GCE A/L PHYSICS 1992

PAPER I

01. Kilowatt - hour is a unit of
(1) power (2) energy (3) current (4) voltage (5) time

02. Which of the following pairs of physical quantities have the same dimensions ?
(1) Work and power. (2) Stress and strain. (3) Young`s modulus and pressure.
(4) Coefficient of viscosity and surface tension. (5) Force and momentum.

03. If the index of refraction of water is $\frac{4}{3}$ and the velocity of light in air 3×10^8 m s^{-1}, then the velocity of light in water is equal to
(1) 2.25×10^8 m s^{-1} (2) 3×10^8 m s-1 (3) 4×10^8 m s^{-1} (4) 4.25×10^8 m s^{-1} (5) 1.2×10^9 m s^{-1}

04. The image of an object placed in front of a convex mirror is
(1) erect, real with magnification > 1 (2) inverted, real with magnification > 1
(3) erect, virtual with magnification < 1 (4) inverted, virtual with magnification < 1
(5) inverted, real with magnification < 1

05. Once the necessary materials are provided which of the following thermometers is easiest to construct in a laboratory ?
(1) Thermocouple. (2) Alcohol in glass thermometer. (3) Constant pressure gas thermometer
(4) Mercury in glass thermometer. (5) Constant volume gas thermometer.

06. The molecular weights of two ideal gases A and B in a mixture are M_1 and M_2 respectively. The ratio $\frac{\text{r. m. s. speed of gas A}}{\text{r. m. s. speed of gas B}}$ is equal to
(1) $\sqrt{\frac{M_1}{M_2}}$ (2) $\frac{M_1}{M_2}$ (3) $\sqrt{\frac{M_2}{M_1}}$ (4) $\frac{M_2}{M_1}$ (5) $\sqrt{M_1M_2}$

07 An object is projected upwards with a velocity of 100 m s^{-1} from the ground . If the air resistance is neglected it will strike the ground in
(1) 5 s (2) 10 s (3) 15 s (4) 20 s (5) 25 s

08. A rail car of mass 5 M rests on a smooth horizontal track, An engine of mass 3M moving at 8 m s^{-1} collides and couples with the rail car. The speed of the engine after the impact is
(1) 1.6 m s^{-1} (2) 3 m s^{-1} (3) 4.8 m s^{-1} (4) 5 m s^{-1} (5) 8 m s^{-1}

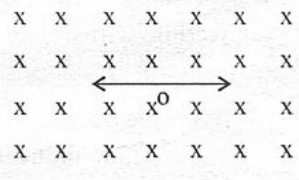
09. The velocity of sound is greatest in
(1) air (2) water. (3) steel (4) aluminium (5) kerosene

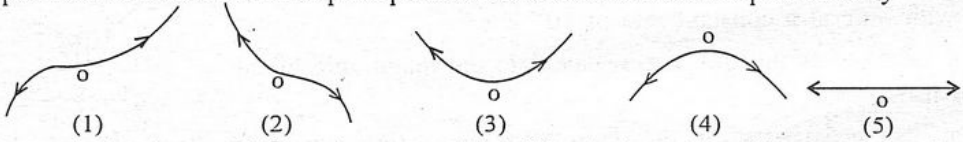
10. The speed of sound in air is 332 ms^{-1} . The frequency of the fundamental note of an open pipe 50 cm long will be
(1) 160 Hz (2) 272 Hz (3) 323 Hz (4) 332 Hz (5) 385 Hz.

11. An electron (charge = - 1.6×10^{-19} C) is accelerated through a potential difference of 10^5 V. The energy acquired by, the electron is
(1) 0.5×10^{-24} J. (2) 1.6×10^{-24} J. (3) 3.2×10^{-24} J (4) 1.6×10^{-14} J. (5) 3.2×10^{-14} J.

12. A body is charged to a value of - 32 C. If the electronic charge is equal to - 1.6×10^{-19} C, then the excess number of electrons existing in the body is
(1) 0 (2) 10^{19} (3) 2×10^{19} (4) 10^{20} (5) 2×10^{20}

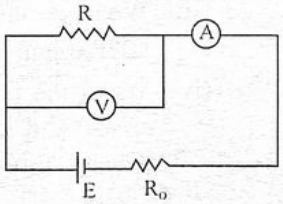
13. A uniform magnctic field is directed vertically into the paper, as shown in the figure. At a point O two electrons are projected horizontally with the same speed but in opposite directions. The subsequent paths of the electrons are best represented by





14. Three equal resistors, 12Ω each are provided. What is the value of the resistance that cannot be obtained from one, or more of them in combination ? (1) 36Ω (2) 24Ω (3) 6Ω (4) 4Ω (5) 2Ω

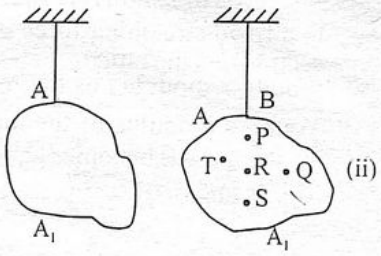
15. A voltmeter of internal resistance R_v and an ammeter of internal resistance R_A are connected to measure a resistance R as shown in the figure.
The ratio of the voltmeter reading V and the current registered by the ammeter *I* gives a resistance R' which is related to R by



(1) $\frac{1}{R'}=\frac{1}{R}-\frac{1}{R_v}-\frac{1}{R_A}$ (2) $\frac{1}{R'}=\frac{1}{R}-\frac{1}{R_v}$ (3) $\frac{1}{R'}=\frac{1}{R}+\frac{1}{R_v}$

(4) $R' = R + R_v + R_A$ (5) $R' = \frac{1}{R_v} + R_A$

16. A thin plate of irregular shape is suspended freely by a cord from a point A as shown in figure (i). Next, the plate is suspended freely from another point B as shown in figure (ii), The centre of gravity of the plate is most likely to be found at



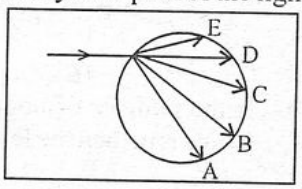
(i) (ii)

(1) P (2) Q (3) R (4) S (5) T

17. Which of the following is not a measurement obtained using one of the laboratory measurig instruments :
Metre ruler, Travelling microscope, vernier callipers, Micrometer screw gauge, Spherometer ?
(1) 3.015 cm (2) 10.122 cm (3) 45.73 cm (4) 72.1 cm (5) 0.027 cm

18. A convex lens is used to form an image of an object on a screen, when the upper half of the lens is painted with an opaque paint, (1) half the image will get less intense (2) upper half of the image will disappear
(3) lower half of the image will disappear (4) intensity of the whole image will decrease
(5) entire image will disappear

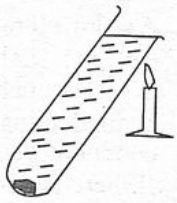
19. The figure shown a ray of light passing through a block of glass having a spherical air cavity. The path of the light ray in the cavity is best represented by the ray



(1) A (2) B (3) C (4) D (5) E

20. A camera is used to take a close-up photograph of a person. If the distance between the lens and the film is 50 mm. the focal length of the lens.
(1) is equal to 50 mm (2) is less than 50 mm
(3) is greater than 50 mm (4) isequal to 100 m
(5) depends upon the size of the lens aperture

21. The figure shows an experimental set-up used to demonstrate the existence of ice at the boffom of a water filled test tube even when water close to the top of the tube is made to boil by means of a burner . which of the following is not a deduction that can be made from this experiment?



(1) In water the predominant method of heat transfer is by convection
(2) water is a poor thermal conductor
(3) Hot water masses always move up in water
(4) In water the heat flow through the conduction process is negligible compared with convection
(5) Hot water molecules move faster than cold water molecules.

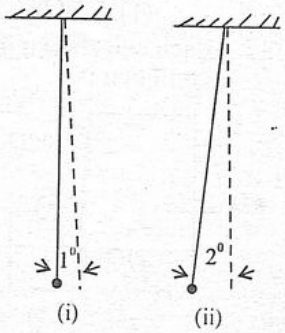
22. Having a large bulb at the end of the stem of a mercury in glass thermometer
(1) will have no advantage. (2) will increase its sensitivity
(3) will increase the useful range of the thermometer.
(4) will decrease the accuracy of the scale reading of the thermometer.
(5) will increase the linearity of the thermometer.

23. An electric kettle of mass 0.6 kg working at a rate of 1.4 kW is used to boil 2 kg of water initially at 30°C. The specific heat capacities of water and the material of the kettle are 4200 J kg^{-1} k^{-1} and 900 J kg^{-1} k^{-1} respectively, The time taken for the process is
(1) 27 s (2) 30 s (3) 420 s (4) 447 s (5) 450 s

24. The statements below refer to a liquid which is being evaporated rapidly. which ofthe following is not correct ?
(1) Molecules move with different speeds in the liquid
(2) Some of the faster molecules leave the liquid surface
(3) Temperature of the liquid depends on the average speed of the molecules
(4) The temperature of the remaining liquid falls
(5) The speeds of all the remaining molecules decrease

25. A block of ice, of constant thickness, floats on sea water with 1 cm appearing above the water level. If the densities of ice and sea water are 920kg m^{-3} and 1030 kg m^{-3} respectively, the total thickness of the ice block is
(1) 10.3 cm (2) 6.2 cm (3) 4.7 cm (4) 2.0 cm (5) 1.0 cm

26. A simple pendulum swings through an angle of 1^0 in one second [figure (i)]. The same pendulum is made to swing through an angle of 2^0 [figure (ii)]. The time taken to swing through the angle of 2^0 is



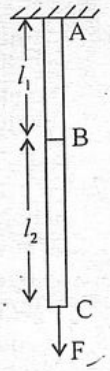
(1) 0.25 s (2) 0.5 s (3) 1 s (4) 1.5 s (5) 2 s

27. An astronaut of mass m is launched from the surface of the moon in a space craft having an initial vertical acceleration of 5g', where g' is the acceleration of free fall in moon.The vertical reaction of the space craft on the astronaut is
(1) zero (2) mg' (3) 4mg' (4) 5mg'
(5) 6mg'

28. A rod AB of length l_1 is connected to another rod BC of length l_2 and the combined rod is subjected to a fixed stretching force of F as shown in the figure. If both rods have identical areas of cross-section and the ratio

$$\frac{\text{young's modulus of the material of the rod AB}}{\text{Young's modulus of the material of the rod BC}} = \frac{2}{3}$$

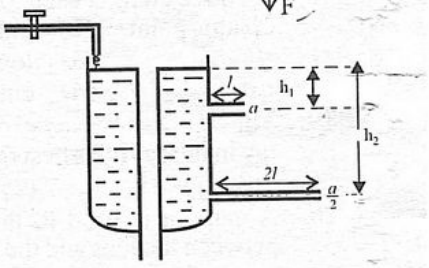
. the extension produced by the rod AB becomes equal to that produced by BC when



(1) $l_1 = \frac{Fl_2}{3}$ (2) $l_1 = \frac{2}{3} l_2$ (3) $l_1 = \frac{3}{2} Fl_2$

(4) $l_1 = \frac{5}{2} l_2$ (5) $l_1 = \frac{3}{5} l_2$

29. In the apparatus shown water flows at the same rate through two narrow tubes of lengths l, $2l$ and radii a, $\frac{a}{2}$ respectively. If the tubes areat depths h_1 and h_2 below the surface of water, then the ratio h_1/h_2 will be



(1) $\frac{1}{2}$ (2) $\frac{1}{4}$ (3) $\frac{1}{8}$

(4) $\frac{1}{16}$ (5) $\frac{1}{32}$

30. If the number of nodes produced in a stretched string connected to two fixed points is n, then the length of the wire in terms of the wavelength λ is

(1) $\frac{n\lambda}{2}$ (2) $\frac{\lambda}{2n}$ (3) $(n+1)\frac{\lambda}{2}$ (4) $(n-1)\frac{\lambda}{2}$ (5) $\frac{\lambda}{2(n-1)}$

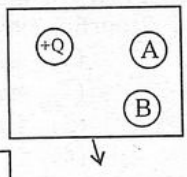
31. A string vibrates with a fundamental frequency. The fundamental frequency could be doubled by,

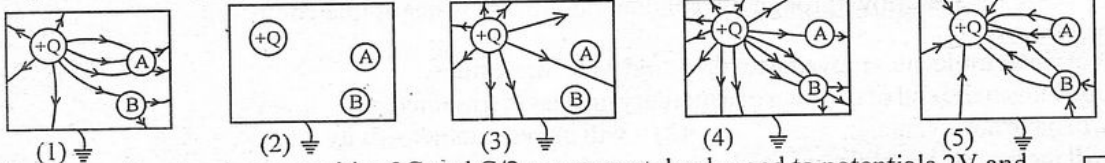
(1) halving the tension (2) doubling the tension (3) doubling the length

(4) halving the length (5) doubling the diameter of the wire

32. A conducting sphere carrying a charge + Q is placed together with two other uncharged conducting spheres A and B in an earthed metallic box as shown in the figure.

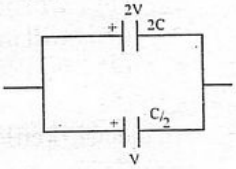
If there is no electrical contact among the spheres and the box, which of the following diagrams correctly represents the electric field around spheres?





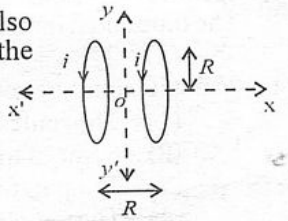
(1) (2) (3) (4) (5)

33. Two capacitors having capacities 2C and C/2 are separately charged to potentials 2V and V respectively. If they are isolated from the charging source and then connected in parallel as shown in the figure. the resultant potential of the capacitor combination will be



(1) V (2) $\frac{3}{2}$ V (3) $\frac{9}{5}$ V (4) 2V (4) $\frac{5}{2}$ V

34. Two identical conducting circular loops are arranged a distance R a part which is also equal to their radius R, as shown in the figure. current i flows through the loops along the directions indicated. the magnetic flux density at the mid point O between the loops



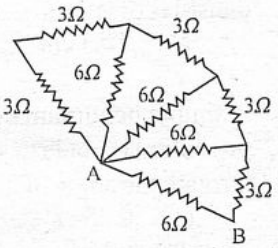
(1) is directed along $\overrightarrow{OX}$ (2) is directed along $\overrightarrow{OX'}$

(3) is directed along $\overrightarrow{OY}$ (4) is directed along $\overrightarrow{OY'}$ (5) is zero

35. A 12 V battery promises to deliver 1 A for 100 hours. If the entire energy of the battery can be utilised in lifting objects, this energy is sufficient to raise a 1200 kg object to a maximum height of

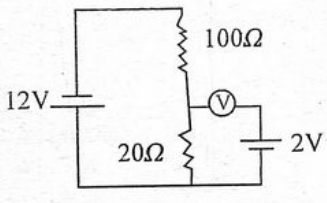
(1) 0.12 m (2) 1.2 m (3) 14.4 m (4) 144m (5) 360 m

36. The effective resistance between the points A and B of the network shown is



(1) 1 Ω (2) 2 Ω (3) 3 Ω (4) 4 Ω (5) 6 Ω

37. Each cell shown in the circuit has negligible internal resistance. The reading of the voltmeter is

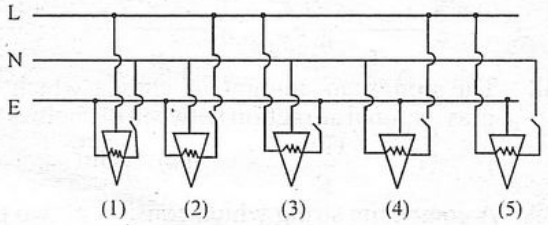


(1) 0 V (2) 2 V (3) 4 V

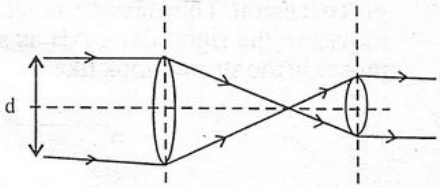
(4) 6 V (5) 10 V

38. Two electric bulbs when connected separately to a 120V power supply draw currents of 0.83 A and 1.66 A respectively. If these two bulbs were connected in series across a 240 V power supply. current through the bulbs would be
    (1) 1.66 A through the first bulb and 3.32 A through the second bulb.
    (2) 0.83 A throuhg the first bulb and 1.66 A through the second bulb.
    (3) 0.83 A through both bulbs. (4) 1.66 A through both bulbs.
    (5) 1.11 A through both bulbs.

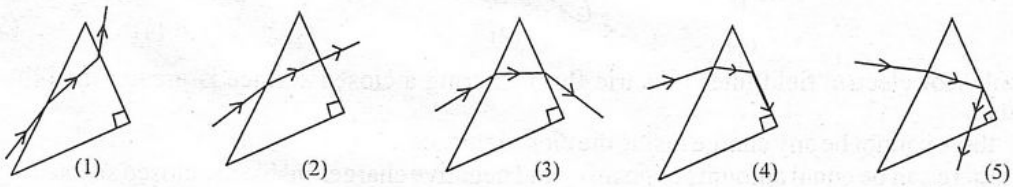
39. Which of the electric irons shown below is correctly connected to a power line ? Each iron is represented by a heating coil and a metal casing.



40. An astronomical telescope is adjusted to view a distant object. The incident rays fill the objective lens whose diameter is d. as shown in the figure. If the angular magnification of the telescope is m, the diameter of the emergent beam is
    (1) dm (2) $\frac{d}{m}$ (3) $\frac{m}{d}$
    (4) $\frac{d}{2m}$ (5) $\frac{2d}{m}$



41. which of the following diagrams shows a ray of light passing through a prism with minimum deviation ?

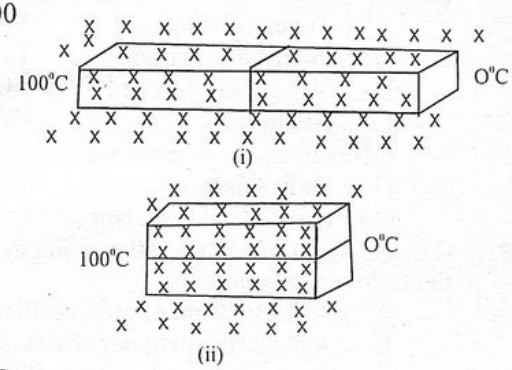


42. A person suffering from vision defect / defects sees more clearly under water He is suffering from
    (1) short sight (2) long sight (3) astigmatism
    (4) colour blindness (5) both long sight and astigmatism

43. A spiral spring of length L, number of turns n and coil diameter d is heated from temperature θ_1 to θ_2. If the linear expansivity of the material of the spring is α, the increase in length of the spring will be
    (1) $L[1+\pi dn\alpha(\theta_2-\theta_1)]$ (2) $La(\theta_2-\theta_1)$ (3) $\pi dn\alpha(\theta_2-\theta_1)$
    (4) $L[1+\alpha(\theta_2-\theta_1)]$ (5) $2\pi dn\alpha(\theta_2-\theta_1)$

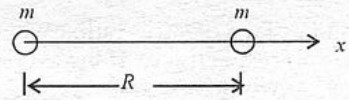
44. A closed container of volume V contains an ideal gas at pressure P_1. when a certain amount of the gas is now removed from this container its pressure becomes P_2. the percentage reduction of the mass of the gas in the container is
    (1) $\frac{P_2}{P_1} \times 100$ (2) $\frac{P_2}{P_1+P_2} \times 100$ (3) $\frac{P_1}{P_1+P_2} \times 100$
    (4) $\frac{P_1P_2}{P_1+P_2} \times 100$ (5) $\frac{P_1-P_2}{P_1} \times 100$

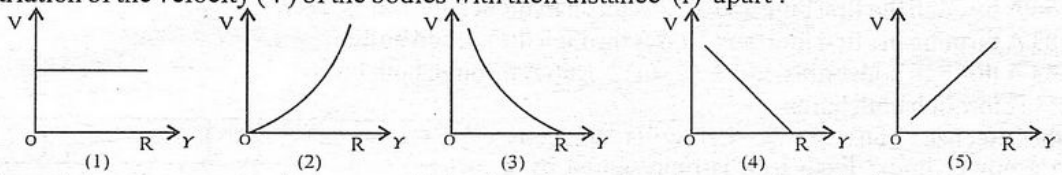
45. Two well lagged identical rectangular metal beams are connected end to end as shown in figure (1). At steady state when a temperature difference of 100^0C is maintained across the ends, 10 J of heat is found to flow through the beams in 2 minutes. If one beam is now placed on top of the other, with faces lagged as in figure (11), the time taken by the same amount of heat to flow through the beams when the same temperature difference is maintained at the open ends is
    (1) 0.25 min (2) 0.5 min (3) 1 min
    (4) 1.5 min (5) 2 min



46. consider the following statements made about the motion of a particle.
    A. velocity of a particle cannot be reversed without changing the direction of its acceleration.
    B. when a particle is projected verticaly downwards with a very large initial velocity its acceleration will exceed the acceleration due to gravity.
    C. when the acceleration of a particle is zero it must necessarily be at rest.
    Of the above statements
    (1) Only A and B are true. (2) Only B and C are true. (3) Only A and C are true.
    (4) all A, B and C are true. (5) all A, B and C are false.

47. Two identical bodies each of mass m kept at a distance R apart on the x axis. as shown in the figure, are released from rest, If the influencesof other bodies on these masses are negligible which of the following graphs best represents the variation of the velocity (V) of the bodies with their distance (r) apart?



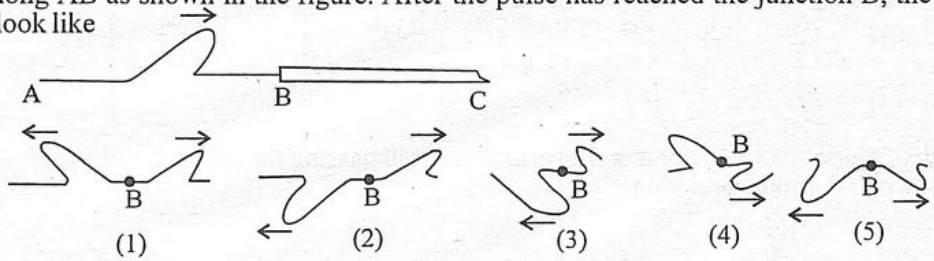


(1) (2) (3) (4) (5)

48. The minimum amount of charge which should be placed on each body in order to counter balance the gravitational attraction between the bobies mentioned in question 47 above is

(1) $\frac{Gm}{R}$ (2) $\sqrt{Gm}$ (3) $m\sqrt{\pi G}$ (4) $2m\sqrt{\pi G\epsilon_0}$ (5) $2mR\pi\epsilon_0$

49. A composite string which consists of two parts AB and BC with different mass per unit length is stretched to a given tension. The mass per unit length of AB is much smaller than that of BC. A pulse is set up in the string and it moves to the right along AB as shown in the figure. After the pulse has reached the junction B, the resulting pulses in the strines look like

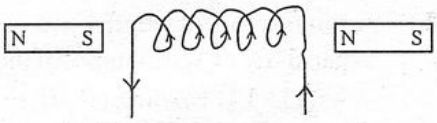


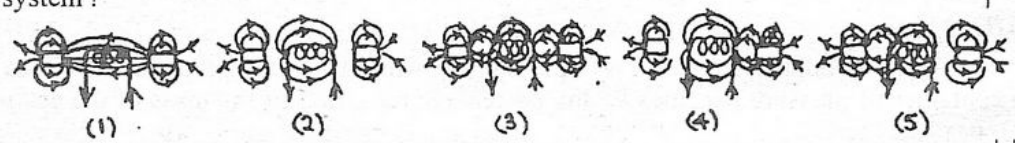
(1) (2) (3) (4) (5)

50. If the number of electric field lines (electric flux) entering a closed surface is greater than the number (flux) leaving, then

(1) there cannot be any charge inside the closed surface
(2) there can be equal amounts of positive and negative charges inside the closed surface
(3) there can be more negative charges than positive charges inside the closed surface
(4) there can be Only positive charges inside the closed surface
(5) there can be Only negative charges inside the closed surface.

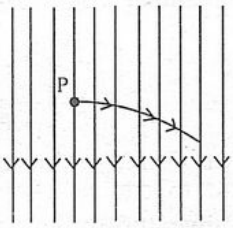
51. Two bar magnets and a current carrying coil are arranged as shown in the diagram.
which of the diagrams best represents the magnetic field pattern of the system?





(1) (2) (3) (4) (5)

52. A particle P moves in a uniform field on the plane of the paper as shown in the diagram, which of the following combinations of the " type of particle" and the "field" will give rise to the above motion?



	Type of particle	Field
A.	Positively charged	Electric
B.	Negatively charged	Magnetic
C.	Uncharged	Gravitational

Of the above combinations

(1) Only A is true. (2) Only B is true. (3) Only C is true.
(4) Only A and B are true. (5) Only A and C are true.

53. A dense beam of protons all moving in the same direction has a tendency to spread out as it advances, Consider the following statements.

A. A dense beam of protons all moving in the same direction will have a tendency to shrink.
B. A dense beam of negative ions all moving in the same direction will have a tendency to spread out.
C. Two overlapping dense beams of protons and electrons of equal densities moving in opposite directions will have a tendency to shrink.

Of the above statements

(1) Only A is true. (2) Only B is true. (3) Only C is true.
(4) Only B and C are true. (5) all A, B and C are true.

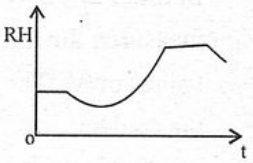
54. A parallel plate capacitor is connected to a battery. A dielectric slab is then inserted to fill the gap between the plates of the capacitor while the battery remained connected. If the quantities charge, potential difference, electric field intensity and energy associated with the capacitor before and after inserting the dielectric slab are givin by $Q_0\ V_0 E_0 U_0$ and V, E, U respcctively then

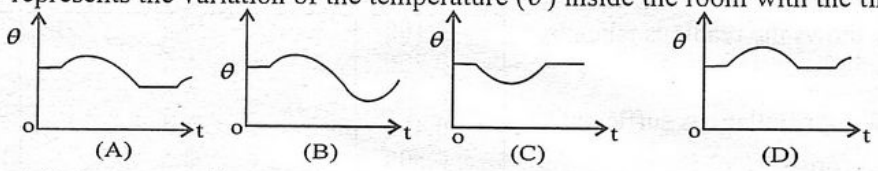
(1) $Q=Q_0, V>V_0, E>E_0, U>U_0$ (2) $Q=Q_0, V=V_0, E<E_0, U<U_0$ (3) $Q>Q_0, V=V_0, E>E_0, U=U_0$
(4) $Q<Q_0, V<V_0, E=E_0, U>U_0$ (5) $Q>Q_0, V=V_0. E<E_0, U>U_0$

55. On the earth the rise of a liquid in a capillary tube is observed to be h above the liquid level in a container. when this arrangement is transported to a planet, where the acceleration due to gravity at the surface is two thirds of the value on the earth and the atmospheric pressure is half that on the earth, the expected height of the liquid column is

(1) $\frac{1}{3}$ h (2) $\frac{1}{2}$ h (3) $\frac{2}{3}$ h (4) h (5) 3h

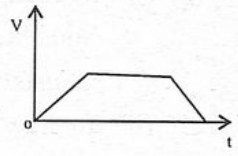
56. The graph shown represents the variation of the relative humidity (RH) of a closed room with time (t) of the day due to the change in temperature. which of the following graphs correctly represents the variation of the temperature (θ) inside the room with the time (t)?

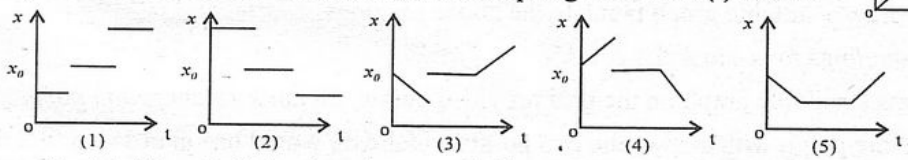




(1) A Only (2) B Only (3) C Only (4) D Only (5) A and B Only

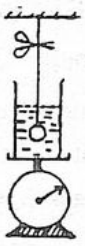
57. When a mass is suspended vertically by a light spring from the ceiling of a stationary lift, the extension of the spring is found to be x_0. If the lift is then set in motion inthe vertically downward direction so that its velocity (V) vaties with time (t) according to the graph shown in the figure, the variation of the extension (x) of the spring with time (t) is best represented by



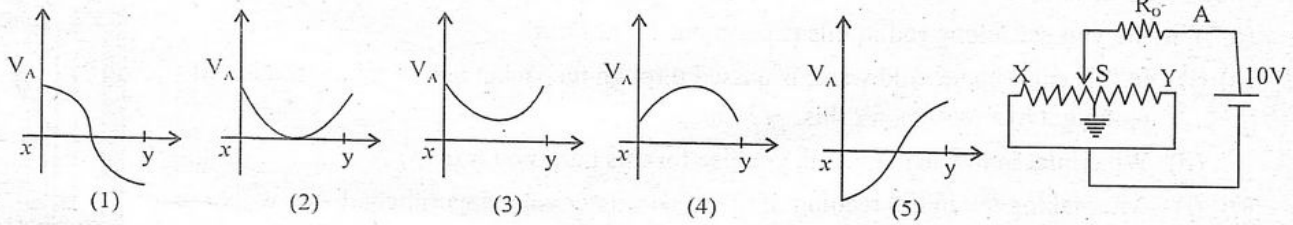


58. A vessel containing a liquid of density P_1 is placed on a welghing scale as shown in the figure, and a piece of metal of mass m and density P_2 held by a string is immersed in the liquid without touching the sides or the bottom of the vessel. Now if the string is cut the reading ofthe scale will be

(1) $mg\left(1+\frac{P_1}{P_2}\right)$ (2) $mg\left(1-\frac{P_1}{P_2}\right)$ (3) $mg\left(1+\frac{P_2}{P_1}\right)$
(4) $mg\left(1-\frac{P_2}{P_1}\right)$ (5) mg



59. In the circuit shown XY is a rheostat whose centre is earthed. when the slider S is moved through the entire length of the resistor from X to Y, which of the following will best represent the variation of the potential (V_A) at A with respect to the earth ?



60. A semicircular conducting wire in the form of a loop OABDO is free to rotate around as axis passing through the centre O and perpendicular to the paper. As shown in the figure a uniform magnetic field is directed into the paper in the region above the line POQ. when the loop of the wire retates around O in the anticlockwise direction with a constant rate, the e.m.f. (E) induced in the loop varies with time (t) as in

