	5
(B)	2	4
(C)	3	3
(D)	4	2

Current splits as a ratio of resistance

D

Item 48 refers to the following diagram of a dry cell.



48. Which arrow points to the depolarizing agent of the cell?

(A) A
(B) B
(C) C
(D) D

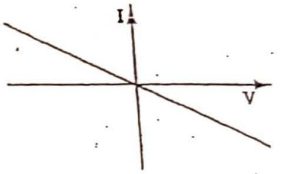
49. Which of the following expressions can be used to calculate the electrical power of a circuit?

B

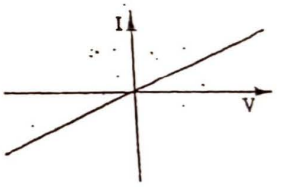
(A) $\frac{I^2}{R}$ $P=IV$
(B) IV $P=I^2R$
(C) ItV $P=\frac{V^2}{R}$
(D) V^2R

50. Which of the following diagrams represents the current/potential difference relationship for a metallic conductor at a constant temperature?

(A)

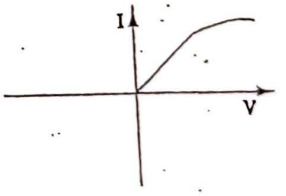


B (B)

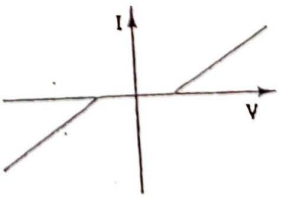


Ohm's Law

(C)



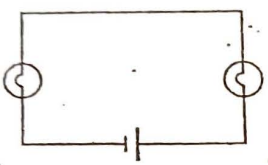
(D)



51. Which of the following quantities is the SMALLEST?

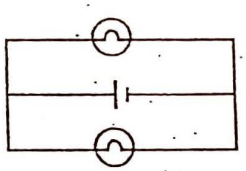
(A) 1 microampere
(B) 1 milliampere
(C) 10^{-3} ampere
(D) 10^{3} ampere

Item 52 refers to the following diagram which shows an electrical circuit with a cell and two filament bulbs.

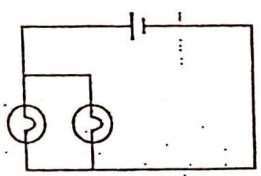


52. Which of the following circuits are electrically the same as the circuit above?

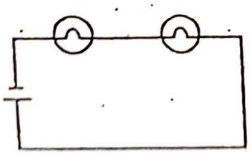
(A)



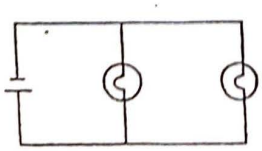
(B)



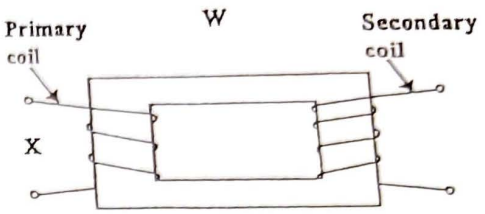
(C)



(D)



Item 53 refers to the following diagram.



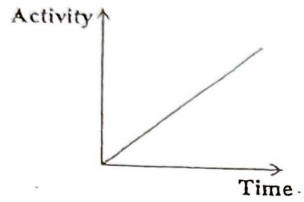
53. Appropriate labels for W and X would be

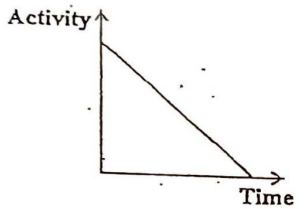
	W	X
(A)	step-up transformer	a.c. input
(B)	step-up transformer	d.c. input
(C)	step-down transformer	a.c. input
(D)	step-down transformer	d.c. input

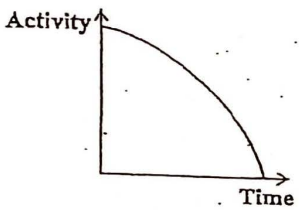
54. The electric power supplied to homes and factories is alternating current (a.c.) rather than direct current (d.c.) because

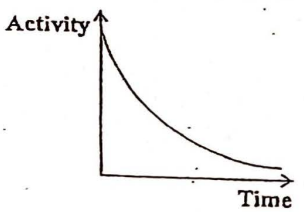
(A) the use of a.c. reduces electrical hazards
(B) the use of a.c. reduces transmission losses
(C) a.c. enables a wider variety of appliances to be used
(D) a.c. power lines are less likely to be struck by lightning than d.c. power lines

55. Which of the following graphs shows how the activity of a radioactive source varies with time?

(A)


(B)


(C)


(D)


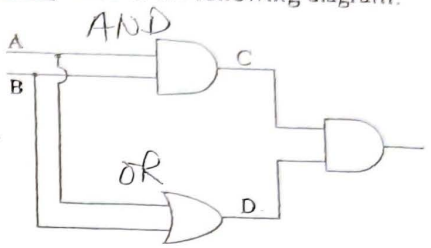
Exp decay curve

56. An alpha particle is

A
(A) a helium nucleus
(B) a positive electron
(C) a high-speed electron
(D) high-frequency electromagnetic radiation

^4_2He or $^4_2\alpha$

Item 57 refers to the following diagram.



57. What is the output at C and D when a 0 0 input is made at A and B?

A

	C	D
(A)	0	0
(B)	1	1
(C)	0	1
(D)	1	0

58. An isotope of uranium, $^{234}_{92}U$, changes to $^{230}_{90}Th$. This is an example of

(A) fission
(B) fusion
(C) α decay
(D) β decay

C

$^{234}_{92}U \rightarrow ^{230}_{90}Th + ^4_2\alpha$

Items 59–60 refer to the following information.

Nucleus	Neutron Number	Proton Number
P	126	82
Q	126	83
R	125	82
S	146	92

59. Which pair of atomic nuclei are isotopes?

same atomic
different
mass ✗

C

(A) P and Q
(B) Q and R
(C) P and R
(D) Q and S

60. Which two elements could occupy adjacent positions in the periodic table?

A

(A) P and Q
(B) P and R
(C) Q and S
(D) R and S

CANDIDATE – PLEASE NOTE!

PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.

_____

FORM TP 2018096

TEST CODE **01238010**

MAY/JUNE 2018

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

06 JUNE 2018 (p.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

   Sample Item

   The SI unit of length is the

   (A) metre
   (B) second
   (C) newton
   (D) kilogram

   Sample Answer

   ● Ⓑ Ⓒ Ⓓ

   The best answer to this item is "metre", so (A) has been shaded.
5. If you want to change your answer, erase it completely before you fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to that item later.
7. Figures are not necessarily drawn to scale.
8. You may do any rough work in this booklet.
9. You may use a silent, non-programmable calculator to answer items.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

1. Errors due to parallax can be minimized by

(A) taking more than one reading
(B) placing the eye at right angles to the mark being read
(C) taking readings from different angles
(D) taking an average of two readings using two separate scales

2. Which of the following measuring instruments is MOST suitable for accurately measuring the volume of 40.2 cm^3 of a liquid?

(A) Burette
(B) Pipette
(C) Beaker
(D) Measuring cylinder

3. Which of the following changes can be caused by a force acting on a body?

I. Shape
II. Motion
III. Density

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

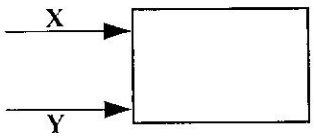
4. The mass of an astronaut is 70 kg when standing on the moon. When he returns to Earth, his approximate weight will be

(A) 70 kg
(B) 70 N
(C) 420 kg
(D) 700 N

5. The moment of a force is defined as the

(A) moment in time when a force is first applied to a body
(B) length of time for which a force is applied to a body
(C) product of the force and its perpendicular distance from the turning point to the force
(D) ratio of the force and its perpendicular distance from the turning point

Item 6 refers to the following diagram which shows two forces, X and Y, applied to an object.



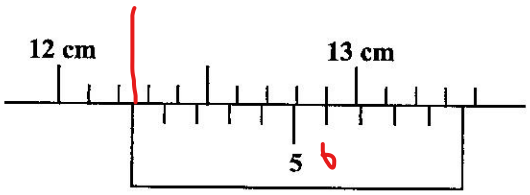
6. What should be the magnitude and direction of a third force which will cause the object to remain stationary?

(A) $X - Y$ to the left
(B) $X + Y$ to the left
(C) $X - Y$ to the right
(D) $X + Y$ to the right

7. When a force, F, is applied to a spring of original length, L, the new length becomes $L + x$. What would be the length of the spring if a force of $\frac{F}{2}$ is applied instead?

(A) $L + 2x$
(B) $2(L + x)$
(C) $L + x$
(D) $L + \frac{x}{2}$

Item 8 refers to the following diagram of a vernier caliper.



8. Which of the following readings is shown on the scale above?

(A) 12.06 cm
(B) 12.26 cm
(C) 12.25 cm
(D) 12.29 cm

9. Which of the following measures may be classified as scalar quantities?

I. Time
II. Speed
III. Displacement

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

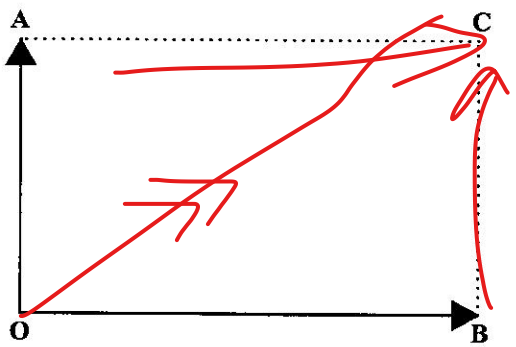
10. Pressure in a liquid can be calculated using the formula

$$P = \rho gh.$$

Which of the following sets of units will result in the SI unit of pressure?

	p	g	h
(A)	g cm^{-3}	m s^{-2}	mm
(B)	g cm^{-3}	N kg^{-1}	m
(C)	kg m^{-3}	cm s^{-2}	cm
(D)	kg m^{-3}	N kg^{-1}	m

Item 11 refers to the following diagram which shows two vectors of magnitudes a and b represented respectively by $\overline{OA}$ and $\overline{OB}$.



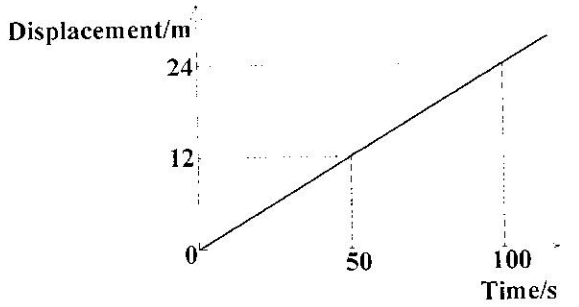
11. The vectors act at point O and are directed perpendicular to each other. Which of the following pairs represents BOTH the magnitude and direction of their resultant?

	Magnitude	Direction
(A)	$a^2 + b^2$	$\overline{OC}$
(B)	$a + b$	$\overline{CO}$
(C)	$\sqrt{(a^2 + b^2)}$	$\overline{CO}$
(D)	$\sqrt{(a^2 + b^2)}$	$\overline{OC}$

12. The acceleration due to gravity (g) is to be determined by measuring the time (t) taken for a small steel ball to fall through a specific height. Which of the following activities is UNNECESSARY?

(A) Find the mass of the ball.
(B) Allow the ball to drop and start the stopwatch at the same instant.
(C) Measure the height through which the ball falls.
(D) Repeat the time measurements and take the average.

Item 13 refers to the following graph which shows how the displacement of a runner from a starting line varies with time.



13. From the graph it can be deducted that the runner is

(A) not moving
(B) going at a steady speed
(C) going faster and faster
(D) going slower and slower

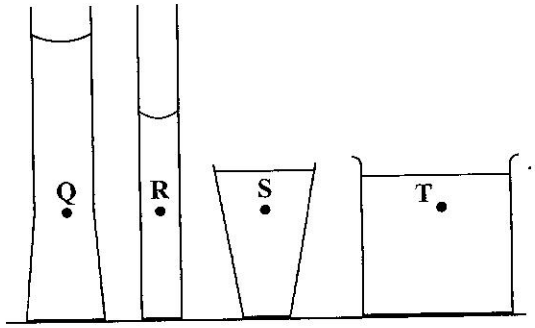
14. The time period of a simple pendulum oscillating with a small amplitude depends on the

(A) mass of the pendulum bob
(B) amplitude of the oscillation
(C) length of the pendulum
(D) force with which the pendulum is set into motion

15. An object is removed from the ground and placed on a shelf. Which of the object's properties is expected to increase?

(A) Mass
(B) Volume
(C) Potential energy
(D) Kinetic energy

Item 16 refers to the following diagrams of four vessels, filled with water.



16. The pressure due to the water is the GREATEST at

(A) Q
(B) R
(C) S
(D) T

17. A bubble of gas rises to the surface of a soft drink. This is because the

(A) density of the gas is greater than the density of the drink
(B) upthrust on the bubble is greater than the weight of the bubble
(C) upthrust on the bubble is greater than the weight of water it displaces
(D) weight of the water displaced by the bubble is less than the weight of the bubble

18. Which of the following statements about the pressure law are true?

I. The ratio of pressure to Kelvin temperature is constant.
II. Volume is constant.
III. Pressure is constant.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

19. Which of the following statements concerning the radiation of heat is/are true?

I. Radiation can only take place in a material medium.
II. A good absorber of radiation is also a good emitter of radiation.
III. Dark, dull surfaces are better emitters than shiny ones.

(A) III only
(B) I and II only
(C) I and III only
(D) II and III only

20. An electric kettle full of water is plugged into the mains. The process by which heat travels through the water is known as

(A) radiation
(B) convection
(C) evaporation
(D) electrification

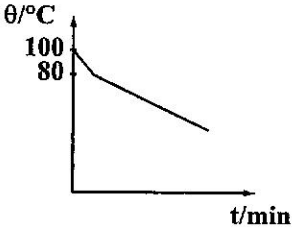
21. The energy required to change the state of a substance was determined to be E_H. If the mass of the substance is DOUBLED, the value of E_H will

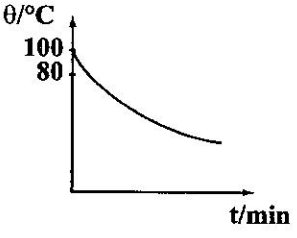
(A) be halved
(B) be doubled
(C) be quadrupled
(D) remain constant

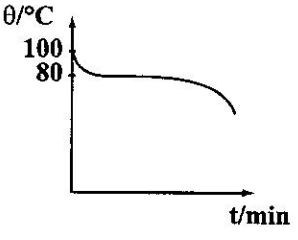
22. Which of the following statements about evaporation is FALSE?

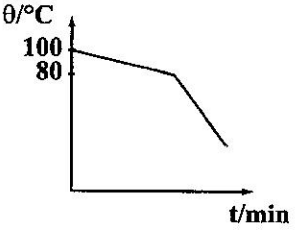
(A) Evaporation occurs at room temperature only.
(B) Evaporation requires heat energy and causes cooling.
(C) Evaporation occurs only at the surface.
(D) In evaporation the faster molecules escape the liquid.

23. Some molten naphthalene at 100 °C is allowed to cool to room temperature. If naphthalene has a melting point of 80 °C, which of the following graphs BEST represents the cooling curve of naphthalene?

(A)


(B)


(C)


(D)


24. The specific latent heat of vaporization of water is the energy required to change 1 kg of water at

(A) 0 °C to ice at 0 °C
(B) 0 °C to steam at 100 °C
(C) 100 °C to steam at 100 °C
(D) 99.9 °C to steam at 100.1 °C

25. A metal of mass m requires energy, E, to raise its temperature from T_1 to T_2. The specific heat capacity of the metal will be given by

(A) $\frac{E}{mT_2}$

(B) $\frac{Em}{(T_1 - T_2)}$

(C) $\frac{E}{m(T_1 - T_2)}$

(D) $\frac{E}{m(T_2 - T_1)}$

26. When heating a substance, a point is reached where no further change in temperature is observed. The MOST likely reason for this is that the

(A) heater is supplying less heat
(B) substance is changing state
(C) substance needs to be stirred less frequently
(D) substance is losing heat to the atmosphere

27. Which of the following phenomena are exhibited by sound waves?

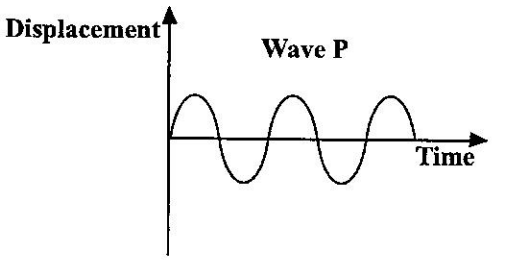
I. Refraction
II. Diffraction
III. Interference

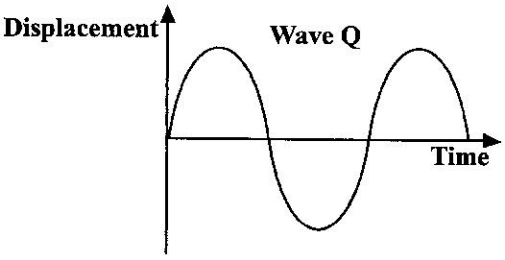
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

28. Whenever there is complete destructive interference between two coherent wave trains, the waves must be

(A) in phase
(B) out of phase by half of a wavelength
(C) out of phase by one wavelength
(D) out of phase by a quarter of a wavelength

Item **29** refers to the following graphs (with axes having the same scales) of two sound waves, P and Q.





29. Which of the following statements is true?

(A) P is louder than Q but Q has a higher pitch.

(B) P is louder than Q and also has a higher pitch than Q.

(C) Q is louder than P but P has a higher pitch.

(D) Q is louder than P and also has a higher pitch than P.

30. Which of the following equations expresses the correct relationship between the wavelength, λ, speed, υ, and frequency, f, of a wave?

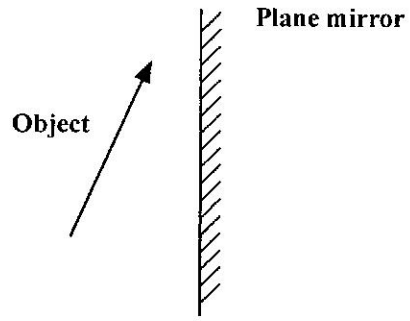
(A) $f = \frac{\upsilon}{\lambda}$

(B) $f = \frac{\lambda}{\upsilon}$

(C) $\lambda = f\upsilon$

(D) $\lambda = \frac{f}{\upsilon}$

Item **31** refers to the following diagram which shows an object in front of a plane mirror.



31. Which of the following options BEST represents the image produced by the plane mirror?

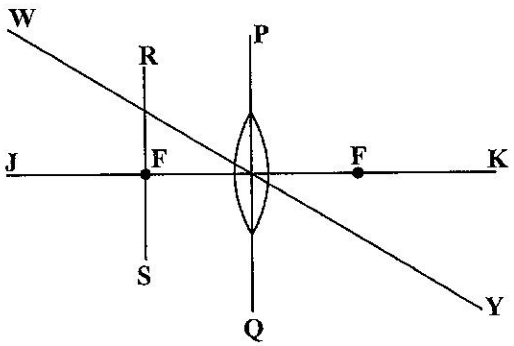
(A)

(B)

(C)

(D)

Item 32 refers the following diagram.

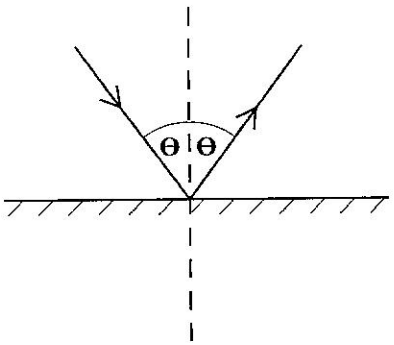


32. Which line lies along the principal axis of the converging lens?

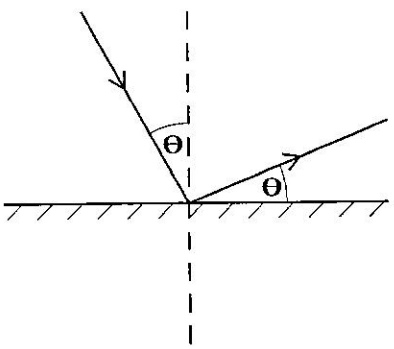
(A) JK
(B) PQ
(C) RS
(D) WY

33. Which of the following diagrams illustrates the law of reflection?

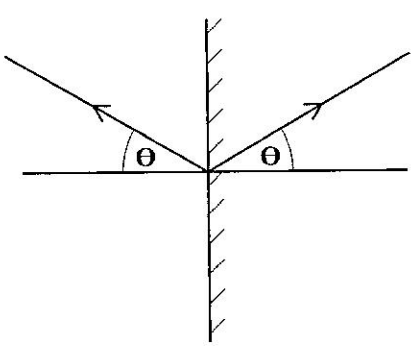
(A)



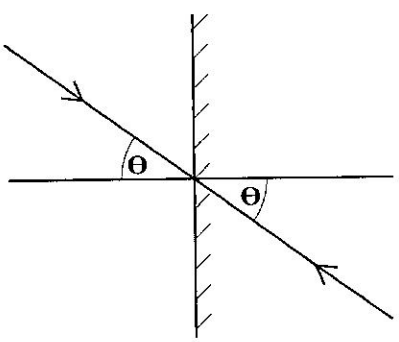
(B)



(C)



(D)

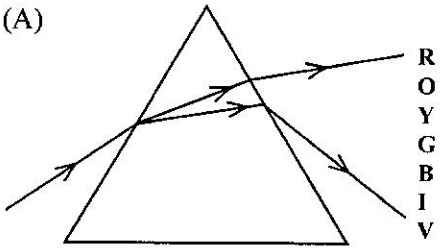


34. Which of the following types of electromagnetic radiation causes tanning?

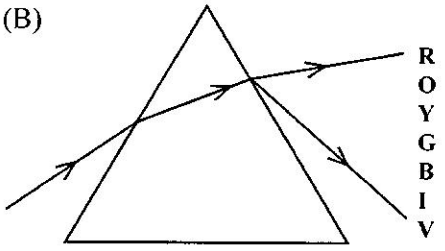
(A) Light
(B) X-ray
(C) Infrared
(D) Ultraviolet

35. A ray of white light enters a transparent glass prism. In which of the following diagrams is the dispersion of light correctly illustrated?

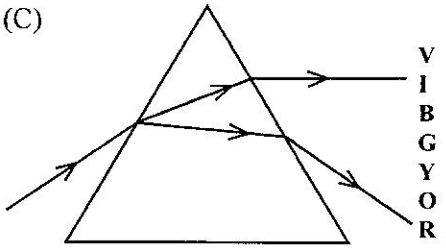
(A)



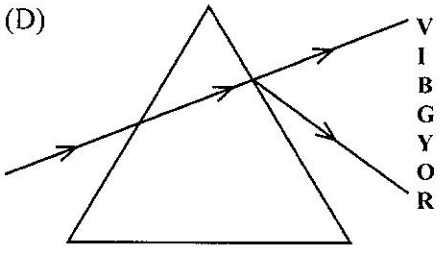
(B)



(C)

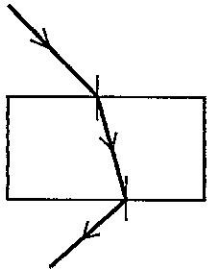


(D)

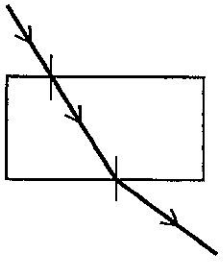


36. Which diagram BEST shows the path taken by a ray of light through a rectangular block?

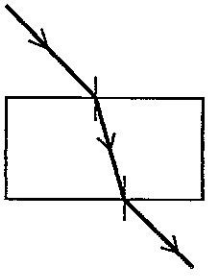
(A)



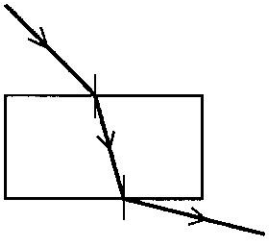
(B)



(C)



(D)



37. A ray of light leaves the air and enters glass of refractive index 1.5. If the angle of incidence is 37°, what is the sine of the angle of refraction?

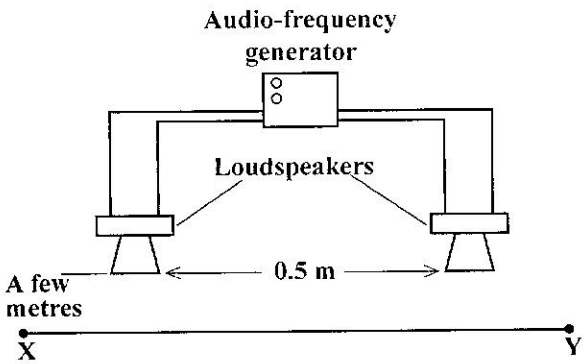
(A) $1.5 \sin 37°$

(B) $1.5 + \sin 37°$

(C) $\dfrac{1.5}{\sin 37°}$

(D) $\dfrac{\sin 37°}{1.5}$

Item 38 refers to the following diagram. Two similar loudspeakers are connected to the same audio-frequency generator and set up as shown.



38. At some points along XY, no sound is heard because

(A) the sound waves are diffracted
(B) sound is refracted away from those points
(C) interference of the sound waves takes place
(D) the sound waves are reflected back to the same source

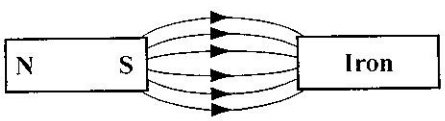
39. The human ear is incapable of hearing a silent dog whistle because

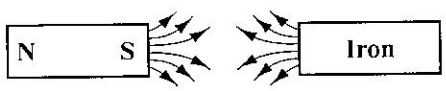
(A) it does not make a noise
(B) the speed of sound is too fast to be detected by the human ear
(C) the frequency of the waves are above the range detected by the human ear
(D) the waves are infrasound with frequencies below that detectable by the human ear

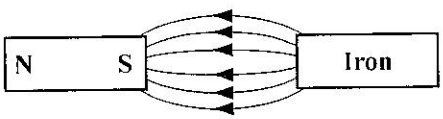
40. Which of the following electromagnetic waves has the SHORTEST wavelength?

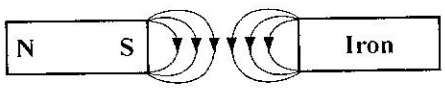
(A) Gamma rays
(B) Infrared waves
(C) Radio waves
(D) Ultraviolet radiation

41. Which of the following diagrams shows the magnetic field formed between a bar magnet and a piece of iron?

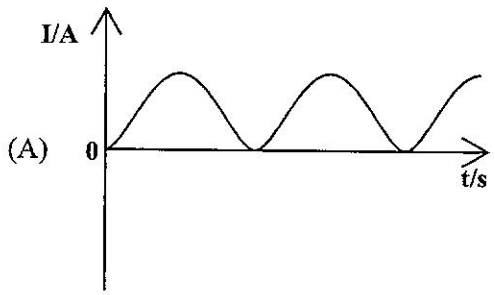
(A) 

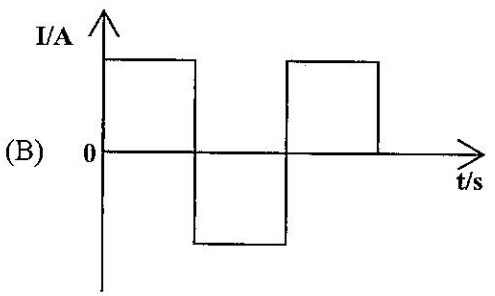
(B) 

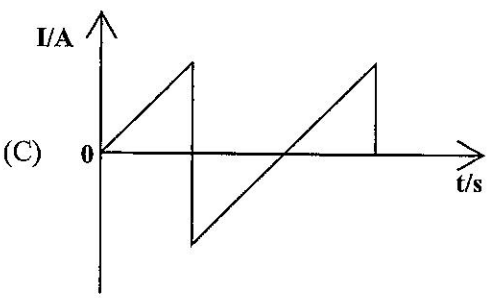
(C) 

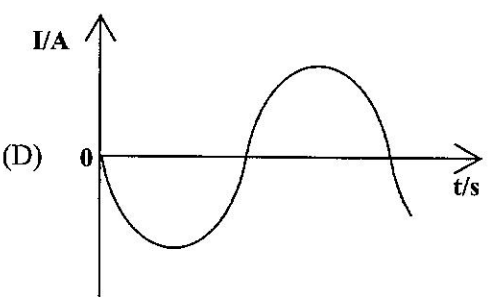
(D) 

42. Which of the following current (I)–time (t) graphs BEST represents a d.c. current?

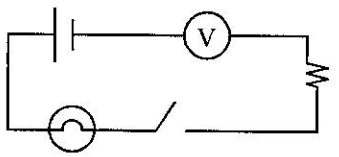
(A)


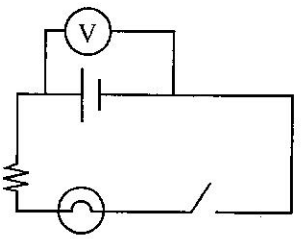
(B)


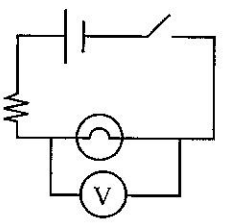
(C)


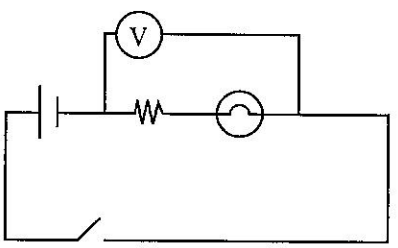
(D)


43. Which of the following circuit arrangements is BEST suited for measuring a lamp's voltage?

(A)


(B)


(C)


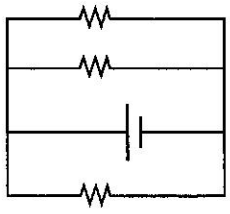
(D)


44. The unit of potential difference is defined as one

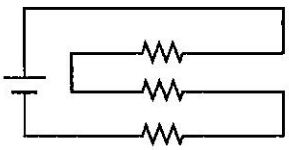
(A) joule per volt
(B) volt per ampere
(C) joule per ampere
(D) joule per coulomb

45. Which of the following circuit diagrams BEST represents a series arrangement?

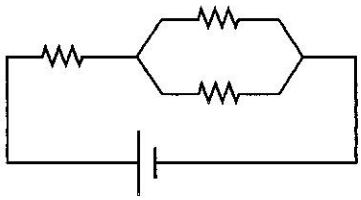
(A)



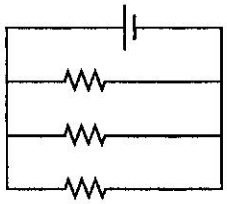
(B)



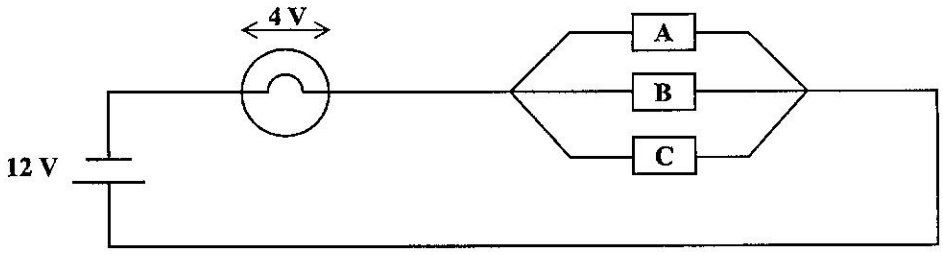
(C)



(D)



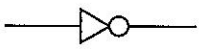
Item **46** refers to the following diagam

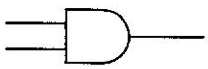


46. Given that the potential difference across the lamp in the circuit is 4 V, what is the potential difference across resistor A?

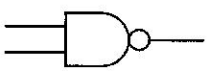
(A) $(12 \div 4)$ V
(B) (12×4) V
(C) $(12 - 4)$ V
(D) $(12 + 4)$ V

47. Which symbol represents the NAND gate?

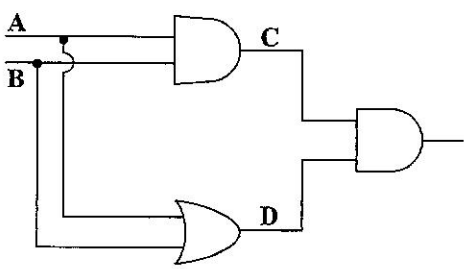
(A) 

(B) 

(C) 

(D) 

Item **48** refers to the following diagram.



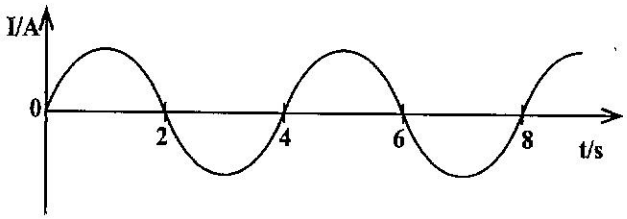
48. What is the output at C and D when the input at A is 0 and input at B is 1.

	C	D
(A)	0	0
(B)	0	1
(C)	1	0
(D)	1	1

49. An ideal transformer has a primary to secondary turns ratio of 1:3. An alternating potential difference of 200 V is applied to the primary coil and a resistance of 200 Ω attached to the secondary coil. What is the current in the secondary circuit?

(A) 0.33 A
(B) 1.00 A
(C) 1.50 A
(D) 3.00 A

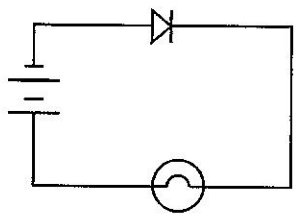
Item 50 refers to the following current–time graph.

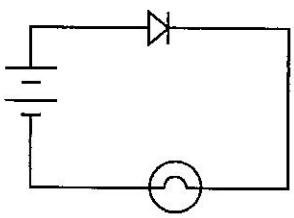


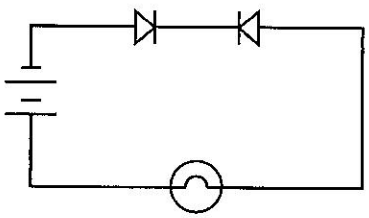
50. What is the period of the current?

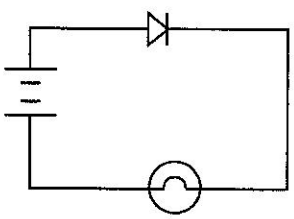
(A) 2 s
(B) 4 s
(C) 6 s
(D) 8 s

51. In which of the following circuits will the lamp light up?

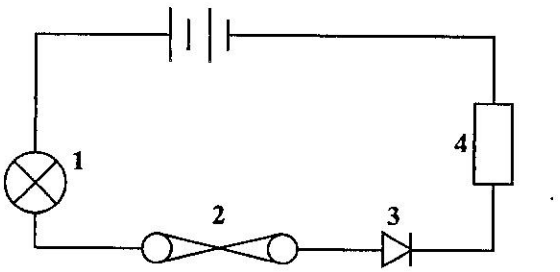
(A)


(B)


(C)


(D)


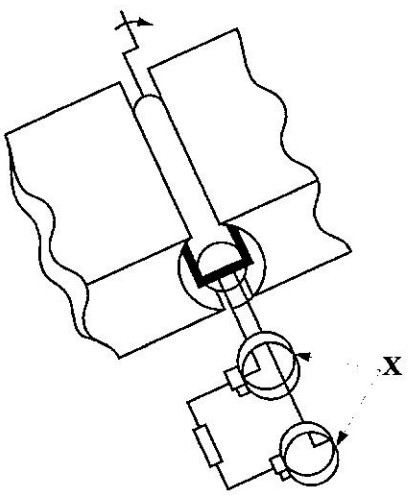
Item 52 refers to the following diagram.



52. Which of the following options shows the correct match of the component name and its number?

	Diode	Lamp	Resistor	Fuse
(A)	3	1	4	2
(B)	4	3	1	2
(C)	1	3	4	2
(D)	2	4	3	1

Item 53 refers to the following diagram of a simple a.c. generator.



53. The parts labelled X in the diagram are known as the

(A) coils
(B) armatures
(C) commutators
(D) slip rings

54. Half-life is defined as

(A) the time it takes half of the radioactive atoms in a sample to decay
(B) the time it takes the radioactive atoms in a sample to decay
(C) half the time it takes a radioactive nucleus to decay
(D) half the lifetime of a radioactive sample

55. Which of the following scientists discovered the relationship $E = mc^2$?

(A) Marie Curie
(B) Isaac Newton
(C) J J Thompson
(D) Albert Einstein

56. Which of the following CANNOT be deflected by a magnetic field?

(A) Alpha particles
(B) Beta particles
(C) Gamma rays
(D) Electrons

57. The nuclide $^{234}_{90}Th$ contains

(A) 90 protons and 234 neutrons
(B) 235 protons and 90 neutrons
(C) 90 protons and 144 neutrons
(D) 144 protons and 90 neutrons

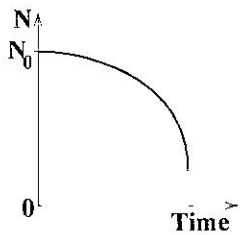
58. Which of the following statements about radioactive decay are correct?

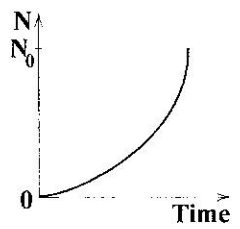
I. It is a random process.
II. It is dependent on conditions external to the nucleus.
III. It is due to changes in the nuclei of atoms.

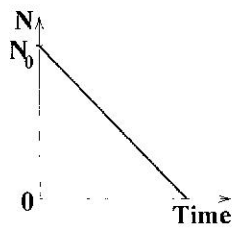
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

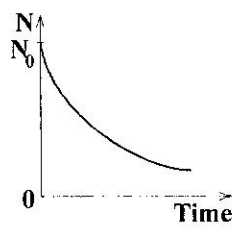
59. N_0 radioactive nuclei are present in a sample at time $t = 0$.

Which of the following graphs BEST represents the variation with time of the number, N, of undecayed nuclei present?

(A)


(B)


(C)


(D)


60. Which of the following equations is correct?

(A) $^{226}_{88}Ra \rightarrow {}^{222}_{86}Rn + \beta\text{-particle}$

(B) $^{14}_{6}C \rightarrow {}^{15}_{7}N + \beta\text{-particle}$

(C) $^{226}_{88}Ra \rightarrow {}^{222}_{86}Rn + \alpha\text{-particle}$

(D) $^{14}_{6}C \rightarrow {}^{15}_{7}N + \alpha\text{-particle}$

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

CANDIDATE – PLEASE NOTE!
PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.

TEST CODE J

FORM TP 2019024

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

17 JANUARY 2019 (p.m.)

364

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer th
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Rea are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the same letter as the answer you have chosen. Look at the sample item below.

   Sample Item

   The SI unit of length is the

   (A) metre
   (B) second
   (C) newton
   (D) kilogram

   Sample Answer

   ● Ⓑ Ⓒ Ⓓ

   The best answer to this item is "metre", so (A) has been shaded.

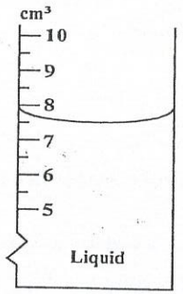
5. If you want to change your answer, erase it completely before you fill in your ne
6. When you are told to begin, turn the page and work as quickly and as carefully a cannot answer an item, go on to the next one. You may return to that item later.
7. You may do any rough work in this booklet.
8. Figures are not necessarily drawn to scale.
9. You may use a silent, non-programmable calculator to answer items.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO

1. 0.0000462 N expressed in standard form is

(A) 4.62×10^{-5} N
(B) 4.62×10^{-4} N
(C) 462×10^{-4} N
(D) 4.62×10^{5} N

Item 2 refers to the following measuring cylinder which is used to determine the volume of a liquid.



2. The volume of the liquid is

(A) 7.0 cm³
(B) 7.5 cm³
(C) 7.8 cm³
(D) 8.0 cm³

3. One gram is equal to

(A) 10 milligrams
(B) 100 milligrams
(C) 1 000 milligrams
(D) 10 000 milligrams

4. Which of the following instruments is suitable for measuring the diameter of a human hair?

(A) Metre rule
(B) Tape measure
(C) Vernier caliper
(D) Micrometer screw gauge

5. Which of the following implements are designed to take advantage of a large moment provided by a relatively small force?

I. Crowbar
II. Claw hammer
III. Pair of tweezers

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

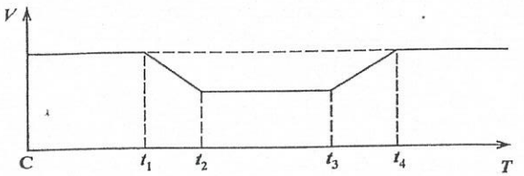
6. The mass of an astronaut is 70 kg when standing on the moon. When he returns to earth his approximate weight will be

(A) 70 kg
(B) 420 kg
(C) 70 N
(D) 700 N

7. Which of the following is a derived unit?

(A) K
(B) s
(C) m^3
(D) kg

Item 8 refers to the following diagram which shows a velocity/time graph for a moving object.



8. Which of the following statements about the object are true?

I. It returns to its starting point.
II. It has zero acceleration between times t_2 and t_3.
III. Its velocity at t_4 is the same as its initial velocity.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

9. Two forces of 8 N and 10 N CANNOT give a resultant of

(A) 1 N
(B) 2 N
(C) 9 N
(D) 18 N

10. Which of the following features must be present in a stable, well-designed racing car?

(A) Low centre of gravity
(B) Narrow wheelbase
(C) Long front
(D) Sunroof

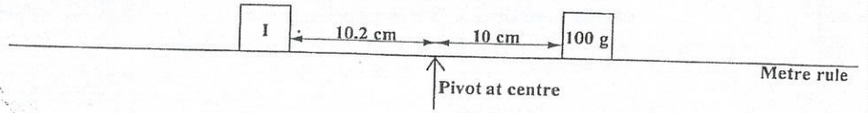
11. A student sets up a simple pendulum and finds that the period is 1.7 s. To obtain a period nearer to one second, he should

(A) use a lighter bob
(B) use a heavier bob
(C) lengthen the pendulum
(D) shorten the pendulum

12. When a ball is thrown vertically upwards and reaches its maximum height, it has

(A) maximum kinetic energy and maximum potential energy
(B) maximum kinetic energy and minimum potential energy
(C) maximum potential energy and minimum kinetic energy
(D) minimum kinetic energy and minimum potential energy

Item 13 refers to the following diagram.



13. The diagram above represents a 100 g mass which can be balanced by placing a mass at I. If th mass at I is to be used to balance the 100 g, it should be

(A) less than 100 g
(B) 100 g
(C) between 100 g and 199 g
(D) 200 g

364

14. What is the unit for the moment of a force?

(A) N
(B) N m
(C) $N\ m^{-1}$
(D) $N\ m^{-2}$

15. When two bodies collide, momentum is conserved. This means that the

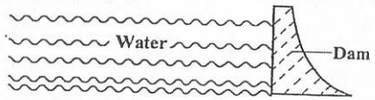
(A) kinetic energy before impact is equal to that after impact
(B) momentum of each body is unchanged
(C) algebraic sum of the velocities before impact is equal to the sum of the velocities after impact
(D) total momentum of the bodies before impact is equal to the total momentum of the bodies after impact

A001

16. A piece of string is tied onto a small stone and the stone is then totally immersed, in water. The tension in the string will be

(A) zero
(B) equal to the weight of the stone
(C) less than the weight of the stone
(D) more than the weight of the stone

Item 17 refers to the following diagram which shows a dam.



17. The pressure on the bottom of the dam depends on the

(A) depth of the water
(B) length of the reservoir
(C) volume of water held by the dam
(D) mass of water held back by the dam

18. Which of the following scientists was responsible for arriving at the conclusion that measured amounts of electrical and mechanical energy can be converted to proportionate amounts of heat energy?

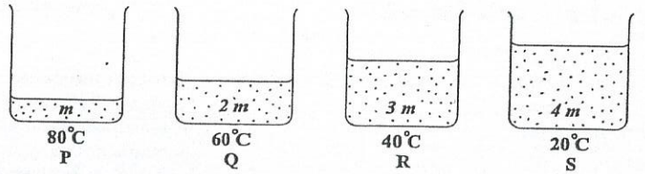
(A) Joule
(B) Coulomb
(C) Rumford
(D) Newton

19. The heat capacity of a substance is defined as the amount of heat energy

(A) the substance can hold
(B) 1 kg of the substance can hold
(C) required to change the substance to another state
(D) needed to raise the temperature of the substance by 1 degree

364

Item 20 refers to the following diagrams where P, Q, R and S are identical containers containing water of masses m, 2m, 3m and 4m respectively, at the temperatures indicated.



20. In which of the containers above is the average kinetic energy of the molecules greatest?

(A) P
(B) Q
(C) R
(D) S

A001

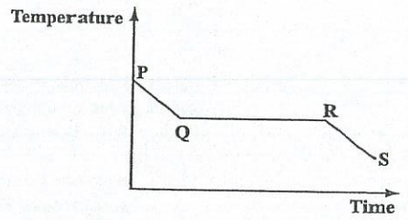
21. The energy required to change the state of a substance was determined to be E_H. If the mass of the substance was DOUBLED, the value of E_H will

(A) be halved
(B) be doubled
(C) be quadrupled
(D) remain constant

22. The specific latent heat of vaporization of water is the energy required to change 1 kg of water at

(A) 0 °C to ice at 0 °C
(B) 99.9 °C to steam at 100.1 °C
(C) 100 °C to steam at 100 °C
(D) 0 °C to steam at 100 °C

Item 23 refers to the following graph.



23. The graph above, arising from an experiment on change of phase, shows that solidification started at Q. During which of the stages is the substance in the liquid phase?

(A) At P only
(B) Between Q and R
(C) Between R and S
(D) Between P and Q

24. Which of the following remains unchanged with an increase in temperature?

(A) Density
(B) Mass
(C) Volume
(D) Relative density

25. Which of the following MOST likely accounts for the fact that pot handles are usually made of wood or plastic?

(A) Conduction
(B) Convection
(C) Evaporation
(D) Radiation

26. A detector of thermal energy is placed an equal distance in turn from each of four faces of a hollow metal cube full of hot water. The reading on the detector is GREATEST when the detector is turned towards the face which is

(A) painted shiny white
(B) painted dull black
(C) highly polished
(D) painted silver

27. Which of the following are reasons why a hot liquid, placed in a double-walled vacuum flask, retains its heat for a long time?

I. Evacuated space between the double walls reduces the loss of heat by conduction.
II. Silver inner walls reduce the loss of heat by radiation.
III. The silvered outer wall helps to absorb heat from the surroundings.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

28. Which of the following is NOT an example of evaporation?

(A) A slice of bread left in the open air becomes dry.
(B) The cooling effect of sweating in animals.
(C) The rapid disappearance of ether if exposed to the air.
(D) A loaded copper wire put around a block of ice gradually cuts through the ice.

29. Two types of radiation, L and R, fall on a woman's left and right hands respectively. Her left hand feels hot but does not become suntanned; her right hand does not feel hot but it eventually becomes tanned. Radiations L and R are respectively

	L	R
(A)	visible light	x-rays
(B)	x-rays	visible light
(C)	ultraviolet	infrared
(D)	infrared	ultraviolet

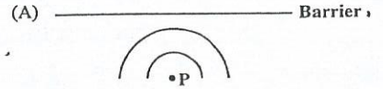
30. The refractive index of a transparent medium with a critical angle, c, for light travelling from the medium to air is

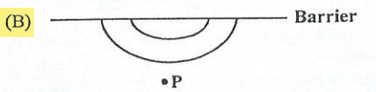
(A) $\frac{1}{c}$
(B) $\frac{90^\circ}{\sin c}$
(C) $\frac{\sin 90^\circ}{\sin c}$
(D) $\sin c$

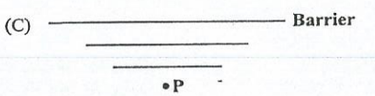
31. A ray of light leaves air and enters glass of refractive index 1.6. The angle of refraction is 27°. What is the sine of the angle of incidence?

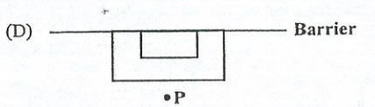
(A) $1.6 + \sin 27^\circ$
(B) $\frac{1.6}{\sin 27^\circ}$
(C) $1.6 \sin 27^\circ$
(D) $\frac{\sin 27^\circ}{1.6}$

32. A pencil point is dipped into water at Point P in front of a straight barrier. Which of the following will the REFLECTED wave look like?

(A)


(B)


(C)


(D)


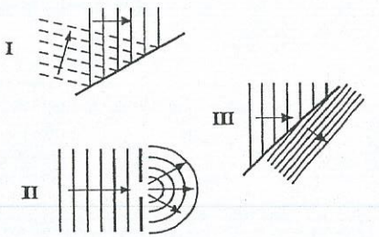
Item 33 refers to the following table which lists the refractive indices for light in four different media.

Medium	Refractive Index
Air	1.0
Ice	1.3
Perspex	1.5
Diamond	2.4

33. In which medium would the light waves have the slowest speed?

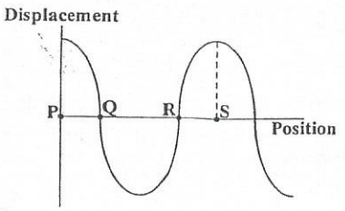
(A) Air
(B) Ice
(C) Perspex
(D) Diamond

34. Which of the following diagrams represent(s) diffraction of water waves in a ripple tank?



(A) I only
(B) II only
(C) I and II only
(D) II and III only

Item 35 refers to the following diagram which shows a transverse wave at a particular instant.



35. The wavelength of the wave is equal to the distance

(A) PQ
(B) PR
(C) PS
(D) QR

36. Which of the following waves travel(s) only longitudinally?

I. Sound waves
II. Radio waves
III. Water waves

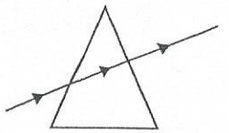
(A) I only
(B) II only
(C) II and III only
(D) I, II and III

37. The waves that reach a listener from a radio are

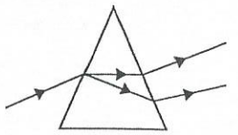
(A) electromagnetic
(B) transverse and stationary
(C) longitudinal and stationary
(D) longitudinal and progressive

38. Which of the following diagrams BEST represents the passage of a beam of white light through a triangular glass prism?

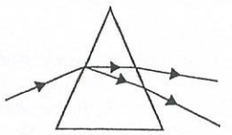
(A)



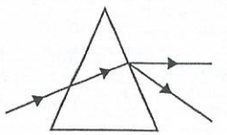
(B)



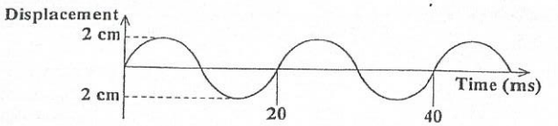
(C)



(D)



Item 39 refers to the following diagram which shows an instantaneous profile of a wave travelling across a water surface.



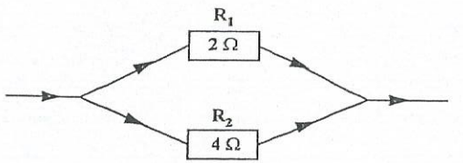
39. From the information given, the frequency is

(A) 20 Hz
(B) 25 Hz
(C) 50 Hz
(D) 100 Hz

40. The note from a drum is louder when it is struck harder because the sound waves produced have a greater

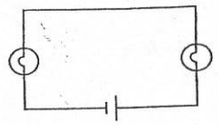
(A) amplitude
(B) wavelength
(C) frequency
(D) velocity

41. What is the equivalent resistance of the two resistors in the following diagram?

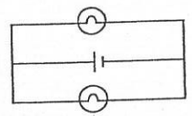


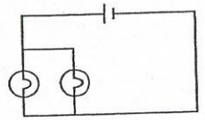
(A) 0.5 Ω
(B) 1.3 Ω
(C) 6 Ω
(D) 8 Ω

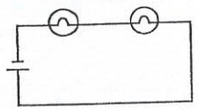
Item 42 refers to the following diagram which shows an electrical circuit with a cell and two filament bulbs.

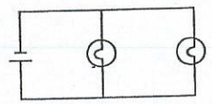


42. Which of the following circuits are electrically the same as the circuit above?

(A)


(B)


(C)


(D)


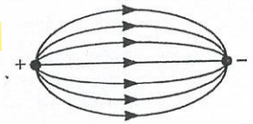
43. The SI unit of charge is the

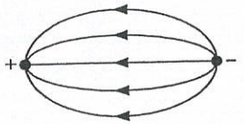
(A) ohm
(B) volt
(C) ampere
(D) coulomb

44. Which of the following is NOT one of the ways in which the strength of the magnetic field near a solenoid (long coil) carrying a current can be increased?

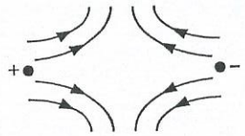
(A) Increasing the resistance of the coil
(B) Increasing the current in the coil
(C) Increasing the number of turns per unit length of the coil
(D) Placing a soft iron core inside the coil

45. Which of the following diagrams represents the electric field existing between two oppositely charged point charges?

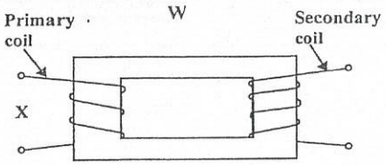
(A)


(B)


(C)


(D)


Item 46 refers to the following diagram.



46. Appropriate labels for W and X respectively would be

(A) step-up transformer, d.c. input
(B) step-up transformer, a.c. input
(C) step-down transformer, d.c. input
(D) step-down transformer, a.c. input

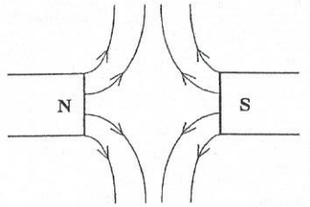
47. An ideal transformer has 1200 turns on the primary and 600 turns on the secondary. If the voltage across the secondary is 20 V, the voltage across the primary is

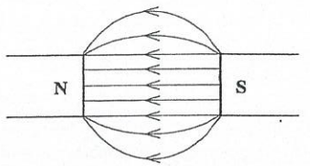
(A) 5 V
(B) 10 V
(C) 20 V
(D) 40 V

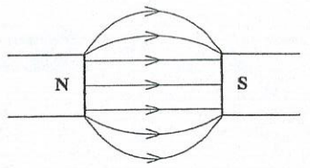
48. A glass rod is rubbed with a piece of silk and is positively charged. The glass rod became charged by

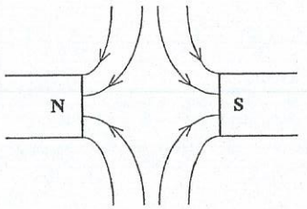
(A) losing protons
(B) losing electrons
(C) gaining protons
(D) gaining electrons

49. Which of the following diagrams represents the magnetic field which exists between two opposite magnetic poles?

(A)


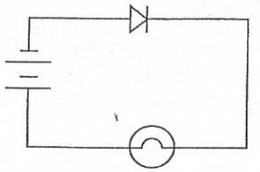
(B)


(C)


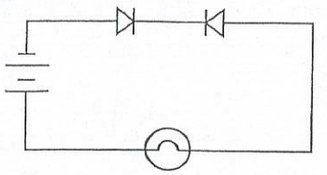
(D)


50. In which of the following circuits will the lamp light up?

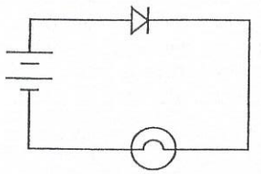
(A)



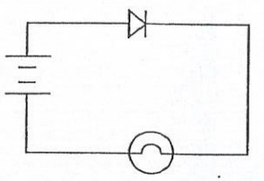
(C)



(B)



(D)



364

51. Given the following truth table with inputs A and B and output C, which logic gate does it describe?

A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

(A) NAND
(B) NOR
(C) AND
(D) OR

A001

52. An electromagnet consists of insulated wire wrapped around an iron core. It works because

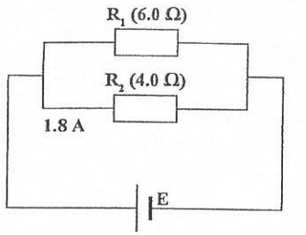
(A) iron is always magnetized
(B) iron is a good electrical conductor
(C) a magnetic field is produced inside the coil
(D) an electric field is produced inside the coil

53. When an excessive current passes through a fuse, which of the following is the sequence of events?

(A) Wire gets hot → current is cut off → wire melts
(B) Wire gets hot → wire melts → current is cut off
(C) Wire melts → current is cut off → wire gets hot
(D) Wire melts → wire gets hot → current is cut off

GO ON TO THE NEXT PAGE

Item 54 refers to the following diagram which shows two resistors, R_1 of 6.0 Ω and R_2 of 4.0 Ω, in parallel.



364

54. What is the current through R_1 if the current through R_2 is 1.8 A?

(A) 1.2 A
(B) 1.8 A
(C) 2.7 A
(D) 3.0 A

55. An ammeter has a very low resistance so that it can be placed in

(A) parallel with a component and not affect the circuit
(B) series with a component and not affect the circuit
(C) parallel with a component and not heat up
(D) series with a component and not heat up

A001

56. The nuclide $^{234}_{90}Th$ contains

(A) 90 protons and 234 neutrons
(B) 235 protons and 90 neutrons
(C) 90 protons and 144 neutrons
(D) 144 protons and 90 neutrons

57. Madame Curie's work in scientific research was chiefly concerned with

(A) radioactivity
(B) atomic structure
(C) nuclear structure
(D) energy from atomic nuclei

58. Which of the following describes two properties of an α-particle?

(A) No charge, very penetrating
(B) Positive charge, very penetrating
(C) Negative charge, not very penetrating
(D) Positive charge, not very penetrating

59. Sodium-24 decays into Magnesium-24 with the emission of a β-particle and can be represented by the following equation.

$^{24}_{11}Na \rightarrow {}^{24}_{12}Mg + \square$

Which of the following options should be placed in the box to complete the equation?

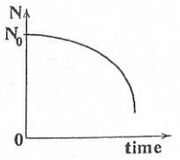
(A) $^{0}_{1}e$
(B) $^{0}_{-1}e$
(C) $^{4}_{2}He$
(D) $^{0}_{1}He$

GO ON TO THE NEXT PAGE

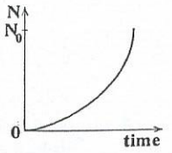
60. The number of radioactive nuclei present in a sample of the time t = 0 is N_0.

Which of the following graphs BEST represents the variation with time of the number, N, of undecayed nuclei present?

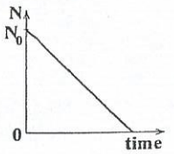
(A)



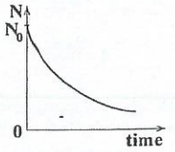
(B)



(C)



(D)



364

A001

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

CARIBBEAN EXAMINATIONS COUNCIL

MULTIPLE CHOICE ANSWER SHEET

SUBJECT: PHYSICS - 01 PROFICIENCY: GENERAL CANDIDATE NAME:

A REGISTRATION NUMBER

G TEST CODE

JAN. 2019.

E GRIDDING OCCURRENCES GRIDDER INITIALS CHECKER INITIALS SCANNING OCCURRENCES

D ABSENT

SIGNATURE OF CANDIDATE

B MARK YOUR ANSWERS BELOW

1	B	C	D	11	A	B	C	21	A	B	C	D	31	A	B	C	D	41	A	B	C	D	51	A	B	C	D
2	A	C	D	12	A	B	D	22	A	B	C	D	32	A	B	C	D	42	A	B	C	D	52	A	B	C	D
3	A	B	D	13	B	C	D	23	A	B	C	D	33	A	B	C	D	43	A	B	C	D	53	A	B	C	D
4	A	B	C	14	A	C	D	24	A	B	C	D	34	A	C	D	D	44	A	B	C	D	54	A	B	C	D
5	B	C	D	15	A	B	C	25	A	B	C	D	35	A	B	D	D	45	A	B	C	D	55	A	B	C	D
6	A	B	C	16	A	B	D	26	A	B	C	D	36	A	B	C	D	46	A	B	C	D	56	A	B	C	D
7	A	B	C	17	A	B	C	D	27	A	B	C	D	37	A	B	C	D	47	A	B	C	D	57	A	B	C	D
8	A	B	D	18	A	B	C	D	28	A	B	C	D	38	A	B	D	D	48	A	B	C	D	58	A	B	C	D
9	B	C	D	19	A	B	C	D	29	A	B	C	D	39	A	B	D	D	49	A	B	D	D	59	A	B	C	D
10	A	C	D	20	B	C	D	D	30	A	B	D	D	40	B	C	D	D	50	A	C	D	D	60	A	B	C	D

IF THERE ARE MORE THAN 60 QUESTIONS TURN OVER AND CONTINUE ON THE OTHER SIDE

AT THE END OF THE EXAMINATION PLACE THIS ANSWER SHEET BETWEEN THE MIDDLE PAGES OF THE QUESTION PAPER BOOKLET THEN SEAL THE TOP, BOTTOM AND FORE EDGE OF THE BOOKLET USING THE THREE SEALS PROVIDED.

CANDIDATE – PLEASE NOTE!

PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.

_____

TEST CODE **01238010**

FORM TP 2019099

MAY/JUNE 2019

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

05 JUNE 2019 (p.m.)

212

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

   Sample Item

   The SI unit of length is the

   (A) metre
   (B) second
   (C) newton
   (D) kilogram

   Sample Answer

   ● Ⓑ Ⓒ Ⓓ

   The best answer to this item is "metre", so (A) has been shaded.
5. If you want to change your answer, erase it completely before you fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to that item later.
7. Figures are not necessarily drawn to scale.
8. You may do any rough work in this booklet.
9. You may use a silent, non-programmable calculator to answer items.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

A005

1. 3.1415926 expressed as TWO significant figures is

(A) 3.1
(B) 3.14
(C) 3.2
(D) 31

2. To measure the external diameter of a measuring cylinder most accurately, one should use a

(A) metre rule
(B) tape measure
(C) length of string
(D) pair of vernier calipers

212

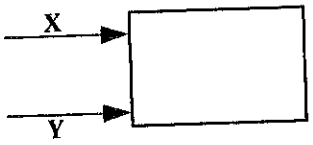
3. A 4 kg mass is travelling with a constant speed of 5 m s^{-1}. It is brought to rest in 2 seconds. The average force acting on it to bring it to rest is

(A) 1.6 N
(B) 2.5 N
(C) 10.0 N
(D) 40.0 N

F = ma
a = v-u/t = 0-5/2 = -2.5
F = 4 x -2.5 = -10N

A005

Item 4 refers to the following diagram which shows two forces, X and Y, applied onto an object.



4. What should be the magnitude and direction of a third force which will cause the object to remain stationary?

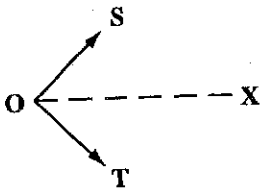
(A) $X - Y$ to the left
(B) $X + Y$ to the left
(C) $X - Y$ to the right
(D) $X + Y$ to the right

5. A boy measured the height of a laboratory table with a metre rule. Which of the following is MOST likely to be correct?

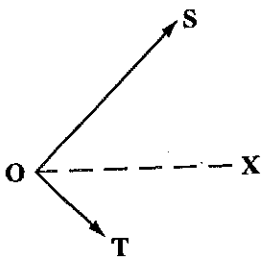
(A) 0.00895 m
(B) 0.0895 m
(C) 0.895 m
(D) 8.95 m

6. The diagrams below, NOT **drawn to scale**, represent two forces, S and T, acting at O. In which of the following is the resultant in the direction OX?

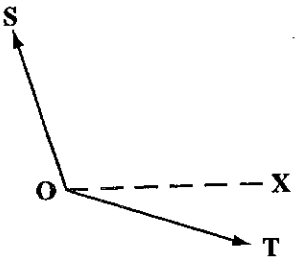
(A)



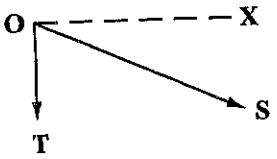
(B)



(C)



(D)



7. When an astronaut is standing on the moon his mass is 70 kg. When he returns to earth his approximate weight will be

(A) 70 kg
(B) 420 kg
(C) 70 N
(D) 700 N

8. Which of the following rates will determine the power of a machine?

I. Doing work
II. Converting energy
III. Changing temperature

(A) I only
(B) III only
(C) I and II only
(D) I, II and III

9. Which of the following features must be present in a stable, well-designed racing car?

(A) Sunroof
(B) Long front
(C) Narrow wheelbase
(D) Low centre of gravity

10. The time period of a simple pendulum oscillating with a small amplitude depends on the

(A) mass of the pendulum bob
(B) amplitude of the oscillation
(C) length of the pendulum
(D) force with which the pendulum is set into motion

T = 2pi Root(l/g)

11. Pressure in a liquid can be calculated using the formula

$P = pgh$.

Which of the following sets of units will result in the SI unit of pressure?

	p	g	h
(A)	g cm^{-3}	m s^{-2}	mm
(B)	kg m^{-3}	N kg^{-1}	m
(C)	g cm^{-3}	N kg^{-1}	m
(D)	kg m^{-3}	cm s^{-2}	cm

12. Which of the following is the unit of momentum?

(A) kg s^{-1}
(B) kg m s^{-1}
(C) kg m s^{-2}
(D) N m

13. Which of the following quantities has the same value as 6 μC?

(A) 6×10^{6} C
(B) 6×10^{3} C
(C) 6×10^{-3} C
(D) 6×10^{-6} C

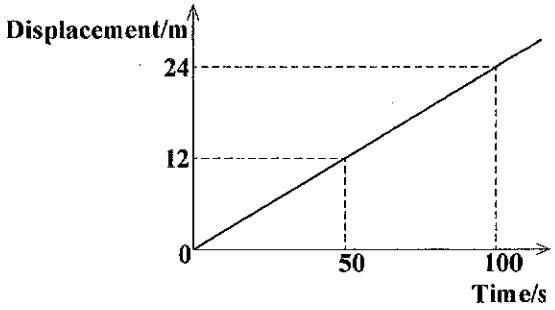
14. Which of the following is an SI base unit?

(A) Volt
(B) Ohm
(C) Ampere
(D) Coulomb

212

A005

Item 15 refers to the following graph which shows how the displacement of a runner from a starting line varies with time.



15. From the graph it can be deducted that the runner is

(A) going slower and slower
(B) going at a steady speed
(C) going faster and faster
(D) not moving

16. An object is removed from the ground and placed on a shelf. Which of its properties is expected to increase?

(A) Mass
(B) Volume
(C) Potential energy
(D) Kinetic energy

17. Which of the following is the POOREST conductor of thermal energy?

(A) Air
(B) Copper
(C) Mercury
(D) Aluminium

18. Boyle's law for a gas can be tested experimentally, provided which of the following remain constant?

I. Temperature
II. Pressure
III. Mass

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

19. Which of the following are characteristic features of a clinical thermometer?

I. Narrow constriction in the tube just above the bulb
II. Limited range of temperatures
III. Large bore to make the mercury more visible

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

20. A metal of mass m requires energy, E, to raise its temperature from T_1 to T_2. The specific heat capacity of the metal will be given by

(A) $\frac{E}{mT_2}$

(B) $\frac{Em}{(T_1 - T_2)}$

(C) $\frac{E}{m(T_1 - T_2)}$

(D) $\frac{E}{m(T_2 - T_1)}$

212

A005

21. The specific latent heat of vaporization of water is 2.26×10^6 J kg^{-1}. When 0.01 kg of water is converted into steam it

(A) absorbs 2.26×10^4 J
(B) gives out 2.26×10^4 J
(C) absorbs 2.26×10^8 J
(D) gives out 2.26×10^8 J

22. A gas occupies 2 m^3 at 27 °C at a pressure of 1 atmosphere. At a pressure of 2 atmospheres it occupies a volume of 1 m^3. What is its temperature at this new volume and pressure?

(A) 54.0 °C
(B) 27.0 °C
(C) 6.75 °C
(D) – 198 °C

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$\frac{1 \times 2}{300} = \frac{2 \times 1}{T_2}$

23. Which of the following statements concerning the radiation of heat is/are true?

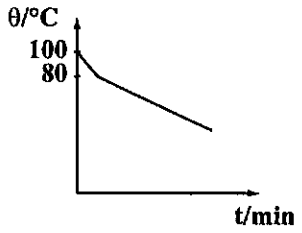
I. Radiation can only take place in a material medium.
II. A good absorber is also a good emitter of radiation.
III. Dark dull surfaces are better emitters than shiny ones.

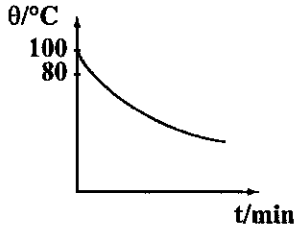
(A) III only
(B) I and II only
(C) I and III only
(D) II and III only

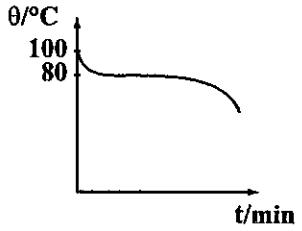
24. Which of the following quantities remain unchanged with an INCREASE in temperature?

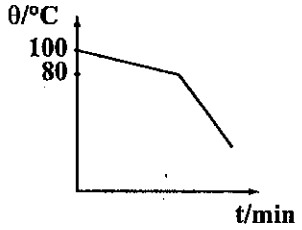
(A) Mass
(B) Density
(C) Volume
(D) Relative density

25. Some molten naphthalene at 100 °C is allowed to cool to room temperature. If naphthalene has a melting point of 80 °C, which of the following graphs BEST represents the cooling curve?

(A)


(B)


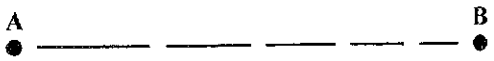
(C)


(D)


26. An electric kettle full of water is plugged into the mains. The MAJOR process by which heat travels through the water is

(A) radiation
(B) convection
(C) conduction
(D) electrification

Item 27 refers to the following diagram.



27. In using a slinky to demonstrate longitudinal waves moving from Point A to Point B above, the spring is made to vibrate

(A) parallel to AB
(B) perpendicular to AB
(C) at an obtuse angle to AB
(D) at an acute angle to AB

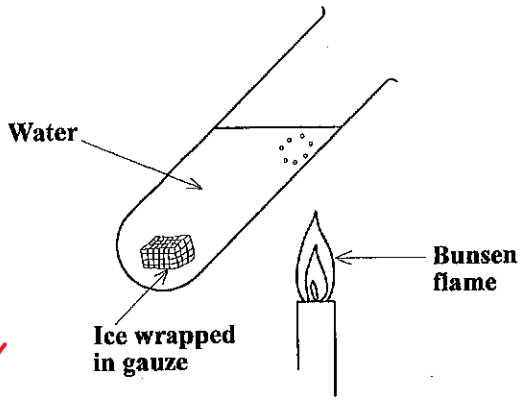
28. In which of the following is conduction the MAIN method of energy transfer?

(A) Food heated in a microwave oven
(B) Energy transferred from the sun to earth
(C) Food being cooked on a barbecue
(D) Food being cooked in a pot on an electric stove

29. Which of the following statements does NOT provide evidence that sound waves can be reflected?

(A) Sound can be heard around a corner in open air.
(B) Speaking tubes can be used for passing messages in ships.
(C) The depth of the ocean can be measured using ultrasound.
(D) Echoes can be heard when a person shouts in a large empty room.

Item 30 refers to the following diagram which shows water boiling at the top of a glass test tube while a piece of ice remains unmelted at the bottom.



30. Which of the following statements is the reason for this occurrence?

(A) Water is a poor conductor of heat.
(B) Gauze is a poor conductor of heat.
(C) Water is a good conductor of heat.
(D) Glass is a good conductor of heat.

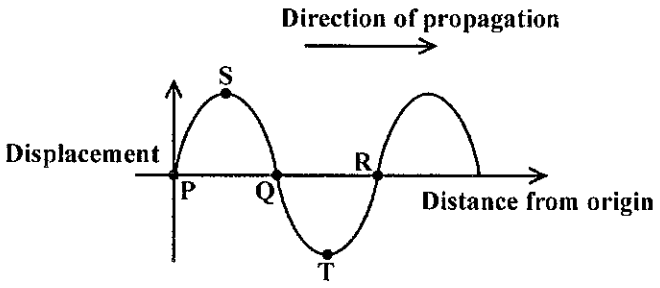
31. Whenever there is complete destructive interference between two coherent wave trains, the waves must be

(A) in phase
(B) out of phase by half of a wavelength
(C) out of phase by one wavelength
(D) out of phase by a quarter of a wavelength

212

A005

Item 32 refers to the following diagram of a wave.



32. Which of the following statements about the wave shown in the diagram are true?

I. Points P, Q and R are in phase.
II. Points S and T are out of phase.
III. The wavelength of the wave is the distance PR.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

33. An echo is quieter than the original sound that produced it. This shows that, compared to the original sound, the echo has a

(A) smaller amplitude
(B) shorter wavelength
(C) lower frequency
(D) slower speed

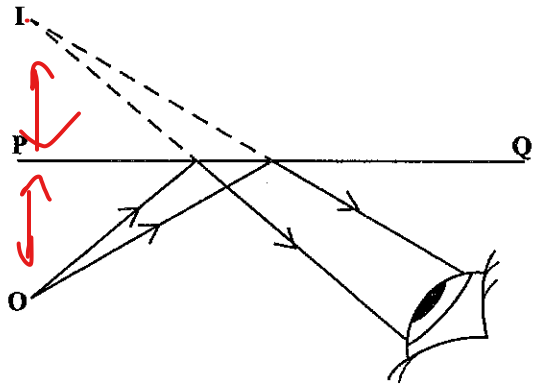
34. Which of the following can produce a diminished virtual image of a real object?

(A) A converging lens
(B) A diverging lens
(C) A plane mirror
(D) A glass block

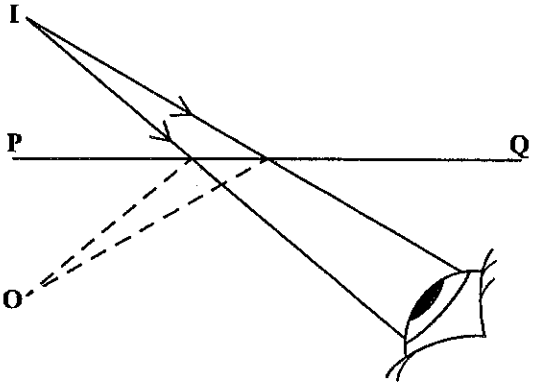
---

35. An object O is viewed in a plane mirror PQ. Which of the following diagrams correctly shows the formation of the image?

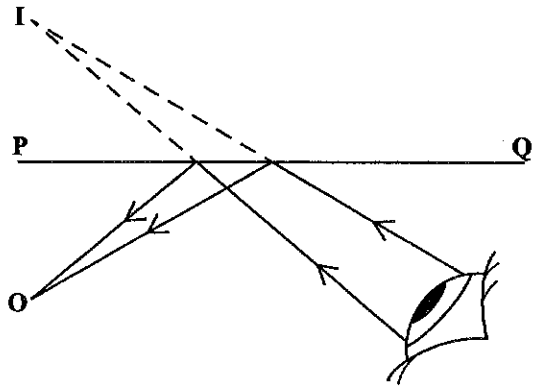
(A)



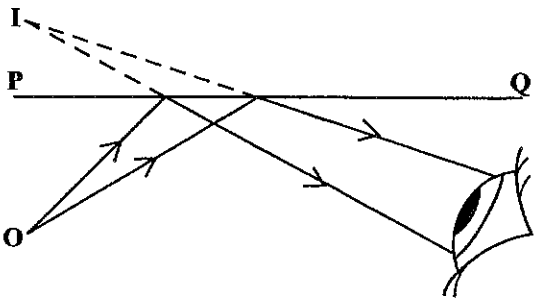
(C)



(B)

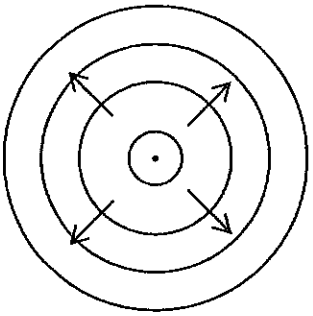


(D)

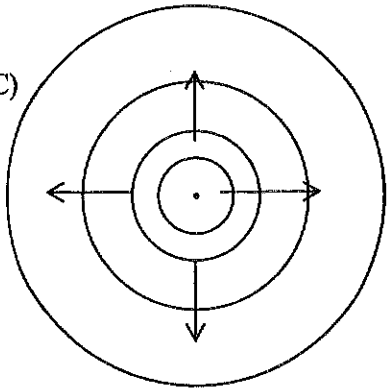


36. Which of the following diagrams BEST represents the wave generated in a ripple tank by a small spherical dipper vibrating at a constant frequency?

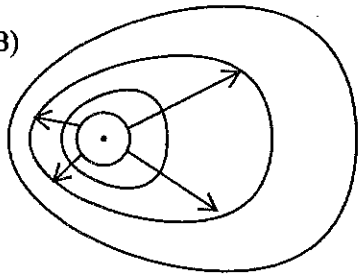
(A)



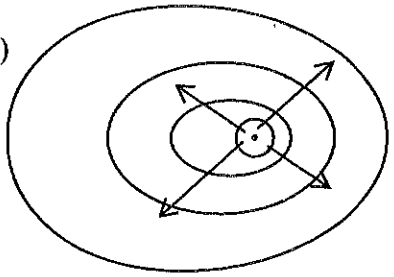
(C)



(B)



(D)



212

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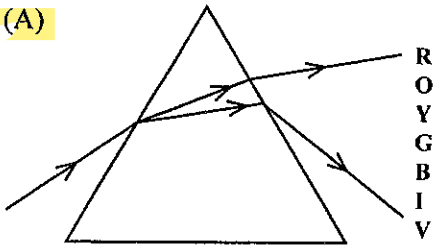
37. Which of the following statements about waves is true?

(A) Only transverse waves undergo reflection.
(B) Diffraction can only take place with light waves.
(C) All waves undergo reflection, refraction and diffraction.
(D) Longitudinal waves do not undergo refraction, but may be reflected.

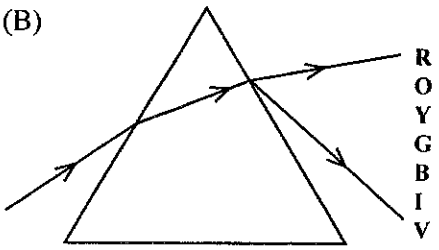
A005

38. A ray of white light enters a transparent glass prism. In which of the following diagrams is the dispersion of light correctly illustrated?

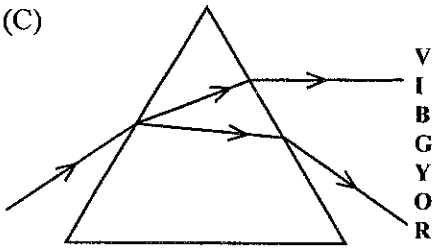
(A)



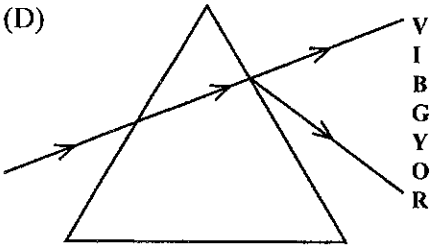
(B)



(C)

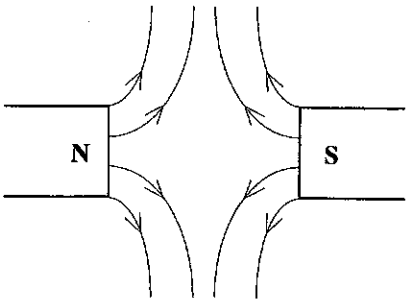


(D)

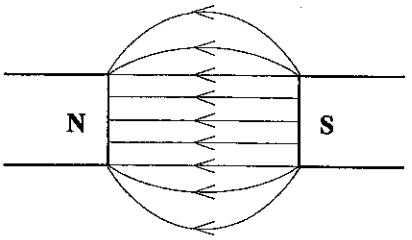


39. Which of the following diagrams represents the magnetic field which exists between two opposite magnetic poles?

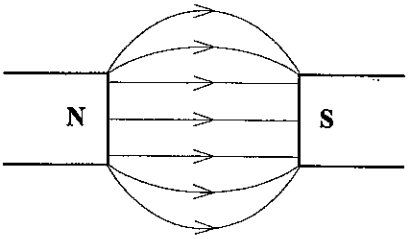
(A)



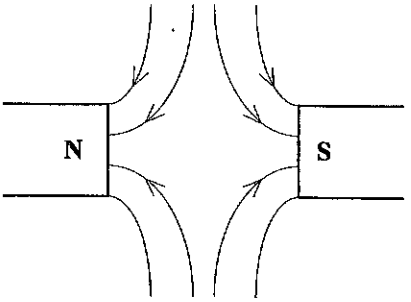
(B)



(C)



(D)

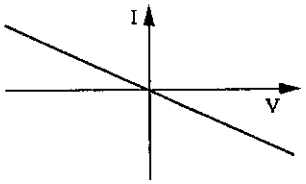


212

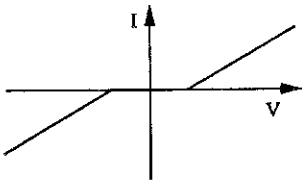
A005

40. Which of the following diagrams is a graphical representation of current versus potential difference for a metallic conductor at a constant temperature?

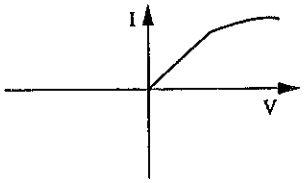
(A)



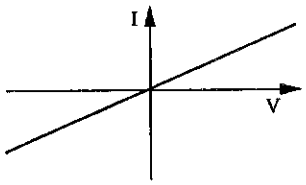
(B)



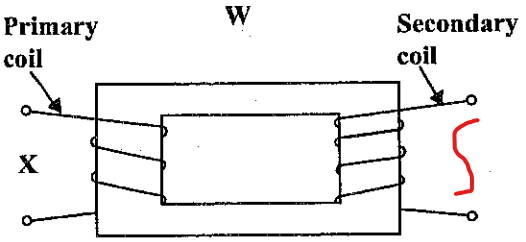
(C)



(D)



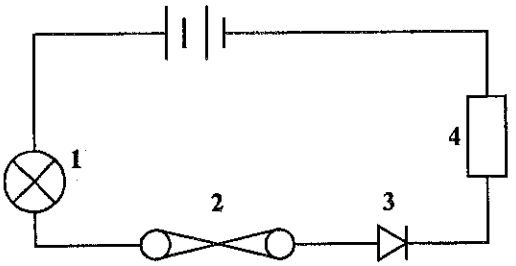
Item 41 refers to the following diagram.



41. Appropriate labels for W and X are

	W	X
(A)	step-down transformer	a.c. input
(B)	step-down transformer	d.c. input
(C)	step-up transformer	a.c. input
(D)	step-up transformer	d.c. input

Item 42 refers to the following diagram.



42. Which of the following options shows the correct match of the component name and its number?

	Diode	Lamp	Resistor	Fuse
(A)	3	1	4	2
(B)	4	3	1	2
(C)	1	3	4	2
(D)	2	4	3	1

212

A005

43. Which of the following equations CANNOT be used to determine the power dissipated in a resistor?

(A) $P = I^2R$

(B) $P = VI$

(C) $P = \frac{R}{V^2}$

(D) $P = \frac{V^2}{R}$

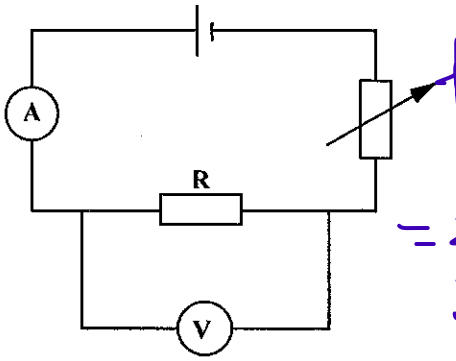
Item 44 refers to the following truth table with inputs A and B and output C.

A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

44. Which of the following logic gates does the truth table above describe?

(A) NAND
(B) NOR
(C) AND
(D) OR

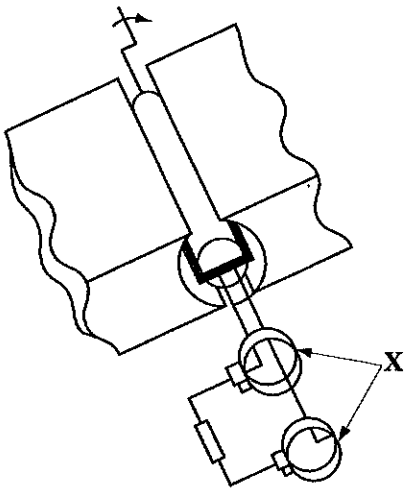
Item 45 refers to the following circuit where the ammeter reads 0.4 A and the voltmeter reads 0.6 V.



45. What is the resistance of R?

(A) 15 Ω
(B) 1.5 Ω
(C) 0.67 Ω
(D) 0.24 Ω

Item 46 refers to the following diagram of a simple a.c. generator.



46. The parts labelled X in the diagram are known as the

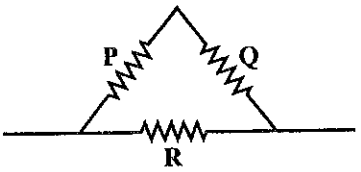
(A) commutators
(B) armatures
(C) slip rings
(D) coils

47. Which of the following statements about alternating current is true?

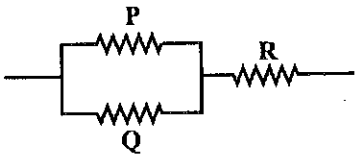
(A) It can be changed into direct current by a transformer.
(B) It can be rectified by using a semiconductor diode.
(C) It can be used to recharge a battery.
(D) It is used to transmit electrical energy because of its high frequency.

48. In which of the following diagrams are resistors P and Q in series with each other and parallel with R?

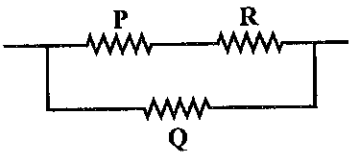
(A)



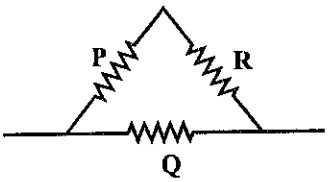
(B)



(C)

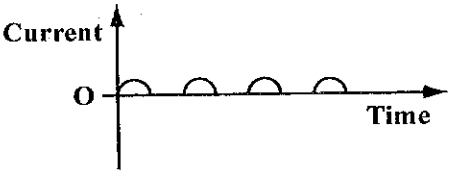


(D)

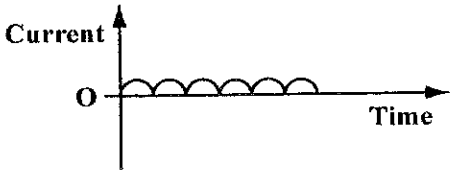


49. Which of the following graphs illustrates an ALTERNATING current?

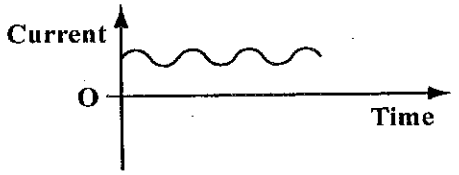
(A)



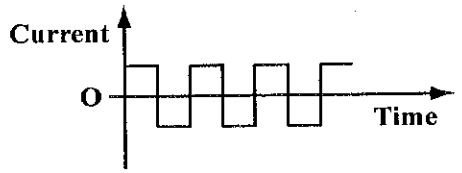
(B)



(C)



(D)



50. Magnetic induction occurs when

(A) an N pole attracts an S pole
(B) an electroscope is charged
(C) a magnet is suspended and points in the NS direction
(D) iron nails near a magnet become magnetized

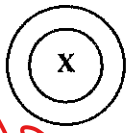
212

A005

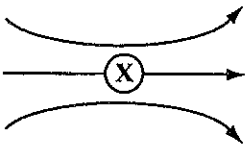
51. Which of the following pairs of statements is true for BOTH iron and steel?

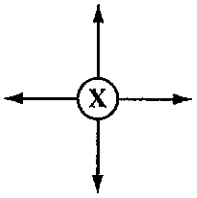
	Iron	Steel
(A)	Easily magnetized	Does not retain its magnetism
(B)	Not easily magnetized	Retains its magnetism well
(C)	Easily magnetized	Retains its magnetism well
(D)	Not easily magnetized	Does not retain its magnetism

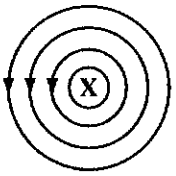
Item 52 refers to the followig diagram which represents a straight wire carrying a current into the plane of the paper.

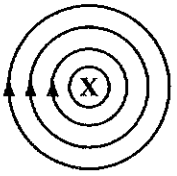


52. Which of the following diagrams BEST represents the magnetic field around the wire?

(A)


(B)


(C)


(D)


53. Which of the following are possible symbols for an isotope of the nuclide ${}^{A}_{Z}X$?

I. ${}^{A-2}_{Z}X$

II. ${}^{A}_{Z-2}X$

III. ${}^{A+2}_{Z}X$

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

54. ${}^{14}_{6}C$ (Carbon–14) decays in accordance with the equation ${}^{14}_{6}C \rightarrow {}^{14}_{7}N + X$. The emission X is

(A) a proton
(B) a gamma ray
(C) a beta particle
(D) an alpha particle

55. In the equation $\Delta E = \Delta mc^2$

(A) c = speed of light, Δm = mass of atom
(B) c = speed of light, Δm = mass lost
(C) c = specific heat capacity of substance, Δm = mass lost
(D) c = specific heat capacity of substance, Δm = mass of substance

56. The number of neutrons present in the nucleus of the nuclide $^{222}_{86}Rn$ is

(A) 308
(B) 222
(C) 136
(D) 86

57. Which of the following describes two properties of an α-particle?

(A) No charge, very penetrating
(B) Positive charge, very penetrating
(C) Negative charge, not very penetrating
(D) Positive charge, not very penetrating

58. Sodium–24 decays into Magnesium–24 with the emission of a ß-particle and can be represented by the following equation.

$$^{24}_{11}Na \rightarrow {}^{24}_{12}Mg + \square$$

Which of the following options should be placed in the box to complete the equation?

(A) $^{0}_{1}e$
(B) $^{0}_{-1}e$
(C) $^{4}_{1}He$
(D) $^{0}_{-1}He$

59. Which of the following scientists discovered the relationship $E = mc^2$?

(A) Marie Curie
(B) Isaac Newton
(C) J.J. Thompson
(D) Albert Einstein

60. A radioactive isotope has a half-life of 20 days. How many days will it take for a given sample to have its activity reduced to $\frac{1}{8}$ of its initial value?

(A) 1.2 days
(B) 60 days
(C) 80 days
(D) 320 days

212

A005

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

FORM TP 2020024

CANDIDATE – PLEASE NOTE
PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.

TEST CODE 01238010

JANUARY 2020

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 01 – General Proficiency

1 hour 15 minutes

17 JANUARY 2020 (p.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

The SI unit of length is the

(A) metre
(B) second
(C) newton
(D) kilogram

Sample Answer

The best answer to this item is "metre", so (A) has been shaded.

5. If you want to change your answer, erase it completely before you fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to that item later.
7. You may do any rough work in this booklet.
8. Figures are not necessarily drawn to scale.
9. You may use a silent, non-programmable calculator to answer items.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

Visualise the gravitational pull towards the earth.

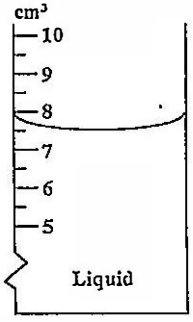
1. Which of the following instruments is suitable for measuring the diameter of a human hair?

(A) Metre rule
(B) Tape measure
(C) Vernier caliper
(D) Micrometer screw gauge

2. 0.0000462 N expressed in standard form is

(A) 4.62×10^{-5} N
(B) 4.62×10^{4} N
(C) 4.62×10^{-4} N
(D) 4.62×10^{5} N

Item 3 refers to the following measuring cylinder which is used to determine the volume of a liquid.



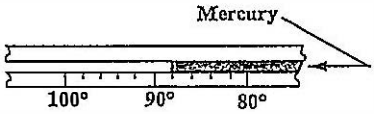
3. The volume of the liquid, in cm^3, is

(A) 7.0
(B) 7.5
(C) 7.8
(D) 8.0

4. In an experiment to locate the centre of mass of a sheet of cardboard, a plumb line (string with a small mass on the end) is used. The plumb line is used to

(A) check that the apparatus is vertical
(B) measure the width of the cardboard
(C) show which points are vertically below the pivot
(D) check that the cardboard is swinging freely

Item 5 refers to the following diagram which shows a section of a thermometer.



5. What is the reading shown on the thermometer?

(A) 88°
(B) 89°
(C) 91°
(D) 92°

6. When standing on the moon, the mass of an astronaut is 70 kg. When he returns to earth his approximate weight will be

(A) 70 kg
(B) 420 kg
(C) 70 N
(D) 700 N

7. Which of the following is a derived unit?

(A) K
(B) s
(C) m^3
(D) kg

8. An object of mass m is attached to a spring balance and its weight, w, recorded. What will be the result if the object is taken to the moon, where the gravitational field strength is less, and weighed?

(A) Mass = m; weight less than w
(B) Mass less than m; weight = w
(C) Mass = m; weight greater than w
(D) Mass greater than m; weight = w

9. A solid object, X, floats in mercury and sinks in water. A solid object, Y, floats in both mercury and water.

Which of the following statements is true about X and Y?

(A) X is less dense than Y.
(B) X is more dense than Y.
(C) X and Y are both denser than water.
(D) X and Y are both denser than mercury.

10. A glass marble, X, moving with a speed of 6 m s^{-1}, collides 'head on' with an identical stationary glass marble, Y. What is the speed of Y after collision, assuming that X is brought to rest?

(A) 0 m s^{-1}
(B) 3 m s^{-1}
(C) 6 m s^{-1}
(D) 12 m s^{-1}

11. Which of the following features must be present in a stable, well-designed racing car?

(A) Low centre of gravity
(B) Narrow wheelbase
(C) Long front
(D) Sunroof

12. When two bodies collide, momentum is conserved. This means that the

(A) kinetic energy before impact is equal to the kinetic energy after impact
(B) momentum of each body is unchanged
(C) algebraic sum of the velocities before impact is equal to the sum of the velocities after impact
(D) total momentum of the bodies before impact is equal to the total momentum of the bodies after impact

13. Which of the following expressions can be used to find the speed of an object?

(A) $\frac{\text{Change in velocity}}{\text{Time taken}}$

(B) $\frac{\text{Change in displacement}}{\text{Time taken}}$

(C) $\frac{\text{Distance travelled}}{\text{Time taken}}$

(D) Distance travelled × Time taken

14. Pressure in a liquid can be calculated using the formula $P = \rho gh$.

Which of the following sets of units will give the pressure in the SI unit?

	ρ	g	h
(A)	g cm^{-3}	m s^{-2}	mm
(B)	kg m^{-3}	N kg^{-1}	m
(C)	g cm^{-3}	N kg^{-1}	m
(D)	kg m^{-3}	cm s^{-2}	cm

GO ON TO THE NEXT PAGE

15. Which of the following sources of energy are classified as renewable?

I. Solar energy
II. Wind energy
III. Geothermal energy

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

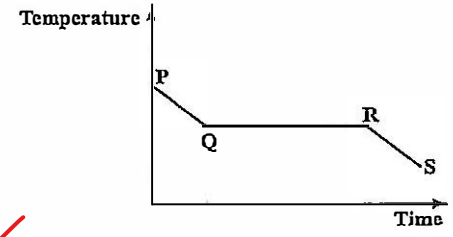
16. The heat capacity of a substance is defined as the amount of heat energy

(A) the substance can hold
(B) 1 kg of the substance can hold
(C) required to change the substance to another state
(D) needed to raise the temperature of the substance by 1 degree

17. When a ball is thrown vertically upwards and reaches its maximum height, it has

(A) maximum kinetic energy and maximum potential energy
(B) maximum kinetic energy and minimum potential energy
(C) maximum potential energy and minimum kinetic energy
(D) minimum kinetic energy and minimum potential energy

Item 18 refers to the following graph which is based on an experiment on change of phase.



18. The graph shows that solidification started at Q. During which of the stages is the substance in the liquid phase?

(A) At P only
(B) Between Q and R
(C) Between R and S
(D) Between P and Q

19. Which of the following processes is MOST likely to account for the fact that pot handles are usually made of wood or plastic?

(A) Conduction
(B) Convection
(C) Evaporation
(D) Radiation

20. To check the upper fixed point on a thermometer on the Celsius scale, the thermometer is placed in

(A) melting ice at atmospheric pressure
(B) boiling water at atmospheric pressure
(C) water in contact with melting ice at atmospheric pressure
(D) steam above boiling water at atmospheric pressure

21. In the pressure law, which of the following statements is true?

(A) Pressure is constant.
(B) Volume is constant.
(C) The ratio of volume to pressure is constant.
(D) The ratio of volume to temperature is constant.

22. Who was responsible for arriving at the conclusion that measured amounts of electrical and mechanical energy can be converted to proportionate amounts of heat energy?

(A) Joule
(B) Newton
(C) Rumford
(D) Coulomb

23. A student carries out an experiment to determine the specific heat capacity, c, of a solid using the electrical method. Which of the following equations should be used?

(A) $c = \frac{M\Delta\theta}{PI}$

(B) $c = \frac{F \times D}{M\Delta\theta}$

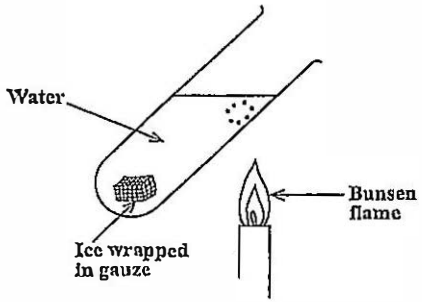
(C) $c = \frac{IVt}{M\Delta\theta}$

(D) $c = \frac{M\Delta\theta}{IVt}$

24. Which of the following is NOT an example of evaporation?

(A) A slice of bread left in the open air becomes dry.
(B) The cooling effect of sweating in animals.
(C) The rapid disappearance of ether if exposed to the air.
(D) A loaded copper wire wrapped around a block of ice gradually cuts through the ice.

Item 25 refers to the following diagram which shows water boiling at the top of a glass test tube while a piece of ice wrapped in gauze remains unmelted at the bottom.



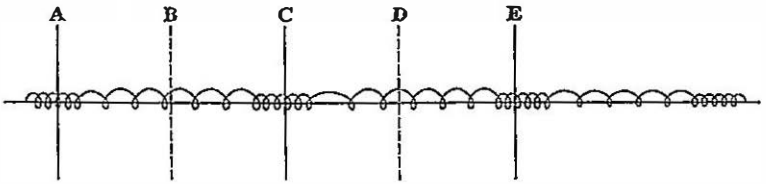
25. Which of the following statements provides the reason for this occurrence?

(A) Gauze is a poor conductor of heat.
(B) Water is a good conductor of heat.
(C) Water is a poor conductor of heat.
(D) Glass is a good conductor of heat.

26. The energy required to change the state of a substance was determined to be E_h. If the mass of the substance was DOUBLED, the new value of E_h will be

(A) doubled
(B) halved
(C) constant
(D) quadrupled

Item 27 refers to the following diagram which illustrates a longitudinal wave train produced on a slinky.



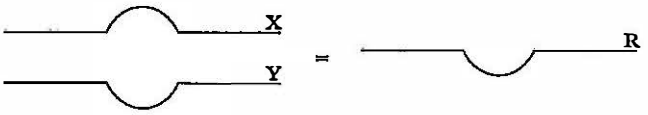
27. Which of the following distances represents the wavelength of the vibration?

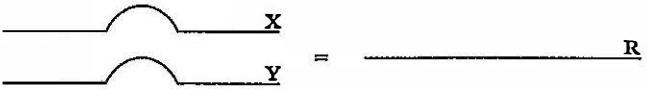
(A) A to B
(B) A to E
(C) C to E
(D) D to E

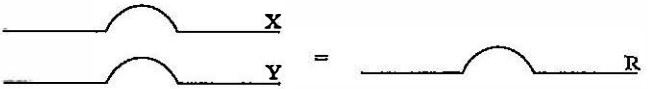
28. Which of the following electromagnetic waves has the SHORTEST wavelength?

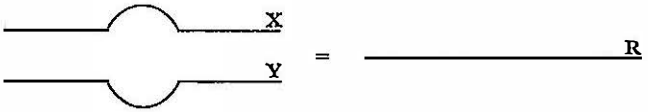
(A) Radio
(B) Infrared
(C) Gamma
(D) Ultraviolet

29. In the following diagrams, X and Y represent two wave pulses superposing on each other to give a resultant R. Which diagram BEST illustrates the principle of superposition?

(A) 

(B) 

(C) 

(D) 

30. If sounds of differing frequencies are played in succession, in which of the following properties would a change be detected?

(A) Pitch
(B) Speed
(C) Loudness
(D) Wavelength

31. The note from a drum is louder when it is struck harder because the sound waves produced have a greater

(A) velocity
(B) amplitude
(C) frequency
(D) wavelength

32. Which of the following are laws of refraction?

I. $\frac{\sin i}{\sin r}$ = constant

II. Angle of incidence = angle of refraction

III. The incident ray, the refracted ray and the normal at the point of incidence all lie in the same plane

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

33. Which of the following equations, regarding units of physical quantities, is NOT correct?

(A) 1 C = 1 A × 1 s
(B) 1 V = 1 A × 1 Ω
(C) 1 J = 1 C × 1 V
(D) 1 W = 1 V × 1 C

34. A ray of light leaves air and enters glass of refractive index 1.6. The angle of refraction is 27°. What is the sine of the angle of incidence?

(A) 1.6 + sin 27°
(B) $\frac{1.6}{\sin 27°}$
(C) 1.6 sin 27°
(D) $\frac{\sin 27°}{1.6}$

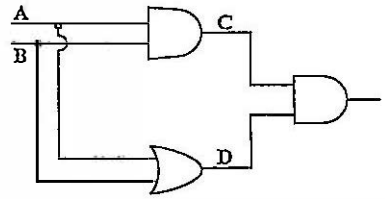
Item 35 refers to the following table which lists the refractive indices of four different materials.

Material	Refractive Index
Air	1.0
Ice	1.3
Perspex	1.5
Diamond	2.4

35. In which material would the light waves have the SLOWEST speed?

(A) Air
(B) Ice
(C) Perspex
(D) Diamond

Item 36 refers to the following diagram.



36. What is the output at **C** and **D** when an input of 0 0 is made at **A** and **B**?

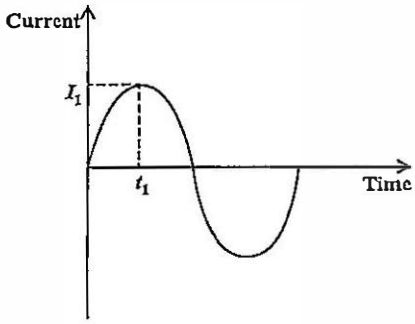
	C	D
(A)	0	0
(B)	1	1
(C)	0	1
(D)	1	0

37. Which of the following combinations of ammeter characteristics is correct?

	Resistance of an Ammeter	Connection of Ammeter to Component
(A)	Low	In series
(B)	High	In series
(C)	Low	In parallel
(D)	High	In parallel

Item 38 refers to the following graph showing the variations of alternating current with time.

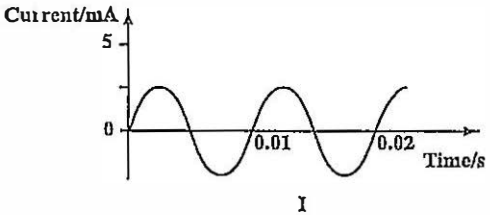
* $V_{rms} = \frac{1}{\sqrt{2}} \times V_{pk}$.



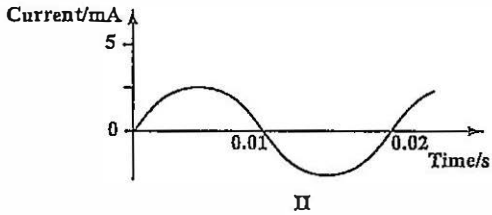
38. The value of the current, I_1, at time, t_1, is called the

(A) root mean square value
(B) sinusoidal value
(C) average value
(D) peak value

Item 39 refers to the following graphs which represent two alternating currents.



I



II

39. Which of the following combinations correctly identifies these currents?

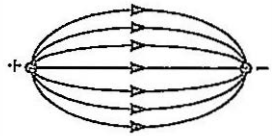
	Current with Greater Frequency	Current with Greater Peak Value
(A)	I	II
(B)	II	Neither
(C)	Neither	I
(D)	I	Neither

40. A glass rod is rubbed with a piece of silk and becomes positively charged. The glass rod became charged by

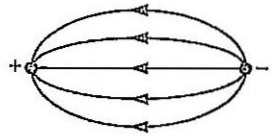
(A) losing protons
(B) losing electrons
(C) gaining protons
(D) gaining electrons

41. Which of the following diagrams represents the electric field existing between two oppositely charged point charges?

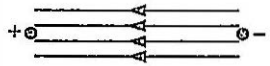
(A)



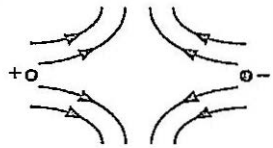
(B)



(C)



(D)



42. A voltmeter has a very high resistance so that it can be placed in

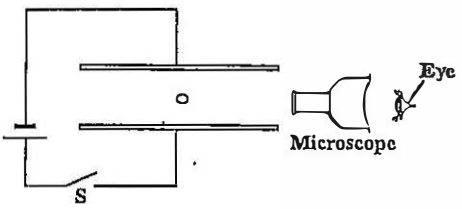
(A) parallel with a component and not affect the circuit
(B) series with a component and not affect the circuit
(C) parallel with a component and the voltmeter does not heat up
(D) series with a component and the voltmeter does not heat up

43. Which of the following statements about insulators are true?

I. All electrons are bound firmly to the atoms in an insulator.
II. In an insulator many electrons can move freely from atom to atom.
III. An insulator could be charged by rubbing.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

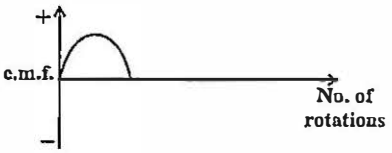
Item 44 refers to the following diagram which shows a small negatively charged dust particle midway between two plates and observed with a microscope.

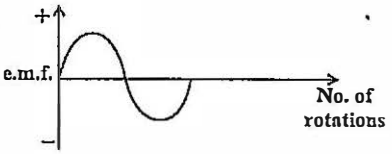


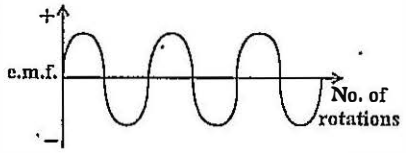
44. Which of the following arrows correctly indicates the direction of the dust particle when the switch, S, is closed?

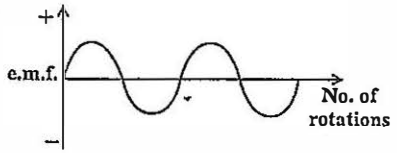
(A) →
(B) ←
(C) ↓
(D) ↑

45. For a simple a.c. generator, which of the following graphs will be produced by two complete rotations of the armature?

(A)


(B)


(C)


(D)


46. Which of the following relationships is correct for the combined resistance, R_T, of resistors R_1, R_2, and R_3 connected in parallel?

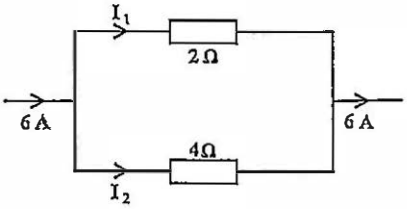
(A) $R_T = R_1 + R_2 + R_3$

(B) $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

(C) $R_T = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

(D) $R_T = \frac{R_1 R_2 R_3}{R_1 + R_2 + R_3}$

Item 47 refers to the following circuit diagram.



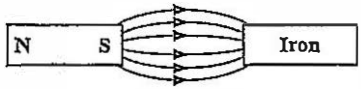
47. Using the information given in the circuit diagram, which pair of values of I_1 and I_2 is correct?

	I_1	I_2
(A)	1	5
(B)	2	4
(C)	3	3
(D)	4	2

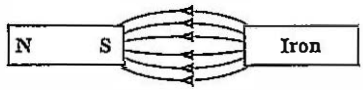
48. When an excessive current passes through a fuse, which of the following is the sequence of events?

(A) Wire gets hot → current is cut off → wire melts
(B) Wire gets hot → wire melts → current is cut off
(C) Wire melts → current is cut off → wire gets hot
(D) Wire melts → wire gets hot → current is cut off

49. Which of the following diagrams shows the magnetic field between a bar magnet and a piece of iron?

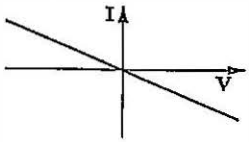
(A) 

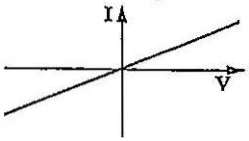
(B) 

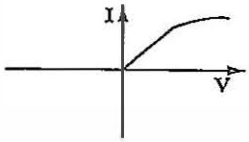
(C) 

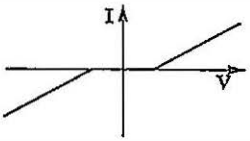
(D) 

50. Which of the following diagrams represents the current/potential difference relationship for a metallic conductor at a constant temperature?

(A)


(B)


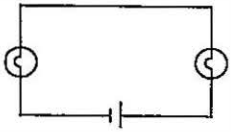
(C)


(D)


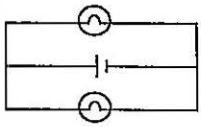
51. A device which converts sound into electricity is called

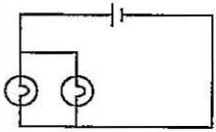
(A) a loudspeaker
(B) a microphone
(C) an amplifier
(D) a motor

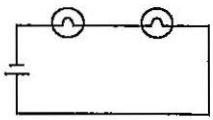
Item 52 refers to the following diagram which shows an electrical circuit with a cell and two filament bulbs.

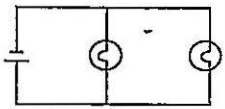


52. Which of the following circuits are electrically the same as the circuit above?

(A)


(B)


(C)


(D)


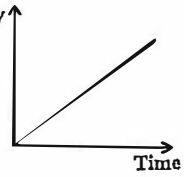
53. Magnetic induction occurs when

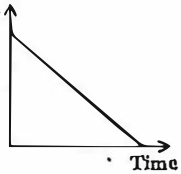
(A) a magnet is suspended and points in the north–south direction
(B) iron nails near a magnet become magnetized
(C) a north pole attracts a south pole
(D) an electroscope is charged

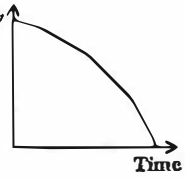
54. Isotopes of an element differ from each other in that they have different

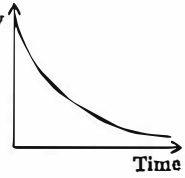
(A) atomic numbers
(B) numbers of protons
(C) numbers of neutrons
(D) numbers of electrons

55. Which of the following graphs shows how the activity of a radioactive source varies with time?

(A)


(B)


(C)


(D)


56. According to the Rutherford–Bohr model of a neutral, stable atom, if

n = number of neutrons,
p = number of protons, and
e = number of electrons in the atom,

then for all elements

(A) $n = e$
(B) $p = e$
(C) $n + e = p$
(D) $n + p = e$

57. Which of the following symbols would be possible for an isotope of a nuclide represented by ${}^{A}_{Z}X$?

(A) ${}^{A-2}_{Z+2}X$
(B) ${}^{A}_{Z-2}X$
(C) ${}^{A-2}_{Z-1}X$
(D) ${}^{A+2}_{Z}X$

58. An isotope of uranium, ${}^{234}_{92}U$, changes to ${}^{230}_{90}Th$. This is an example of

(A) fission
(B) fusion
(C) α decay
(D) β decay

59. Sodium-24 decays into Magnesium-24 with the emission of a ß-particle and can be represented by the following equation.

$$^{24}_{11}Na \rightarrow {}^{24}_{12}Mg + \square$$

Which of the following particles should be placed in the box to complete the equation?

(A) $^{0}_{-1}e$

(B) $^{0}_{1}e$

(C) $^{4}_{1}He$

(D) $^{0}_{-1}He$

60. Which of the following statements about radioisotopes is true?

(A) They are not used in scientific work because they are too dangerous.

(B) They are most frequently used in radio communications.

(C) They are sometimes used in medicine.

(D) They are never found to occur naturally.

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.