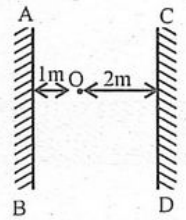
GCE A/L PHYSICS 1995

PAPER I

1. The constant called 'the faraday ' appears in electrolysis is equal to
   (1) 96496 s. (2) 96496 Ω (3) 96496 J. (4) 96496 A. (5) 96496 C.
2. The optical element that can be used to form an image that is free of chromatic aberration is a
   (1) Prism. (2) glass sphere. (3) concave lens. (4) convex lens. (5) concave mirror.
3. Which one of the following summarizes the changes occur when visible light passes from air into glass ?

	frequency	speed	wavelength
(1)	no change	no change	no change
(2)	changes	changes	no change
(3)	changes	changes	changes
(4)	changes	no change	no change
(5)	no change	changes	changes

4. Neon and Helium behave as ideal gases. The ratio of the kinetic energy of Neon and Helium atoms at the same temperature is
   (1) $\frac{1}{5}$ (2) $\frac{1}{2}$ (3) 1. (4) 2. (5) 5.
5. Which of the following method / instrument **cannot** be used to measure small changes of the order of a millimetre occurring in a length of about 50 cm ?
   (1) Spherometer (2) travelling microscope (3) micrometer screw guage
   (4) lever method (5) metre ruler
6. Which of the following combinations of units is equivalent to the tesla ?
   (1) $\frac{m}{C\,s}$ (2) $\frac{Ns}{C}$ (3) $\frac{N}{C\,m}$ (4) $\frac{Ns}{C\,m}$ (5) $\frac{Ns}{m}$
7. In the equation given below V is the velocity, g is the acceleration due to gravity, Y is the surface tension and ρ is the density.
   $$V^2 = \frac{gA}{2\pi} + \frac{2\pi Y}{\rho A}$$
   A has the dimensions
   (1) L. (2) LT. (3) LT^{-1}. (4) LT^{-2}. (5) L^2.
8. Which one of the following statements is true for electromagnetic waves but not for other transverse waves ?
   (1) They obey the principle of conservation of energy. (2) They obey the principle of superposition.
   (3) They travel at a finite speed. (4) They travel in a vacuum.
   (5) They can be reflected.
9. A lens of a certain camera has a focal length of 54 mm and a f-number of 1.8. The diameter of the lens is
   (1) $\frac{1.8}{54}$ mm. (2) $\frac{1.8}{35}$ mm. (3) $\frac{35}{1.8}$ mm. (4) 30 mm (5) 1.8 x 54 mm.
10. If a real image if formed by a plane mirror. Which of the following statements is correct ?
    (1) Light striking the mirror is parallel. (2) Light striking the mirror is diverging.
    (3) Light striking the mirror is converging. (4) The object is placed at infinity.
    (5) Light leaving the mirror is diverging.
11. 

    O is a point object placed between two parallel plane mirrors as shown in the figure. The distance between the two images nearest to each other which are seen in the mirror AB is
    (1) 1 m. (2) 2 m. (3) 3 m. (4) 4 m. (5) 5 m.
12. A certain person can see objects clearly, only when they lie between 0.75 m and 1.8 m from his eyes. To see distant objects clearly,which of the following lenses are most suitable for him ?
    (1) Concave lenses of focal length 0.75 m. (2) Convex lenses of focal length 0.75 m.
    (3) Convex lenses of focal length 1.8 m. (4) Concave lenses of focal length 1.8 m.
    (5) Concave lenses of focal length 1.275 m.

13. When 10 g of water at 100 ^{0}C is added to a certain amount of water at 30^{0}C the final temperature of the mixture is found to be 40 ^{0}C. Instead of 10 g if 20 g of water at 100 ^{0}C is added, the final temperature of the mixture will become (neglect the heat capacity of the container and heat losses to the surroundings)
(1) 45^{0}C. (2) 47.5 ^{0}C. (3) 50 ^{0}C. (4) 52.5 ^{0}C. (5) 55 ^{0}C.

14. Which of the following statements regarding thermal radiation is not correct ?
(1) Thermal radiation is electromagnetic in nature.
(2) An object which is a good absorber of radiation is also a good radiator.
(3) Radiation losses in thermos flasks are reduced by silvering the walls of the glass.
(4) Heat cannot be transferred from one place to another through radiation only.
(5) White clothes are recommended for hot sunny places, because they do not absorb thermal radiation very much.

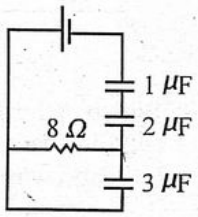
15. A bird flyig at a hight of 40 m with a speed of 10 ms^{-1} drops a small fruit from its mouth. If free fall is assumed the speed of the fruit just before it reaches theground is
(1) 10 ms^{-1}. (2) 15 ms^{-1}. (3) 20 $\sqrt{2}$ ms^{-1}. (4) 25 ms^{-1}. (5) 30 ms^{-1}.

16. Two spring scales of negligible mass are connected together and a 10 kg mass is hung as shown in the figure. which of the following statements is true ?
(1) Each scale will read 5 kg. (2) Each scale will read 10 kg.
(3) The bottom scale will read 10 kg and the top one will read zero.
(4) The top scale will read 10 kg and the bottom one will read zero.
(5) Each scale will show a reading between zero and 10 kg such that the sum of the two readings is 10 kg.

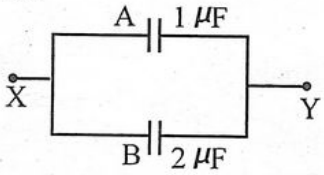
17. If two objects collide in the absence of external forces, which one of the following statements is always true ?
(1) The momentum of each object remains unchanged.
(2) The kinetic energy of each object remains unchanged.
(3) The total kinetic energy of objects remains unchanged.
(4) The total momentum of objects remains unchanged.
(5) Direction of motion of each object remains unchanged.

18. Which of thefollowing statements regarding the rate of flow of a viscous liquid flowing steadily through a narrow trbe is not correct ?
(1) The rate of flow is directly proportional to the pressure difference between the ends of the tube.
(2) The rate of flow is directly propotional to the fourth power of the diameter of the tube.
(3) The rate of flow is inversely proportional to the coefficient of viscosity of the liquid.
(4) The rate of flow is inversely proportional to the length of the tube.
(5) The rate of flow is independent of the pressure gradient across the tube.

19. A battery is conneted to three capacitors and a resistor as shown in the circuit diagram. If the voltage across the 2μ F capacitor is 3 V, the e.m.f of the battery is
(1) 11 V. (2) 9 V. (3) 6 V. (4) 4.5 V. (5) 3 V.

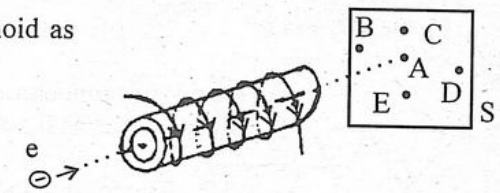


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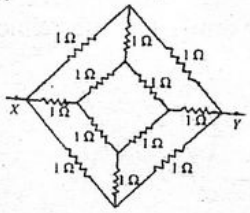


Two capacitors A and B of capacitances 1μ F and 2μ F are separately charged to potentials 10 V 5V respectively. The oppositely charged plates are then connected together as shown in the figure. The potential difference between X and Y is
(1) 15 V. (2) $\frac{20}{3}$ V. (3) 5 V. (4) $\frac{10}{3}$ V. (5) 0.

21. An electon is fired along the axis of a current carrying long solenoid as shown in the figure. It will strike the fluroscent screen S at the point.
(1) A. (2) B. (3) C.
(4) D. (5) E.



22.



Twelve resistors of 1 Ω each are connected as shown in the figure. The equivalent resistance across XY is
(1) $\frac{2}{3}$ Ω (2) $\frac{3}{4}$ Ω (3) 1 Ω
(4) $\frac{4}{3}$ Ω (5) $\frac{3}{2}$ Ω

23. Two planets X and Y have masses M_x and M_y and R_x and R_y respectively. If the accelerations due to gravity on the surface of the two planets are the same, then the ratio of $\frac{M_x R_y^2}{M_y R_x^2}$ is

(1) 2. (2) 1. (3) $\frac{1}{2}$ (4) $\frac{1}{4}$ (5) $\frac{1}{8}$

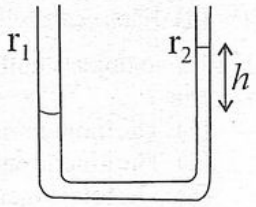
24. A galvanometer that reads 1 mA for a full scale deflection, has a resistance of 75 Ω. The galvanometer can be used to measure currents upto 1 A by connecting a 0.0751 Ω resistor in a suitable manner. The value of effective resistance of the ammeter thus produced is approximately.

(1) 75 Ω. (2) 75.075 Ω. (3) 0.075 Ω. (4) 69.925 Ω. (5) 0.75 Ω.

25. A positively charged small sphere is brought down into an uncharged tall metallic container placed on an insulating surface. The sphere is allowed to touch the botteom of the container and then removed without touching it again. Which of the following statements is true ?

(1) The container is positively charged on the outside and negatively charged on the inside.
(2) The charge is equally devided between the sphere and the container.
(3) The sphere will have a negative charge. (4) The sphere retains all of its positive charge.
(5) The sphere retains no charge.

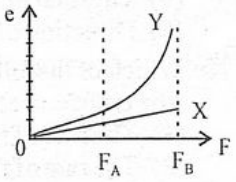
26. A U tube whose limbs are made of two capillary tubes having internal radii r_1 and r_2 ($r_1 > r_2$) is kept vertical and is filled with water as shown in the figure. If ρ is the density and Y is the surface tension of water, the difference in water levels h is given by

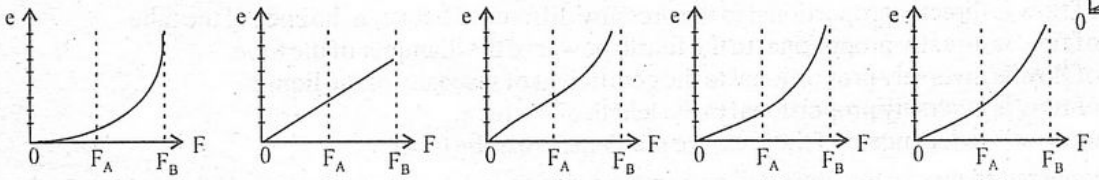


(1) $\frac{2Y}{\rho g}(r_1 - r_2)$ (2) $\frac{2Y}{\rho g}\left(\frac{1}{r_1} - \frac{1}{r_2}\right)$ (3) $\frac{2Y}{\rho g}\left(\frac{1}{r_2} - \frac{1}{r_1}\right)$

(4) $\frac{2Y}{\rho g}\left(\frac{1}{r_1 - r_2}\right)$ (5) $\frac{2Y}{\rho g}\left(\frac{r_1 - r_2}{r_1 + r_2}\right)$

27. Figure shows the variations of extensions e of two wires X and Y with the applied force F. If one end of X is connected to one end of Y to form a long single wire, the variation of e with F for the composite wire is best represented by





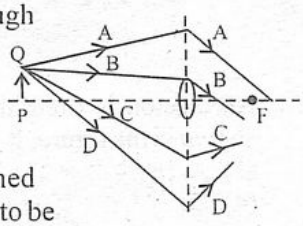
(1) (2) (3) (4) (5)

28. Which of the following items has/have to be replaced when converting a 5 A wall plug point to a 15 A point ?

(A) Plug base (B) live and neutral wires
(C) earth wire (D) relevant fuse

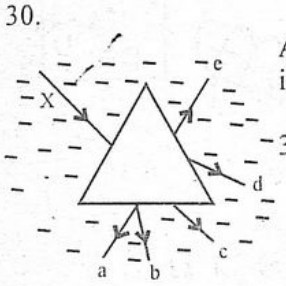
(1) (A) only. (2) (A) and (D) only. (3) (B) and (D) only.
(4) (A), (B),and (D) only. (5) All (A), (B), (C) and (D).

29. An object PQ is situated in front of a thin convex lens and figure shows four rays of light drawn by a student, starting from the point Q. Of the rays indicated which will pass through the image of the point Q ?



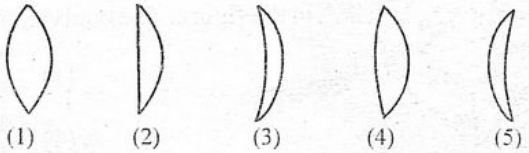
(1) Only A. (2) Only C.
(3) Only A and B. (4) Only A and C. (5) Only B and C.

30. A ray of monochromatic light X is incident on an air prism formed inside water, as shown in the figure, The emerging ray is most likely to be



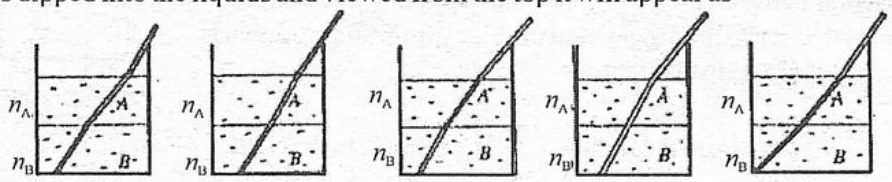
(1) a. (2) b. (3) c. (4) d. (5) e.

31. The following lenses are made of same naterial and their radii are drawn to scale, Which one has the shortest focal length ?



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

32. A beaker contains two immiscible transparent liquids A and B of different refractive indices n_A and n_B ($n_A > n_B$.) If a rod is dipped into the liquids and viewed from the top it will appear as

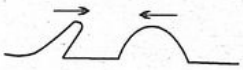


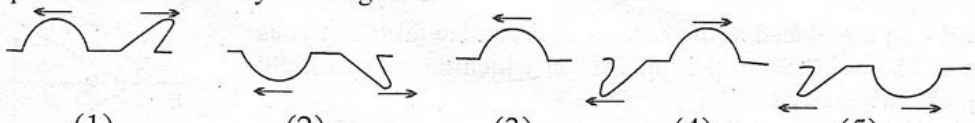
(1) (2) (3) (4) (5)

33. An aluminium plate 80 mm x 20 mm contains a rectangular hole with dimensions 20 mm x 5 mm. When the plate is heated uniformly its length increases by 0.002 %. The length of the hole
(1) increases by 4.0×10^{-4} mm. (2) decreases by 4.0×10^{-4} mm.
(3) increases by 1.2×10^{-4} mm. (4) decreases by 1.2×10^{-4} mm.
(5) remains the same.

34. 1 kg of water contained in a metal container of negligible heat capacity is heated with a 1 kW immersion heater, If the temperature rises from 25 ^{0}C to 45 ^{0}C in 100 s. what is the average rate of heat loss to the surroundings from the container during this time ? (Specific heat capacity of water is 4.2×10^3 Jkg^{-1} K^{-1}).
(1) 40 W. (2) 80 W. (3) 160 W. (4) 320 W. (5) 640 W.

35. Figure shows, two wave pulses travelling in opposite directions along a stretched string. Which of the following diagrams best represents the shape of th pulse/pulses in the subsequent motion after they meet together.



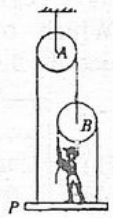


(1) (2) (3) (4) (5)

36. A violin string of length 0.04 m is tuned to a fundamental frequency of 480 Hz, By how much the string must be shortend to raise the fundamental frequency to 600 Hz ?
(1) 10 cm. (2) 8 cm. (3) 6 cm. (4) 4 cm. (5) 2 cm.

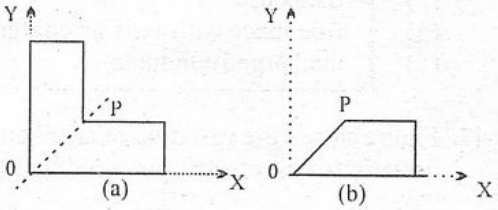
37 A system of coplanar forces acts on a rigid body. If the resultant of moments of forces about a certain point on the body is zero. consider the following statements.
(A) The resultant of the moments of forces about any other point on the body is always zero.
(B) The body must be in equilibium.
(C) The resultant force acting on the body must be zero.
Of the above statements
(1) all A, B and C and false. (2) only A is true. (3) only B is true.
(4) only C is true. (5) only A and B are true.

38. A man of weight 500 N standing on a platform P, supported by two light strings passing over two light smooth pullyes A and B supports himself by pulling the string as shown in the figure. If the weight of the platform is 1000 N, the force exerted by the man on the string to keep the platform stationary is



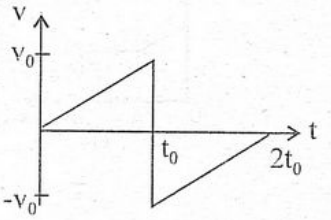
(1) 1000 N. (2) 800 N. (3) 500 N.
(4) 400 N. (5) 200 N.

39. The co-ordinates of the centre of gravity of a uniform sheet of cardboard shown in fig. (a) are (x_0, y_0). The cardboard is now folded along OP as shown in fig. (b) .The centreof gravity of the folded cardboard has co-ordinates (x,y) where

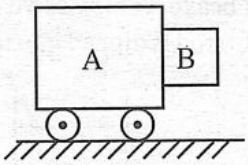


(1) $x = x_0 ; y = y_0$. (2) $x < x_0 ; y < y_0$. (3) $x > x_0 ; y > y_0$'
(4) $x > x_0 ; y < y_0$. (5) $x < x_0 ; y > y_0$.

40. The velocity (V) - time (t) curve of a particle of mass m moving along a straight line is shown in the figure.
Consider the following statements.
(A) The particle returns to its initial position at the end of the motion.
(B) Acceleration of the particle does not change directions during the motion.
(C) At $t = t_0$ the impulse acting on the particle is infinite.
Of the above statements
(1) only A is true. (2) only B is true. (3) only C is true.
(4) only A and B are true. (5) all A, B and C are true.



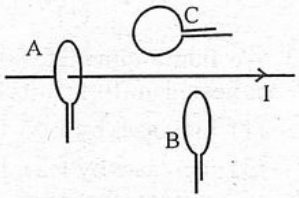
41. A trolley A is on a horizontal track. B is a wooden block of mass m. If the coefficient of static friction between the trolley and the block is μ,the minimum acceleration of the trolley that is required to prevent the block from sliding down is



(1) $\frac{g}{\mu}$, to the right. (2) g, to the right.

(3) $\frac{g}{\mu}$, to the left. (4) μg, to the right. (5) $\frac{mg}{\mu}$, to the right.

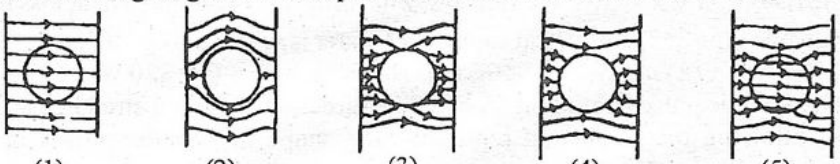
42. Three conducting loops A, B and C made of thin wire are placed in the vicinity of a long straight wire which carries a changing current. The planes of A and B are perpendicular to the wire and plane of C and wire lie in the same plane. In which loop/loops shown in the figure, an e.m.f is/are developed ?



(1) A only. (2) B only.

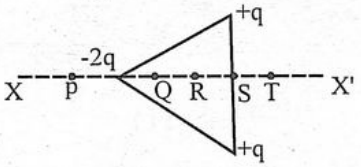
(3) C only. (4) A and B only. (5) B and C only.

43. A metal sphere is placed in the region between two oppositely charged parallel plates. Which one of the following diagrams best represents the electric field between the plates ?



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

44. Charges +q, +q and - 2q are placed at the corners of a equilateral triangle, as shown in the figure. The point along the line *XX'*, at which the electric field intensity is most likely to be zero is



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

45. The following three methods have been suggested by a student as possible ways of obtaining a steady voltage of 3 V using a single 1 V cell.

(A) By connecting the cell to a step-up transformer having primary to secondary turns ratio of 1 : 3 .

(B) By taking the voltage across a series connection of three 1Ω resistors after connecting the cell across any one of the resistors.

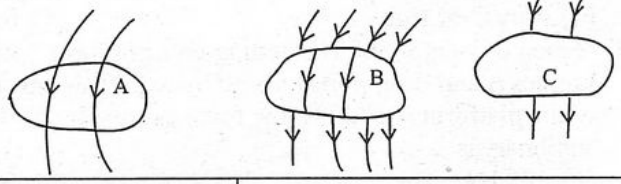
(C) By charging three identical capacitors to 1 V separately using the cell, then connecting them in series and taking the voltage across the combination.

Of the above methods

(1) only (A) can generate 3 V. (2) only (C) can generate 3 V.

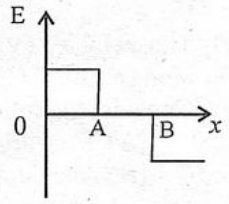
(3) only (A) and (C) can generate 3 V. (4) all can generate 3 V. (5) none can generate 3 V.

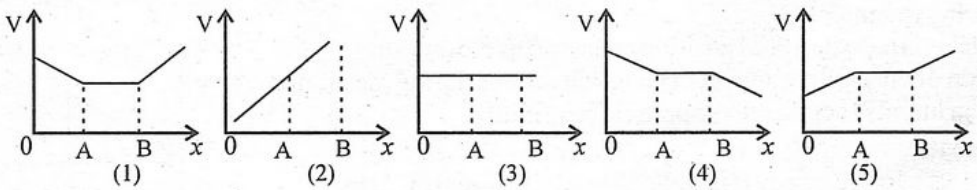
46. The paths of electric lines of forces in and around three regions A, B and C are shown in the figure. Which of the following combinations correctly decribe the nature of teh regions.



	A	B	C
(1)	uncharged conductor	charged conductor	dielectric
(2)	free space with zero net charge	dielectric	charged conductor
(3)	dielectric	free space with positive charges	free space with zero net charge.
(4)	free space with zero net charge	dielectric	uncharged conductor
(5)	uncharged conductor	free space with negative charge	dielectric

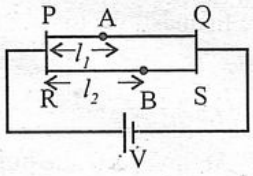
47. Figure shows the variation of an electric field itensity E along the direction Ox. The variation of the electric potential V along the same direction is best represented by





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

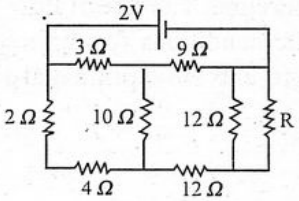
48. Two uniform metal wires PQ and RS having different areas of corss section and resistivities but same length L_0 are subjected to a potential difference V as shown in the figure. If A and B are two points on these wires such that PA = l_1 and RB = l_2 as shown, then the potential difference between points A and B will depend.



(1) on all the parameters, i.e. areas of cross - sections, resistivities, L_0, V and $(l_2 - l_1)$.
(2) only on resistivities, L_0, V and (l_2-l_1).
(3) only on L_0, V and (l_2-l_1).
(4) only on V and (l_2-l_1).
(5) only on (l_2-l_1).

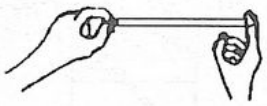
49. Consider following statements made about a 9 V cell with 10 Ω internal resistance.
(A) The cell cannot be used to obtain currents greater than 0.9 A.
(B) It will produce only a potential difference less than 4.5 V across a resistor having resistance greater than 10Ω when it is connected across the terminals of the cell.
(C) It will provide 9 V to an external circuit connected across its terminals only if th circuit does not draw any current.
Of the above statements
(1) only (A) is true.
(2) only (C) is true.
(3) only (A) and (C) are true.
(4) only (B) and (C) are true.
(5) all (A), (B), and (C) are true.

50. In the circuit shown, for what value of R the 10 Ω resistor produces no heat ?



(1) 0
(2) 3 Ω
(3) 6 Ω
(4) 9 Ω
(5) 12 Ω

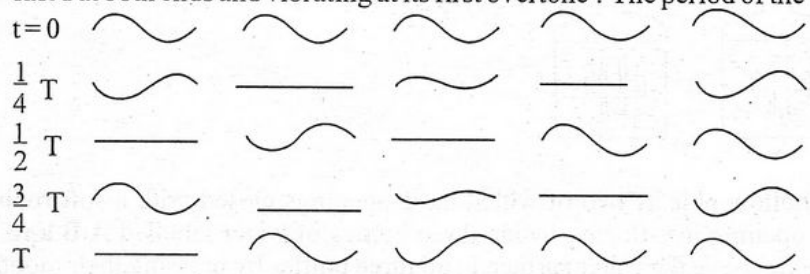
51.



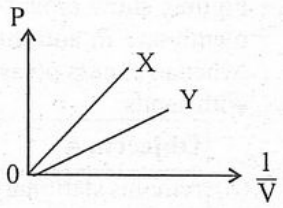
A small rubber loop made of a rubber band of length l and mass m is held with one finger and stretched by applying a force F with the other hand as shown in the figure so that its length becomes $2l$. If the loop is then released to fly off freely the maximum possible velocity gained by the loop jus after therelease will be.

(1) $\sqrt{\frac{Fl}{m}}$
(2) $\frac{Fl}{2m}$
(3) $\sqrt{\frac{2Fl}{m}}$
(4) $\sqrt{\frac{Fl}{2m}}$
(5) $\frac{Fl}{m}$

52. Which of the following diagrams best represents the wave pattern at successions of time t of a stretched string fixed at both ends and vibrating at its first overtone ? The period of the vibration is equal to T.



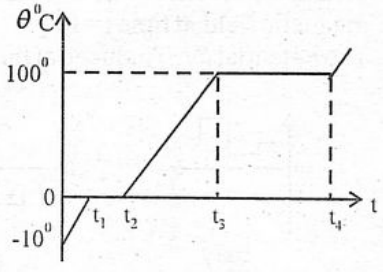
53. Pressure (P) versus $\frac{1}{\text{volume}}$, ($\frac{1}{V}$) graphs at constant temperature of two ideal gases X and Y contained in two separate vesselsare shown in figure.



Consider the following statements.
(A) Number of moles in the gas X is greater than that of Y.
(B) Curve of X can be made to coincide with the curve of Y by removinga certain amount of gas X.
(C) The molecular weight of gas X must be larger than that of Y.
Of the above statements
(1) only (A) is true.
(2) only (A) and (B) are true.
(3) only (B) and (C) are true.
(4) only (A) and (C) are true.
(5) all (A), (B) and (C) are true.

Refer the graph given below to answer questions No . 54 and 55.

54. Figure shows the variation of th temperature (θ) with tinie (t) of a certain amount of ice initially at - 10 ^{0}C when heated at a constat rate.



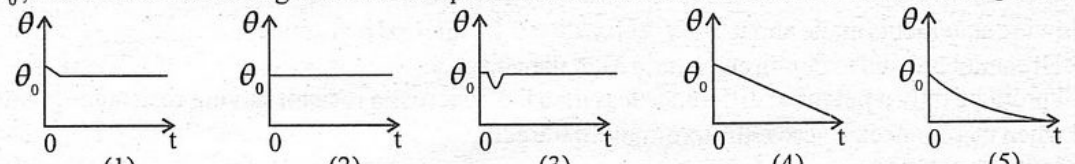
The ratio $\frac{\text{specific heat capacity of ice}}{\text{specific heat capacity of water}}$ is.

(1) $\frac{t_1}{(t_3 - t_2)}$
(2) $\frac{10t_1}{(t_3 - t_2)}$
(3) $\frac{(t_3 - t_2)}{10t_1}$
(4) $\frac{(t_3 - t_2)}{t_1}$
(5) $\frac{10t_1}{(t_3 - t_1)}$

55. In question No. 54 the ratio $\frac{\text{specific latent heat of fusion of ice}}{\text{specific latent heat of vaporization of water}}$ is

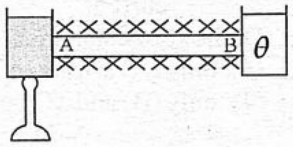
(1) $\frac{(t_4 - t_3)}{(t_2 - t_1)}$ (2) $\frac{t_2}{t_4}$ (3) $\frac{(t_2 - t_1)}{(t_4 - t_3)}$ (4) $\frac{(t_4 - t_2)}{(t_3 - t_1)}$ (5) $\frac{t_3}{t_1}$

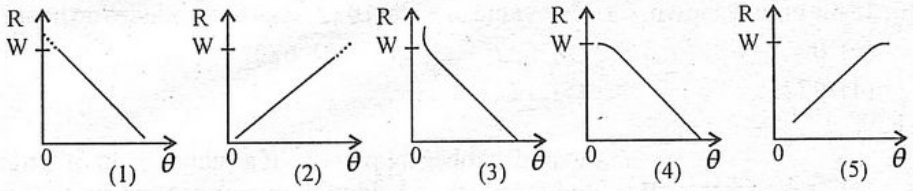
56. At time t = 0 ,the bulb of a sensitive mercury in glass thermometer is wrapped with a small piece of damped cloth which is at room temperature and left in still air in a room unsaturated with water vapour. If the room temperaature is θ_0 ,which of the following curves best represents the variationof the thermometer reading (θ) with time (t)



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

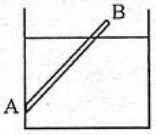
57. End A of the well lagged uniform rod AB is kept in contact with a water reserviour which is supplied with heat at a constant rate (W). Temperature of the end B can be maintained at different values by adjusting the temperature θ of the adjoining reserviour. The rate of flow of heat (R) through the rod is measured under steady state conditions for different values of θ. Which of th following curves best represents the exprimental data ?





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

58. In the diagram, AB is a thin uniform rod made of a material of density ρ freely hinged at A to the wall of a vessel containing a liquld of density σ. When in equilibrium one fifthe of the rod is projecting outside the liquid, the ratio of the densities $\frac{\rho}{\sigma}$ is equal to



(1) $\frac{16}{25}$ (2) $\frac{9}{25}$ (3) $\frac{8}{25}$ (4) $\frac{4}{25}$ (5) $\frac{1}{25}$

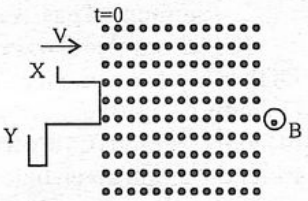
59.



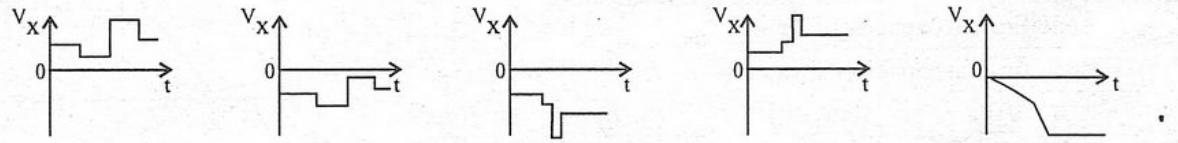
Figures show cross - sections of three hollow objects two of which have openings closed with a soft rubber membrane *R*, and the other without an opening just floaing inside three bottles of water labelled **A,B and C** .whenan excess pressue is applied to the air above the water surface in all three bottles by pressing their mouths with hands.

	Object in A	**Object in B**	**Object C**
(1)	remains stationary	remains stationary	remainsstationary
(2)	moves up	moves up	moves down
(3)	moves down	moves down	moves down
(4)	moves down	moves down	remains stationary
(5)	moves up	moves up	moves up

60. A piece of metal wire XY bent into the form shown in the figure and moving at a constant velocity V in the direction shown, enters a region with an uniform magnetic field,at time t = 0.



The potential (V_X) induced at the end X with respect to the end Y with time (t) can be best represented by



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