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.
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

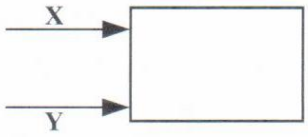
(A) taking more than one reading
(B) placing the eye at a right angle to the mark being read
(C) taking readings from different angles
(D) taking an average of two readings using two separate scales

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

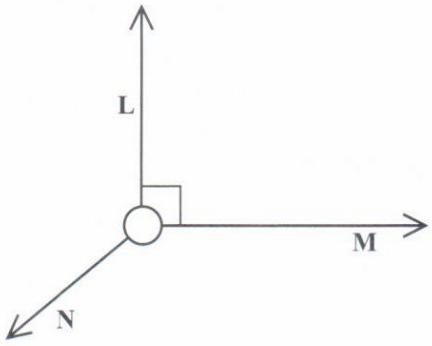
Item 4 refers to the following diagram which shows two forces, X and Y, applied onto an object.



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?

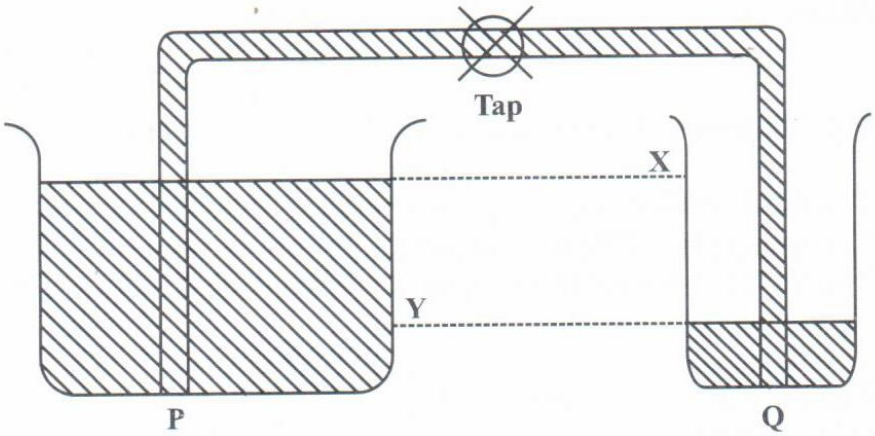
(A) $L^2 = M^2 + N^2$
(B) $N^2 = L^2 + M^2$
(C) $N^2 = L^2 - M^2$
(D) $N = L + M$

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

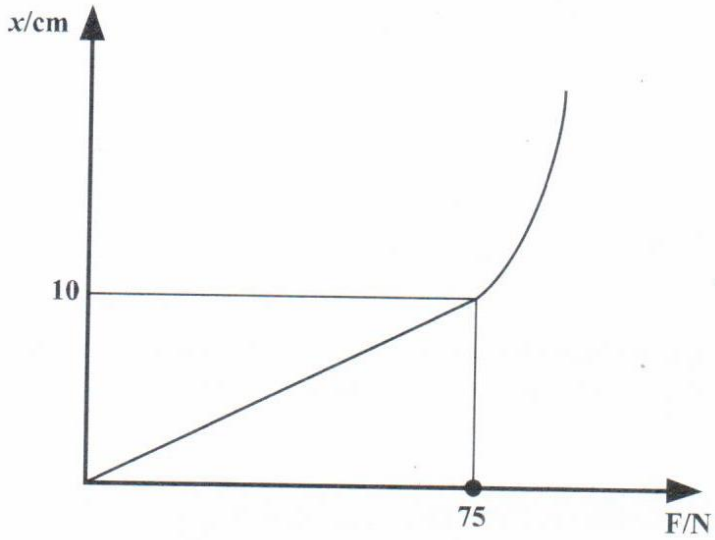
Item 7 refers to the following diagram which shows two different sized containers, P and Q, with water at different levels, connected by a glass tube and controlled by a tap.



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

$$P = \rho gh.$$

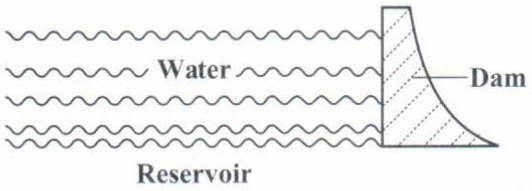
Which of the following sets of units will result in the SI unit of pressure?

	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.



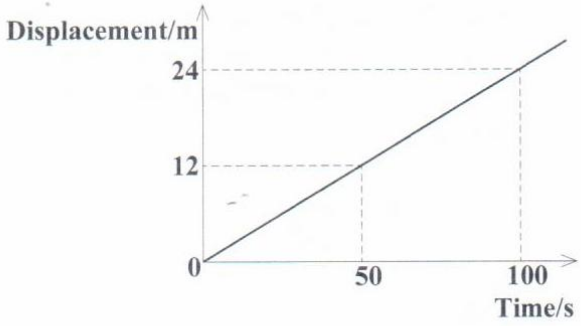
13. The pressure on the dam at the bottom of the reservoir depends on the

(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

GO ON TO THE NEXT PAGE

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.

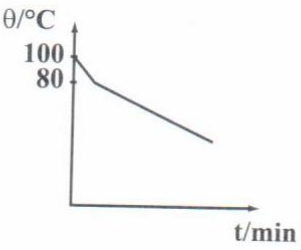
24. Which of the following is the POOREST conductor of thermal energy?

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

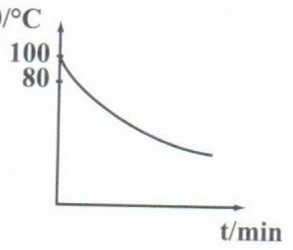
GO ON TO THE NEXT PAGE

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?

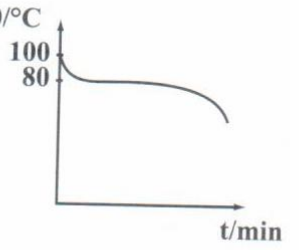
(A)



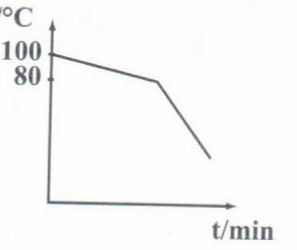
(B)



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

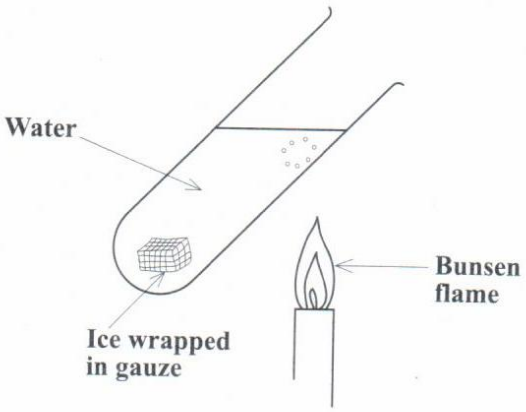
(B) $\frac{360}{393} \times P$

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

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

GO ON TO THE NEXT PAGE

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.

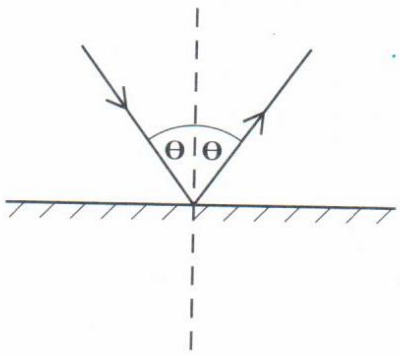


30. Which of the following statements explains the reason for this occurrence?

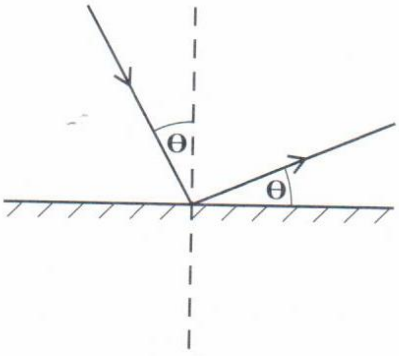
(A) Water is a poor conductor of heat.
(B) Gauze is a poor conductor of heat.
(C) Water is a good conductor of heat.
(D) Glass is a good conductor of heat.

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

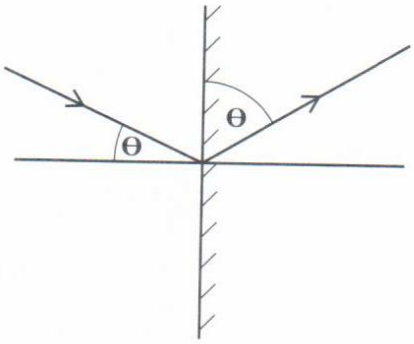
(A)



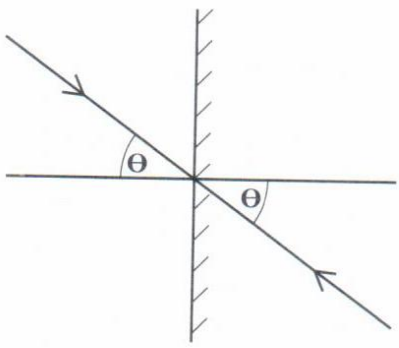
(B)



(C)



(D)



GO ON TO THE NEXT PAGE

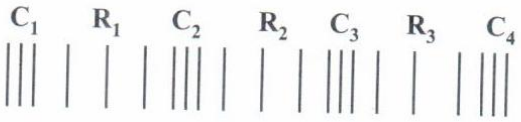
32. The human ear is incapable of hearing a silent dog whistle because

(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) $2\,\lambda$

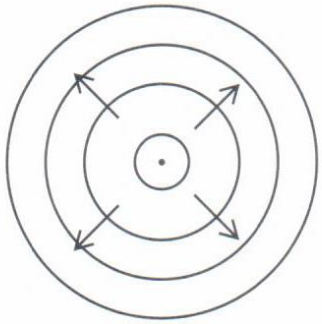
35. A ray of light leaving air enters glass of refractive index 1.6. The angle of refraction is 27°. What is the sine of the angle of incidence?

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

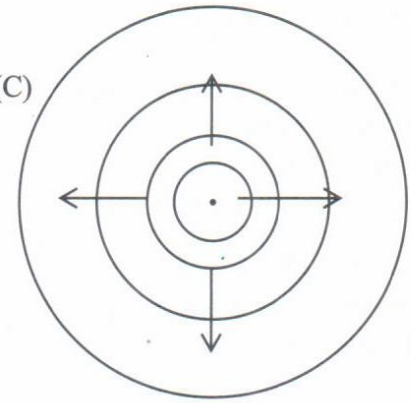
GO ON TO THE NEXT PAGE

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?

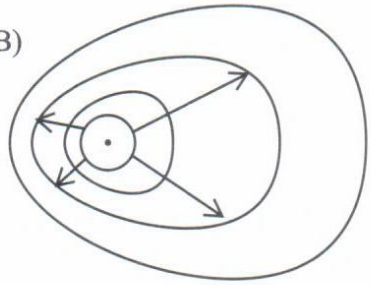
(A)



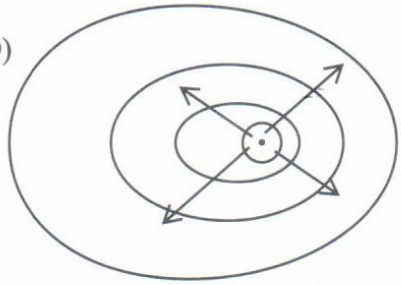
(C)



(B)



(D)



---

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) $\frac{1}{c}$

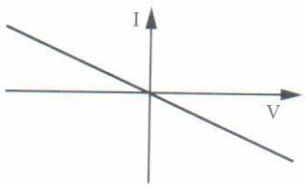
(B) $\frac{90°}{\sin c}$

(C) $\frac{\sin 90°}{\sin c}$

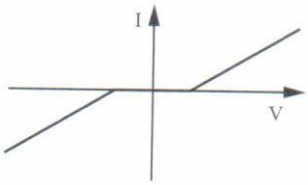
(D) $\sin c$

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

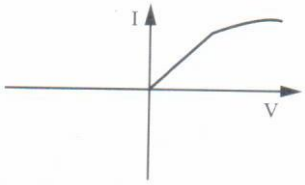
(A)



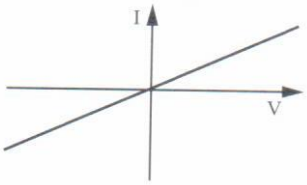
(B)



(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?

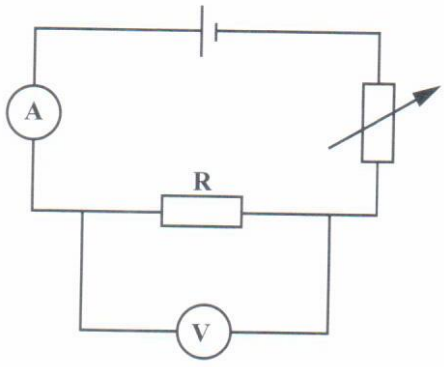
(A) $V = P I$

(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

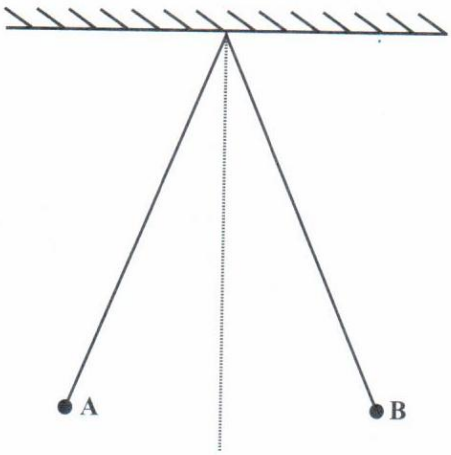
(B) 1.5 Ω

(C) 0.67 Ω

(D) 0.24 Ω

GO ON TO THE NEXT PAGE

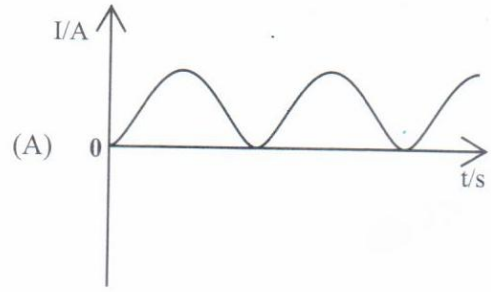
Item **46** refers to the following diagram.

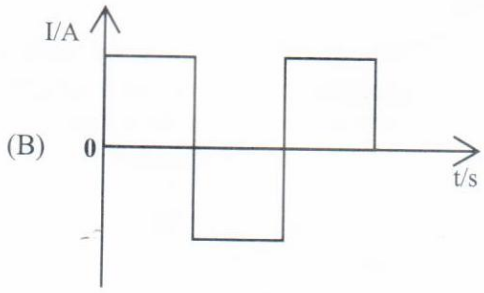


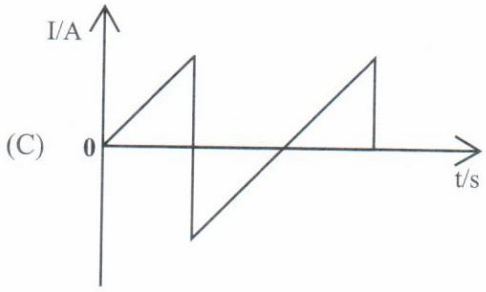
46. Two light aluminium spheres, A and B, are suspended by insulating threads. If they come to rest as shown in the diagram, the force keeping them apart is

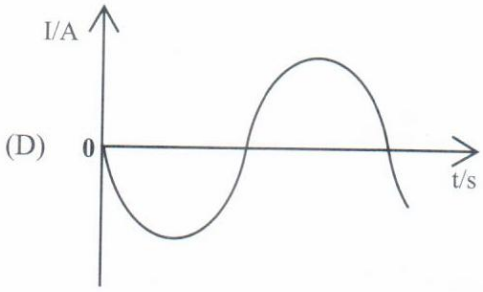
(A) magnetic
(B) centripetal
(C) electrostatic
(D) gravitational

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

(A)


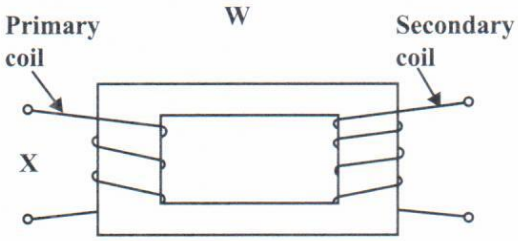
(B)


(C)


(D)


GO ON TO THE NEXT PAGE

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



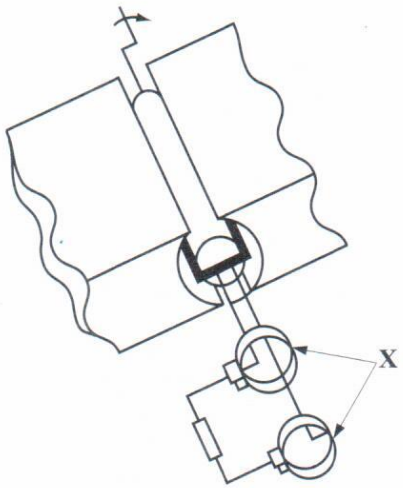
48. Appropriate labels for W and X are

	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.

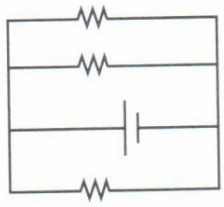


50. The parts labelled X in the diagram are known as the

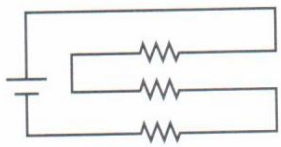
(A) commutators
(B) armatures
(C) slip rings
(D) coils

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

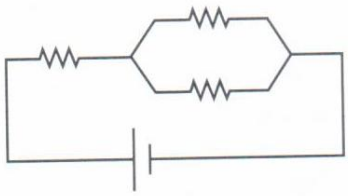
(A)



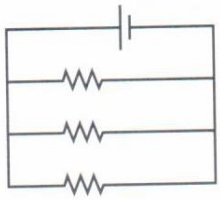
(B)



(C)



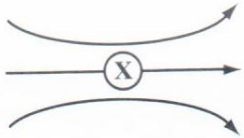
(D)



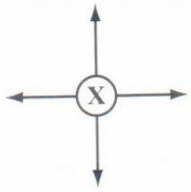
Item **52** refers to the following diagram which represents a straight wire carrying a current into the plane of the paper.

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.