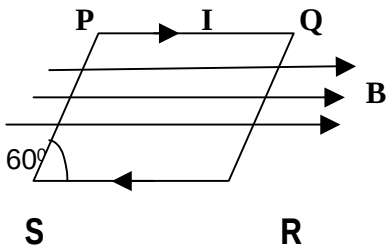
# MAGNETIC EFFECT OF ELECTRIC EFFECT

# AND MAGNETISM

1) A closed loop PQRS is lying in a magnetic field B as shown in the following figure.




The loop carries a current I and total length L . Find the magnitude of magnetic force acting on each side of the loop.

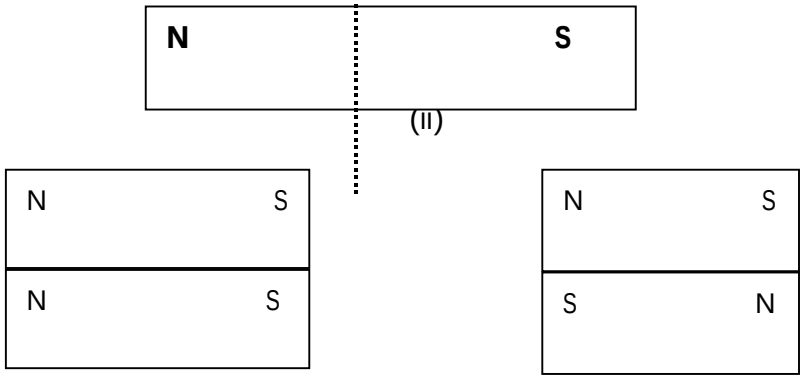
($F_{PS} = F_{QR} = \frac{\sqrt{3}}{8} BIL$ ; $F_{PQ} = F_{SR}$)

2) A magnet was found to vibrate at a place with a time period of T.A piece of brass of same length ,breadth and mass was placed over the magnet.What will be the new time period?

( $T= 2\pi\sqrt{\frac{I}{M}}$ )

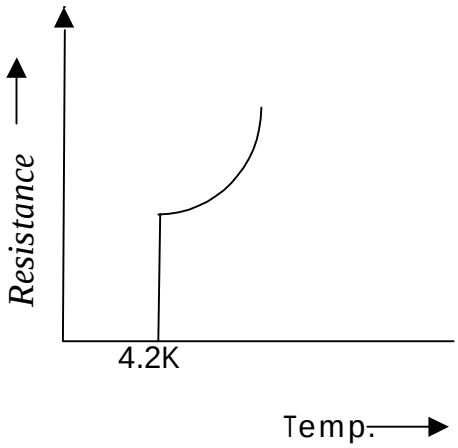
3) A hypothetical bar magnet AB is cut into t wo equal parts.One part is now kept over the other as shown. If M is the magnetic moment of the original magnet, what would be the magnetic moment of the following combinations so formed?

(i)

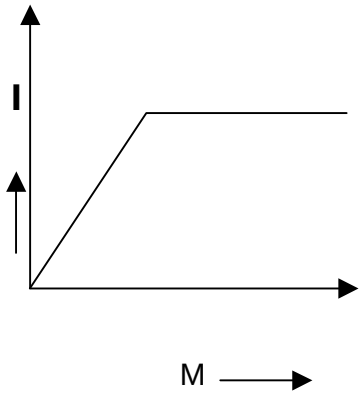


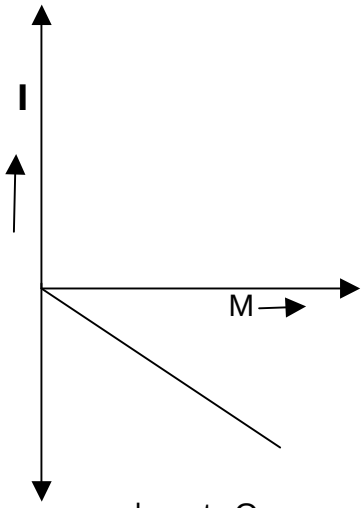

(ii)

4) Identify the magnetic material which follows the graphical representation given below.Also locate any two inferences about the behavior of the material from the graph.

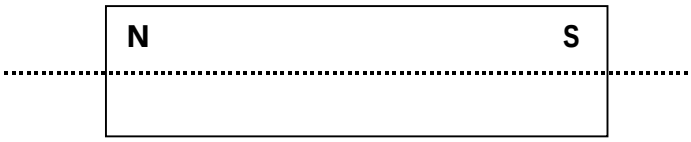



5) Identify the magnetic materials from the following curves.

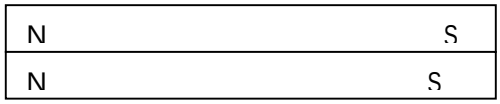


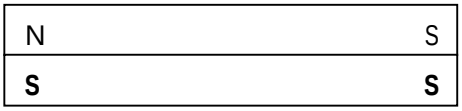

6) A hypothetical bar magnet AB is cut into t wo equal parts.One part is now kept near/over the other as shown. If M is the magnetic moment of the original magnet, what would be the magnetic moment of the following combinations so formed?



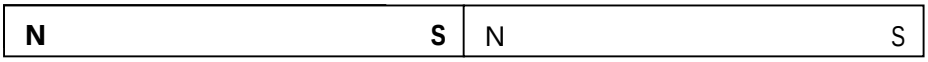

(i)




(ii)

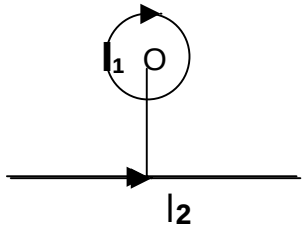



(iii)



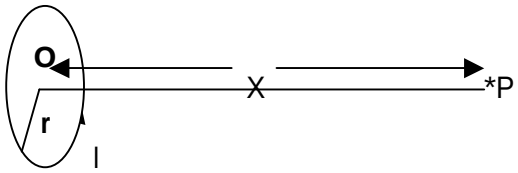

7) A circular loop and a long wire are carrying currents $I_1$ and $I_2$ respectivelly as shown.

The distance between the centre of the loop and long wire is 2r, where r is radius of the loop.If $I_2$ = 1A, find out the value of $I_1$ when the net magnetic field at the centre of the loop is zero.




($I_1$ = 1/2π A )

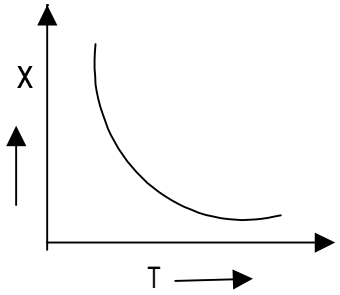
8) Nirmala records the following data for the magnitude B of the magnetic field at axial points at different distances 'x' from the centre of a circular coil of radius 'r' carrying a current 'I' . Verify for ,any two, that these observations are in good agreement with the expected theoretical variation of B with 'x'.



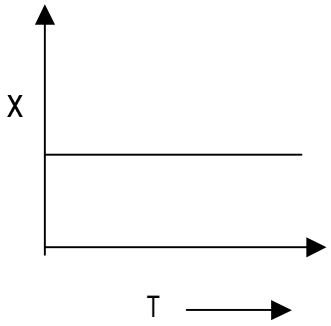

| X ⟶ | X = 0 | X = r | X = 2r | X = 3r |
|---|---|---|---|---|
| B | $B_0$ | $0.25\sqrt{2}B_0$ | $0.039\sqrt{5}B0$ | $0.010\sqrt{10}B0$ |

9) Identify the magnetic material corresponding to the following curves

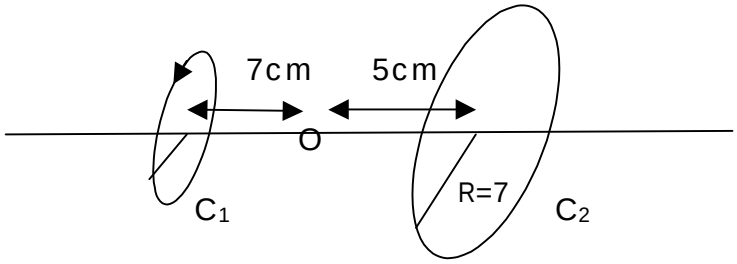
(1)




(2)




10) Two co-axial circular loops $C_1$ and $C_2$ of radii 5 cm and 7 cm are placed as shown . What should be the magnitude and direction of the current in the loop $C_2$ so that the net magnetic field at the point O be zero?




11) A conductor when thermally heated possess large number of freely moving electron,even then no magnetic field is experienced near such a conductor.What do you conclude?

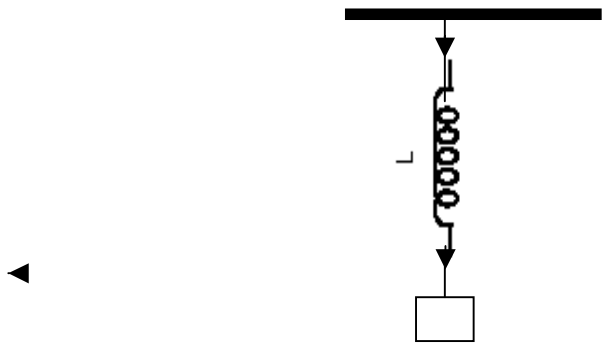
( Electrons move randomly on account of thermal energy. Magnetic field due to random moving electrons cancel out each other.So no magnetic field is experienced near a conductor in which no net current flows)

12) Net charge within a current carrying conductor is zero .State whether it experiences a force or not when placed in a magnetic field?

( In a current carrying conductor ,free electrons move with drift velocity while positive ions remains at rest. Free electrons

experiences a magnetic force while positively charged ions at rest does not experience magnetic force.)

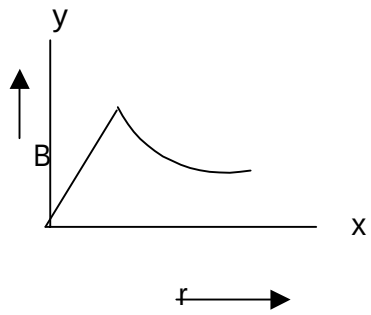
13)



Suppose a helical metallic spring is suspended from the roof and a very small weight is attached to its lower end. What will happen to the spring when the current is passed through it? Justify your answer.

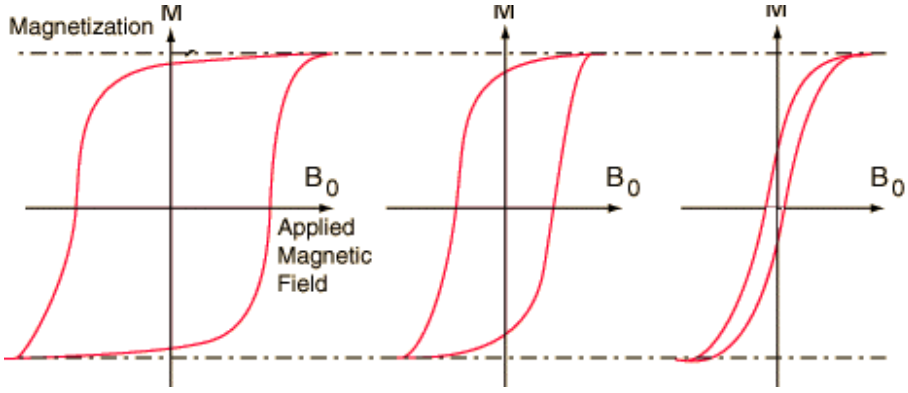
( As the currents flow in the same direction through parallel turns, each trurn attract each other ,as a result the coil contracts)

14) Current flows through a long and thick conductor. The magnetic field produced by the current carrying conductor is plotted against the distance from the centre of the conductor. What do you infer from the graph?




15) Identify the following curves and name it. The following curves are drawn for three different magnetic materials. Describe the nature of the magnetic materials.

Out of the three ,(i)name the curve which reperesents the material usually used for making Permanent Magnets.(ii) name the curve which reperesents the material usually used for making Temporary Magnets(electromagnets.)




16)A particle of mass m and charge q moves at right angles to a uniform magnetic field. Plot a graph showing the variation of the radius of the circular path described by it with the increase in its

(a) charge,(b) kinetic energy,where ,in each case other factors remain constant .Justify your answer.

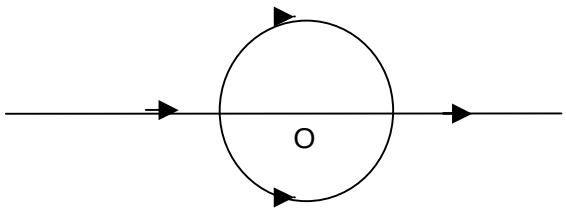
17)A charged paricle having a charge q ,is moving with a speed v along the x-axis. It enters a region of space where an electric field E along y-axis and a magnetic field B are both present.

The particle, on emerging from this region, is observed to be moving along the x-axis only. Obtain an expression for the magnitude of B in terms of v and E. Also give the direction of B.

18) A long wire is first bent into a circular coil of one turn and then into a circular coil of smaller radius having n turns. If the same current passes in both the cases find the ratio of the magnetic field produced at the centers in the two cases.

19)Why is diamagnetism independent of temperature?

20)What is the magnetic field at the centre of the circular loop shown in figure?




21)A toroidal coil has N = 1200 turns average length of core l = 80 cm; cross sectional area A = 60 $cm^2$ ;current I = 15 A. Compute B , H, total flux and energy density E.Assume an empty core.

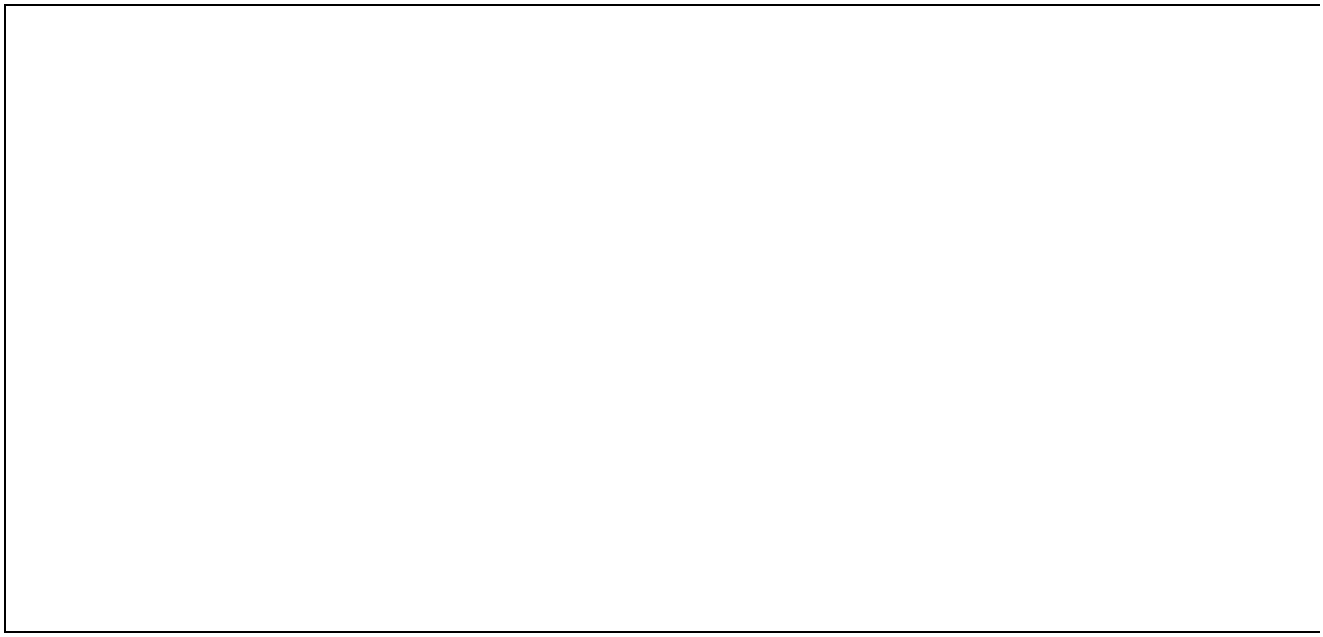
Also compute the results when a bismuth core ($\chi_m = -2 \times 10^{-6}$) is used.

{ Hint: $B = \mu_0 nI = 2.8274334$ mT; $H = B/\mu_0 = 2250$ A/m; $\varphi = BA = 16.964598$ μWb; $E = 1/2BH = 3.180626$ J/$m^3$ } { When bismuth core is used the above values decreases slightly due to the diamagnetic material}

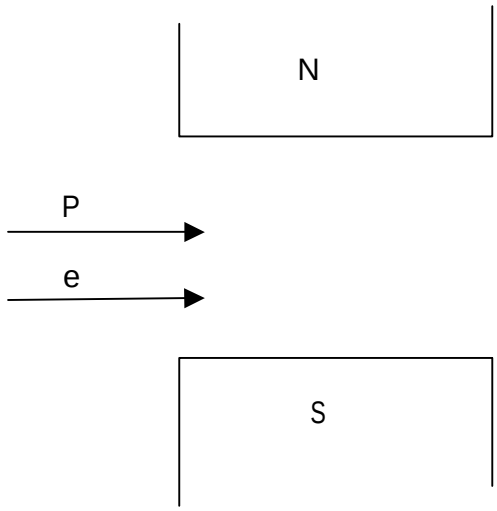
22)Identify the following curve and name it. Explain the following terms on the basis of the curve.

(a) Soft magnetic material (b) Hard magnetic material

c) Give one example each for the material d) one application each for the material



21) An electron and a proton ,moving parallel to each other in the same direction with equal momenta, enter ino a uniform magnetic field ,which is at right angles to their velocities. Trace their trajectories in the magnetic field.




(Trace the path such that Proton deflects ino the paper and the electron deflects out of the paper.)