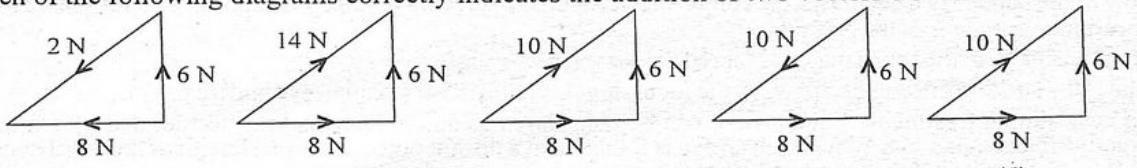
GCE A/L PHYSICS 1993

PAPER I

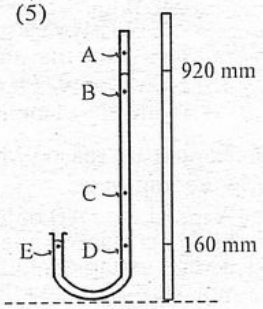
01. Which one of the following quantities is calculated by multiplying force by time ?
(1) acceleration (2) momentum (3) velocity (4) kinetic energy (5) power

02. Which of the following diagrams correctly indicates the addition of two vectors 8 N and 6 N ?



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

03. The diagram shows a mercury barometer. The point in the mercury column at which the pressure is 500 mm of Hg is.



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

04. Which one of the following is the poorest conductor of heat ?
(1) still air (2) water (3) rubber (4) wool (5) vacuum

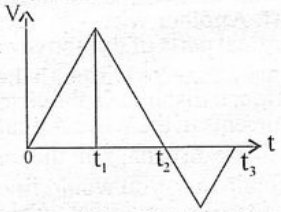
05. Heat energy is supplied at the same rate to 100 g of paraffin and 100 g of water in two similar containers The temperature of paraffin rises faster. This is because the paraffin.
(1) is more dense than water. (2) is less dense than water.
(3) is a good conductor compared to water. (4) has a smaller specific heat capacity.
(5) has a larger specific heat capacity.

06. An immersion heater rated at 150 W is embedded in a large block of ice at 0^0C . The specific latent heat of fusion of ice is 3×10^5 J kg^{-1} how long does it take to melt 10 g of ice ?
(1) 2 s (2) 10 s (3) 20 s (4) 150s (5) 4500 s

07. The mercury column of an uncalibrated thermometer stands at 12cm when placed in steam, at 2 cm when placed in melting ice and at 4 cm when placed in salt water. The approximate temperature of salt water is
(1) 2^0C (2) 20^0C (3) 33^0C (4) 40^0C (5) 80^0C

08. An object is dropped from a helicopter which is moving horizontally at a constant velocity of 45 ms^{-1} 180 m above the ground. Time taken for the object to reach the ground is
(1) 3 s (2) 4 s (3) 5 s (4) 6 s (5) 12 s

09. The figure shows the velocity - time graph for a particle which starts from rest and moves along X direction. According to this graph.



(A) the particle comes to rest only at time $t = t_3$
(B) the particle retums to its original position at time $t = t_3$
(C) the particle accelerates only during the time interval 0 - t_1
Of the above statements.
(1) Only (A) is true. (2) Only (B) is true.
(3) Only (A) and (C) are true. (4) Only (A) and (B) are true. (5) all (A), (B) and (C) are false.

10. A pin P is placed in front of a small plane mirror as shown.



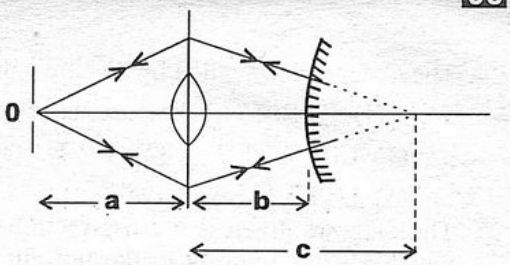


An image of P can be seen in the mirror when the eye is placed.
(1) at A only (2) at B only
(3) at any point between A and B
(4) at any point between B and C
(5) at any point between A and D

11. The lens of a camera has a focal length of 45 mm and a diameter of 30 mm. Its *f*-number is
(1) 0.33 (2) 0.67 (3) 1.33
(4) 1.5 (5) 2.25

12. An object is located on the axis and 15cm from a concave mirror of raius of curvature 12 cm. The image is
(1) real, inverted and magnification < 1 (2) real, erect and magnification > 1
(3) virtual, erect and magnification > 1 (4) virtual, inverted and magnification < 1
(5) real, erect and magnification < 1

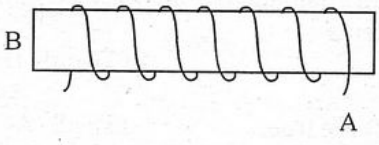
13. The diagram shows an experimental setup to measure the focal length of a convex mirror. O is an illuminated cross-wire, The focal length of the mirror is



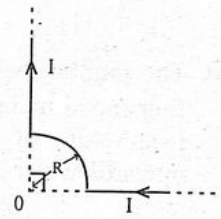
(1) $\frac{c-b}{2}$ (2) c-b (3) $\frac{c}{2}$ (4) c (5) b-a

14. Two vibrating strings under the same tension would produce beats if
    (A) the wavelengths of their sounds differ only sligtly.
    (B) their lengths differ slightly but linear densities are the same.
    (C) their linear densities differ slightly but lengths are are same.
    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.
15. Consider the following statements made about transverse waves in a string.
    (A) They are associated with compressions and rarefactions.
    (B) They are associated with troughs and crests.
    (C) The shortest distance between two particles in the indentical state of motion is one wave- length.
    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.
16. When a light wave travelling in a rare medium enters a dense medium.
    (1) its velocity increases. (2) only the frequency of the wave changes.
    (3) only the wavelength of the wave changes. (4) both frequency and wavelength change.
    (5) both frequency and wavelength remain unchanged.
17. The diagram shows an electromagnet with a coil A and a core B. Which combination of the following would make the magnet stronger ?

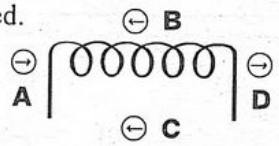
No. of turns in A	**The core B**
(1) small	soft - iron
(2) small	steel
(3) large	soft - iron
(4) large	copper
(5) large	air



18. Two concentric spherical metal shells of radii R and 2R carry charges 4Q and 3Q respectively. The quantity of charge that passes from one to the other when the two shells are connected tegether by a conducting wire is
    (1) 4Q (2) 2Q (3) Q (4) $\frac{Q}{2}$ (5) Zero
19. A rectangular coil of length 0.10 m and breadth 0.04 m consists 500 turns and is placed in a uniform magnetic field of flux density 0.10 T. If the coil carries a current of 10^{-2} A, the maximum possible torque on the coil is
    (1) 10^{-3} Nm (2) 2×10^{-3} Nm (3) 3×10^{-3} Nm (4) 4×10^{-3} Nm (5) 5×10^{-3} Nm
20. Two long straight wires are connected by a circular section that has a radius R as shown in the diagram. All three wires lie in the same plane and carry a steady current I. The magnetic flux density at the centre O is

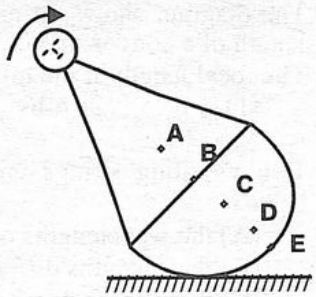


    (1) $\frac{\mu_o I}{R}$ (2) $\frac{\mu_o I}{2R}$ (3) $\frac{\mu_o I}{4R}$ (4) $\frac{\mu_o I}{8R}$ (5) 0
21. Four compass needles A, B,C and D are placed around a strong electromagent as shown in the figure. If the current through the electromagent is reversed.
    (1) the directions of A, B, C and D will remain unchanged.
    (2) directions of A, B, C and D will be reversed.
    (3) the directions of only A and D will be reversed.
    (4) the directions of only B and C will be reversed.
    (5) the directions of only A and B will be reversed.



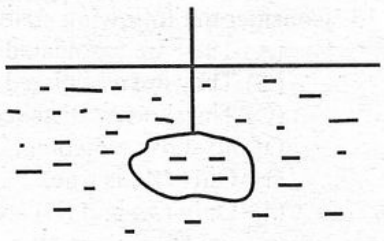
22. The lemperature coefficient of resistance of copper for the temperature range 20^0C - 30^0C can be taken as 3.9×10^{-1} K^{-1} the percentage change in resistance of a copper wire when its temperature changes from 20^0C to 30^0C is (1) 0.039 (2) 3.9 (3) 7.8 (4) 39 (5) 78
23. A small bar magnet of magnetic moment M is placed in a uniform magnetic field of flux density B. if the magnet makes an angle of 30^0 with the field, the torque acting on the magnet is
    (1) MB (2) $\frac{MB\sqrt{3}}{2}$ (3) $\frac{MB}{2}$ (4) $\frac{MB}{3}$ (5) $\frac{MB}{4}$

24. The distance S travelled by a vehicle during time t is given by the equation $S=At^2(1+\frac{1}{2}Bt)$ The dimensions of A and B are respectively.
(1) LT^2 ; $L^{\frac{1}{2}}T^{\frac{3}{2}}$ (2) T^2 ; T^3 (3) LT^{-2} ; T^{-1} (4) LT^{-2} ; $(LT^{-3})^{\frac{1}{2}}$
(5) L ; L



25. The diagram given is a cross-section of a toy placed on a horizontal table which always returns to the upright vertical position when released. The centre of gravity of this toy is most likely to be at,
(1) A (2) B
(3) C (4) D (5) E

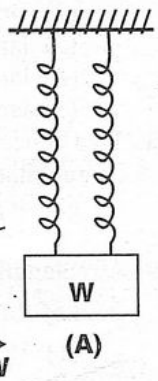
26. A measuring cylinder contains $60cm^3$ of oil at 0^0C when a piece of ice was reopped into the cylinder it sank completely in oil and the oil level rose to $90cm^3$ mark. when the ice melted the oil level came down to 87 cm^3 mark, The relative density of ice is
(1) 0.80 (2) 0.85 (3) 0.90 (4) 0.95 (5) 0.98

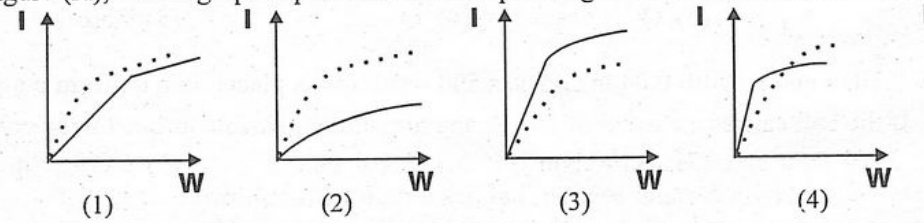


27. A thin polythene bag containing $10^{-4}m^3$ of water with no air bubbles inside is tied by a light string and lowered into a bath of water as shown in the figure. If the density of water $=10^3$ kg m^{-3} the lension in the string is
(1) 2 N (2) 1.5 N.
(3) 1 N. (4) 0.5 N. (5) 0.

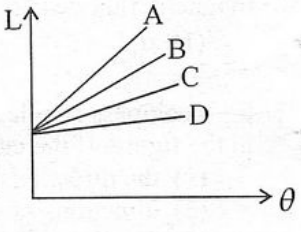
28. Two small metal spheres of the same size but made of aluminium and brass are released simultaneously. from rest inside a tall vessel filled with a viscous liquid. consider the following statements.
(A) Upthrusts on both spheres are the same.
(B) The initial accelerations of both spheres are the same.
(C) Both spheres will attain the terminal velocity at the same depth.
Of the above statements
(1) only (A) is true. (2) only (B) is true. (3) o n l y (C) is true.
(4) only (A) and (B) are true. (5) all (A) , (B) and (C) are true.

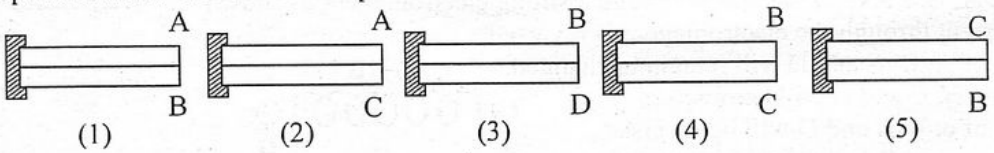
29. The dotted lines in the following graphs represents the extension (l)versus load (W) curve of a light spring hung from a ceiling. when the load is hung from two such springs as shown in figure (A), which graph represents the corrsponding extension versus load curve ?



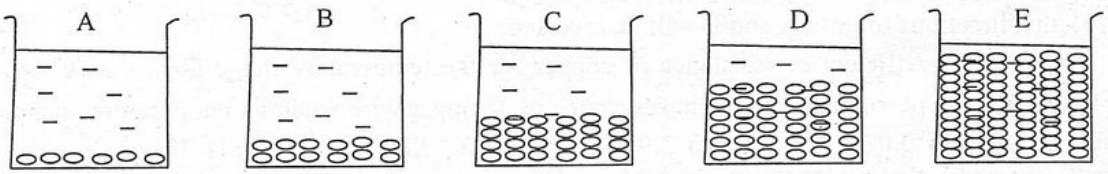


30. The graphs show the variation of length (L) with temperature (θ) of four metal metal strips A, B, C and D , Five bimetallic strips ate made from pairs of these metal strips. which bimetallic strip will bend upwards when one end is clamped and heated ?



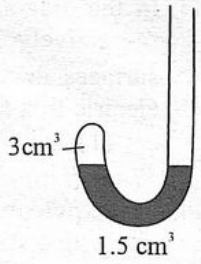


31.



Five identical beakers A,B,C,D and E contain different amounts of lead shots and are filled with water to the same level as shown, In which beaker will the water level rise most when heated to about 85^0C ?
(1) A (2) B (3) C (4) D (5) E

32. A J- tube contains $3cm^3$ of dry air trapped by a mercury column. The levels of mercury are the same on both limbs as shown in the figure, More mercury is now poured into the open limb until the levels differ by 76 cm. If the atmospheric pressure is 76 cm . of Hg what is the new volume of trapped air.

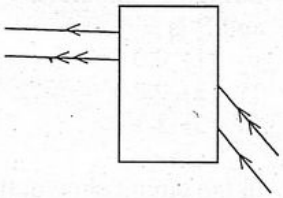


(1) $0.25\ cm^3$ (2) $0.5cm^3$ (3) $0.67\ cm^3$
(4) $1.0\ cm^3$ (5) $1.5\ cm^3$

33. To see one`s face as a one single image without lateral inversion, two plane mirrors should be placed touching each other along one edge and inclined at an angle.

(1) 30^0 (2) 60^0 (3) 90^0 (4) 120^0 (5) 150^0

34. An inclined paralled beam of monochromatic light is incident from the right on an optical element and leaves it from the left as indicated by the arrows in the figure. The optical element could be

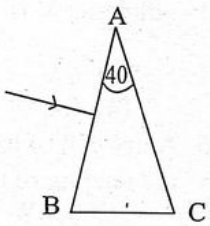


(1) an equi-convex lens (2) a plano-convex lens
(3) a plane mirror (4) a concave lens (5) a prism

35. A child 1.5 m tall stands at a distance of 7.5m from pinhole of a pinhole camera. The distance of the screen from the pinhole is 0.20 m. The height of the image of the child formed on the screen is,

(1) 0.01 m (2) 0.02 m (3) 0.04 m
(4) 0.08 m (5) 0.4 m

36. A ray of light is incident on the face AB of a prism normal to it. This ray emerges through the face AC grazing it. If the angle $A=40^0$ the refractive index of the material of the prism is



(1) $\frac{1}{\sin 40^0}$ (2) $\frac{1}{\sin 50^0}$ (3) $\sin 40^0$ (4) $\sin 50^0$ (5) $\frac{\sin 40^0}{\sin 50^0}$

37. Which of the following will produce overtones with even-integral multiples of its fundamental frequency ?
(A) An open organ pipe.
(B) An organ pipe closed at one end.
(C) A rod clamped at the centre and producing transverse vibrations
(1) (A) and (B) only (2) (B) and (C) only (3) (A) and (C) only
(4) All (A), (B) and (C) (5) None of the above.

38. Consider the following statements made about a standing wave in a medium.
(A) The displacement of particles at tha antinode is greater than the displacement at any other point.
(B) The velocity of the particles at the antinode is greater than the velocity at any other point.
(C) At any instant all the particles between any two consecutive nodes move in the same direction
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.

39. Two pipes one closed at one end and the other open at both ends have length L_1 and L_2 repectively. If the two pipes when sounded together have the same frequency at their first overtones, then $\frac{L_1}{L_2}$ is equal to

(1) $\frac{1}{4}$ (2) $\frac{1}{3}$ (3) $\frac{1}{2}$ (4) $\frac{3}{4}$ (5) $\frac{3}{6}$

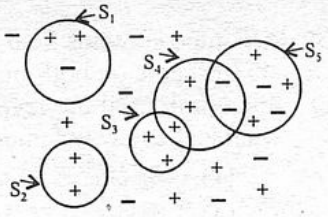
40. If the velocity of sound in air at 0^0C is v_0 the temperature at which the velocity becomes $2\ v_0$ is,

(1) $-205\ ^0C$ (2) 2^0C (3) 673^0C (4) 819^0C (5) 1092^0C

41. In a normal three pin plug top the earth pin is thicker than the other two pins. This is because
(1) the earth pin should have a higher resistance than the other two.
(2) the earth pin should have a higher thermal capacity.
(3) the earth pin opens gates to the other two pins when the plug is pushed into a socket.
(5) to provide a low resistance to the earth line.

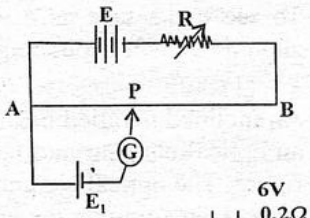
42. An electron passes through a space with a constant velocity. If E and B represent the magnitudes of the electic field intensity and the magnetic flux density of the electric and magnetic fields respectively, this region of space may have (A) $E = 0, B \neq 0$ (B) $E \neq 0, B = 0$ (C) $E \neq 0, B \neq 0$
Of the above conditions
(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.

43. In the diagram shown + and − symbols represent + q and − q charges respectively in a charge distribution. S_1 to S_5 are five closed spherical surfaces drawn by a student enclosing these charges. The total outward electric flux from the surfaces is maximum in



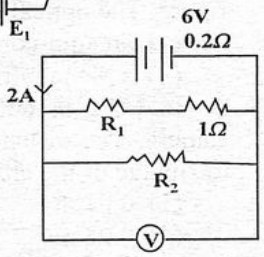
(1) S_1 (2) S_2 (3) S_3 (4) S_4 (5) S_5

44. In the potentiometer arrangement shown, the wire AB has a length of 200 cm, with a standard cell of e.m.f. 1.0183 V at E_1, the contact P is set so that AP is 101.83 cm and the resistance R is adjusted until there is no deflection in the galvanometer G. Then the total potential drop between the points A and B is



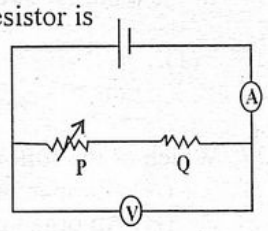
(1) 0.01 V (2) 0.1 V
(3) 0.2 V (4) 1 V
(5) 2 V

45. In the circuit shown, the battery has an e.m.f. 6 V and an internal resistance 0.2Ω if the current through the cell is 2 A, then the reading of the voltmeter V is



(1) 6 V (2) 5.8 V (3) 5.6 V
(4) 5.4 V (5) 2.8 V

46. A dry cell of e.m.f 9 V and internal resistance of 0.5Ω is connected across a resistor and an ammerer is series. the reading of the ammeter is found to be 1 A. The rate of dissipation of energy in the resistor is

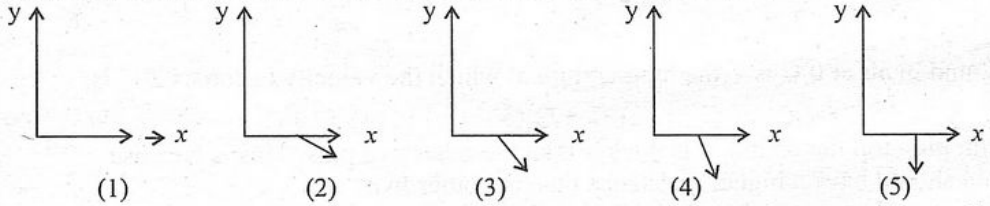


(1) 0.5 W (2) 2 W (3) 2.5 W (4) 8 . 5 W
(5) 9 W

47. In the circuit shown P is a variable resistor Q is a fixed resistor and the cell has negligible internal resistance. A is an ammeter and V is a voltmeter. As the resistance of P is increased, the reading of
(1) both A and V decreases. (2) A decreases and V increases
(3) both A and V remain unchanged
(4) A decreases and V remains unchanged. (5) both A and V increase.

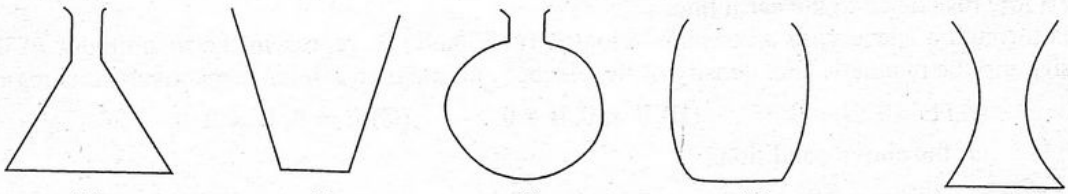
48. A ball thrown vertically upwards returns to the thrower's hand. consider the following statements.
(A) If there is no air resistance, the times taken for the upward and the downward journies are the same.
(B) If there is air resistance, the ball will reach the thrower's hand with a speed that is less than the speed with which it was thrown up.
(C) If there is air resistance, the time taken for the upward journey is greater than that for the downward journey.
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.

49. An object of mass m, moving with speed V along the *x*-axis, suddenly breaks into two identical pieces, If one of the broken pieces moves parallel to the y-axis along tis positive direction with speed V which of the following diagrams best indicates the direction of motion of the other piece ?



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

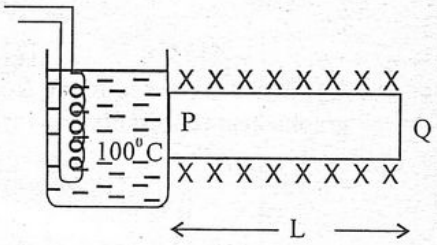
50. In which of the following vessels the liquid surface can be seen flat right up to the wall. when it is filled with any liquid to a cerain height? the height to which the liquid is filled depends on the liquid used.



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

51. A region with maximum relative humidity and minimum absolute humidity is most likely to be found in a place
    (1) just above the surface of boiling water,
    (2) just above the surface of a block of ice kept in still air at 30^0C
    (3) inside a closed room at dew point
    (4) inside a closed freezer at - 10^0C
    (5) inside a crowded room with less ventillation

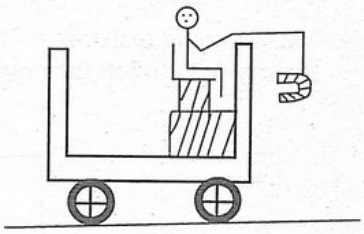
52. In the figure shown the immersion heater provides heat at the rate of W which maintains the temperature of the water in the reservoir at 100^0C



The rod PQ of length L and area of cross section A is lagged except its end Q and heat flows through the rod under steady state condition. If K is the thermal conducitivity of the material of the rod, then the minimum temperature to which the end Q can be lowered without altering the above mentioned conditions is

(1) 0 (2) $\frac{WL}{KA}$ (3) $100 - \frac{WL}{KA}$ (4) $\frac{100K}{LA}$ (5) $\frac{KA}{WL}$

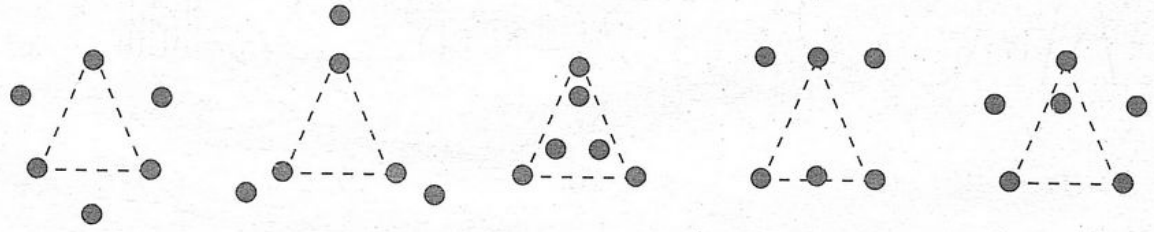
53. As shown in the figure a child is holding a strong magnet in front of an iron trolley placed on a amooth track, which of the following statements made about the trolley is true?



    (1) It moves with a uniform speed.
    (2) it moves with a uniform acceleration.
    (3) It accelerates initially and then moves with a uniform speed.
    (4) It does not move at all.
    (5) It moves only a short distance and then stops.

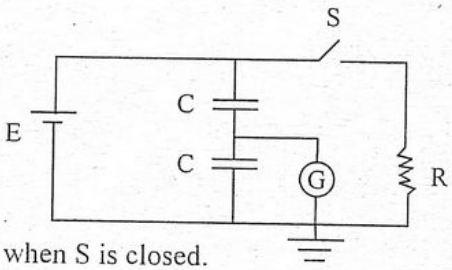
54. Which of the following is not a consequence of the fact that the moon has a very thin atmosphere compared to that of the earth ?
    (1) Boiling point of water at the moon is very much less than 100^0C
    (2) Ordinary microphone can not be used on the moon to detect sound.
    (3) A person can jump to a greater height on the moon than on the earth.
    (4) On viewing, stars will appear brighter on the moon than on the earth
    (5) Surface of the moon is bound to get more `hits` due to meteorites when compared to the number of hits received by the earth.

55. Figures show five different systems each containing six identical masses three of which are placed at the vertices of an equilateral triangle, and the other three are held firmly close to them. All the masses lie in the same plane. If all the forces acting on the systems except the gravitational forces among the masses are negligible, in which of the configurations the masses are most likely to be at equilibrium ?



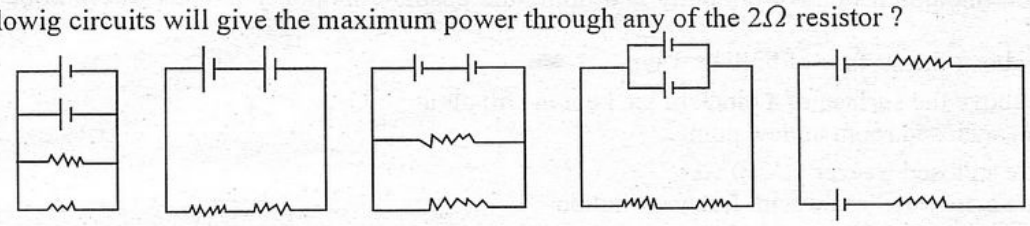
(1) (2) (3) (4) (5)

56. In the circuit shown, E is cell with an internal resistance, and G is a sensitive gold leaf electroscope, Both capacitors have the same capacitance. which of the following is true regrading the deflection of G when the switch S is open and closed.



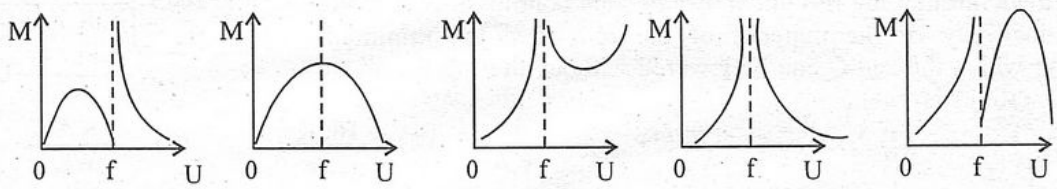
    (1) G shows a non zero deflection which remains unchanged upon opening and closing of the switch S.
    (2) G shows a zero deflection whether S is open or closed.
    (3) G shows a non zero deflection when S is open but becomes zero when S is closed.
    (4) G shows a non zero deflection when S is open but it reduces to a lower value when S is closed.
    (5) G shows a zero deflection when S is open but shows a non zero deflection when S is closed..

57. You are given two cells each with an e.m.f. of 2 V and internal resistance 0.1Ω and two 2Ω resistors which of the followig circuits will give the maximum power through any of the 2Ω resistor ?



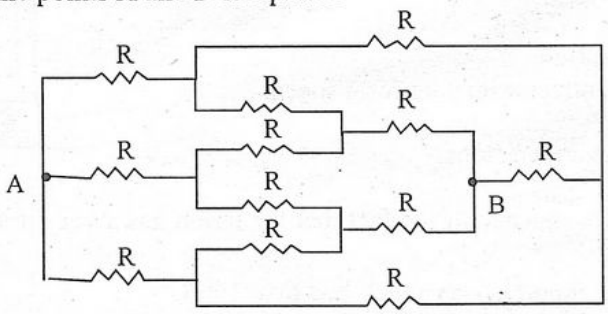
(1) (2) (3) (4) (5)

58. An object is moved away from the optical centre of a convex lens long its axis, which one of the following graphs best represents the variation of the magnification M with the object distance U?



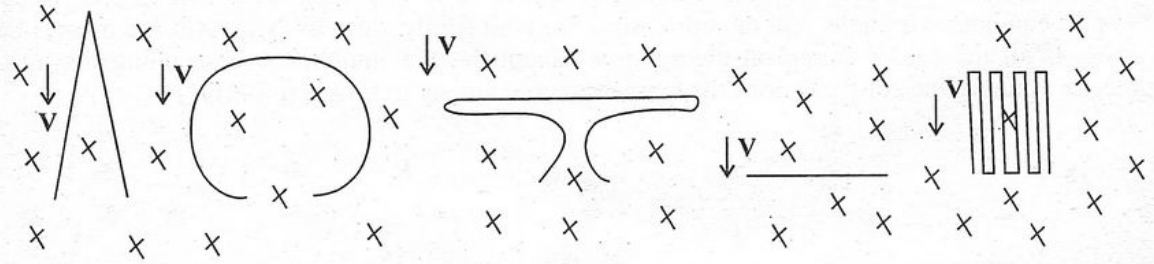
(1) (2) (3) (4) (5)

59. Twelve equal resistors each of resistancer R are joined to form the network shown in the figure. the effective resistance between the points A and B is equal to



(1) $\frac{1}{3}$ R (2) $\frac{2}{3}$ R (3) R (4) $\frac{5}{6}$ R (5) $\frac{4R}{3}$

60. Five pieces of wire are bent as shown in diagrams and are made to move with a constant velocity V maintaing their planes perpendicular to a uniform magnctic field. which of the wires will develop the largest induced e.m.f across its ends ?



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