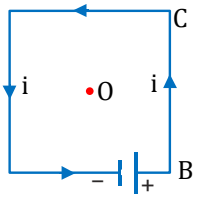
## Exercise - I (Conceptual Questions) Build Up Your Understanding

### MAGNETIC FIELD & BIOT-SAVART LAW

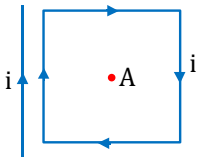
**1.** A stationary magnet does not interact with :-
(1) iron rod (2) moving charge
(3) moving magnet (4) stationary charge
**PME001**

**2.** Figure shows a square shape loop, whose one arm BC produces magnetic field B at the centre of coil. The resultant magnetic field due to all the arms will be :-




(1) 4B (2) B/2 (3) B (4) 2B
**PME002**

**3.** A wire is parallel to one arm of a square current carrying loop, which also carries current. Now at any point A within the coil the magnetic field will be :-



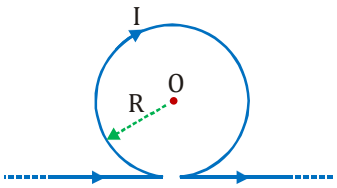

(1) less than the magnetic field produced due to loop only.
(2) more than the magnetic field produced due to loop only.
(3) equal to the earlier.
(4) zero
**PME003**

**4.** A current of 10 A is established in a long wire along positive z -direction. The magnetic field B at the point (1m, 0, 0) is :-
(1) 1μT along the –y direction
(2) 2μT along the +y direction
(3) 1μT along the –x direction
(4) 2μT along the +x direction
**PME004**

**5.** Radius of current carrying coil is 'R'. Then ratio of magnetic fields at the centre of the coil to the axial point, which is $R\sqrt{3}$ distance away from the centre of the coil :-
(1) 1 : 1 (2) 1 : 2 (3) 1 : 4 (4) 8 : 1
**PME005**

**6.** A coil of one loop is made by a wire of length L and there after a coil of two loops is made by same wire. The ratio of magnetic field at the centre of coils respectively :-
(1) 1 : 4 (2) 1 : 1 (3) 1 : 8 (4) 4 : 1
**PME006**

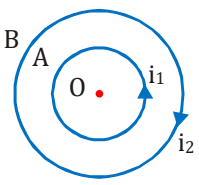
**7.** Magnetic field at point O will be :-




(1) $\frac{\mu_0 I}{2R}\otimes$ (2) $\frac{\mu_0 I}{2R}\odot$
(3) $\frac{\mu_0 I}{2R}\left(1-\frac{1}{\pi}\right)\otimes$ (4) $\frac{\mu_0 I}{2R}\left(1+\frac{1}{\pi}\right)\odot$
**PME007**

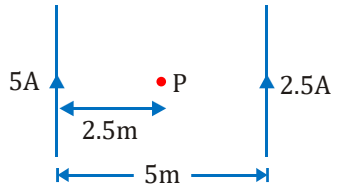
**8.** The vector form of Biot savart law for a current carrying element is :-
(1) $d\vec{B}=\frac{\mu_0}{4\pi}\frac{id\ell\sin\phi}{r^2}$ (2) $d\vec{B}=\frac{\mu_0}{4\pi}\frac{i\vec{d\ell}\times\hat{r}}{r^2}$
(3) $d\vec{B}=\frac{\mu_0}{4\pi}\frac{i\vec{d\ell}\times\hat{r}}{r^3}$ (4) $d\vec{B}=\frac{\mu_0}{4\pi}\frac{i\vec{d\ell}\times\vec{r}}{r^2}$
**PME008**

**9.** A and B are two concentric circular loop carrying current $i_1$ and $i_2$ as shown in figure. If ratio of their radii is 1:2 and ratio of the flux densities at the centre O due to A and B is 1:3 then the value of $\frac{i_1}{i_2}$ will be :-




(1) $\frac{1}{2}$ (2) $\frac{1}{3}$
(3) $\frac{1}{4}$ (4) $\frac{1}{6}$
**PME009**

**10.** For the given current distribution the magnetic field at point, 'P' is :-




(1) $\frac{\mu_0}{4\pi}\odot$ (2) $\frac{\mu_0}{\pi}\otimes$ (3) $\frac{\mu_0}{2\pi}\otimes$ (4) $\frac{\mu_0}{2\pi}\odot$

**PME010**

**11.** 1A current flows through an infinitely long straight wire. The magnetic field produced at a point 1m. away from it is :–

(1) $2 \times 10^{-3}$ T (2) $\frac{2}{10}$ T

(3) $2 \times 10^{-7}$ T (4) $2\pi \times 10^{-6}$ T

**PME011**

**12.** Two infinite long parallel wires carry equal currents in same direction. The magnetic field at mid point between the two wires is :–

(1) Twice the magnetic field produced due to each of the wires

(2) Half of the magnetic field produced due to each of the wires

(3) Square of the magnetic field produced due to each of the wires

(4) Zero

**PME012**

**13.** A closely wound flat circular coil of 25 turns of wire has diameter of 10 cm and carries a current of 4 ampere. Determine the magnetic flux density at the centre of the coil :-

(1) $1.679 \times 10^{-5}$ T (2) $2.028 \times 10^{-4}$ T

(3) $1.257 \times 10^{-3}$ T (4) $1.512 \times 10^{-6}$ T

**PME013**

**14.** $\pi$ ampere current is flowing through a long straight wire. Due to this a field of $5 \times 10^{-5}$ T produced, then distance of the point from the axis of the wire is :-

(1) $10^4\mu_0$ m (2) $10^5\mu_0$ m

(3) $10^6\mu_0$ m (4) $10^8\mu_0$ m

**PME014**

**15.** Radius of a current carrying coil is 'R'. The ratio of magnetic field at a axial point which is R distance away from the centre of the coil to the magnetic field at the centre of the coil :-

(1) $\left(\frac{1}{2}\right)^{1/2}$ (2) $\frac{1}{2}$ (3) $\left(\frac{1}{2}\right)^{3/2}$ (4) $\frac{1}{4}$

**PME015**

**16.** When the current flowing in a circular coil is doubled and the number of turns of the coil in it is halved, the magnetic field at its centre will become :-

(1) Same (2) Four times

(3) Half (4) Double

**PME016**

**17.** Which of the following statement is not true; magnetic field at the centre of current carrying loop :-

(1) proportional to current

(2) inversely proportional to radius

(3) proportional to number of turns

(4) none

**PME017**

**18.** A circular coil of radius R carries an electric current. The magnetic field due the coil at a point on the axis of the coil located at a distance r from the center of the coil, such that r >> R varies as :-

(1) $1/r$ (2) $1/r^{3/2}$ (3) $1/r^2$ (4) $1/r^3$

**PME018**

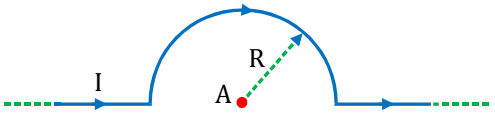
**19.** Two concentric circular loops of radii 0.08m and 0.1m carries current such that magnetic field at the centre is zero. If the current in the outer loop is 8A clockwise, current in the inner loop is :-

(1) 6.4 A anticlockwise (2) 6.4 A clockwise

(3) 8A anticlockwise (4) 3.2 A clockwise

**PME019**

**20.** In the shown figure magnetic field at point A will be :-




(1) $\frac{\mu_0 I}{4\pi}$ (2) $\frac{\mu_0 I}{4R}$ (3) $\frac{\mu_0 I}{4\pi R}$ (4) Zero

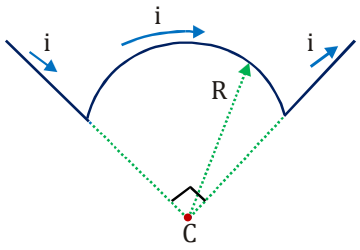
**PME020**

**21.** If radius of coil becomes two times and current becomes half then magnetic field at centre of the coil will be :-
(1) Two times (2) Four times
(3) Half (4) One fourth
**PME021**

**22.** 2A current is flowing in a circular loop of radius 1m. Magnitude of magnetic field at the centre of circular loop will be :-
(1) $\frac{\mu_0}{2}$ (2) $2\mu_0$ (3) $\mu_0$ (4) $\frac{\mu_0}{2\pi}$
**PME022**

**23.** A horizontal overhead powerline is at a height of 4m from the ground and carries a current of 100 A from east to west. The magnetic field directly below it on the ground is :-
(1) $2.5 \times 10^{-7}$ T, southward
(2) $5 \times 10^{-6}$ T, northward
(3) $5 \times 10^{-6}$ T, southward
(4) $2.5 \times 10^{-7}$ T, northward
**PME023**

**24.** The wire in the figure carries a current i and consists of a circular arc of radius R and central angle $\frac{\pi}{2}$ rad, and two straight sections whose extensions intersect the centre C of the arc. The magnetic field $\vec{B}$ that the current produces at C is :-




(1) $|\vec{B}| = \frac{\mu_0 i}{8R}$ into the plane of the figure
(2) $|\vec{B}| = \frac{\mu_0 i}{8R}$ out of the plane of the figure
(3) $|\vec{B}| = \frac{\mu_0 i}{8\pi R}$ into the plane of the figure
(4) $|\vec{B}| = \frac{\mu_0 i}{8\pi R}$ out of the plane of the figure
**PME024**

## AMPERE'S LAW

**25.** For the hollow thin cylindrical current carrying pipe which statement is correct :-
(1) magnetic field inside the pipe is not zero
(2) magnetic field outside the pipe is zero
(3) electric field outside the pipe is zero
(4) electric field on the surface of pipe is zero
**PME025**

**26.** In a current carrying long solenoid the field produced does not depend on :-
(1) number of turns per unit length
(2) current in solenoid
(3) radius of cross section of the solenoid
(4) all of the above
**PME026**

**27.** If length and number of turns becomes half for a solenoid then value of magnetic field becomes:-
(1) twice (2) same
(3) half (4) one fourth
**PME027**

**28.** If number of turns and current become double for any solenoid, then value of magnetic field becomes :-
(1) twice (2) same
(3) half (4) four times
**PME028**

**29.** A current of $1/4\pi$ ampere is flowing through a toroid. It has 1000 number of turn per meter then value of magnetic field (in $Wb/m^2$) along its axis is :-
(1) $10^{-2}$ (2) $10^{-3}$ (3) $10^{-4}$ (4) $10^{-7}$
**PME029**

**30.** Mean radius of a toroid is 10 cm and number of turns are 500. If current flowing through it is 0.1 ampere then value of magnetic field (in tesla) for toroid :-
(1) $10^{-2}$ (2) $10^{-5}$ (3) $10^{-3}$ (4) $10^{-4}$
**PME030**

**31.** A long solenoid has length L, average diameter D and n layer of turns. Each layer contains N turns. If current flowing through the solenoid is i the value of magnetic field at the centre :-
(1) Proportional to D
(2) Inversely proportional to D
(3) Does not depend on D
(4) Proportional to L
**PME031**

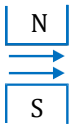
**32.** A long solenoid carrying a current produces a magnetic field B along its axis. If the current is doubled and the number of turns per cm is halved, the new value of the magnetic field is :-
(1) B/2 (2) B (3) 2B (4) 4B
**PME032**

**33.** A long solenoid having 200 turns/cm and carries current i. Magnetic field at its axis is $6{\cdot}28 \times 10^{-2}$ wb/m$^2$. An another solenoid having 100 turns/cm and carries $\frac{i}{3}$ current, then magnetic field at its axis will be :-
(1) $1.05 \times 10^{-4}$ Wb/m$^2$
(2) $1.05 \times 10^{-2}$ Wb/m$^2$
(3) $1.05 \times 10^{-5}$ Wb/m$^2$
(4) $1.05 \times 10^{-3}$ Wb/m$^2$
**PME033**

## MAGNETIC FORCE & MOVING CHARGE IN MAGNETIC FIELD

**34.** A proton and an alpha particle are separately projected in a region where a uniform magnetic field exists. The initial velocities are perpendicular to the direction of magnetic field. If both the particles move along circles of equal radii, the ratio of momentum of proton to alpha particle $\left(\frac{P_p}{P_\alpha}\right)$ is :-
(1) 1 (2) 1/2 (3) 2 (4) 1/4
**PME034**

**35.** Cathode rays are moving between the poles of a magnet. Due to the effect of magnetic field of magnet :-




(1) velocity of rays increases
(2) velocity of rays decreases
(3) rays deflected towards south pole
(4) rays deflected in upward direction and perpendicular to the plane of the paper
**PME035**

**36.** Following charge has maximum frequency of rotation in uniform transverse magnetic field :-
(1) a proton (2) an alpha particle
(3) an electron (4) a neutron
**PME036**

**37.** Which of the following particle will experiences maximum magnetic force, when projected with the same velocity perpendicular to a magnetic field :-
(1) electron (2) proton
(3) $He^+$ (4) $Li^{++}$
**PME037**

**38.** When $\alpha$ and $\beta$ rays are subjected to a magnetic field which is perpendicular to the direction of their motion, with their same speed. The curvature of path of both the particles are :-
(1) equal
(2) more for $\alpha$ particles
(3) more for $\beta$ particles
(4) none
**PME038**

**39.** Two identically charged particles A and B initially at rest, are accelerated by a common potential difference V. They enters into a uniform transverse magnetic field B and describe a circular path of radii $r_1$ and $r_2$ respectively then their mass ratio is :-
(1) $\left(\frac{r_1}{r_2}\right)^2$ (2) $\left(\frac{r_2}{r_1}\right)^2$
(3) $\left(\frac{r_1}{r_2}\right)$ (4) $\left(\frac{r_2}{r_1}\right)$
**PME039**

**40.** An $\alpha$-particle experiences a force of $3.84\times10^{-14}$ N when it moves perpendicular to magnetic field of 0.2 Wb/m$^2$ then speed of the $\alpha$ - particle is :-
(1) $6.0 \times 10^5$ m/sec (2) $5.0 \times 10^5$ m/sec
(3) $1.2 \times 10^6$ m/sec (4) $3.8 \times 10^6$ m/sec
**PME040**

**41.** If an electron enters a magnetic field with its velocity pointing in the same direction as the magnetic field then :–
(1) the electron will turn towards right
(2) the electron will turn towards left
(3) the velocity of the electron will increase
(4) the velocity of the electron will remain unchanged
**PME041**

**42.** A charge having q/m equal to $10^8$ C/kg and with velocity $3 \times 10^5$ m/s enters into a uniform magnetic field B = 0.3T at an angle 30° with direction of field. Then radius will be :-
(1) 0.01 cm (2) 0.5 cm
(3) 1 cm (4) 2 cm
**PME042**

**43.** When a charged particle enters in a uniform magnetic field its kinetic energy :-
(1) remains constant (2) increases
(3) decreases (4) becomes zero
**PME043**

**44.** Two particles x and y have equal charges and possessing equal kinetic energy enter in a uniform magnetic field and describe circular path of radius of curvature $r_1$ and $r_2$ respectively. The ratio of their masses is :-
(1) $\left(\frac{r_1}{r_2}\right)$ (2) $\left(\frac{r_1}{r_2}\right)^{1/2}$ (3) $\left(\frac{r_1}{r_2}\right)^2$ (4) $\left(\frac{r_2}{r_1}\right)$
**PME044**

**45.** An electron having mass 'm' and kinetic energy E enter in uniform magnetic field B perpendicularly, then its frequency of uniform circular motion will be :-
(1) $\frac{eE}{qVB}$ (2) $\frac{2\pi m}{eB}$ (3) $\frac{eB}{2\pi m}$ (4) $\frac{2m}{eBE}$
**PME045**

**46.** In a mass spectrograph an ion A of mass number 24 and charge +e and an ion B of mass number 22 and charge +2e are entered in transverse magnetic field with same velocity. The ratio of radii of their paths respectively :-
(1) $\frac{11}{24}$ (2) $\frac{12}{11}$ (3) $\frac{11}{22}$ (4) $\frac{24}{11}$
**PME046**

**47.** A charge particle is moving in the direction of a magnetic field. The magnetic force acting on the particle :-
(1) is in the direction of its velocity
(2) is in the direction opposite to its velocity
(3) is perpendicular to its velocity
(4) is zero
**PME047**

**48.** An electron of kinetic energy of $7.2 \times 10^{-18}$ J is revolving in a circular path in magnetic field $9 \times 10^{-5}$ Wb/m$^2$ then radius of its circular path is:–
(1) 1.25 cm. (2) 2.5 m.
(3) 2.5 cm. (4) 25.0 cm.
**PME048**

**49.** An electron moves with velocity v in uniform transverse magnetic field B on circular path of radius 'r', then e/m for it is :-
(1) $\frac{v}{Br}$ (2) $\frac{B}{rv}$ (3) Bvr (4) $\frac{vr}{B}$
**PME049**

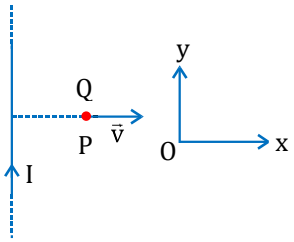
**50.** A proton, deutron and an α–particle are accelerated by same potential, enter in uniform magnetic field perpendicularly. Ratio of radii of circular path respectively :-
(1) $1 : \sqrt{2} : \sqrt{2}$ (2) 2 : 2 : 1
(3) 1 : 2 : 1 (4) 1 : 1 : 1
**PME050**

**51.** A charged particle moves through a magnetic field in a direction perpendicular to it. Then the :-
(1) speed of the particle remains unchanged
(2) direction of motion of particle remains unchanged
(3) acceleration of particle remains unchanged
(4) velocity of particle remains unchanged
**PME051**

**52.** A magnetic field :-
(1) Always exerts a force on charged particle
(2) Never exerts a force on charged particle
(3) Exert a force, if the charged particle is moving across the magnetic field line
(4) Exerts a force, if the charged particle is moving along the magnetic field line
**PME052**

**53.** A proton and an α-particle moving with the same velocity and enter into a uniform magnetic field which is acting normal to the plane of their motion. The ratio of the radii of the circular paths described by the proton and α-particle respectively :-
(1) 1 : 2 (2) 1 : 4 (3) 1 : 16 (4) 4 : 1
**PME053**

**54.** A very long straight wire carries a current I. At the instant when a charge +Q at point P has velocity $\vec{v}$, as shown, the magnetic force on the charge is:-




(1) along ox (2) opposite to oy
(3) along oy (4) opposite to ox

**PME054**

## LORENTZ FORCE & MOTION OF CHARGED PARTICALS IN B

**55.** In Thomson mass spectrograph $\vec{E} \perp \vec{B}$ then the velocity of undeflected electron beam will be :–

(1) $\frac{|\vec{E}|}{|\vec{B}|}$ (2) $\vec{E} \times \vec{B}$

(3) $\frac{|\vec{B}|}{|\vec{E}|}$ (4) $\frac{E^2}{B^2}$

**PME055**

**56.** A charge 'q' moves in a region where electric field and magnetic field both exist, then force on it :-

(1) $q(\vec{v}\times\vec{B})$ (2) $q\vec{E}+q(\vec{v}\times\vec{B})$

(3) $q\vec{E}+q(\vec{B}\times\vec{v})$ (4) $q\vec{B}+q(\vec{E}\times\vec{v})$

**PME056**

**57.** An electric field E and a magnetic field B applied on a proton which moves with velocity v, it goes undeflected through the region if :-

(1) $E \perp B$
(2) E is parallel to v and perpendicular to B
(3) E, B and v all three mutually perpendicular to each other and v = E/B
(4) E and B both are parallel but perpendicular to v

**PME057**

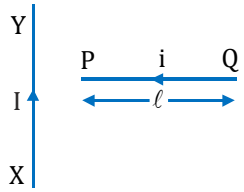
**58.** In a region constant uniform electric and magnetic field is present. Both field are parallel. In this region a charge released from rest, then path of particle is :-

(1) Circle (2) Helical
(3) Straight line (4) Ellipse

**PME058**

## FORCE ON A CURRENT-CARRYING CONDUCTOR

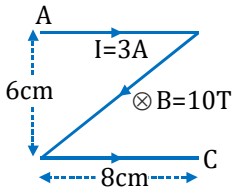
**59.** A wire PQ carries a current 'i' is placed perpendicular to a long wire XY carrying a current I. The direction of force on PQ will be:-




(1) towards right (2) towards left
(3) upwards (4) downwards

**PME059**

**60.** A current carrying wire AC is placed in uniform transverse magnetic field then the force on wire AC :-




(1) 3N (2) 4.2N (3) 6N (4) 4N

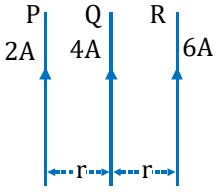
**PME060**

**61.** Force exist on a current carrying wire which is placed in external magnetic field, due to :–

(1) free electrons in wire
(2) free positive ions in wire
(3) (1) & (2) both
(4) none

**PME061**

**62.** P, Q and R long parallel straight wires in air, carrying currents as shown. The direction of resultant force on R is :-




(1) towards left
(2) towards right
(3) the same as that of current in Q
(4) perpendicular to plane of paper

**PME062**

**63.** Two parallel wires in free space are 10 cm apart and each carries a current of 10 A in the same direction. The magnetic force per unit length of each wire is :-
(1) $2 \times 10^{-4}$ N, attractive
(2) $2 \times 10^{-4}$ N, repulsive
(3) $2 \times 10^{-7}$ N, attractive
(4) $2 \times 10^{-7}$ N, repulsive

**PME063**

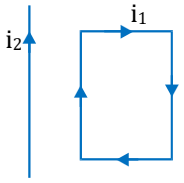
**64.** Wire in the form of a right angle ABC, with AB=3cm and BC = 4cm, carries a current of 10A. There is a uniform magnetic field of 5T perpendicular to the plane of the wire. The force on the wire will be :-
(1) 1.5N (2) 2.0N (3) 2.5N (4) 3.5N

**PME064**

**65.** When direct current passed through a spring then it :-
(1) Contracts (2) Expands
(3) Vibrate (4) Unchange

**PME065**

**66.** A rectangular loop carrying a current $i_1$, is situated near a long straight wire carrying a steady current $i_2$. The wire is parallel to one of the sides of the loop and is in the plane of the loop as shown in the figure. Then the current loop will :–




(1) move away from the wire
(2) move towards the wire.
(3) remain stationary.
(4) rotate about an axis parallel to the wire.

**PME066**

**67.** A current carrying wire is arranged at any angle in an uniform magnetic field, then
(1) only force acts on wire
(2) only torque acts on wire
(3) both
(4) none

**PME067**

**68.** Two parallel beams of positrons moving in the same direction will :-
(1) Repel to each other
(2) Will not interact with each other
(3) Attract to each other
(4) Be deflected normal to the plane containing the two beams

**PME068**

## CURRENT LOOP & MOVING COIL GALVANOMETER

**69.** Due to the flow of current in a circular loop of radius R, the magnetic field produced at the centre of the loop is B. The magnetic moment of the loop is :-
(1) $BR^3/2\ \pi\mu_0$ (2) $2\pi\ BR^3/\mu_0$
(3) $BR^2/2\pi\mu_0$ (4) $2\pi\ BR^2/\mu_0$

**PME069**

**70.** A circular loop has a radius of 5 cm. and it is carrying a current of 0.1 A. its magnetic moment is :–
(1) $1.32 \times 10^{-4}$ amp-$m^2$
(2) $2.62 \times 10^{-4}$ amp-$m^2$
(3) $5.25 \times 10^{-4}$ amp-$m^2$
(4) $7.85 \times 10^{-4}$ amp-$m^2$

**PME070**

**71.** An electron is moving in a circle of radius $5.1 \times 10^{-11}$ m at a frequency of $6.8 \times 10^{15}$ rev./sec. The equivalent current is approximately :–
(1) $5.1 \times 10^{-3}$ A (2) $6.8 \times 10^{-3}$ A
(3) $1.1 \times 10^{-3}$ A (4) $2.2 \times 10^{-3}$ A

**PME071**

**72.** If number of turn, area and current through the coil is given by n, A and i respectively then its magnetic moment will be :–
(1) niA (2) $n^2iA$ (3) $niA^2$ (4) $\frac{ni}{\sqrt{A}}$

**PME072**

**73.** An electron is moving around a proton in an orbit of radius 1Å and produces 16 $Wb/m^2$ of magnetic field at the centre, then find the angular velocity of electron :-
(1) $20\ \pi \times 10^{16}$ rad/sec
(2) $10 \times 10^{16}$ rad/sec
(3) $\frac{5}{2\pi} \times 10^{16}$ rad/sec
(4) $\frac{5}{4\pi} \times 10^{16}$ rad/sec

**PME073**

**74.** Current I is flowing in a conducting circular loop of radius R. It is kept in a magnetic field B which is perpendicular to the plane of circular loop, the magnetic force acting on the loop is :-
(1) IRB (2) $2\pi$IRB (3) Zero (4) $\pi$IRB
**PME074**

**75.** The unit of magnetic moment will be :-
(1) $\frac{A}{m}$ (2) A-$m^2$
(3) $\frac{T-m}{A}$ (4) $\frac{T-m}{A^2}$
**PME075**

**76.** A current carrying coil behave like tiny magnet. If area of coil is A and magnetic moment is 'M' then current through the coil is :-
(1) $\frac{M}{A}$ (2) $\frac{A}{M}$ (3) MA (4) $\frac{A^2}{M}$
**PME076**

**77.** An electron revolves with frequency $6.6 \times 10^{15}$ r.p.s. around nucleus in circular orbit of radius 0.53 Å of hydrogen atom, then magnetic field produced at centre of orbit is :-
(1) 0.125 T (2) 1.25 T
(3) 12.5 T (4) 125 T
**PME077**

**78.** A current loop of area $0.01m^2$ and carrying a current of 10A is held perpendicular to a magnetic field of 0.1T, the torque in N–m acting on the loop is :-
(1) 0 (2) 0.001 (3) 0.01 (4) 1.1
**PME078**

**79.** A current carrying coil is placed in a constant uniform magnetic field B. Torque is maximum on this coil when plane of coil is :-
(1) perpendicular to B (2) parallel to B
(3) at 45° to B (4) at 60° to B
**PME079**

**80.** Magnetic field is parallel to the plane of coil then torque will be :-
(1) Maximum (2) Minimum
(3) Zero (4) None of these
**PME080**

## BAR MAGNET

**81.** The work done in rotating a magnet of magnetic moment M by an angle of 90° from the external magnetic field direction is 'n' times the corresponding work done to turn it through an angle of 60°. Where 'n' gives by :-
(1) 1/2 (2) 2 (3) 1/4 (4) 1
**PME081**

**82.** Magnetic field lines produced by a bar magnet, cuts each other :–
(1) At neutral points
(2) Near the poles of the magnets
(3) At equatorial axis
(4) Never intersects to each other
**PME082**

## MAGNETIC PROPERTIES OF MATERIALS

**83.** For protecting a magnetic needle it should be placed :-
(1) in an iron box (2) in wooden box
(3) in metallic box (4) none of these
**PME083**

**84.** Which of the following materials is repelled by an external magnetic field :-
(1) Iron (2) Cobalt
(3) Steel (4) Copper
**PME084**

**85.** If a diamagnetic material is placed in a magnetic field, the flux density inside the material compared to that outside will be :
(1) Slightly less (2) Slightly more
(3) Very much more (4) Same
**PME085**

**86.** To protect a sensitive instrument from external magnetic jerks, it should be placed in a container made of :-
(1) Nonmagnetic substance
(2) Diamagnetic substance
(3) Paramagnetic substance
(4) Ferromagnetic substance
**PME086**

**87.** Substances in which the magnetic moment of a single atom is not zero, are known as :-
(1) Diamagnetic (2) Ferromagnetic
(3) Paramagnetic (4) (2) and (3) both
**PME087**

**88.** Susceptibility of a magnetic substance is found to depend on temperature and the strength of the magnetising field. The material is a :-
(1) Diamagnetic
(2) Ferromagnetic
(3) Paramagnetic
(4) Superconductor

**PME088**

**89.** Property possessed by only ferromagnetic substance is :-
(1) Attracting magnetic substance
(2) Hysteresis
(3) Susceptibility independent of temperature
(4) Directional property

**PME089**

**90.** The hard ferromagnetic material is characterized by :-
(1) Narrow hysteresis loop
(2) Broad hysteresis loop
(3) High mechanically hardness, all over
(4) Mechanically hard surface

**PME090**

**91.** The magnetic moment of paramagnetic materials is :-
(1) Infinity (2) Zero
(3) Constant but low (4) None of above

**PME091**

**92.** The cause of paramagnetism is :-
(1) Unparied electrons
(2) Electron excess and spin motion of electrons
(3) Paired electrons and orbital motion of electrons
(4) Electrons and orbital motion of electrons

**PME092**

**93.** The cause of diamagnetism is :-
(1) Orbital motion of electrons
(2) Spin motion of electrons
(3) Paired electrons
(4) None of the above

**PME093**

**94.** The magnetic moment of diamagnetic materials is :-
(1) Infinity
(2) Zero
(3) 100 amp–$m^2$
(4) None of the above

**PME094**

**95.** Which of the following statements is correct for diamagnetic materials :-
(1) $\mu_r < 1$
(2) $\chi$ is negative and low
(3) $\chi$ does not depend on temperature
(4) All of the above

**PME095**

**96.** The area of B–H loop for soft iron, as compared to that for steel is :-
(1) More
(2) Less
(3) Equal
(4) None of the above

**PME096**

**97.** The liquid in the watch glass in the following figure is -


(1) Ferromagnetic (2) Paramagnetic
(3) Diamagnetic (4) Nonmagnetic

**PME097**

**98.** Powerful permanent magnets are made of :-
(1) Cobalt (2) Aluminum
(3) Tin–coal (4) Cobalt–steel

**PME098**

**99.** Which of the following statements is correct for ferromagnetic material :-
(1) These become diamagnetic at Curie temperature
(2) These become paramagnetic at Curie temperature
(3) Their magnetic susceptibility becomes zero at Curie temperature
(4) Its magnetic properties are explained on the basis of electron principle

**PME099**

**100.** A material rod, when placed in a strong magnetic field, aligns itself at right angles to the magnetic field. The nature of material is :-
(1) Diamagnetic
(2) Paramagnetic
(3) Ferromagnetic
(4) Low ferromagnetic

**PME100**

**101.** The relative permeability of air is :-
(1) Zero (2) 1.04
(3) Infinity (4) 1

**PME101**

**102.** If the magnetic susceptibility of a magnetic material is –0.004 then its nature will be :-
(1) Diamagnetic (2) Paramagnetic
(3) Ferromagnetic (4) Non magnetic
**PME102**

**103.** The correct measure of magnetic hardness of a material is :-
(1) Remanent magnetism
(2) Hysteresis loss
(3) Coercivity
(4) Curie temperature
**PME103**

**104.** If the relative permeability of a material is 0.9999 then its nature will be :-
(1) Paramagnetic (2) Diamagnetic
(3) Ferromagnetic (4) Non-magnetic
**PME104**

**105.** The magnetic susceptibility of a paramagnetic material at –73°C is 0.0075 then its value at –173°C will be :-
(1) 0.0045 (2) 0.0030
(3) 0.015 (4) 0.0075
**PME105**

**106.** When a magnetic substance is heated, then it :
(1) Becomes a strong magnet
(2) Losses its magnetism
(3) Does not effect the magnetism
(4) Either (1) or (3)
**PME106**

**107.** Diamagnetic substance are :-
(1) Feebly attracted by magnets
(2) Strongly attracted by magnets
(3) Feebly repelled by magnets
(4) Strongly repelled by magnets
**PME107**

**108.** If a diamagnetic solution is poured into a U-tube and one arm of this U-tube placed between the poles of a strong magnet with the meniscus in a line with the field, then the level of the solution will :-
(1) Rise (2) Fall
(3) Oscillate slowly (4) Remain as such
**PME108**

**109.** Magnetic permeability is maximum for :
(1) Diamagnetic substance
(2) Paramagnetic substance
(3) Ferromagnetic substance
(4) All of these
**PME109**

**110.** Which one of the following is ferro-magnetic :-
(1) Co (2) Zn (3) Hg (4) Pt
**PME110**

**111.** For paramagnetic materials magnetic susceptibility is related with temperature as :-
(1) $\propto T^2$ (2) $\propto T^1$ (3) $\propto T^{-1}$ (4) $\propto T^{-2}$
**PME111**

**112.** According to Curie's law, the magnetic susceptibility of a substance at an absolute temperature T is proportional to :-
(1) $1/T$ (2) $T$ (3) $1/T^2$ (4) $T^2$
**PME112**

**113.** A diamagnetic material in a magnetic field moves
(1) from stronger to the weaker parts of the field
(2) from weaker to the stronger parts of the field
(3) perpendicular to the field
(4) in none of the above directions
**PME113**

**114.** Diamagnetic substances characterise by :-
(1) low and negative magnetic susceptibility
(2) low and positive magnetic susceptibility
(3) high and negative magnetic susceptibility
(4) high and positive magnetic susceptibility
**PME114**

**115.** Magnetic susceptibility of a diamagnetic substance varies with absolute temperature as :-
(1) directly proportional to T
(2) inversely proportional to T
(3) remains unchanged with T
(4) exponential decrease with T
**PME115**

**116.** The material of permanent magnet has
(1) High retentivity, low coercivity
(2) Low retentivity, high coercivity
(3) Low retentivity, low coercivity
(4) High retentivity, high coercivity
**PME116**

**117.** Hysteresis property is shown by :-
(1) paramagnetic and diamagnetic
(2) diamagnetic
(3) paramagnetic
(4) ferromagnetic
**PME117**

**118.** Magnetic susceptibility of the following is :
(1) negative for diamagnetic
(2) positive for diamagnetic and paramagnetic
(3) negative for diamagnetic and zero for paramagnetic
(4) zero for paramagnetic and positive for ferromagnetic
**PME118**

**119.** Which statement is true :
(1) atomic magnetic dipole moment of diamagnet is zero
(2) atomic magnetic dipole moment of para-magnet is zero
(3) atomic magnetic dipole moment of ferro-magnet is zero
(4) ferromagnet is demagnetised rapidly after moving in magnetising field.

**PME119**

**120.** Curie-Weiss law is obeyed by iron at a temperature.....
(1) Below Curie temperature
(2) Above Curie temperature
(3) At Curie temperature only
(4) At all temperatures

**PME120**

**121.** Ferromagnetic substance contain :-
(1) empty subshell
(2) partially empty subshell
(3) full fill subshell
(4) none of these

**PME121**

**122.** Soft iron is used to make the core of transformer, because of its :
(1) low coercivity and low retentivity
(2) low coercivity and high retentivity
(3) high coercivity and high retentivity
(4) high coercivity and low retentivity

**PME122**

**123.** Above curie temperature ferromagnetic substance converts into :
(1) paramagnetic
(2) diamagnetic
(3) ferromagnetic
(4) non magnetic

**PME123**

**124.** Relation between $\mu_r$ and $\chi$ will be :
(1) $\mu_r = 1 + \chi$
(2) $\chi = \mu_r + 1$
(3) $\frac{\mu_0}{\mu}$
(4) $\mu_0\chi$

**PME124**

## EXERCISE-I (Conceptual Questions) ANSWER KEY

| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Answer | 4 | 1 | 2 | 2 | 4 | 1 | 3 | 2 | 4 | 3 | 3 | 4 | 3 | 1 | 3 |
| Question | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| Answer | 1 | 4 | 4 | 1 | 2 | 4 | 3 | 3 | 1 | 3 | 3 | 2 | 4 | 3 | 4 |
| Question | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 |
| Answer | 3 | 2 | 2 | 2 | 4 | 3 | 4 | 3 | 1 | 1 | 4 | 2 | 1 | 3 | 3 |
| Question | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| Answer | 4 | 4 | 4 | 1 | 1 | 1 | 3 | 1 | 3 | 1 | 2 | 3 | 3 | 4 | 1 |
| Question | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 |
| Answer | 1 | 1 | 1 | 3 | 1 | 2 | 1 | 1 | 2 | 4 | 3 | 1 | 2 | 3 | 2 |
| Question | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| Answer | 1 | 3 | 1 | 2 | 1 | 2 | 4 | 1 | 4 | 1 | 4 | 4 | 2 | 2 | 2 |
| Question | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 |
| Answer | 2 | 2 | 1 | 2 | 4 | 2 | 2 | 4 | 2 | 1 | 2 | 1 | 3 | 2 | 3 |
| Question | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 |
| Answer | 2 | 3 | 2 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 4 | 4 | 1 | 1 | 2 |
| Question | 121 | 122 | 123 | 124 | | | | | | | | | | | |
| Answer | 2 | 1 | 1 | 1 | | | | | | | | | | | |

## Exercise - II (Previous Year Questions) AIPMT/NEET

### AIPMT 2014

**1.** Two identical long conducting wires AOB and COD are placed at right angle to each other, with one above other such that 'O' is their common point for the two. The wires carry $I_1$ and $I_2$ currents respectively. Point 'P' is lying at distance 'd' from 'O' along a direction perpendicular to the plane containing the wires. The magnetic field at the point 'P' will be :-

(1) $\frac{\mu_0}{2\pi d}\left(I_1 / I_2\right)$ (2) $\frac{\mu_0}{2\pi d}(I_1 + I_2)$

(3) $\frac{\mu_0}{2\pi d}(I_1^2 - I_2^2)$ (4) $\frac{\mu_0}{2\pi d}(I_1^2 + I_2^2)^{1/2}$

**PME125**

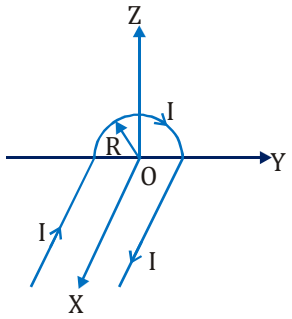
### AIPMT 2015

**2.** An electron moving in a circular orbit of radius r makes n rotations per second. The magnetic field produced at the centre has magnitude :

(1) Zero (2) $\frac{\mu_0 n^2 e}{r}$ (3) $\frac{\mu_0 ne}{2r}$ (4) $\frac{\mu_0 ne}{2\pi r}$

**PME126**

**3.** A wire carrying current I has the shape as shown in adjoining figure. Linear parts of the wire are very long and parallel to X-axis while semi-circular portion of radius R is lying in Y-Z plane. Magnetic field at point O is :




(1) $\vec{B} = -\frac{\mu_0}{4\pi}\frac{I}{R}\left(\pi\hat{i} - 2\hat{k}\right)$

(2) $\vec{B} = -\frac{\mu_0}{4\pi}\frac{I}{R}\left(\pi\hat{i} + 2\hat{k}\right)$

(3) $\vec{B} = \frac{\mu_0}{4\pi}\frac{I}{R}\left(\pi\hat{i} - 2\hat{k}\right)$

(4) $\vec{B} = \frac{\mu_0}{4\pi}\frac{I}{R}\left(\pi\hat{i} + 2\hat{k}\right)$

**PME127**

### Re-AIPMT 2015

**4.** A rectangular coil of length 0.12m and width 0.1m having 50 turns of wire is suspended vertically in a uniform magnetic field of strength 0.2 Weber/$m^2$. The coil carries a current of 2A. If the plane of the coil is inclined at an angle of 30° with the direction of the field, the torque required to keep the coil in stable equilibrium will be :

(1) 0.12 Nm (2) 0.15 Nm
(3) 0.20 Nm (4) 0.24 Nm

**PME128**

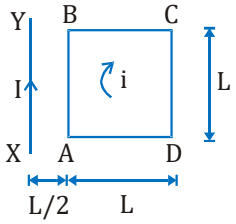
**5.** A proton and an alpha particle both enter a region of uniform magnetic field, B, moving at right angles to the field B. If the radius of circular orbits for both the particles is equal and the kinetic energy acquired by proton is 1 MeV, the energy acquired by the alpha particle will be :-

(1) 1 MeV (2) 4 MeV
(3) 0.5 MeV (4) 1.5 MeV

**PME129**

### NEET-I 2016

**6.** A square loop ABCD carrying a current i, is placed near and coplanar with a long straight conductor XY carrying a current I, the net force on the loop will be :-




(1) $\frac{2\mu_0 Ii}{3\pi}$ (2) $\frac{\mu_0 Ii}{2\pi}$

(3) $\frac{2\mu_0 IiL}{3\pi}$ (4) $\frac{\mu_0 IiL}{2\pi}$

**PME130**

**7.** The magnetic susceptibility is negative for :

(1) diamagnetic material only
(2) paramagnetic material only
(3) ferromagnetic material only
(4) paramagnetic and ferromagnetic materials

**PME131**

**8.** A long straight wire of radius a carry a steady current I. The current is uniformly distributed over its cross-section. The ratio of the magnetic fields B and B', at radial distances $\frac{a}{2}$ and 2a respectively, from the axis of the wire is :

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

**PME132**

**NEET-II 2016**

**9.** A long wire carrying a steady current is bent into a circular loop of one turn. The magnetic field at the centre of the loop is B. It is then bent into a circular coil of n turns. The magnetic field at the centre of this coil of n turns will be :-

(1) 2nB (2) $2n^2B$
(3) nB (4) $n^2B$

**PME133**

**10.** A bar magnet is hung by a thin cotton thread in a uniform horizontal magnetic field and is in equilibrium state. The energy required to rotate it by 60° is W. Now the torque required to keep the magnet in this new position is :-

(1) $\frac{\sqrt{3}W}{2}$ (2) $\frac{2W}{\sqrt{3}}$
(3) $\frac{W}{\sqrt{3}}$ (4) $\sqrt{3}$ W

**PME134**

**11.** An electron is moving in a circular path under the influence of a transverse magnetic field of $3.57 \times 10^{-2}$ T. If the value of e/m is $1.76 \times 10^{11}$ C/kg, the frequency of revolution of the electron is :-

(1) 62.8 MHz (2) 6.28 MHz
(3) 1 GHz (4) 100 MHz

**PME135**

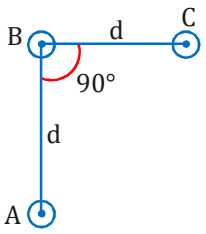
**NEET(UG) 2017**

**12.** A 250 turn rectangular coil of length 2.1 cm and width 1.25 cm carries a current of 85 μA and subjected to magnetic field of strength 0.85 T. Work done for rotating the coil by 180° against the torque is:-

(1) 4.55 μJ (2) 2.3 μJ
(3) 1.15 μ J (4) 9.1 μ J

**PME136**

**13.** An arrangement of three parallel straight wires placed perpendicular to plane of paper carrying same current 'I along the same direction is shown in fig. Magnitude of force per unit length on the middle wire 'B' is given by :-




(1) $\frac{2\mu_0 i^2}{\pi d}$ (2) $\frac{\sqrt{2}\mu_0 i^2}{\pi d}$
(3) $\frac{\mu_0 i^2}{\sqrt{2}\pi d}$ (4) $\frac{\mu_0 i^2}{2\pi d}$

**PME137**

**NEET(UG) 2018**

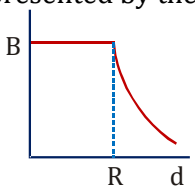
**14.** A thin diamagnetic rod is placed vertically between the poles of an electromagnet. When the current in the electromagnet is switched on, then the diamagnetic rod is pushed up, out of the horizontal magnetic field. Hence the rod gains gravitational potential energy. The work required to do this comes from

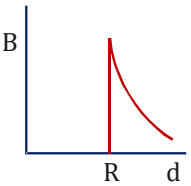
(1) the current source
(2) the magnetic field
(3) the lattice structure of the material of the rod
(4) the induced electric field due to the changing magnetic field

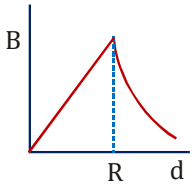
**PME138**

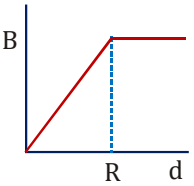
**NEET(UG) 2019**

**15.** A cylindrical conductor of radius R is carrying a constant current. The plot of the magnitude of the magnetic field, B with the distance d, from the centre of the conductor, is **correctly** represented by the figure :

(1) 


(2) 


(3) 


(4) 


**PME139**

**16.** Ionized hydrogen atoms and $\alpha$-particles with same momenta enters perpendicular to a constant magnetic field B. The ratio of their radii of their paths $r_H : r_\alpha$ will be

(1) 2 :1 (2) 1 : 2
(3) 4 : 1 (4) 1 : 4

**PME140**

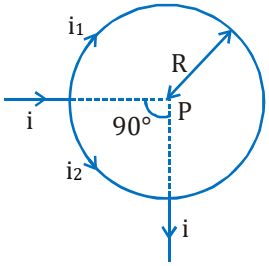
**NEET(UG) 2019 (Odisha)**

**17.** Two toroids 1 and 2 have total number of turns 200 and 100 respectively with average radii 40 cm and 20 cm respectively. If they carry same current i, then the ratio of the magnetic fields along the two is :

(1) 1 : 1 (2) 4 : 1
(3) 2 : 1 (4) 1 : 2

**PME141**

**18.** A straight conductor carrying current i splits into two parts as shown in the figure. The radius of the circular loop is R. The total magnetic field at the centre P of the loop is :




(1) Zero
(2) $3\mu_0 i/32$ R, outward
(3) $3\mu_0 i/32R$, inward
(4) $\mu_0 i/2R$, inward

**PME142**

**NEET(UG) 2020**

**19.** An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 A $m^{-1}$. The permeability of the material of the rod is :

($\mu_0 = 4\pi \times 10^{-7}$ T m $A^{-1}$)

(1) $2.4\pi \times 10^{-7}$ T m $A^{-1}$
(2) $2.4\pi \times 10^{-4}$ T m $A^{-1}$
(3) $8.0 \times 10^{-5}$ T m $A^{-1}$
(4) $2.4\pi \times 10^{-5}$ T m $A^{-1}$

**PME143**

**20.** A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is :

($\mu_0 = 4\pi \times 10^{-7}$ T m $A^{-1}$)

(1) $3.14 \times 10^{-5}$ T (2) $6.28 \times 10^{-4}$ T
(3) $3.14 \times 10^{-4}$ T (4) $6.28 \times 10^{-5}$ T

**PME144**

**NEET(UG) 2020 (COVID-19)**

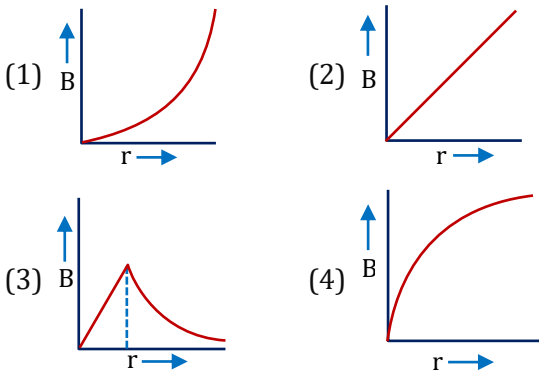
**21.** A wire of length L metre carrying a current of I ampere is bent in the form of a circle. Its magnetic moment is,

(1) $IL^2/4$ A $m^2$ (2) $I\pi L^2/4$ A $m^2$
(3) $2IL^2/\pi$ A $m^2$ (4) $IL^2/4\pi$ A $m^2$

**PME145**

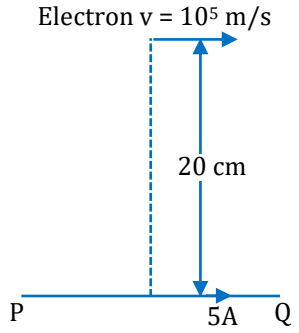
**NEET(UG) 2021**

**22.** A thick current carrying cable of radius 'R' carries current 'I' uniformly distributed across its cross-section. The variation of magnetic field B(r) due to the cable with the distance 'r' from the axis of the cable is represented by :




**PME146**

**23.** An infinitely long straight conductor carries a current of 5 A as shown. An electron is moving with a speed of $10^5$ m/s parallel to the conductor. The perpendicular distance between the electron and the conductor is 20 cm at an instant. Calculate the magnitude of the force experienced by the electron at that instant.




(1) $4 \times 10^{-20}$ N (2) $8\pi \times 10^{-20}$ N
(3) $4\pi \times 10^{-20}$ N (4) $8 \times 10^{-20}$ N

**PME147**

**24.** In the product

$\vec{F} = q\left(\vec{v} \times \vec{B}\right) = q\vec{v} \times \left(B\hat{i} + B\hat{j} + B_0\hat{k}\right)$

For q = 1 and $\vec{v} = 2\hat{i} + 4\hat{j} + 6\hat{k}$

and $\vec{F} = 4\hat{i} - 20\hat{j} + 12\hat{k}$

What will be the complete expression for $\vec{B}$ ?

(1) $-8\hat{i} - 8\hat{j} - 6\hat{k}$ (2) $-6\hat{i} - 6\hat{j} - 8\hat{k}$
(3) $8\hat{i} + 8\hat{j} - 6\hat{k}$ (4) $6\hat{i} + 6\hat{j} - 8\hat{k}$

**PME148**

**25.** A uniform conducting wire of length 12a and resistance 'R' is wound up as a current carrying coil in the shape of,
(i) an equilateral triangle of side 'a'.
(ii) a square of side 'a'.
The magnetic dipole moments of the coil in each case respectively are:

(1) $\sqrt{3}\,Ia^2$ and $3\,Ia^2$ (2) $3\,Ia^2$ and $Ia^2$
(3) $3\,Ia^2$ and $4\,Ia^2$ (4) $4\,Ia^2$ and $3\,Ia^2$

**PME149**

## NEET(UG) 2022

**26.** Given below are two statements:
Statement I :
Biot-Savart's law gives us the expression for the magnetic field strength of an infinitesimal current element (Idl) of a current carrying conductor only.
Statement II :
Biot-Savart's law is analogous to Coulomb's inverse square law of charge q, with the former being related to the field produced by a scalar source, Idl while the latter being produced by a vector source, q.
In light of above statement choose the most appropriate answer from the options given below:

(1) Both statement I and Statement II are incorrect
(2) Statement I is correct and Statement II is incorrect
(3) Statement I is incorrect and Statement II is correct
(4) Both statement I and Statement II are correct

**PME150**

**27.** From Ampere's circuital law for a long straight wire of circular cross-section carrying a steady current, the variation of magnetic field in the inside and outside region of the wire is:

(1) a linearly increasing function of distance upto the boundary of the wire and then linearly decreasing for the outside region.
(2) a linearly increasing function of distance r upto the boundary of the wire and then decreasing one with 1/r dependence for the outside region.
(3) a linearly decreasing function of distance upto the boundary of the wire and then a linearly increasing one for the outside region.
(4) uniform and remains constant for both the regions.

**PME151**

## RE-NEET (UG) 2022

**28.** A closely packed coil having 1000 turns has an average radius of 62.8 cm. If current carried by the wire of the coil is 1 A, the value of magnetic field produced at the centre of the coil will be (permeability of free space = $4\pi \times 10^{-7}$ H/m) nearly:

(1) $10^{-1}$ T (2) $10^{-2}$ T
(3) $10^{2}$ T (4) $10^{-3}$ T

**PME152**

**29.** The shape of the magnetic field lines due to an infinite long, straight current carrying conductor is :

(1) a straight line (2) circular
(3) elliptical (4) a plane

**PME153**

**30.** Two very long, straight, parallel conductors A and B carry current of 5A and 10A respectively and are at a distance of 10 cm from each other. The direction of current in two conductors is same. The force acting per unit length between two conductors is:
($\mu_0 = 4\pi \times 10^{-7}$ SI unit)
(1) $2 \times 10^{-4}$ $Nm^{-1}$ and is attractive
(2) $2 \times 10^{-4}$ $Nm^{-1}$ and is repulsive
(3) $1 \times 10^{-4}$ $Nm^{-1}$ and is attractive
(4) $1 \times 10^{-4}$ $Nm^{-1}$ and is repulsive

**PME154**

**31.** The magnetic field on the axis of a circular loop of radius 100 cm carrying current $I = \sqrt{2}$ A, at point 1 m away from the centre of the loop is given by:
(1) $3.14 \times 10^{-7}$ T (2) $6.28 \times 10^{-7}$ T
(3) $3.14 \times 10^{-4}$ T (4) $6.28 \times 10^{-4}$ T

**PME155**

**NEET (UG) 2023**

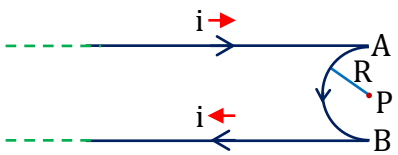
**32.** The net magnetic flux through any closed surface is :
(1) Positive (2) Infinity
(3) Negative (4) Zero

**PME156**

**33.** A wire carrying a current I along the positive x-axis has length L. It is kept in a magnetic field $\vec{B} = (2\hat{i} + 3\hat{j} - 4\hat{k})$T. The magnitude of the magnetic force acting on the wire is :
(1) $\sqrt{5}$ IL (2) 5 IL
(3) $\sqrt{3}$ IL (4) 3 IL

**PME157**

**34.** A very long conducting wire is bent in a semi-circular shape from A to B as shown in figure. The magnetic field at point P for steady current configuration is given by :




(1) $\frac{\mu_0 i}{4R}$ pointed away from the page
(2) $\frac{\mu_0 i}{4R}\left[1-\frac{2}{\pi}\right]$ pointed away from page
(3) $\frac{\mu_0 i}{4R}\left[1-\frac{2}{\pi}\right]$ pointed into the page
(4) $\frac{\mu_0 i}{4R}$ pointed into the page

**PME158**

**RE-NEET (UG) 2023**

**35.** A long straight wire of length 2 m and mass 250 g is suspended horizontally in a uniform horizontal magnetic field of 0.7 T. The amount of current flowing through the wire will be ($g = 9.8$ $ms^{-2}$) :
(1) 2.45 A (2) 2.25 A
(3) 2.75 A (4) 1.75 A

**PME159**

**36.** A uniform electric field and a uniform magnetic field are acting along the same direction in a certain region. If an electron is projected in the region such that its velocity is pointed along the direction of fields, then the electron:
(1) will turn towards right of direction of motion
(2) will turn towards left of direction of motion
(3) speed will decrease
(4) speed will increase

**PME160**

**NEET (UG) 2024**

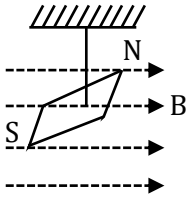
**37.** Match **List-I** with **List-II**

| **List-I (Material)** | **List-II (Susceptibility($\chi$))** |
|---|---|
| **A.** Diamagnetic | I. $\chi = 0$ |
| **B.** Ferromagnetic | II. $0 > \chi \geq -1$ |
| **C.** Paramagnetic | III. $\chi >> 1$ |
| **D.** Non-Magnetic | IV. $0 < \chi < \varepsilon$ (a small positive number) |

Choose the correct answer from the options given below:
(1) A–II, B–III, C–IV, D–I
(2) A–II, B–I, C–III, D–IV
(3) A–III, B–II, C–I, D–IV
(4) A–IV, B–III, C–II, D–I

**PME161**

**38.** In a uniform magnetic field of 0.049 T, a magnetic needle performs 20 complete oscillations in 5 seconds as shown. The moment of inertia of the needle is $9.8 \times 10^{-6}$ kg m$^2$. If the magnitude of magnetic moment of the needle is $x \times 10^{-5}$ Am$^2$; then the value of '$x$' is :




(1) $5\ \pi^2$ (2) $128\ \pi^2$

(3) $50\ \pi^2$ (4) $1280\ \pi^2$

**PME162**

**39.** A tightly wound 100 turns coil of radius 10 cm carries a current of 7 A. The magnitude of the magnetic field at the centre of the coil is (Take permeability of free space as $4\pi \times 10^{-7}$ SI units) :

(1) 44 mT (2) 4.4 T

(3) 4.4 mT (4) 44 T

**PME163**

**40.** An iron bar of length L has magnetic moment M. It is bent at the middle of its length such that the two arms make an angle 60° with each other. The magnetic moment of this new magnet is :

(1) M (2) $\frac{M}{2}$

(3) 2M (4) $\frac{M}{\sqrt{3}}$

**PME164**

**41.** A sheet is placed on a horizontal surface in front of a strong magnetic pole. A force is needed to :

A. hold the sheet there if it is magnetic.

B. hold the sheet there if it is non-magnetic.

C. move the sheet away from the pole with uniform velocity if it is conducting.

D. move the sheet away from the pole with uniform velocity if it is both, non-conducting and non-polar.

Choose the correct statement(s) from the options given below:

(1) B and D only

(2) A and C only

(3) A, C and D only

(4) C only

**PME165**

## RE-NEET (UG) 2024

**42.** The magnetic potential energy, when a magnetic bar of magnetic moment $\vec{m}$ is placed perpendicular to the magnetic field $\vec{B}$ is :

(1) $-\frac{mB}{2}$ (2) zero

(3) –m B (4) m B

**PME166**

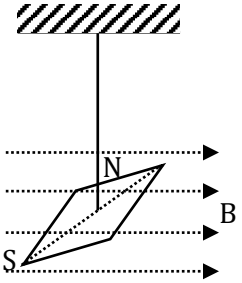
**43.** The incorrect relation for a diamagnetic material (all the symbols carry their usual meaning and $\varepsilon$ is a small positive number) is :

(1) $\mu < \mu_0$ (2) $0 \le \mu_r < 1$

(3) $-1 \le \chi < 0$ (4) $1 < \mu_r < 1 + \varepsilon$

**PME167**

**44.** The magnetic moment and moment of inertia of a magnetic needle as shown are, respectively $1.0 \times 10^{-2}$ A m$^2$ and $\frac{10^{-6}}{\pi^2}$ kg m$^2$. If it completes 10 oscillations in 10 s, the magnitude of the magnetic field is :




(1) 0.4 T (2) 4 T

(3) 0.4 mT (4) 4 mT

**PME168**

**45.** The magnetic moment of an iron bar is M. It is now bent in such a way that it forms an arc section of a circle subtending an angle of 60° at the centre. The magnetic moment of this arc section is:

(1) $\frac{3M}{\pi}$ (2) $\frac{4M}{\pi}$

(3) $\frac{M}{\pi}$ (4) $\frac{2M}{\pi}$

**PME169**

## EXERCISE-II (Previous Year Questions) ANSWER KEY

| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Answer | 4 | 3 | 2 | 3 | 1 | 1 | 1 | 3 | 4 | 4 | 3 | 4 | 3 | 1 | 3 |
| Question | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| Answer | 1 | 1 | 1 | 2 | 2 | 4 | 3 | 4 | 2 | 1 | 2 | 2 | 4 | 2 | 3 |
| Question | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 |
| Answer | 1 | 4 | 2 | 2 | 4 | 3 | 1 | 4 | 3 | 2 | 2 | 2 | 4 | 3 | 1 |

## Exercise – III (Analytical Questions) Master Your Understanding

**1.** Two circular coils of radii 5 cm and 10 cm carry currents of 2 A. The coils have 50 and 100 turns respectively and are placed in such a way that their planes as well as their centres coincide. Magnitude of magnetic field at the common centre of coils is
(a) $8\pi \times 10^{-4}$ T if currents in the coils are in same sense
(b) $4\pi \times 10^{-4}$ T if currents in the coils are in opposite sense
(c) zero if currents in the coils are in opposite sense
(d) $8\pi \times 10^{-4}$ T if currents in the coils are in opposite sense
(1) b and d are correct (2) a and c are correct
(3) only a are correct (4) only d are correct

**PME170**

**2.** When a current carrying coil is placed in a uniform magnetic field with its magnetic moment anti-parallel to the field
(a) Torque on it is maximum
(b) Torque on it is zero
(c) Potential energy is maximum
(d) Dipole is in unstable equilibrium
(1) b, c, d are correct (2) only b is correct
(3) a and c are correct (4) none

**PME171**

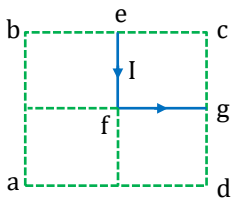
**3.** If a long cylindrical conductor carries a steady current parallel to its length
(a) the electric field along the axis is zero
(b) the magnetic field along the axis is zero
(c) the magnetic field outside the conductor is zero
(d) the electric field outside the conductor is zero
(1) b and d are correct (2) a and c are correct
(3) only d is correct (4) none

**PME172**

**4.** A charged particle revolves in circular path in uniform transverse magnetic field after being accelerated by a potential difference of V volt. If V is doubled, then choose the correct options.
(a) Kinetic energy of particle will become two times
(b) Radius of circular path will become two times
(c) Radius of circular path will become $\sqrt{2}$ times
(d) angular velocity will remain unchanged
(1) a and b are correct
(2) a and c are correct
(3) a, c, d are correct
(4) none

**PME173**

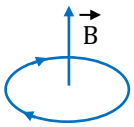
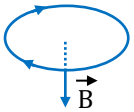
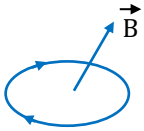
**5.** abcd is a square. There is a current I in wire efg as shown. Choose the correct options :




(a) Net magnetic field at a is inwards
(b) Net magnetic field at f is zero
(c) Net magnetic field at c is zero
(d) Net magnetic field at g is zero
(1) a and b are correct
(2) a, b, c are correct
(3) b and c are correct
(4) none

**PME174**

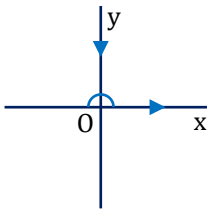
**6.** In column I, a current carrying loop and a uniform magnetic field are shown. Match this with column II.

| | Column-I | | Column-II |
|---|---|---|---|
| (a) |   | (p) | $F \neq 0$ |
| (b) |   | (q) | Maximum torque |
| (c) |   | (r) | Minimum potential energy |
| (d) |   | (s) | Positive potential energy |

(1) a-s, b-p, c-r, d-q (2) a-s, b-q, c-r, d-s
(3) a-s, b-r, c-p, d-q (4) a-q, b-p, c-r, d-s

**PME175**

**7.** Equal currents are flowing in two infinitely long separate wires lying along x and y-axes in the directions shown in figure. Match the following two columns.



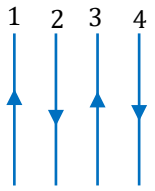

| | Column-I | | Column-II |
|---|---|---|---|
| (a) | Magnetic field at (a, a) | (p) | along positive y-axis |
| (b) | Magnetic field at (–a. – a) | (q) | along positive z-axis |
| (c) | Magnetic field at (a, –a) | (r) | along negative z-axis |
| (d) | Magnetic field at (–a, a) | (s) | zero |

(1) a-p, b-q, c-s, d-r (2) a-q, b-r, c-s, d-s

(3) a-r, b-s, c-p, d-r (4) a-s, b-p, c-q, d-s

**PME176**

**8.** Equal currents are flowing in four infinitely long wires. Distance between two wires is same and directions of currents are shown in figure. Match the following two columns.



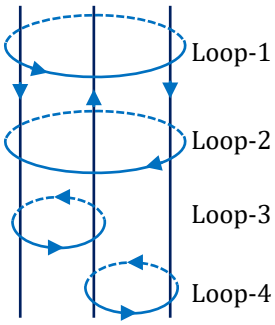

| | Column-I | | Column-II |
|---|---|---|---|
| (a) | Force on wire-1 | (p) | Inwards |
| (b) | Force on wire-2 | (q) | Leftwards |
| (c) | Force on wire-3 | (r) | Rightwards |
| (d) | Force on wire-4 | (s) | Zero |

(1) a-q, b-r, c-q, d-r (2) a-r, b-q, c-p, d-r

(3) a-q, b-p, c-q, d-p (4) a-p, b-r, c-p, d-r

**PME177**

**9.** Three wires are carrying same constant current i in different directions. Four loops enclosing the wires in different manners are shown in figure. The direction of $d\vec{\ell}$ is shown in the figure.




| | Column-I | | Column-II |
|---|---|---|---|
| a | Along close Loop-1 | p | $\oint \vec{B} d\vec{\ell} = \mu_0 i$ |
| b | Along close Loop-2 | q | $\oint \vec{B} \cdot d\vec{\ell} = -\mu_0 i$ |
| c | Along close Loop-3 | r | $\oint \vec{B} \cdot d\vec{\ell} = 0$ |
| d | Along close Loop-4 | s | $\oint \vec{B} \cdot d\vec{\ell} = 2\mu_0 i$ |

(1) a – q, b – p, c – r, d – r

(2) a – p, b – r, c – s, d – s

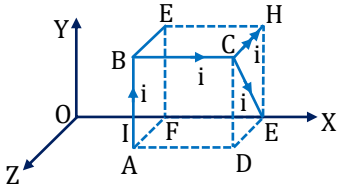
(3) a – r, b – p, c – s, d – p

(4) a – r, b – q, c – q, d – q

**PME178**

**10.** Side of cube is 'a' and wire AB, BC, CH and CE are insulated with each other. If each having current i, then match the following. External magnetic field applied along positive x-axis as $\vec{B} = B_0 \hat{i}$

given that OF = a



| | List-I (Magnitude of force due to external magnetic field only) | | List-II |
|---|---|---|---|
| (a) | On AB | (p) | Zero |
| (b) | On BC | (q) | $\sqrt{2}iB_0a$ |
| (c) | On CH | (r) | $iB_0a$ |
| (d) | On CE | (s) | $2iB_0a$ |

(1) a – r, b – p, c – r, d – q
(2) a – p, b – p, c – s, d – q
(3) a – q, b – s, c – r, d – s
(4) a – s, b – r, c – d, d – q

**PME179**

**11.** Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A) :** Force on a current carrying wire of length $\vec{d\ell}$ placed in magnetic field $\vec{B}$ is given by $\vec{dF} = i\vec{d\ell} \times \vec{B}$

**Reason (R) :** Net force on a current carrying loop in a non-uniform magnetic field must be non-zero.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

**PME180**

**12.** Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A) :** The ferromagnetic substances obey Curie's law.

**Reason (R) :** At Curie point ferromagnetic substances start behaving as paramagnetic substances.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

**PME181**

**13.** Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A) :** The surface integral of magnetic field over any closed surface is always zero.

**Reason (R) :** Magnetic poles always exists in pair.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

**PME182**

**14.** Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A) :** A moving charge produces magnetic field.

**Reason (B) :** A current element produces magnetic field.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

**PME183**

**15.** Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A) :** Parallel wires carrying currents in same direction attracts each other due to magnetic force.

**Reason (R) :** Two electron beams moving parallel to each other repel each other due to electric force.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) **(A)** is false but **(R)** is true.

**PME184**

**16.** Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A) :** Ampere's circuital law is not suitable for a finite straight wire carrying current I.

**Reason (R) :** One cannot calculate magnetic field due to a finite straight current carrying wire by using Biot Savart Law.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) **(A)** is false but **(R)** is true.

**PME185**

**17.** Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A) :** The diamagnetic substances do not obey Curie's law.

**Reason (R) :** At Curie point ferromagnetic substances start behaving as paramagnetic substances.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) **(A)** is false but **(R)** is true.

**PME186**

**18.** **Statement–1** : In an isolated conductor, free electrons keep on moving but no net magnetic force acts on a conductor in a magnetic field.

**Statement–2** : In a conductor, the average velocity of thermal motion of electrons is zero. Hence no current flows through the conductor.

(1) Statement–1 is True, Statement–2 is True ; Statement–2 is a correct explanation for Statement–1.

(2) Statement–1 is True, Statement–2 is True ; Statement–2 is not a correct explanation for Statement–1.

(3) Statement–1 is True, Statement–2 is False.

(4) Statement–1 is False, Statement–2 is True.

**PME187**

**19.** A particle with charge Q is moving in fields of combination given below. Match for the most correct possible path/s. Then match the following :-

| | Column-I | | Column-II |
|---|---|---|---|
| (A) | Uniform $\vec{E}$ | (P) | Straight line |
| (B) | Uniform $\vec{B}$ | (Q) | Parabola |
| | | (R) | Circular |

**Options :-**

(1) A $\rightarrow$ PQ, B $\rightarrow$ PR

(2) A $\rightarrow$ P, B $\rightarrow$ R

(3) A $\rightarrow$ Q, B $\rightarrow$ PR

(4) A $\rightarrow$ P, B $\rightarrow$ PQ

**PME188**

**20.** **Match the column I with column II -**

| | Column-I | | Column-II |
|---|---|---|---|
| (A) | Paramagnetic substance | (P) | $\chi_m = -1$ |
| (B) | Diamagnetic substance | (Q) | $\chi_m < 0$ |
| (C) | Super conductor | (R) | $\chi_m >> 1$ |
| (D) | Ferromagnetic substance | (S) | $\mu_r > 1$ |

**Options :-**

(1) A → S, B → Q, C → P, D → R

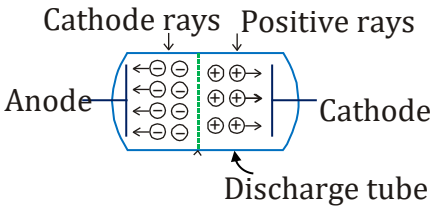
(2) A → R, B → P, C → Q, D → S

(3) A → S, B → P, C → Q, D → R

(4) A → R, B → Q, C → P, D → S

**PME189**

**21.** A magnetic field is applied at perpendicular to the axis of cylindrical discharge tube then cathode and positive rays deflected in –




(1) Same direction.

(2) Opposite direction.

(3) Mutually perpendicular direction.

(4) No deflection for both.

**PME190**

**22.** A square current carrying loop of side 'a' produced magnetic field at its centre is 'B'. Find magnetic moment of this loop in terms of 'B'.

(1) $\frac{\pi a^3 B}{2\sqrt{2}\mu_0}$ (2) $\frac{8\pi a^3 B}{\mu_0}$

(3) $\frac{\pi a^2 B}{2\sqrt{2}\mu_0}$ (4) $\frac{8\pi a^2 B}{\mu_0}$

**PME191**

**23.** Two long parallel wires carry i and 2i current in same direction. Magnetic field just between the wires is 'B'. If 2i current is switched off then magnetic field at the same point is :-

(1) 2B (2) B

(3) B/2 (4) $\sqrt{2}$ B

**PME192**

## EXERCISE-III (Analytical Questions) ANSWER KEY

| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Answer | 2 | 1 | 1 | 3 | 1 | 2 | 2 | 1 | 1 | 1 | 3 | 4 | 1 | 2 | 2 |
| Question | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | | | | | | | |
| Answer | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | |