GCE A/L PHYSICS 1996

PAPER I

1. Ampere - hour is a unit of
(1) current. (2) power. (3) energy . (4) time. (5) quantitiy of charge.

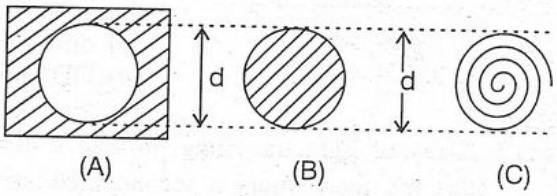
2. Consider the following quantities used in physics.
(A) Electric charge (B) Mass (C) Temperature
Which of the above is/are base quantity/quantities of the international system of Units (SI) ?
(1) B only. (2) A and B only. (3) A and C only. (4) B and C only. (5) all A, B and C

3. Of the following colours, the angle of deviation due to a glass prism is greatest for
(1) violet. (2) red. (3) blue. (4) green. (5) yellow.

4. In the human eye the location of the image of an object is adjusted to appear on the retina by changing the
(1) diameter of the pupil. (2) position of the lens.
(3) focal length of the lens. (4) shape of the cornea. (5) diameter of the eye ball.

5. Assuming that no heat is lost to the surroundings, a final temperature of 50 ^{0}C could be obtained by mixing equal masses of,
(1) ice at -5 ^{0}C and steam at 105 ^{0}C. (2) ice at 0 ^{0}C and water at 100 ^{0}C.
(3) water at 0 ^{0}C and steam at 100 ^{0}C. (4) ice at 0 ^{0}C and steam at 100 ^{0}C.
(5) water at 0 ^{0}C and water at 100 ^{0}C.

6. Figure A shows a circular hole of diameter d cut in a uniform aluminium sheet. Fig. B shows a uniform circular aluminium disc of diameter d. Fig. C shows a piece of uniform aluminimum wire bent to form a spiral. If Δd_A, $\Delta d_B$and Δd_C ae the corresponding changes in d of A, B and C respectively for a given temperature change, then



(1) $\Delta d_A = \Delta d_B < \Delta d_C$. (2) $\Delta d_A = \Delta d_B > \Delta d_C$. (3) $\Delta d_A < \Delta d_B < \Delta d_C$.
(4) $\Delta d_A = \Delta d_B = \Delta d_C$. (5) $\Delta d_A < \Delta d_B > \Delta d_C$.

7. An electric motor pulls a 100 kg mass to a height of 20 m in 2 s. The minimum power needed for this is
(1) 2000 kW. (2) 1000 kW. (3) 200 kW. (4) 100 kW. (5) 10 kW.

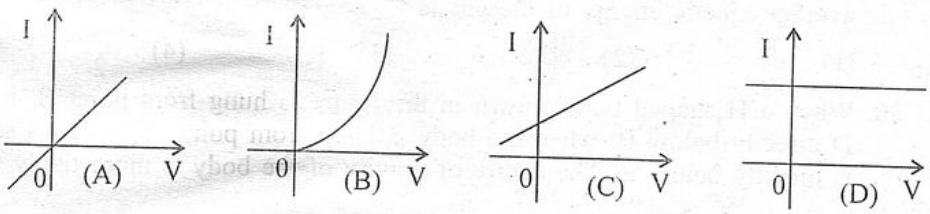
8. A vessel contains oil (density = 800 kg m^{-3}) and mercury (density = 13 600 kg m^{-3}) . A metal sphere floats at the interface with one half of its volume immersed in mercury and the other half in oil. The density of the metal is
(1) 1000 kg m^{-3} (2) 1700 kg m^{-3} (3) 4800 kg m^{-3} (4) 7200 kg m^{-3} (5) 12 800 kg m^{-3}

9. A soap bubble has a radius of 3 cm, If the surface tension of soap solution is 1.5 x 10^{-2} N m^{-1} , the excess pressure inside the bubble is
(1) 10^{-2} N m^{-2} (2) 2x10^{-2} N m^{-2} (3) 1 N m^{-2} (4) 2 N m^{-2} (5) 4 N m^{-2}

10. If M and R are the mass and the radius of the planet mars respectively and G is the universal constant of gravitation,the acceleration due to gravity at the surface of mars is
(1) $\frac{GR}{M}$ (2) $\frac{R^2M}{G}$ (3) $\frac{GM}{R^2}$ (4) $\frac{GM}{R}$ (5) $\frac{GM^2}{R}$

11. When a current of 1 A is passed through a solution containing ions of an element, the mass of the element deposited in 1 s is called
(1) Avogadros's number. (2) the Faraday. (3) its valency.
(4) its electrochemical equivalent. (5) its atomic weight.

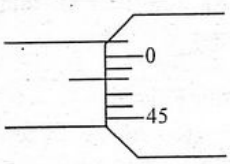
12. Which of the following current (I) potential difference (V) curves obey/s Ohms law ?



(1) A only.
(2) A and C only.
(3) A, B and C only. (4) A, C and D only. (5) None of the above.

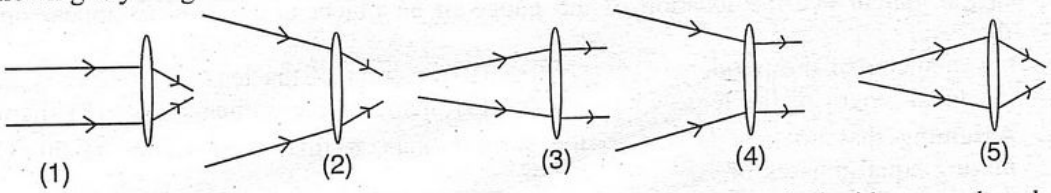
13. Which of the following statements made about sound and radio waves is true ?Each of the waves
(1) can travel longitudinally or transversly. (2) can be reflected or refracted.
(3) can be heard by human ear. (4) can travel faster in some materials than in air.
(5) is eletromagnetic in nature.

14. The figure shows a partofa micrometer screw gauge at a time when its two jaws are in contact. The zero error of the instrument is

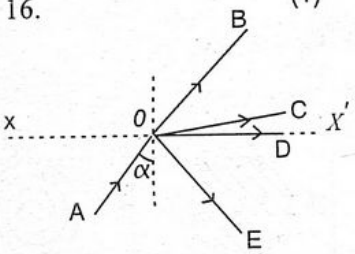


(1) 0.48 mm and it must be added to the final scale reading.
(2) 0.48 mm and it must be subtracted from the final scale reading.
(3) 0.02 mm and it must be added to the final scale rerading.
(4) 0.02 mm and it must be subracted from the final scale reading.
(5) 0.03 mm and it must be added to the final scale reading.

15. Which of the following ray diagrams is incorrect ?



16.



A ray of red light AO travelling in a glass medium is incident on the glass - air inteface XX' at an angle of incidence α as shown in the figure, where α is the critical angle for glass-air interface for yellow light, The possible subsequent path/paths of the red ray is/are
(1) only OE. (2) only OD. (3) only OB.
(4) OD and OE. (5) OC and OE.

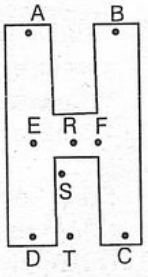
17. A ray of light travelling through a medium of refractive index n_1 has a speed v_1 and wavelength λ_1 . if this ray then enters a second medium of refractive index n_2. which of the following correctly gives the speed and wavelength of the ray in the second medium.

	Speed		**Wavelength**
(1)	$\frac{n_2 v_1}{n_1}$	,	λ_1
(2)	$\frac{n_1 v_1}{n_2}$	,	λ_1
(3)	$\frac{n_1 v_1}{n_2}$	,	$\frac{n_1}{n_2}\lambda_1$
(4)	$\frac{n_2 v_1}{n_1}$	,	$\frac{n_2}{n_1}\lambda_1$
(5)	$\frac{n_2}{n_1} v_1$	,	$\frac{n_1}{n_2}\lambda_1$

18. The pressure of hydrogen gas (relative molecular mass = 2) in a cotainer is 2 atmospheres. If helium gas (relative atomec mass = 4) is added to the container so that the pressure in the container becomes 3 atmospheres,
then the ratio, $\frac{\text{mass of hydrogen}}{\text{mass of helium}}$ in the container is (Assume that the termperature remains constant)
(1) 1 (2) $\frac{1}{2}$ (3) 2 (4) $\frac{1}{4}$ (5) 4

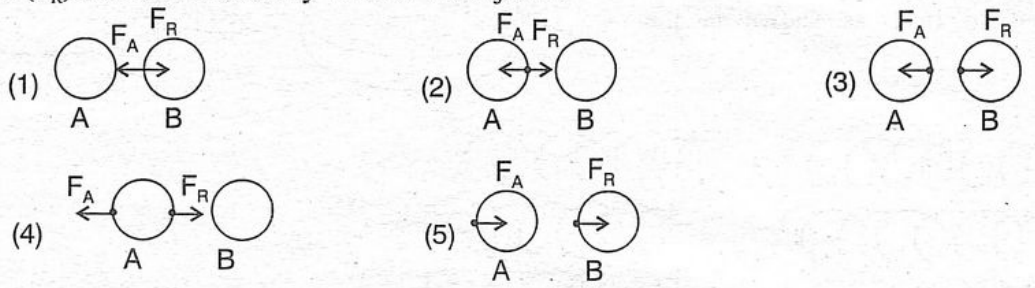
19. The average kinetic energy of a certain amount of an ideal gas is K. when this gas is allowed to expand so that its volume doubles, the pressure of the gas is found to drop by a factor of three. The new average kinetic energy of the gas is
(1) $\frac{K}{6}$ (2) $\frac{2K}{3}$ (3) K (4) $\frac{3K}{2}$ (5) 6K

20. When a H shaped body shown in the figure is hung from point B, it hangs with point D directly below B. when the body is hung from point. E, it hangs so that the point C is directly below E. The centre of gravity of the body is more likely to be at



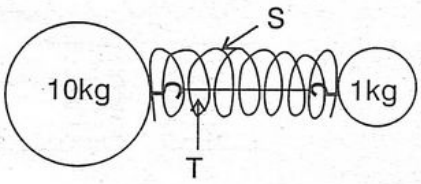
(1) E. (2) Q. (3) R.
(4) S. (5) T.

21. When two objects A and B collide with each other, in which of the following , the action (F_A) and reaction (F_R) forces are correctly marked on objects ?



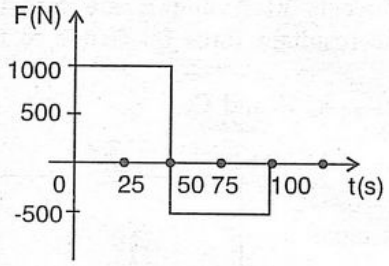
22. Which of the following group of forces acting on a body. cannot have a zero resultant force ?
(1) 2N, 2N, 2N. (2) 2N, 3N, 4N. (3) 1N, 2N, 2N. (4) 1N, 1N, 2N. (5) 1N, 2N, 4N.

23. S is a light spring compressed between two masses and the masses are held together by a string T. when the string is cut, the 1 kg mass moves off with a velocity of 20 m s^{-1} . Then the 10 kg mass will move with a velocity of



(1) 20 m s^{-1}. (2) 10 m s^{-1}. (3) 2 m s^{-1} .
(4) 20/11 m s^{-1} . (5) 1 m s^{-1}.

24.

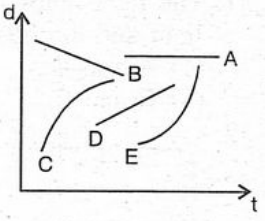


A force F varying with time as indicated in the figure is applied to a wagon of mass 10 000 kg, which is initially at rest on frictionless horizontal rails.

After 100 s the speed of the wagon in ms^{-1} is

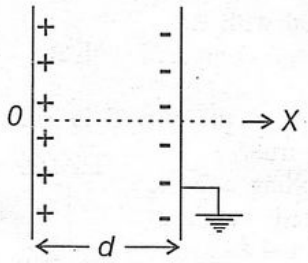
(1) 2.5. (2) 5. (3) 7.5.
(4) 10. (5) 15.

25 Figure shows five displacement (d) - time (t) curves for five different objects, The object which has an acceleration in direction of its motion is represented by

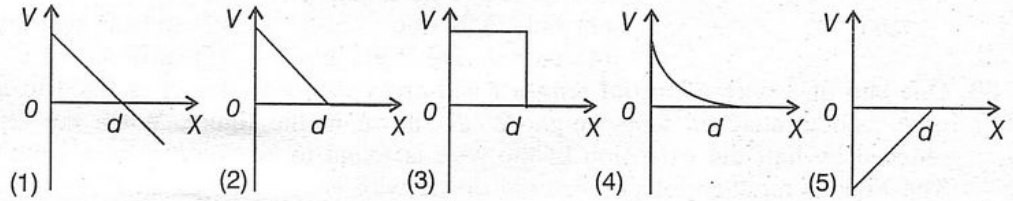


(1) A. (2) B. (3) C.
(4) D. (5) E.

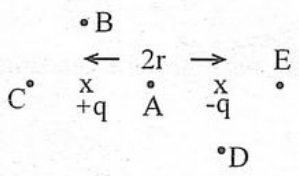
26.



The variation of the potential V along the direction OX due to a charged, parallel plate capacitor placed as shown in the figure is best represented by



27.

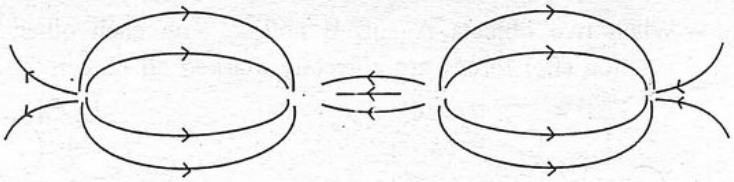


Two point charges +q and -q are at a distance 2r apart, as shown in the figure. The points A, B and C are situated at a distance r from +q, while the points D and E are situated at a distance r from -q. Of the points given the largest positive potential can be found at

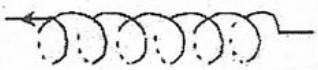
(1) A. (2) B. (3) C. (4) D. (5) E.

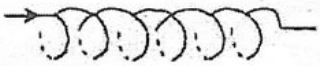
28. Each of the metal spheres, A and B of radii 'a' and '2a' respectively carries a + Q charge. If A and B are connected by a metal wire.
(1) a charge of + Q/3 will flow from A to B. (2) a charge of + Q/3 will flow from B to A.
(3) a charge of + Q/2 will flow from A to B. (4) a charge of + Q/2 will flow from B to A.
(5) a charge will not flow from A to B or B to A.

29. Which of the following current carrying solenoid combinations will produce magnetic field lines as shown in the figure. ?

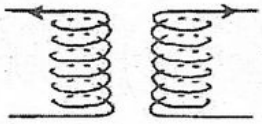


(1) 

(2) 

(3) 

(4) 

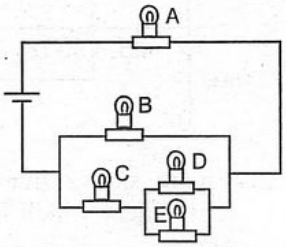
(5) 

30. 
(A) (B) (C)

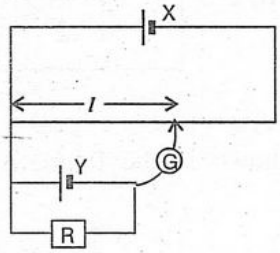
A, B and C represent three long straight thin wires placed perpendicular to the plane of the paper. The directions of the currents in A and B are into the paper while that in C is out of the paper. The resultant force on B due to the currents in A and C is

(1) Zero
(2) Perpendicular to the line joining A, B and C.
(3) in a direction from B to C.
(4) in a direction from B to A.
(5) in a direction which depends on the magnitudes of the currents.

31. The light bulbs in the circuit shown are identical. The bulb which gives most light and the one which gives least light are respectively



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

32. 

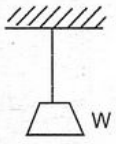
In the pontentiometer circuit shown it is observed that the balance - length l of the potentiometer remains the same when R is varied. This is only possible if

(A) the internal resistance of Y is neglegible compared with R.
(B) the internal resistance of X is neglegible compared with R.
(C) the resistance of the potentiometer wire is very high compared with R.

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 A and C are true.

33. One end of a wire of **initial length** l and cross-sectional area A is fixed to a ceiling and the other end is attached to a weight W as shown in the figure. When the attached weight is reduced by half the extension of the wire is found to be reduced by a length equal to $\frac{l}{10}$. The Youngs modulus of the material of the wire is

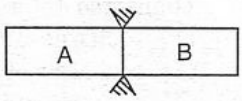


(1) $\frac{Wl}{A^2}$ (2) $\frac{W}{2A}$ (3) $\frac{5W}{A}$ (4) $\frac{10Wl}{A^2}$ (5) $\frac{9\,W}{10A}$

34. Two steel violin strings A and B of the same length and subjected to the same tension have fundamental frequencies of f_1 and f_2 respectively. The ratio $\frac{\text{diameter of A}}{\text{diameter of B}}$ is

(1) $\frac{f_1}{f_2}$ (2) $\sqrt{\frac{f_1}{f_2}}$ (3) $\frac{f_1^2}{f_2^2}$ (4) $\frac{f_2}{f_1}$ (5) $\frac{f_2^2}{f_1^2}$

35. Two rods A and B of equal dimensions are joined together to form a single rod which is then rigidly fixed at the centre as shown in the figure. The densities of the materials of A and B are equal but the Young's modulus of A is four times that of B. when the rod is stroked at one end two different fundamental frequencies f_A and f_B are heard from A and B respectively.



The ratio $f_A : f_B$ is

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

36. Duringa power cut, a person tried to use twenty, 12 V car batteries to power some domestic electric appliances. which of the following appliances will not work ?
(1) An iron. (2) A filament bulb. (3) A ceiling fan.
(4) A hot plate. (5) An immersion coil.

37. The distance between any two consecutive degree marks of the scales of two mercury in glass thermometers P and Q are found to be 1 mm and 3 mm respectively.
Consider the following deductions made about the thermometers.
(A) Thermometer Q has a smaller capillary bore radius than that of P,
(B) Thermometer Q has a larger mercury bulb than that of P.
(C) Readings taken with the thermometer Q is more accurate than those taken with P.
Of the above statements
(1) only A is true. (2) only B is true. (3) only C is true.
(4) only A and C are true. (5) all A,B and C are true.

38. A dentist places a curved mirror 1 cm from a tooth and observes the image of the tooth, which is three times bigger than its natural size. The curved mirror is a
(1) Concave mirror of focal length 1.5 cm. (2) Concave mirror of focal length 0.75 cm.
(3) Concave mirror of focal length 2.0 cm. (4) Convex mirror offocal length 1.5 cm.
(5) Convex mirror of focal length 0.75 cm.

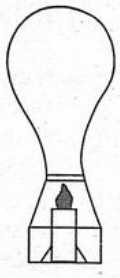
39. Two rays of light enter a box from one side and leave as shown in the figure. The possible optical element/s inside the box is/are
(1) a concave lens and a convex lens.
(2) arectangular glass block.
(3) a convex lens and a rectangular glass block.
(4) two convex lenses.
(5) two concave lenses.



40. Consider the following statements made about microscopes and telescopes
(A) The magnifying power of a compound microscope becomes maximum when the final image is formed at rhe near point of the eye.
(B) It is suitable to have an object lens with a large diameter for astronomical telescopes used to study very distant objects.
(C) The magnifying power of an astronomical telescope becomes maximum when the final image is formed at infinity.
Of the above statements
(1) only B 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.

41 A large vessel of water is placed inside a closed room having a relative humidity of 50% . If the temperature remains constant,. as time goes on
(A) absolute humidity inside the room will increase continuously.
(B) relative humidity inside the room stays constant.
(C) the dew point of the room becomes equal to the room temperature.
Of the above statements]
(1) only B is true. (2) only C is true. (3) only A and B are true.
(4) only B and C are true. (5) all A,B and C are true.

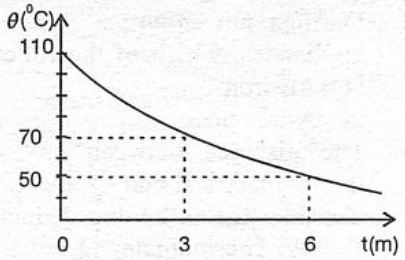
42. A hot-air ballon of constant volume contains air at 100 ^{0}C .(See the figure) When the temperature of the air, inside the balloon is raised by 2 ^{0}C , the fraction of the air which escapes is approximately equal to (assume that the air behaves as an ideal gas and the pressure inside the balloon remains constant)



(1) $\frac{2}{373}$ (2) $\frac{2}{375}$ (3) $\frac{2}{100}$ (4) $\frac{373}{375}$ (5) $\frac{100}{102}$

43 A thin walled metal tank of surface area 4 m^2 is filled with water which is heated by a 1 kW immersion heater. The tank is covered with a 4 cm thick layer of insulation whose thermal conductivity is 0.2 W m^{-1} K^{-1}, In the steady state if the outer surface of the insulation is at 20 ^{0}C , the temperature of the water in the tank is (assumethat there is no heat loss due to evaporation)
(1) 35 ^{0}C. (2) 50 ^{0}C. (3) 60 ^{0}C. (4) 70 ^{0}C. (5) 80 ^{0}C.

44. The graph shows the cooling curve of a liguid which is kept in a room having a temperature of 30 ^{0}C .



Consider the following statements.

(A) The rate of loss of heat from the liquid during the first 3 minutes is twice that during the second 3 minutes.

(B) The total loss of heat from the liquid during the first 3 minutes is twice that during the second 3 minutes.

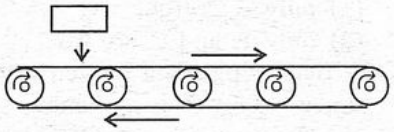
(C) The liquid may attain the room temperature after 9 minutes.

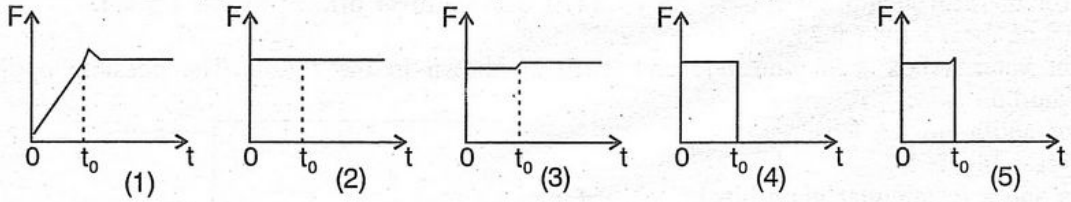
Of the above statements

(1) only A is true. (2) only C is true. (3) only A and B are true.

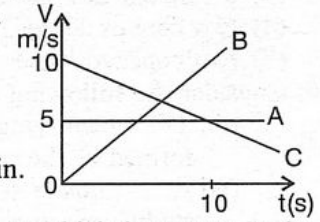
(4) only B and C are true. (5) all A, B and C are true.

45. A box is dropped at time t = 0 vertically on to a conveyer belt moving at a constant speed in the horizontal direction as shown inthe figure. If the box attains the velocity of the belt at time to which of the following curves best represents the variation of the magnitude of the frictional force (F) exerted on the box by the belt with time (t)





46. Figure shows velocity (V) - time (t) curves of three particles A,B and C moving along a straight line. If at t=0 all the particles can be found together at a certain point on the straight line then at t= 10 s

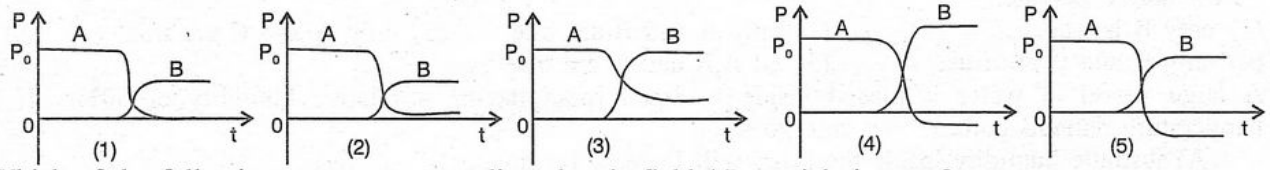


(1) particles A and B meet again. (2) particles B and C meet again.

(3) particles C and A meet again. (4) particles A,B and C all meet again.

(5) none of the particles meet again.

47. A particle A moving on a smooth horizontal table collides with another particle B which is at rest. It the magnitude of the initial momentum of A is p_0 which of the following curves best represents the momenta (p) of particles with time (t)



48. Which of the following statements regarding electric fields/ Potentials is true ?

(1) If the electric field intensity iss zero at a point, then the electric potential must also be zero at that point .

(2) If the electric potential is zero at a point, then the electric field intensity must also be zero at that point.

(3) If the electric field intensity is zero throughout a region, then the electric potential must also be zero throughout that region.

(4) If the electric potential is zero throughout a region,then the electric field intensity must also be zero throughout that region.

(5) The electric field intensity is large where the electric potential is large and small where the potential is small.

49. Two identical conducting spheres X and Y carry charges of + 97 e and - 100 e respectively. Here e is the charge of an electron. When X and Y are allowed to touch, the final charge on Y is

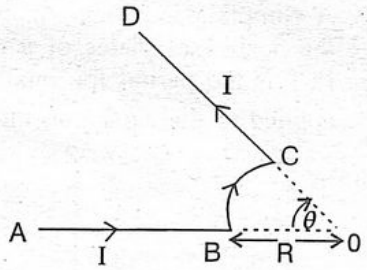
(1) -1.5 e or 0. (2) -1.5 e. (3) -3 e or 0. (4) -3 e. (5) -1 e or -2 e.

50. The readings V_A, V_B and V_C of three properly calibrated voltmeters A,B and C when connected separately across a certain cell are as follows. V_A = 8.95 V V_B = 8.85 V V_C = 8.75 V

When all three voltmeters are connected across the cell at the same time, their readings will most probably be

	V_A(V)	V_B(V)	V_C(V)
(1)	8.95	8.95	8.95
(2)	8.85	8.85	8.85
(3)	8.75	8.75	8.75
(4)	8.61	8.61	8.61
(5)	8.75	8.61	8.51

51. A current I flows in the wire ABCD bent into the shape as shown in the figure. AB and CD are straight portions while BC has a shape of an are of radius R. The magnetic flux density at the centre O is (θ is given in radians)

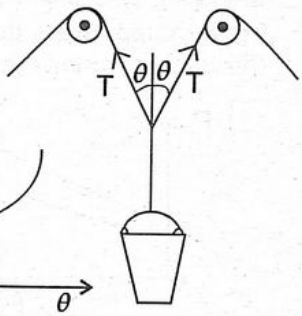


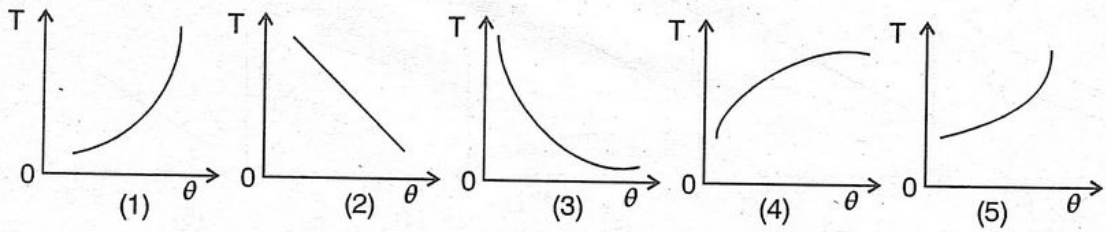
(1) $\frac{\mu_o I\theta}{8\pi R}$ (2) $\frac{\mu_o I\theta}{4\pi R}$ (3) $\frac{\mu_o I\theta}{2\pi R}$

(4) $\frac{\mu_o I\theta}{2R}$ (5) $\frac{\mu_o I\theta}{R}$

52. Consider the following statements made about stationary waves produced in a pipe open at both ends .
(A) Allowed oscillation modes form pressure nodes at each of the ends.
(B) Allowed frequencies consist of all harmonics of the fundamental.
(C) The length of the pipe corresponding to allowed oscillation modes is always an integral multiple Of the wavelength of the wave.
(1) only A is true. (2) only A and C are true. (3) only A and B are true.
(4) only B and C are true. (5) all A,B and C are true.

53. The diagram shows two boys pulling a bucket of water from a well. Which of the following graphs correctly represents the variation of the tension T in the strings with the angle θ.

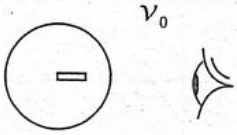




54. A sphere of radius a attains a terminal velocity v_0 when it falls down in a fluid of coefficient of viscosity η_1 and density d_1. The sane sphere is found to attain the same terminal velocity v_0 when it rises up in a different fluid of coefficient of viscosity η_2 and density d_2. The difference of the densities of two fluids (d_2-d_1) is then proportional to

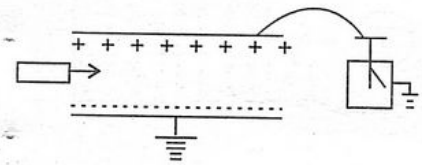
(1) $\frac{(\eta_2+\eta_1)v_2}{a^2}$ (2) $\frac{(\eta_2-\eta_1)v_2}{a^2}$ (3) $\frac{(\eta_2+\eta_1)v_2}{a^3}$ (4) $\frac{(\eta_2-\eta_1)v_2}{a^3}$ (5) $\frac{(\eta_2-\eta_1)a^2}{v_0}$

55. A glass sphere of radius 10cm has an internal cavity of length 5cm with one end coinciding with the centre as shown in the figure. If the cavity is viewed as shown, the length of the cavity appears to be (reactive index of glass $\frac{3}{2}$ =)

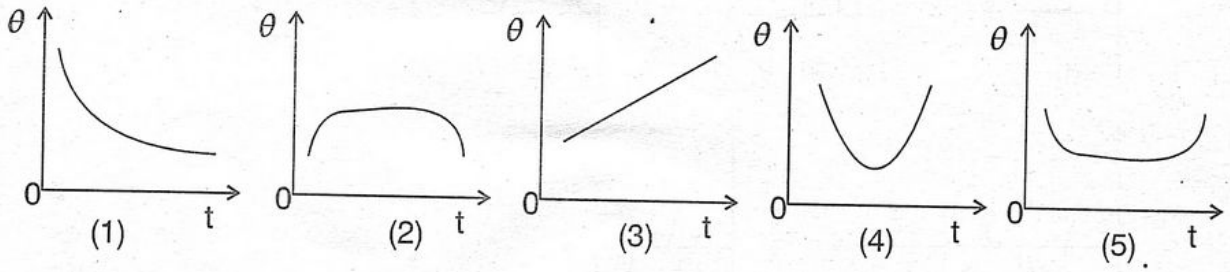


(1) 6 cm (2) 7 cm (3) 8 cm
(4) 9 cm (5) 10 cm

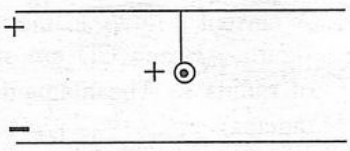
56.

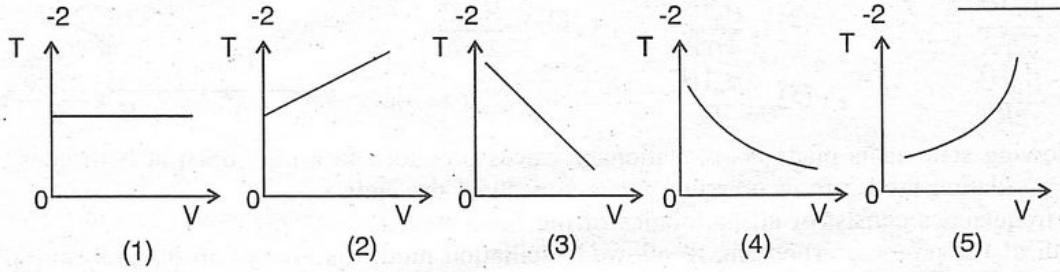


A charged capacitor is connected to the cap of a gold leaf electroscope as shown in the figure.
When an uncharged dielectric slab is inserted with a certain velocity from one side and removed from the other side of the capacitor as shown, the variation of deflection (θ) of the leaf with time (t) is best represented by

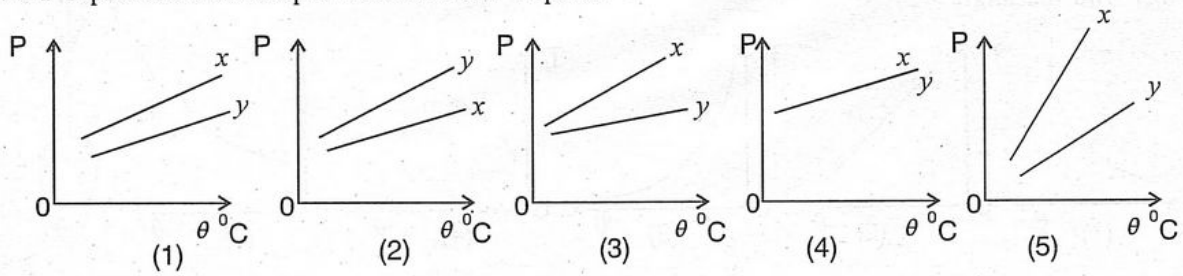


57. A Simple pendulum which caries a positive charge is placed in between the horizontal plates of a parallel plate capacitors, as shown in the figure. If T is the period for small oscillations when a potential difference of V is applied to the capacitor, the variation of T^{-2} with V is best represented by

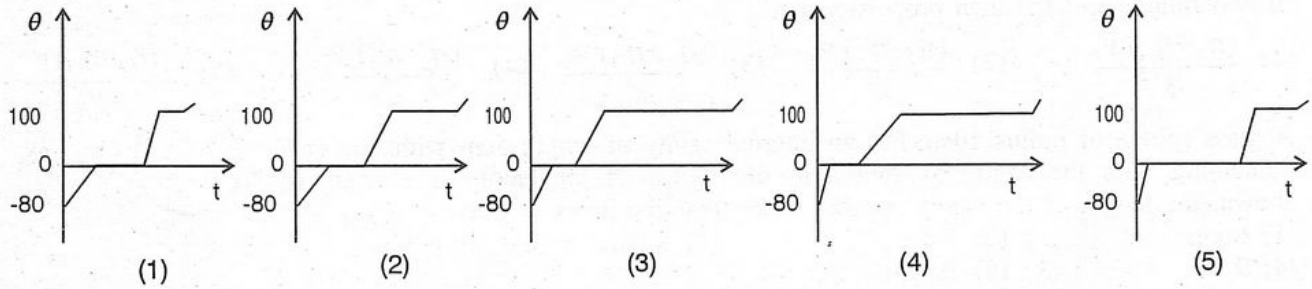




58. Two air samples, one dry and the other containing a little amount of water vapour (unsaturated) are used in an experiment to verify charles law. If the masses of the two samples are the same Which of the following pressure (P) versus temperature (θ) curves would you expect for the two samples ?
Curve X represents the sample with water vapour
Curve Y represents the sample without water vapour.



59. A certain quantity of curshed ice at - 80^0C is heated at a constant rate until all the ice is converted into steam. Specific heat capacity of water is greater than that of ice. Which of the following graphs best represents the variation of the temperature (θ) with time (t) ?



60. A circular conducting loop S passes through a region of uniform magnetic field with a constant velocity as shown in the figure. Which of the following graphs best represents the variation of the induced current (I) in the loop with time (t) ?

