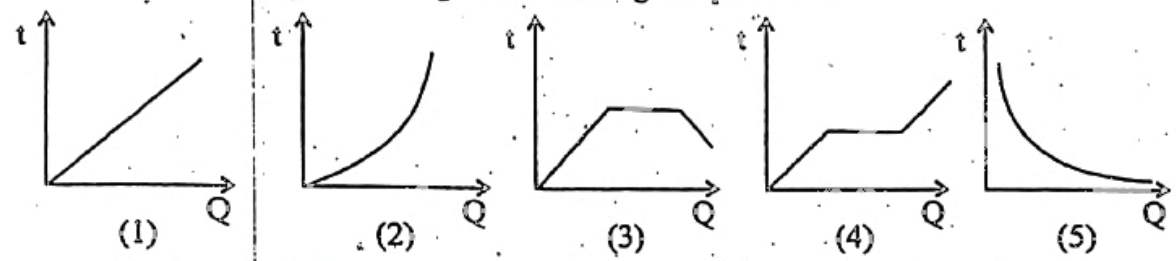
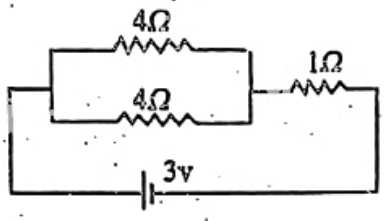
PAPER I

1. Kilowatt-hour is a unit of
   (1) power (2) energy (3) current (4) voltage (5) time.
2. Work has the same dimensions as
   (1) energy (2) force. (3) momentum. (4) power. (5) impulse.
3. The ratio $\frac{\text{amount of heat required to raise the temperature of a body by } 1^{\circ}\text{C.}}{\text{amount of heat required to raise the temperature of the same body by } 1\text{ K.}}$ takes the value,
   (1) 273 (2) 1 (3) $\frac{5}{9}$ (4) $\frac{100}{373}$ (5) $\frac{1}{273}$
4. Which of the following curves best represents the variation of temperature (t) with the heat supplied (Q) to a substance which undergoes a change of state at a given pressure ?

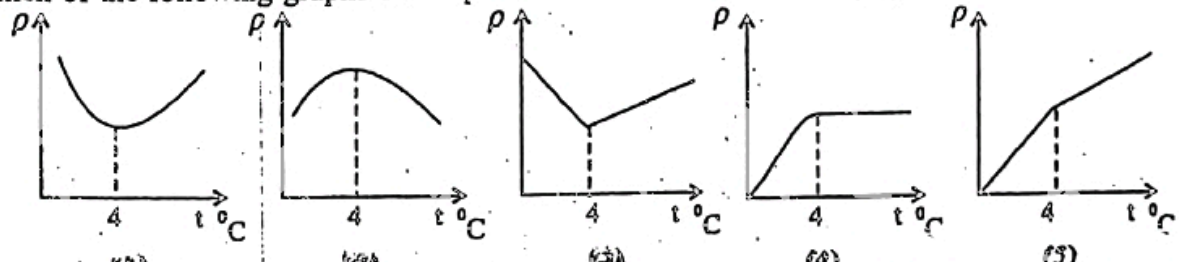


(1) (2) (3) (4) (5)

5. When the kinetic energy of an object is doubled the factor by which its momentum will be changed is,
   (1) $\frac{1}{2}$ (2) $\frac{1}{\sqrt{2}}$ (3) $\sqrt{2}$ (4) 2 (5) 4
6. A light -year is equivalent to, (the velocity of light = 3×10^{8} ms^{-1})
   (1) $3 \times 10^{8} \times 365 \times 24 \times 3.6$ km (2) $3 \times 10^{8} \times 365 \times 24 \times 3\,600$ km
   (3) $3 \times 10^{8} \times 365 \times 3.6$ km. (4) $365 \times 24 \times 3.6$ s.
   (5) $365 \times 24 \times 3\,600$ s.
7. A 1.0 m wire has a mass of 0.01 kg and is held under a tension of 100 N. The velocity of transverse waves on the wire is
   (1) 100 ms^{-1} (2) 10 ms^{-1} (3) $\sqrt{50}$ ms^{-1} (4) $\sqrt{20}$ ms^{-1} (5) $\sqrt{10}$ ms^{-1}
8. The battery in the circuit shown has a negligible internal resistance. The power dissipated in the 1 Ω resistor is



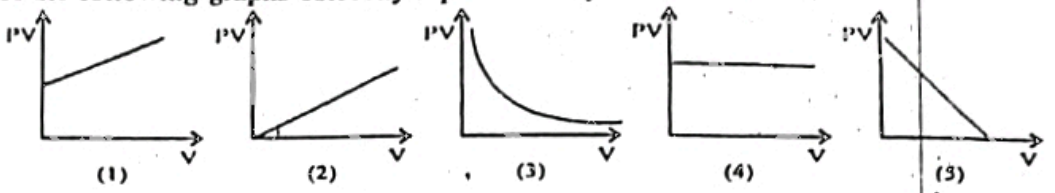
   (1) $\frac{1}{9}$ W (2) $\frac{4}{9}$ W (3) 1 W
   (4) 3 W (5) 9 W
9. The dimensions of magnetic flux density when expressed in terms of dimensions, mass (M) length (L) time, (T) , and current (I) is
   (1) $ML^{2}IT^{-2}$ (2) $ML^{-2}T^{-1}T^{-1}$ (3) $M^{2}LIT$ (4) $MI^{-1}T^{-2}$ (5) $ML^{2}IT$
10. Which of the following graphs best represents the variation of density (ρ) of water with temperature (t)



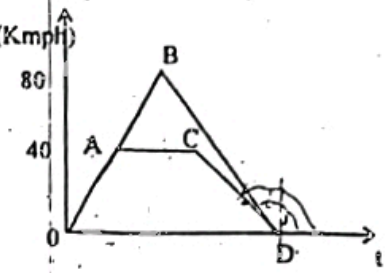
(1) (2) (3) (4) (5)

11. A closed vessel contains an ideal gas at pressure P. The root mean square velocity of the gas molecules is proportional to
   (1) $P^{\frac{1}{3}}$ (2) $P^{\frac{1}{2}}$ (3) P (4) P^{2} (5) P^{3}

12. Which of the following graphs correctly represents Boyle's law ?



13. The speed (v) - time (t) curves of two similar private buses P and Q overloaded with passengers are shown in the figure. OABD represents the v - t curve for the bus P, and OACD represents the v-t curve for the bus Q. consider the following statements.



(A) Retardation of bus p is greater than that of bus Q.
(B) Both buses have travelled equal distances during the journey.
(C) Standing passengers in bus Q feel more uncomfortable than those in p during the journey.

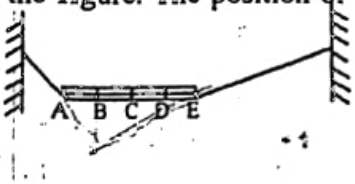
Of the above statements,

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

14. A car and a bus stop at a red light signal. The car is 100 m behind the bus. When the light turns green, the car accelerates with 6 ms^{-2} and at the same time the bus accelerates with 4 ms^{-2}. Car will overtake the bus after

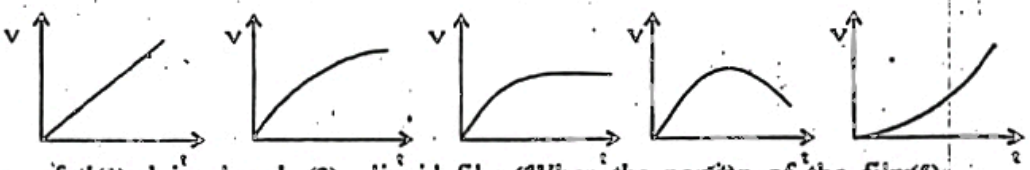
(1) 4 s (2) 6 s (3) 8 s (4) 10 s (5) 12s

15. A bar AE is suspended is a horizontal position by two light cords as shown in the figure. The position of the centre of gravity of the bar is at



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

16. Which of the following graphs best represents the variation of the velocity (v) with time (t) of a metal ball falling through water in a deep lake ?



17. A loop of thread is placed on a liquid film. When the portion of the film inside the loop is removed its shape becomes circular with radius R as shown in the figure. If the surface tension of the liquid is T, the tension of the thread is given by

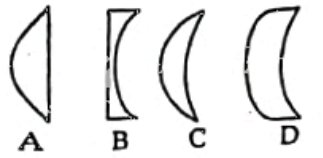
(1) $2\pi TR$. (2) $4TR$. (3) πTR (4) 2 T R
(5) TR.

18. Two thin lenses of focal length f_1 and f_2 are in contact. The focal length f of the lens combination is given by (1) $f = \frac{f_1 + f_2}{2}$ (2) $f = \frac{f_1 f_2}{f_1 + f_2}$ (3) $f = \frac{f_1 - f_2}{2}$ (4) $f = \frac{f_1 f_2}{f_1 - f_2}$ (5) $f = f_1 + f_2$

19. The image of an object placed between the centre of curvature and the focus of a concave 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.

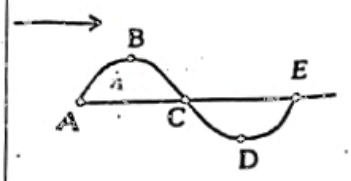
20. The wavelength of yellow sodium light in air is 5.0×10^{-7} m. Its frequency is (velocity of light in air = 3×10^8 m s^{-1})
(1) 1.7×10^{14} Hz. (2) 2.0×10^{14} Hz. (3) 4.0×10^{14} Hz. (4) 6.0×10^{14} Hz (5) 8.0×10^{14} Hz

21. The figure shows four thin lenses A, B, C and D which of the above lens/lenses can be used to converge parallel light ?



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

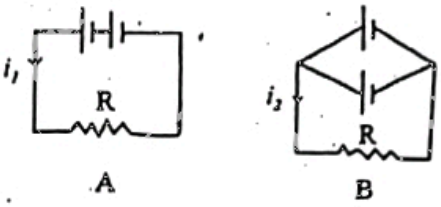
22. Figure shows an instant shape of a part of a transverse wave on a stretched string travelling to the right. At which point/ points of the wave is the string momentarily at rest ?



(1) C Only (2) B and D Only (3) A and E Only
(4) A, C and E Only (5) none of the above points.

1. Consider the following statements made about travelling waves and standing waves formed on a stretched string.
   (A) In a travelling wave each particle of the string vibrates with the same amplitude.
   (B) In a standing wave all particles of the string vibrate with the same frequency.
   (C) In a standing wave amplitude is different for different particles in the string.
   Of the above statements
   (1) Only (C) is true. (2) Only (A) and (B) are true. (3) Only (A) and (C) are true.
   (4) Only (B) and (C) are true. (5) all (A), (B) and (C) are true.

4. Two identical batteries with negligible internal resistances are connected to an external resistance R as shown in figures (A) and (B). The relationship between the currents through resistor R in circuits A and B can be represented as



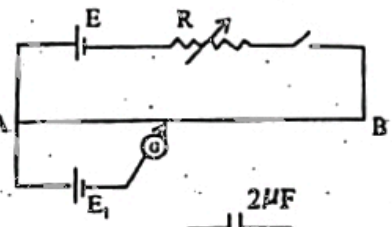
   (1) $i_1 = 2\,i_2$ (2) $i_1 = i_2$ (3) $i_2 = 2\,i_1$
   (4) $i_1 = \sqrt{2}\ i_2$ (5) $i_2 = \sqrt{2}\ i_1$

5. A current of 2A passes through a cell containing a solution of copper sulphate. Time taken to deposit 0.01 Kg of copper (electrochemical equivalent of copper = 3.3×10^{-7} Kg C^{-1}) is

   (1) $\dfrac{0.01 \times 10^{7}}{2 \times 3.3}$ s (2) $\dfrac{0.01 \times 3.3 \times 10^{-7}}{2}$ s (3) $0.01 \times 2 \times 3.3 \times 10^{-7}$ s

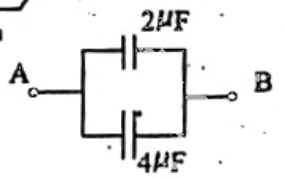
   (4) $\dfrac{0.01 \times 2 \times 10^{7}}{3.3}$ s (5) $\dfrac{2 \times 3.3 \times 10^{-7}}{0.01}$ s

An arrangement to determine the e.m.f. E_1 of a cell by potentiometer method is shown in the figure. To increase the balance length



   (1) descrease R and increase E. (2) descrease R keeping E same.
   (3) increase E keeping R same. (4) increase R keeping E same.
   (5) decrease the diameter of the potentiometer wire.

7. When a potential difference of 300 V is applied across AB of the circuit shown, electrical energy stored in the system is



   (1) 6×10^{-2} J. (2) 9×10^{-2} J. (3) 1.8×10^{-1} J.
   (4) 2.7×10^{-1} J. (5) 5.4×10^{-1} J.

If the mass and the radius of the earth are M and R respectively and the Universal Gravitational Constant is G. then the acceleration due to gravity at a height H from the earth surface is

   (1) $\dfrac{GM}{R^2}$ (2) $\dfrac{GM}{R^2+H^2}$ (3) $\dfrac{GM}{R}$ (4) $\dfrac{GM}{R+H}$ (5) $\dfrac{GM}{(R+H)^2}$

A spherical droplet of mercury of radius R has a capacitance

   (1) $4\,\pi\epsilon_o R$ (2) $4\,\pi R$ (3) $\dfrac{1}{R}$ (4) $\dfrac{1}{4\,\pi R}$ (5) $\dfrac{1}{4\,\pi\epsilon_o R}$

An electric iron has a heating coil to heat its bottom surface. In a faulty electric iron an appreciable lenght of the heating coil was found to be damaged (burnt). If the damaged portion of the coil is removed and the rest is used to heat the same iron,

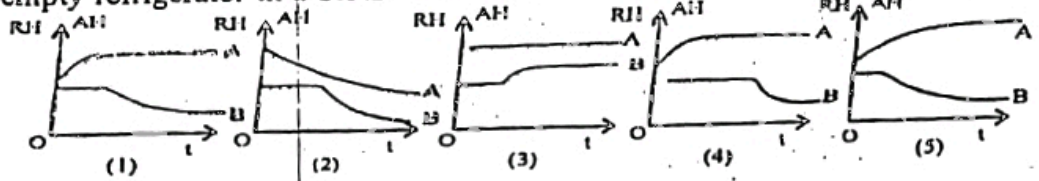
   (1) it will work normally. (2) it will produce less heat but the iron will have a longer life time.
   (3) it will work for a short time and the coil will burn again. (4) it will have a smaller wattage.
   (5) it will draw a small current.

The sensitivity of a liquid-in-glass thermometer can be increased by

   (A) increasing the length of the capillary of the thermometer.
   (B) increasing the internal radius of the capillary of the thermometer.
   (C) increasing the volume of the liquid bulb ofthe thermometer.
   Of the above statements.

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

Which one of the following curves best represents the variation of the relative humidity RH wiht time t (i.e. curve B) of air inside a (i.e. curve A), and the variation of the absolute humidity AH with time t closed empty refrigerator in a Sri Lankan home which is switched on for the first time?



33. A vessel with a small opening contains an ideal gas at 27°C and at 1 atmosphere. To what temperature must this vessel be heated to drive out one fifth of the molecules originally present in the vessel ? (Neglect the expansion of the vessel).

(1) 87°C (2) 102°C (3) 135°C (4) 375°C (5) 1 227°C.

34. When a certain mass is suspended freely from a spring it is extended by a distance *l*.The spring is now cut into two halves and the same mass is suspended freely from one of the halves. The new extension of the spring will be

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

35. Consider the following statements made by a student regarding the angle of contact of a liquid with a surface.

(A) In a capillary tube liquid will have a higher capillary rise if its angle of contact with the material of the tube is close to 90°.

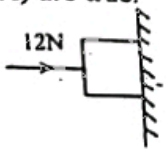
(B) Liquids that wet a surface have contact angles greater than 90°.

(C) Angle of contact of a liquid in a glass tube depends on its radius.

Of the above statements,

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

36. A horizontal force of 12 N pushes a block weighing 5 N against a rough vertical wall as shown in the figure. if the block is stationary, then the magnitude of the force exerted on the block by the wall is

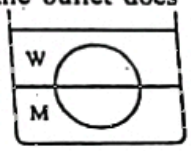


(1) 17 N. (2) 13 N. (3) 12 N. (4) 7 N. (5) 5 N.

37. A bullet moving at a certain velocity enters a wooden block suspended freely by a light inextensible string, and gets embedded in the block.which of the following is true?

(1) Law of conservation of energy cannot be applied to this impact.
(2) Mechanical energy is not conserved in this impact.
(3) Law of conservation of linear momentum cannot be applied to this impact.
(4) Total kinetic energyof the system is conserved in the impact.
(5) Law of conservation of linear momentum can be applied to this impact only if the bullet does not penetrate the block.

38. A metal ball having a volume, 4.0×10^{-4} m^3 floats at the interface of mercury (M) and water (W) with one half of the ball submerged in mercury as shown in the figure. If the densities of mercury and water are 1.36×10^4 kg m^{-3} and 1.0×10^3 kg m^{-3} respectively the weight of the ball in air is



(1) 2.526 kg. (2) 2.720 kg. (3) 2.920 kg. (4) 5.360 kg (5) 5.840 kg.

39. In a compound microscope the objective produces a magnification of 10, while the eyepiece produces a magnification of 15. The overall magnification achieved by the compound microscope is

(1) $\frac{2}{3}$ (2) 1.5 (3) 5. (4) 25. (5) 150.

40. A beam of white light without the green colour appears red to human eye.which of the following apparatus can be used to distinguish the above mentioned light beam from a pure beam of red light ?

(A) A concave mirror. (B) A prism. (C) A spectrometer.

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

41. Consider the following statements made about thin lenses and spherical mirrors

(A) It is possible for a given lens to act as a converging lens in one medium and as a diverging lens in another medium.

(B) The focal length of a lens depends on the medium in which it is immersed.

(C) The focal length of a spherical mirror depends on the medium in which it is immersed.

Of the above statements

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

42. If the radius of curvature of an equi-convex lens is 30 cm and the refractive index of the lens material is 1.5, its focal length in air is

(1) 7.5 cm. (2) 15 cm. (3) 30 cm. (4) 45 cm. (5) 60 cm.

43. A sound wave travelling in a fluid medium is reflected back at a barrier so that a standing wave is formed The distance between two consecutive nodes ofthe standing wave is 3.75 cm and the velocity o propagation of sound inthe fluid is 1 500 ms^{-1}. The frequency of the standing wave is

(1) 16.0×10^5 Hz (2) 8.0×10^4 Hz. (3) 4.0×10^4 Hz.
(4) 2.0×10^4 Hz. (5) 1.0×10^4 Hz.

44. A point source of light is placed in water 0.8 m below its surface. If the refractive index of water is n, the radius of the largest circle at the surface through which light can emerge from the water is

(1) $\frac{0.8}{n}$ m (2) $\frac{1.6}{n}$ m (3) $0.8\sqrt{n^2-1}$ m (4) $\frac{0.8}{\sqrt{n^2-1}}$ m (5) $\frac{1.6}{\sqrt{n^2-1}}$ m

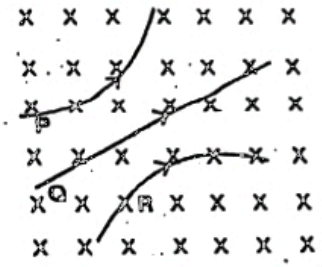
45. Two tuning forks A and B produce 10 beats per second when sounded together. when a small piece of wax is stuck to a prong of the fork A only 5 beats are heard in one second, If the frequency of the tuning fork B is 200 Hz,the frequency of the fork A after sticking wax is

(1) 190 Hz. (2) 195 Hz. (3) 200 Hz. (4) 205 Hz. (5) 210 Hz.

46. The raius of the equipotential surface having a potential of 30 V due to a point charge of 1.5×10^{-8} C is, $\left(\frac{1}{4\pi\epsilon_o} = 9 \times 10^9\ Nm^2\ C^{-2}\right)$

(1) $\sqrt{4.5}$ m. (2) $\sqrt{0.5}$ m. (3) $\sqrt{6}$ m. (4) 2.5 m. (5) 4.5 m.

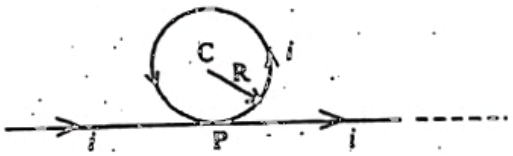
47. Three particles P, Q and R follow the paths as shown in the figure under the influence of an uniform magnetic field which is directed into the paper.



Which of the following correctly indicates the type of charges carried by each particle ?

	P	Q	R
(1)	negative	neutral	positive
(2)	positive	neutral	negative
(3)	neutral	positive	negative
(4)	neutral	negative	positive
(5)	positive	negative	neutral

48. A long wire is bent into a shape as shown in the figure without making a contact at P. If the radius of the circular section is R, and the current through the wire is *i*, the magnitude and direction of the magnetic flux density at the centre C can be written as.

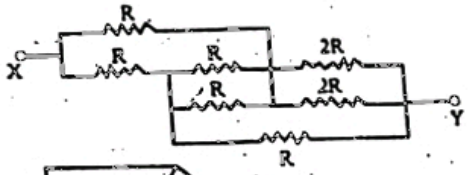


(1) $\frac{\mu_o i}{2R}\left(1-\frac{1}{\pi}\right)$: out of the paper (2) $\frac{\mu_o i}{2R}\left(1-\frac{1}{\pi}\right)$: into the paper

(3) $\frac{\mu_o i}{2R}\left(1+\frac{1}{\pi}\right)$: into the paper (4) $\frac{\mu_o i}{2R}\left(1+\frac{1}{\pi}\right)$: out of the paper

(5) $\frac{\mu_o i}{4R}\left(1+\frac{1}{\pi}\right)$: out of the paper

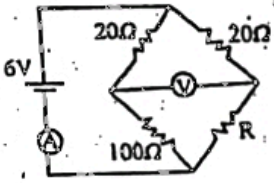
9. The equivalent resistance between the points X and Y of the following network is



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

(5) R.

0. In the circuit shown 6 V cell has a negligible internal resistance and the voltmeter V reads zero.



The reading of the ammeter A of negligible resistance will be

(1) 0. (2) 0.05 A. (3) 0.1 A. (4) 0.6 A.

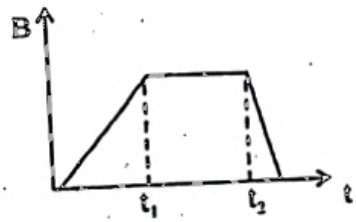
(5) cannot be calculated from the given data.

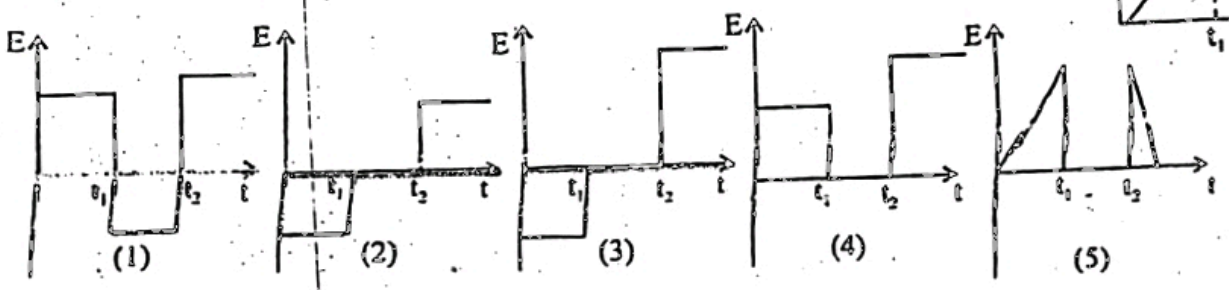
1. In the circuit shown,the cell has a negligible internal resistance and the current through the cell is 1.0 A. When an additional resistance of 2 Ω is inserted into the circuit the current through the cell becomes 3.0 A. The value of R is

(1) 10 Ω (2) 8 Ω (3) 6 Ω (4) 4 Ω

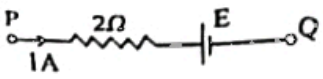
(5) 2 Ω

2. The magnetic flux density (B) through a loop of wire changes with time (t) as shown in the figure. the variation of the induced e.m.f. (E) in the loop with time (t) is best represented by



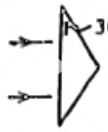


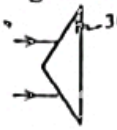
53. The section of a circuit PQ absorbs 5 W of power when a current of 1.0 A is made to pass through it in the direction shown. If the internal resistance of the battery is negligible, its e.m.f. is

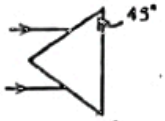


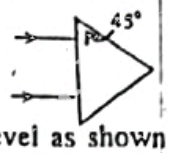
(1) 5 V. (2) 4 V. (3) 3 V. (4) 2 V. (5) 1 V.

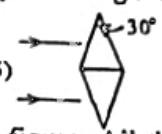
54. Which of the following arrangements of glass prisms will not converge the beam of parallel light shown?

(1) 

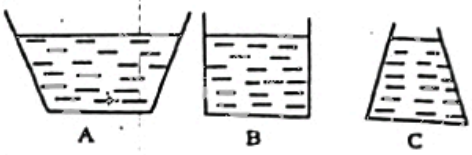
(2) 

(3) 

(4) 

(5) 

55. The vessels A, B and C are filled with water up to the same level as shown inthe figure. All the vessels have identical base area and mass. If the resultant forces acting on the bottoms of each of the vessels A, B and C due to water are F_A, F_B and F_C respectively and if the weights of the vessels with water when put on a scale are given by W_A, W_B, and W_C respectively, then

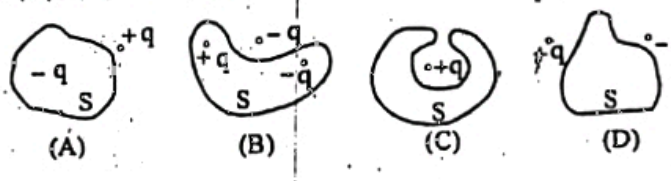


(1) $F_A = F_B = F_C$ and $W_A = W_B + W_C$
(2) $F_A > F_B > F_C$ and $W_A > W_B > W_C$
(3) $F_A < F_B < F_C$ and $W_A < W_B < W_C$
(4) $F_A = F_B = F_C$ and $W_A < W_B < W_C$
(5) $F_A = F_B = F_C$ and $W_A > W_B > W_C$

56. In an experiment to find the specific latent heat (L) of ice using the method of mixtures a student droppe a large piece of wet ice without wiping out water on its surface in to a calorimeter containing water a room temperature. During the experiment be observed a layer of mist formed on the outer - surface of the calorimeter. He can expect a lower value for L

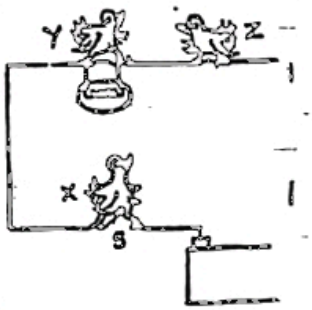
(A) as the ice cube was wet.
(B) as the ice- piece takes a considerable time to melt.
(C) due to the formation of mist.
Of the above statements
(1) Only (A) is true. (2) Only (B) is true. (3) Only (C) is true.
(4) Only (A) and (B) are true. (5) all (A), (B) and (C) are true.

57. Of the four figures (A) to (D) shown the total electric flux leaving the closed surface S is zero in



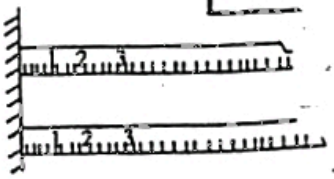
(1) (A) and (B) Only.
(2) (C) and (D) Only
(3) (B) and (D) Only.
(4) (B), (C) and (D) Only. (5) all four cases.

58. The figure shows three birds X,Y and Z sitting on bare wires of a circuit which provides power to a lamp the power is provided by a battery having a reasonably high voltage and S is a switch.



Consider the following statements.
(A) When the switch is open the bird X is likely to get an electric shock.
(B) When the switch is closed the bird Y is likely to get an electric shock.
(C) When the switch is closed the bird Z is likely to get an electric shock.
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) Only B and C are true

59. Two metre rulers made of metal of linear expansivity $25 \times 10^{-6}\ {}^{\circ}C^{-1}$ are calibrated at 0°C. One end of each of the metre rulers is fixed to a vertical wall and held side by side horizontally as shown in the figure. One ofthe metre rulers is maintained at 0°C and the other at 100°C which of the following two scale markings of metre rulers coincide with each other ?



(1) 25.0 cm and 25.1 cm. (2) 24.9 cm and 25.0 cm.
(3) 39.9 cm and 40.0 cm (4) 40.0 cm and 40.1 cm (5)
(5) 80.0 cm and 79.9 cm.

60. Each of the two equal point charges of + q are placed along the x axis at a distance d apart as shown in the figure. Assuming that the left hand charge is at x = 0 the variation of the electric field intensity (E) with x is best represented by