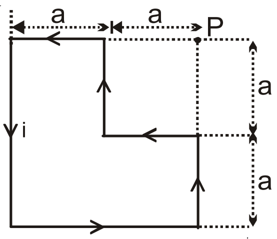
**CPP-04**
**ONE YEAR**
**MEDICAL**

# Physics

## Chapterwise Practise Problems (CPP) for NEET

### Chapter - Moving Charges and Magnetism

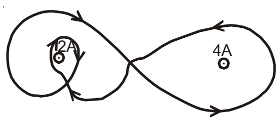
1. The magnetic field at point P is

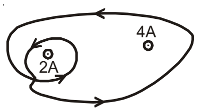


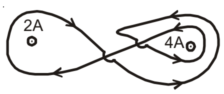

(1) $\frac{\mu_0 i}{4\sqrt{2}\pi a} \odot$ (2) $\frac{\mu_0 i}{4\sqrt{2}\pi a} \otimes$

(3) $\frac{\mu_0 i}{8\sqrt{2}\pi a} \odot$ (4) $\frac{\mu_0 i}{8\sqrt{2}\pi a} \otimes$

2. A current carrying wire carries a current of 2A along the z-axis which is out of the page while, another wire carrying current of 4A in the same direction lies parallel to the first as shown in the figure. Then around which loop linking both wires $\oint \vec{B}.d\vec{l}$ will be zero?

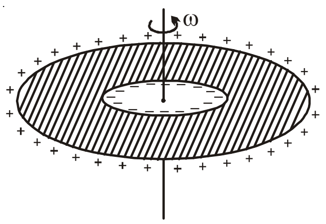
(1) 


(2) 


(3) 

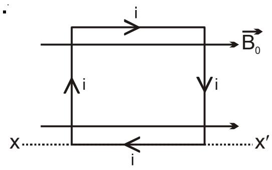

(4) None of these

3. Positive like charge of linear charge density $\lambda_1$ is passed on the outer circumference of an annular disc, having outer radius 2R. Negative like charge of linear charge density $\lambda_2$ is passed on the inner circumference of the disc, having inner radius R. The disc is rotating with constant angular velocity $\omega$ about an axis passing through the centre of mass and perpendicular to its plane. If the net magnetic field at the centre of the disc is 0, then the ratio $\lambda_1/\lambda_2$ is




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

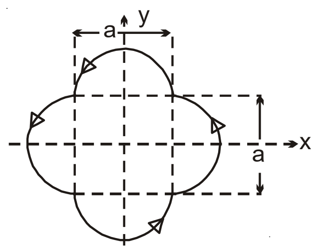
4. A square loop made of 4 identical conducting rods each of mass m and length $l$ carry current i. The loop is placed in a vertical position on a frictionless horizontal plane. A uniform horizontal magnetic field $B_0$ is in the plane of the loop, then find the torque due to magnetic field on the loop at this instant.




(1) Zero (2) $il^2B_0$

(3) $\frac{il^2B_0}{2}$ (4) $2il^2B_0$

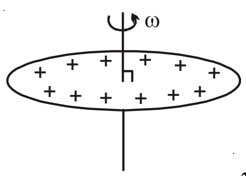
5. A loop carrying current i lies in x–y plane as shown in the figure. The loop is made of 4 semicircular portions. The magnetic moment of the current loop is




(1) $a^2i\hat{k}$ (2) $(2\pi+1)a^2i\hat{k}$

(3) $\left(1+\frac{\pi}{2}\right)ia^2\hat{k}$ (4) $-\left(1+\frac{\pi}{2}\right)ia^2\hat{k}$

6. A homogeneous non conducting disc of radius R carries uniform surface charge density $\sigma$. The disc is rotating about an axis through its centre of mass and perpendicular to the plane with constant angular velocity $\omega$. The magnetic dipole moment is




(1) $\frac{\pi\sigma R^4\omega}{4}$ (2) $\frac{\pi\sigma R^4\omega}{2}$

(3) $\frac{\sigma R^2\omega}{2}$ (4) $\frac{\pi\sigma R^2\omega}{4}$

7. Keeping all the parameters constant, the number of turns in the coil of a moving coil galvanometer is doubled for the sake of increment in its sensitivity. Choose the correct alternative.

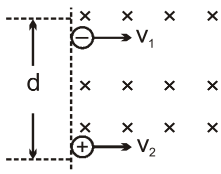
(1) Current sensitivity and voltage sensitivity both are doubled

(2) Voltage sensitivity is doubled but current sensitivity remains unchanged

(3) Current sensitivity is doubled but voltage sensitivity remains unchanged

(4) Current sensitivity is doubled but voltage sensitivity is halved

8. Two charged particles having the same mass m and charges q and –q separated by a distance d enter a uniform magnetic field B directed perpendicular to the paper inward with speeds $v_1$ and $v_2$ as shown. The particles will not collide if (neglect electrostatic force between charges)




(1) $d \geq \frac{2m}{Bq}(v_1 - v_2)$ (2) $d \leq \frac{2m}{qB}(v_1 - v_2)$

(3) $d \leq \frac{2m}{Bq}(v_1 + v_2)$ (4) $d \geq \frac{2m}{Bq}(v_1 + v_2)$

9. A charged particle moves in a gravity-free space without change in velocity. If $\vec{E}$ and $\vec{B}$ represents the electric and magnetic field respectively, this region may have

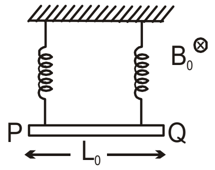
(1) $\vec{E} = 0; \vec{B} \neq 0$

(2) $\vec{E} \neq 0; \vec{B} \neq 0$

(3) $\vec{E}$ and $\vec{B}$ are inclined at 45° with each other

(4) Both (1) and (2)

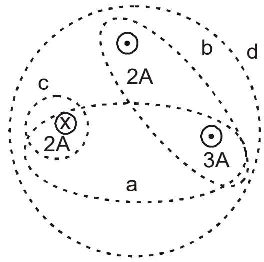
10. A wire of length $L_0$ and mass m is suspended by a pair of springs in a magnetic field of induction $B_0$. The magnitude and direction of the current required to remove the tension in the supporting springs is




(1) $\frac{2mg}{L_0 B_0}$ from P to Q (2) $\frac{mg}{L_0 B_0}$ from P to Q

(3) $\frac{2mg}{L_0 B_0}$ from Q to P (4) $\frac{mg}{L_0 B_0}$ from Q to P

11. Rank the magnitude of value of $\oint \vec{B} \cdot d\vec{l}$ for the closed paths shown in figure from the smallest to largest




(1) abcd (2) acdb

(3) adcb (4) acbd

12. A particle of charge q and mass m moves in a circular orbit of radius 'r' with angular speed $\omega$. Its Gyromagnetic ratio depends upon:-

(1) $\omega$ and q (2) $\omega$, q and m

(3) q and m (4) $\omega$ and m

13. A proton moving with velocity v is acted upon by electric field $\vec{E}$ and magnetic field $\vec{B}$. The proton will move undeflected with constant speed if

(1) E is perpendicular to B

(2) E is parallel to v and perpendicular to B

(3) E, B and v are mutually perpendicular and $v = \frac{E}{B}$

(4) E and B both parallel to v

14. A circular loop of area $0.01 m^2$ carrying a current of 10A is held with its plane perpendicular to a magnetic field of intensity 0.1T. The torque acting on the loop is

(1) Zero (2) 0.01 Nm

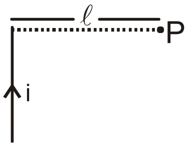
(3) 0.001 Nm (4) 0.8 Nm

15. A ring of radius R with charge q uniformly distributed over it is rotated with angular speed '$\omega$' around its axis. Find magnetic field at the centre of the ring:-

(1) $\frac{\mu_o q\omega}{2r}$ (2) $\frac{\mu_o q\omega}{2\pi r}$

(3) $\frac{\mu_o q\omega}{4\pi r}$ (4) $\frac{\mu_o q\omega}{4r}$

16. Figure shows a straight wire of length $\ell$ carrying a current i. The magnitude of magnetic field produced by the current at point P is




(1) $\frac{\sqrt{2}\mu_0 i}{\pi l}$ (2) $\frac{\mu_0 i}{4\pi l}$

(3) $\frac{\sqrt{2}\mu_0 i}{8\pi l}$ (4) $\frac{\mu_0 i}{2\sqrt{2}\pi l}$

17. A charged particle of specific charge $\alpha\left(=\frac{q}{m}\right)$ is released from origin at t=0 with velocity $\vec{v} = v_0\left(\hat{i}+\hat{j}\right)$ in uniform magnetic field $\vec{B} = B_0\,\hat{i}$.

Coordinates of particle at time $t = \frac{\pi}{B_0\alpha}$ are

(1) $\left(\frac{v_0}{2B_0\alpha}, \frac{\sqrt{2}v_0}{\alpha B_0}, \frac{-v_0}{B_0\alpha}\right)$ (2) $\left(\frac{-v_0}{2B_0\alpha}, 0, 0\right)$

(3) $\left(0, \frac{2v_0}{B_0\alpha}, \frac{v_0\pi}{2B_0\alpha}\right)$ (4) $\left(\frac{v_0\pi}{B_0\alpha}, 0, \frac{-2v_0}{B_0\alpha}\right)$

18. A solenoid 50cm long has 4 layers of winding of 350 turns each. If the current is 6A then magnetic field at the centre of solenoid is

(1) $5.3\times10^{-3}$ T (2) $2.1\times10^{-2}$ T

(3) $3.1\times10^{-4}$ T (4) $4.1\times10^{-2}$ T

19. If the electric field and if magnetic field are mutually perpendicular to each other, then a charged particle would move undeflected if

(1) $|v| = \frac{E}{B}$ (2) $|v| = \frac{B}{E}$

(3) $|v| = BE$ (4) $|v| = B^2E$

(Here charge particle is moving perpendicular to both E and B)

20. If the uniform magnetic field exist in a region towards north direction then the direction of force acting on positively charged particle projected along east direction is

(1) Vertically upward

(2) Vertically downward

(3) Towards south

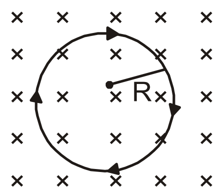
(4) Towards west

21. If a uniformly charged non-conducting spherical body is rotating with angular velocity $\omega$, the charge and mass of body are q and m respectively, then the magnetic moment is

(1) $\frac{1}{5}qr^2\omega$ (2) $\frac{2}{5}qr^2\omega$

(3) $\frac{1}{3}qr^2\omega$ (4) $\frac{2}{3}qr^2\omega$

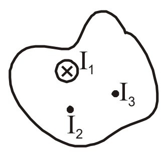
22. A circular loop of radius R is kept in a uniform magnetic field pointing perpendicular to plane of figure when the current I flows in loop the tension produced in the loop is




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

(3) 2BIR (4) Zero

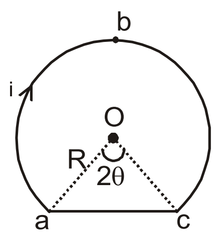
23. Figure shows, in cross section, several conductors that carry currents through the plane of figure. The currents have magnitude $I_1$ = 4.0A, $I_2$ = 2.0A and $I_3$ = 2.0A in direction shown in figure. Find the value of line integral $\int \vec{B}\cdot d\vec{l}$ along the given loop




(1) $-5\times10^{-6}$Tm (2) $2.5\times10^{-6}$Tm

(3) 0 (4) $5\times10^{-6}$Tm

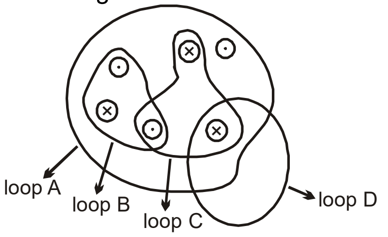
24. A current i flows through a closed loop as shown in the figure. If the part abc is a circular arc of radius R and the part ac is a straight wire, then the magnetic field at the centre O is




(1) $\frac{\mu_0 i}{2\pi R}(\tan\theta - \theta)$ (2) $\frac{\mu_0 i}{\pi R}(\pi - \theta + \tan\theta)$

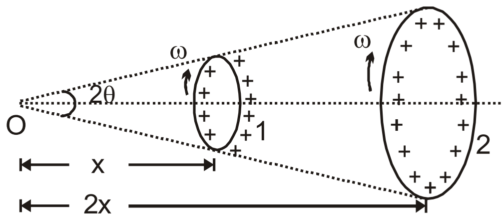
(3) $\frac{\mu_0 i}{2R}(\pi - \theta + \tan\theta)$ (4) $\frac{\mu_0 i}{2\pi R}(\pi - \theta + \tan\theta)$

25. Consider six wires coming into or out of the page, all with the same current. Rank the line intergral of the magnetic field (from most positive to most negative) taken counter clockwise around each loop shown in the figure




(1) A > B > C > D (2) B > A > C = D
(3) B > C = D > A (4) C > B = D > A

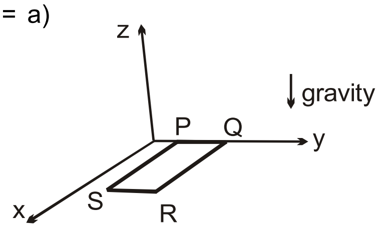
26. Two coaxial circular loops 1 and 2, which form same semi vertical angle $\theta$ at point O. Same charges are uniformly distributed along the circumference of both the loops. The loops are rotating with same angular velocity in same direction about their axis through centre of mass and perpendicular to their plane. If $B_1$ and $B_2$ are magnetic field due to the loops 1 and 2 respectively, then




(1) $\frac{B_1}{B_2} = 2$ (2) $\frac{B_1}{B_2} = \frac{1}{2}$

(3) $\frac{B_1}{B_2} = 8$ (4) $\frac{B_1}{B_2} = 4$

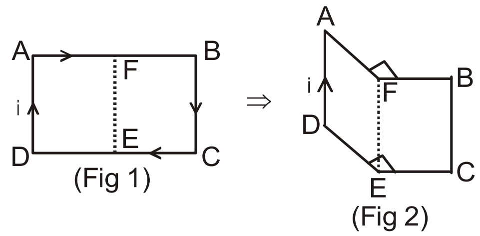
27. A rectangular loop PQRS made from a uniform wire has length a and breadth b and mass m. It is free to rotate about the arm PQ, which is hinged about the horizontal axis (y–axis). A uniform magnetic field $B_0\hat{i}$ exists in the region. If the loop remains in horizontal position in equilibrium, then the magnitude of current in loop is (PQ = SR = b, SP = QR = a)




(1) $\frac{mg}{3B_0a}$ (2) $\frac{mg}{6B_0a}$

(3) $\frac{mg}{2B_0b}$ (4) $\frac{mg}{6B_0b}$

28. The magnitude of magnetic moment of a rectangular loop ABCD (Fig 1) carrying a current i is M. EF is the perpendicular bisector of side AB and DC. If the loop is folded about EF (Fig 2) to convert it into two mutually perpendicular planes AFED and ECBF, then the magnitude of new magnetic moment will be



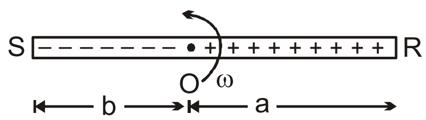

(1) M

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

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

(4) $\sqrt{2}M$

29. A homogeneous non conducting rod RS rotates about an axis passing through O and perpendicular to its length. The length of OR and OS are respectively a and b. Charges Q and –2Q are uniformly distributed on OR and OS respectively. If the magnetic moment is zero, then the relation between a and b is




(1) $a = \sqrt{2}b$

(2) $b = \sqrt{2}a$

(3) a = b

(4) a = 2b

30. A moving coil galvanometer shows deflection of 100 divisions when 20mA current is passed through it. If the resistance of the galvanometer coil is 50Ω, find the voltage sensitivity of galvanometer

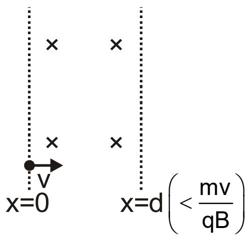
(1) 0.1 division/mV

(2) 5 division/mV

(3) 3 division/mV

(4) 10 division/mV

31. A charged particle of charge q and mass m moving along positive x-direction with a velocity v enters a region where there is a uniform magnetic field $B_0(-\hat{k})$, from x=0 to x=d. The particle gets deflected through an angle $\theta$ from its initial path. The specific charge of the particle is




(1) $\frac{v\cos\theta}{Bd}$ (2) $\frac{v\sin\theta}{Bd}$

(3) $\frac{u\tan\theta}{Bd}$ (4) $\frac{u}{Bd}$

32. If a charged particle goes unaccelerated in a region containing non-zero electric and magnetic field, then

(1) $\vec{E}$ must be perpendicular to $\vec{B}$ and velocity ($\vec{v}$) must be along $\vec{E}\times\vec{B}$

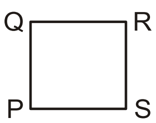
(2) $\vec{E}$ must be perpendicular to $\vec{B}$ and $\vec{v}$ and must be along $\vec{v}\times\vec{B}$

(3) $\vec{E}$ is parallel to $\vec{B}$ and $\vec{v}$ must be along $\vec{B}\times\vec{E}$

(4) $\vec{E}$ is parallel to $\vec{B}$ and $\vec{v}$ is along $\vec{E}\times\vec{B}$

33. A square current carrying loop PQRS is placed in a uniform magnetic field which is directed along PS.

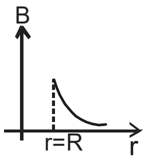
If the magnetic force on QP is $\vec{F}$, then the force on RS is

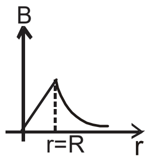


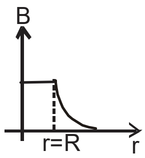

(1) $-\sqrt{2}\vec{F}$ (2) $-\vec{F}$

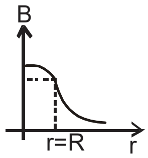
(3) $\sqrt{2}\vec{F}$ (4) $\vec{F}$

34. Following graphs show the variation of magnetic field due to a infinitely long solid straight current carrying wire of radius of cross section R, with distance 'r' from the central axis. Which of these is correct ? Assume that current density is uniform.

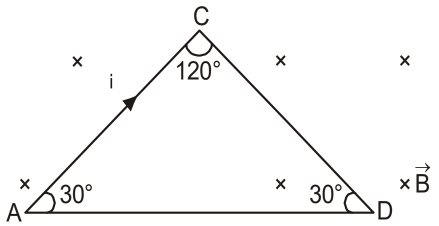

(1)



(2)



(3)



(4)



35. A triangular current carrying wire loop with current i is placed in a uniform and transverse magnetic field as shown in the figure




If the magnetic force on the sides AC, CD and DA respectively have a magnitude of $F_1$, $F_2$ and $F_3$ then –

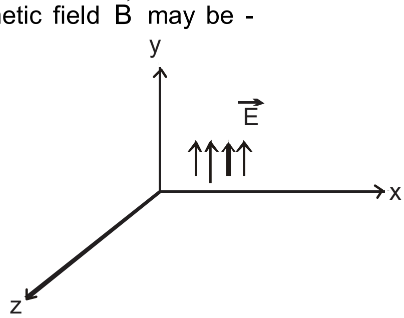
(1) $F_1 = \frac{F_3}{\sqrt{3}}$

(2) $\vec{F_1}$ and $\vec{F_2}$ have an angle of 120° between them

(3) $F_2 = \sqrt{3}\,F_3$

(4) All of these

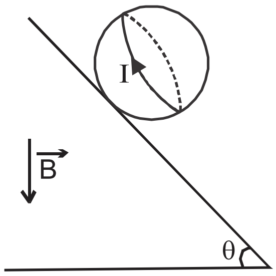
36. A region contains uniform electric field $\vec{E}$ in the positive y-direction. A charge 'q' projected along the x-axis with velocity 'v' moves undeflected. Then magnetic field $\vec{B}$ may be -




(1) $\frac{E}{v}\hat{j}$ (2) $\frac{E}{v}(-\hat{j})$

(3) $\frac{E}{v}(-\hat{k})$ (4) $\frac{E}{v}\hat{k}$

37. A coil of single turn is wrapped around a sphere of radius 'r' and mass 'm'. The plane of the coil is parallel to the inclined plane and lies in the equatorial plane of the sphere. If the sphere is in rotational equilibrium, the value of strength of uniform magnetic field in vertically downward direction is : (current in the coil is I as shown in figure)



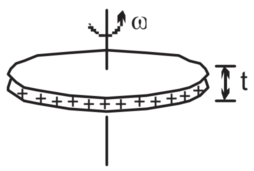

(1) $\frac{mg}{\pi Ir}$

(2) $\frac{mg\sin\theta}{\pi Ir}$

(2) $\frac{mg}{\pi Ir\sin\theta}$

(3) None of these

38. A uniformly charged ring of thickness 't' and surface charge density 'σ' is rotated about its axis with angular velocity 'ω'. The magnetic field at the centre is




(1) $\mu_0\sigma t\omega$

(2) $\frac{\mu_0\sigma t\omega}{2}$

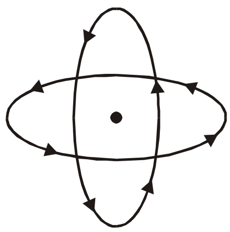
(3) $2\mu_0\sigma t\omega$ (4) None of these

39. The ratio of magnetic field at the centre of a current carrying circular wire of radius R and at a distance R from centre on its axis is

(1) $2\sqrt{2}$ (2) 2

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

40. In figure there are two concentric coils in perpendicular planes carrying equal currents. Magnetic field at centre is B. If current in one coil becomes zero, then magnitude of new magnetic field will be



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

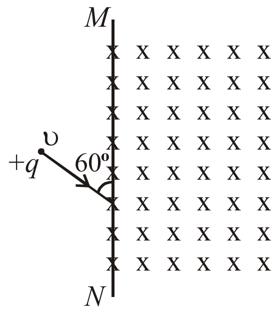
(3) $\frac{B}{\sqrt{2}}$ (4) $B\sqrt{2}$

41. If a beam of charged particles moving with speed 3 × 106 m/s enters normally into a region of uniform magnetic field 90 mT and specific charge of each particle is 108 C/kg, then the radius of the circular path described by it will be

(1) 0.33 m (2) 0.57 m

(3) 0.82 m (4) 1.25 m

42. Figure shows a uniform magnetic field B normally into the paper. If the charge +q is incident on the boundary MN at an angle 60° as shown, then the deviation produced to the path of the charge, on emergence is (Region of magnetic field is finite upto the left boundary MN only)




(1) 60° (2) 240°

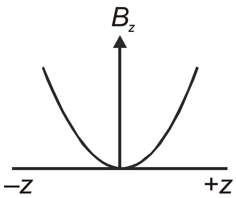
(3) 180° (4) 300°

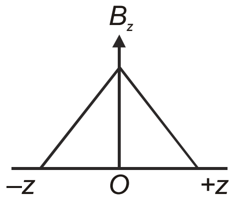
43. When a charged particle is fired with a velocity $\vec{v}$ in a region containing both electric field $\vec{E}$ and magnetic field $\vec{B}$, it is not deflected from its straight line trajectory. Then

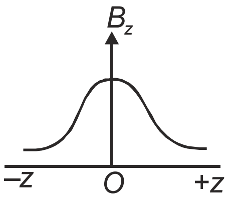
(1) $\vec{v}\times\vec{E}=\vec{B}$ (2) $\vec{E}\times\vec{v}=\vec{B}$

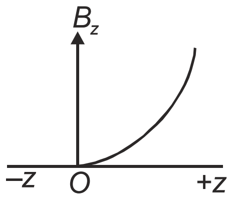
(3) $\vec{B}\times\vec{v}=\vec{E}$ (4) $\vec{v}\times\vec{B}=\vec{E}$

44. The graph that depicts the variation of magnetic field due to a circular loop of current placed with its centre at origin in x-y plane

(1) 


(2) 


(3) 


(4) 


45. A semicircular wire of radius r, carrying current I, is placed in a magnetic field of magnitude B. The force acting on it

(1) Can never be zero

(2) Can have maximum magnitude 2BIr

(3) Can have the maximum magnitude $BI\pi r$

(4) Can have the maximum magnitude BIr

46. A rectangular loop of sides 20 cm and 10 cm carries a current of 5.0A. A uniform magnetic field of magnitude 2T exists parallel to the longer side of the loop. The torque acting on the loop is

(1) 0.2 Nm (2) 0.3 Nm

(3) 2 Nm (4) 3 Nm

47. A non conducting ring of radius r and mass m has a total charge q distributed uniformly on it. The ring is rotated about its axis with angular speed $\omega$. Find the magnetic field at the centre

(1) $\frac{\mu_0 q\omega}{4\pi r}$

(2) $\frac{2\mu_0 q\omega}{\pi r}$

(3) $\frac{\mu_0 q\omega}{2\pi r}$

(4) $\frac{\mu_0 q\omega}{\pi r}$

48. If two straight current carrying wires are kept perpendicular to each other almost touching, then the wires

(1) Attract each other

(2) Repel each other

(3) Remain stationary

(4) Become parallel to each other

49. In a toroid, the number of turns per unit length is 1000 and current through it is $\frac{1}{4\pi}$ ampere. The magnetic field produced inside (in $Wb/m^2$) is

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

(3) $10^{-4}$ (4) $10^{-7}$

50. A rod has a total charge Q uniformly distributed along its length L. If the rod rotates with angular velocity $\omega$ about its end, compute its magnetic moment

(1) $\frac{Q\omega L^2}{6}$ (2) $\frac{Q\omega L^2}{3}$

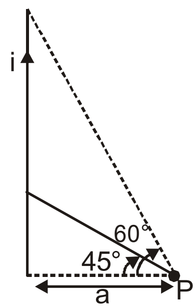
(3) $\frac{Q\omega L^2}{4}$ (4) $\frac{Q\omega L^2}{2}$

51. The scale of a galvanometer is divided into 150 equal divisions. The galvanometer has the current sensitivity of 10 divisions per mA and voltage sensitivity of 2 division per mV. Find the resistance of the galvanometer.

(1) $5\Omega$ (2) $50\Omega$

(3) $5000\Omega$ (4) $500\Omega$

52. Calculate the value of Magnetic field $\left(\vec{B}\right)$ due to a current carrying conductor at a location shown in the figure.




(1) $\vec{B} = \frac{\mu_0 i}{4\pi a}\left[\frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}}\right] \otimes$

(2) $\vec{B} = \frac{\mu_0 i}{2\pi a}\left[\frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}}\right]$ □

(3) $\vec{B} = \frac{\mu_0 i}{4\pi a}\left[\frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}}\right] \otimes$

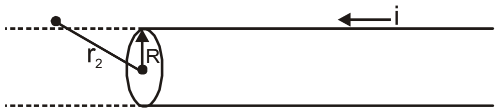
(4) $\vec{B} = \frac{\mu_0 i}{2\pi a}\left[\frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}}\right]$ □

53. The value of Magnetic field at the end of a very long solenoid carrying a current i will be (n is the number of turns per unit length)

(1) $\mu_0 ni$  (2) $\frac{\mu_0 ni}{2}$

(3) $\frac{\mu_0 ni}{4}$  (4) Zero

54. A long cylindrical conductor of radius R carries a current i as shown in figure. The current density $\hat{j}$ is a function of distance from the axis (r) according to j = br where b is a constant. Find an expression of the magnetic field B at a distance $r_2 > R$ measured from the axis




(1) $\frac{\mu_0 b r_2^2}{3}$  (2) $\frac{\mu_0 b R^3}{3\,r_2}$

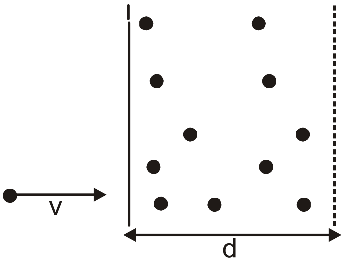
(3) $\frac{\mu_0 b R^2}{3}$  (4) $\mu_0 b r_2^2$

55. A beam of protons with a velocity of $4\times10^5$ m/s enters a uniform magnetic field of 0.3T. The velocity makes an angle of 60° with the magnetic field. The pitch of the helical path taken by the proton beam is

(1) 44 cm  (2) 4.4 cm

(3) 88 cm  (4) 8.8 cm

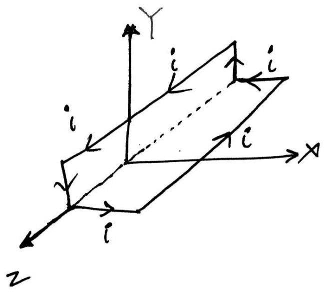
56. A negatively charged particle (mass $\to$ m, charge $\to$ q) is thrown with speed v along x-axis in a region of uniform magnetic field B directed along positive z-axis. If thickness of the region is $d\left[<\frac{mv}{qB}\right]$, find angular deviation in path of the particle as it comes out of the magnetic field.




(1) $\theta = \sin^{-}\left(\frac{dqB}{mv}\right)$  (2) $\theta = \sin^{-}\left(\frac{dqB}{2mv}\right)$

(3) $\theta = \sin^{-}\left(\frac{dqB}{mv^2}\right)$  (4) $\theta = \tan^{-}\left(\frac{dqB}{mv}\right)$

57. Magnetic field in a region is given by $\vec{B} = B_0\hat{i} + 2B_0\hat{j}$. Find torque on the loop shown in figure.




[Each wire segment is of length L]

(1) $iL^2B_0\hat{K}$  (2) $-iL^2B_0\hat{K}$

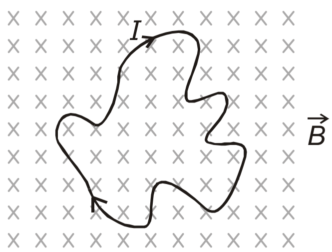
(3) $2iL^2B_0\hat{K}$  (4) $-2iL^2B_0\hat{K}$

58. An alpha particle and a proton are projected normally into uniform magnetic field with same kinetic energy. Radii of their path is

(1) 1 : 1  (2) 1 : $\sqrt{2}$

(3) 2 : 1  (4) $2\sqrt{2}$ : 1

59. A flexible wire loop carrying a current I is placed in a uniform magnetic field $\vec{B}$ at an instant as shown in figure




Which of the following is correct at equilibrium?

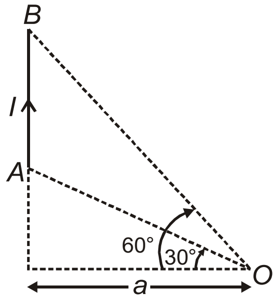
(1) Shape of loop remains unchanged and its plane becomes parallel to $\vec{B}$

(2) Shape of loop remains unchanged and its plane becomes normal to $\vec{B}$

(3) Shape of the loop becomes circular and its plane becomes parallel to magnetic field $\vec{B}$

(4) Shape of the loop becomes circular and its plane becomes normal to magnetic field $\vec{B}$

60. The magnetic field at the point O in the given figure is



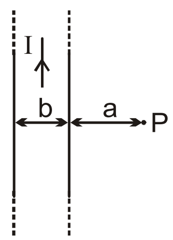

(1) $\frac{\mu_0 I}{8\pi a}(\sqrt{3}-1)$

(2) $\frac{\mu_0 I}{8\pi a}(\sqrt{3}+1)$

(3) $\frac{\mu_0 I}{4\pi a}(\sqrt{3}-1)$

(4) Zero

61. A very long thin strip of metal of width 'b' carries a current 'I' along its length as shown. Find the magnitude of magnetic field in the plane of the strip at a distance 'a' from the edge, nearest to the point.




(1) $B=\frac{\mu_0}{4\pi}.\frac{2I}{b}\ln\left[1+\frac{b}{a}\right]$

(2) $B=\frac{\mu_0}{4\pi}.\frac{2I}{b}\ln\left[1+\frac{a}{b}\right]$

(3) $B=\frac{\mu_0}{4\pi}.\frac{2I}{a}\ln\left[1+\frac{b}{a}\right]$

(4) $B=\frac{\mu_0}{4\pi}.\frac{2I}{a}\ln\left[1+\frac{a}{b}\right]$

62. A particle of mass m and charge q having kinetic energy K enters a stationary magnetic field. After 3s its kinetic energy is

(1) 9 K (2) K

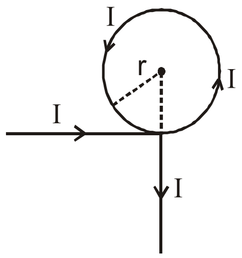
(3) 3 K (4) $\frac{K}{\ }$

63. A proton moving with constant velocity passes through a region without any change in its velocity. If E and B denote electric and magnetic field respectively, this region must not have

(1) E = 0, B = 0 (2) $E \neq 0, B \neq 0$

(3) $E = 0, B \neq 0$ (4) $E \neq 0, B = 0$

64. An electric current of I ampere is flowing in a long conductor as shown in figure. The magnetic field at the centre of coil is




(1) $\frac{\mu_0 I}{2r}\left(1+\frac{1}{2\pi}\right)$ (2) $\frac{\mu_0 I}{2r}\left(1+\frac{1}{\pi}\right)$

(3) $\frac{\mu_0 I}{2r}$ (4) Zero

65. A square of side 10 m is placed in a magnetic field of 0.2T. The maximum torque on it when a current of $10^{-3}$A is passed through it, is

(1) $2 \times 10^{-2}$ Nm (2) 2 Nm

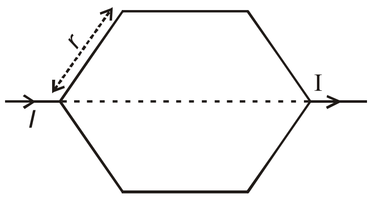
(3) $2 \times 10^{2}$ Nm (4) Zero

66. A hollow conducting pipe of radius 15 cm, is carrying current of 2 A. Magnetic field due to this hollow conductor is zero at a distance x from the axis of conductor. Then x may be

(1) 10 cm (2) 16 cm

(3) 20 cm (4) 15.6 cm

67. Magnetic field induction at the centre of the regular hexagon coil in the given figure is (every arm has resistance equal to R)




(1) $\frac{\mu_0 I}{4\pi r}6\sqrt{3}$ (2) $\frac{\mu_0 I}{4\pi r}3\sqrt{3}$

(3) Zero (4) $\frac{\mu_0 I}{4\pi r}$

68. Ampere circuital law is given by $\oint \vec{B} \cdot \vec{dl} = \mu_0 I$ inside for a closed loop. Now choose the correct alternative

(1) Magnetic field is due to all the current element inside as well as outside the loop

(2) Magnetic field is only due to the current element outside the loop

(3) Magnetic field is only due to the current element inside the loop

(4) Magnetic field is only due to the current element passing through the loop

69. A particle of charge 'q' and mass 'm' moves in a circular orbit of radius 'r' with angular speed '$\omega$'. The ratio of the magnitude of its magnetic moment to that of its angular momentum depends on

(1) $\omega$ and q (2) $\omega$, q and m

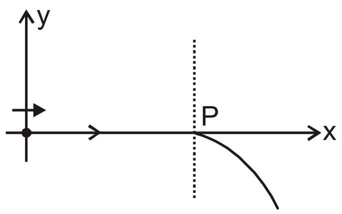
(3) q and m (4) $\omega$ and m

70. A coil having N turns is wound tightly in the form of a spiral with inner and outer radii a and b respectively. When a current I passes through the coil, the magnetic field at the centre is

(1) $\frac{\mu_0 NI}{b}$ (2) $\frac{2\mu_0 NI}{d}$

(3) $\frac{\mu_0 NI}{2(b-a)} \ln\frac{b}{a}$ (4) $\frac{\mu_0 I^N}{2(b-a)} \ln\frac{b}{a}$

71. For a positively charged particle moving in a x – y plane, initially along the x-axis, there is a sudden change in its path due to the presence of electric and/or magnetic fields beyond P. The curved path shown is in the x - y plane and is found to be non circular.




Which one of the following combination is possible?

(1) $\vec{E} = a\hat{i}, \vec{B} = c\hat{k}$

(2) $\vec{E} = a\hat{i} \cdot \vec{B} = c\hat{k} + a\hat{i}$

(3) $\vec{E} = 0, \vec{B} = c\hat{j} + b\hat{k}$

(4) $\vec{E} = a\hat{i} \quad \vec{B} = c\hat{k} + b\hat{j}$

72. In a moving coil galvanometer, identify the incorrect option

(1) We obtain a non-linear scale since $i \propto \tan\theta$

(2) Increasing the number of turns increases the voltage sensitivity proportionally

(3) The magnetic torque on the coil is proportional to $\cot\theta$ where $\theta$ is the deflection in the coil

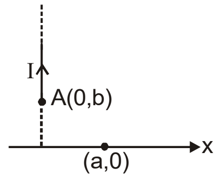
(4) All of these

73. The magnetic field in a toroid of 600 turns, current of 0.76A and central line radius = 0.50m is

(1) $13.5 \times 10^{-7}$T (2) $7.8 \times 10^{-2}$T

(3) $1.8 \times 10^{-4}$T (4) $25 \times 10^{-2}$T

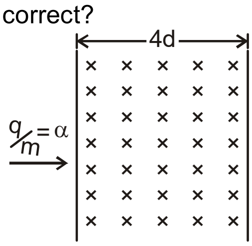
74. An infinitely long wire carrying current I is along y axis such that its one end is at point A (0, b) while the wire extends upto +$\infty$. The magnitude of magnetic field strength at point (a, 0) is




(1) $\frac{\mu_0 I}{4\pi a}\left(1+\frac{b}{\sqrt{a^2+b^2}}\right)$ (2) $\frac{\mu_0 I}{4\pi a}\left(1-\frac{b}{\sqrt{a^2+b^2}}\right)$

(3) $\frac{\mu_0 I}{4\pi a}\left(\frac{b}{\sqrt{a^2+b^2}}\right)$ (4) None of these

75. If a charged particle of specific charge $\frac{q}{m} = \alpha$ is entering in a uniform magnetic field of strength B which is extended upto a distance 4d as shown in figure at a speed v = (2 $\alpha$ d)(B), then which of the following is correct?




(1) angle subtended by path of the charged particle at the centre of circular path is $\pi/6$ till it exits out of the field.

(2) the charge will move on a circular path and will come out from magnetic field at a distance 4d from the point of insertion

(3) the time for which particle will be in the magnetic field is $\frac{2\pi}{\alpha B}$

(4) the charged particle will subtend an angle of 90° at the centre of circular path till it exits out of the field

76. A proton of energy I MeV describes a circular path in plane at right angle to a uniform magnetic field of $6.28\times10^{-4}$T. The mass of the proton is $1.7 \times 10^{-27}$kg. The cyclotron frequency of the proton is very nearly equal to

(1) $10^7$Hz (2) $10^5$Hz
(3) $10^6$Hz (4) $10^4$Hz

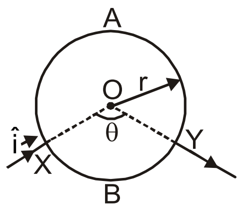
77. Find the ratio of magnetic dipole moment to angular momentum of an electron in a hydrogen like atom in ground state

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

78. A straight wire of infinite length carries a current i. The magnitude of magnetic field at perpendicular distance 'a' from the wire is–

(1) $\frac{\mu_0 I}{2\pi a}$ (2) $\frac{\mu_0 I}{4\pi a}$
(3) $\frac{\mu_0 i}{\pi a}$ (4) zero

79. A current enters a uniform conducting loop of radius r at x and leaves at y. Calculate the magnetic field at O due to the portion XAY of the loop




(1) Zero (2) $\frac{\mu_0 i\theta(2\pi-\theta)}{8\pi^2 r}$
(3) $\frac{\mu_0 i\theta(2\pi-\theta)}{4\pi^2 r}$ (4) $\frac{\mu_0 i}{2\pi r}\theta$

80. Inside a homogeneous straight wire of circular cross-section, there is a cylindrical cavity whose axis is parallel to the conductor axis and displaced relative to it by a distance L. A direct current of density J flows in the wire. Calculate the magnetic field inside the cavity

(1) $\mu_0\left[\vec{J}\times\vec{L}\right]$ (2) $\frac{\mu_0}{2}\left[\vec{J}\times\vec{L}\right]$
(3) Zero (4) $\frac{\mu_0}{4}\left[\vec{J}\times\vec{L}\right]$

81. Calculate the force per unit length acting on conductor '2' carrying a current $i_2$ due to conductor 1 carrying a current $i_1$ in the same direction [Magnitude only]. 'r' is the separation between the two

(1) $\frac{\mu_0 i_1 i_2}{4\pi r}$ (2) $\frac{\mu_0 i_1 i_2}{2r}$
(3) $\frac{\mu_0 i_1 i_2}{2\pi r}$ (4) $\frac{\mu_0 i_1 i_2}{8\pi r}$

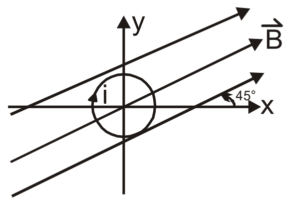
82. A particle of charge q, mass m moving with velocity $v_0\left(\hat{i}+\hat{j}\right)$ enters a region of uniform magnetic field $B_o\hat{i}$, from the origin. The displacement of the particle after time $\frac{2\pi m}{qB_0}$

(1) $\frac{mv_0}{qB}\left[\pi\hat{i}+2\hat{k}\right]$ (2) $2\pi\frac{mv_0}{qB}\hat{i}$
(3) $\frac{mv_0}{qB}\left[\pi\hat{i}-2\hat{k}\right]$ (4) $\frac{2\pi mv_0}{qB}\hat{j}$

83. The dimensional formula of gyromagnetic ratio is

(1) [ATM] (2) $[M^{-1}A^{-1}T]$
(3) $[MA^{-1}T]$ (4) $[M^{-1}AT]$

84. A current carrying circular loop of Radius R is placed in a uniform magnetic field $B_0$ tesla in x-y plane as shown in figure. The loop carries a current i = 1A in the direction shown. The torque acting on the loop is




(1) $\frac{\pi R^2 B_0}{\sqrt{2}}\left(\hat{i}+\hat{j}\right)$

(2) $\frac{\pi R^2 B}{2}\left(\hat{i}-\hat{j}\right)$

(3) $\frac{\pi R^2 B_0}{\sqrt{2}}\left(\hat{i}-\hat{j}\right)$

(4) $\frac{\pi R^2 B_0}{4}\left(\hat{i}+\hat{j}\right)$

❑ ❑ ❑

# ANSWERS

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | (1) | 2. | (1) | 3. | (4) | 4. | (2) | 5. | (3) | 6. | (1) | 7. | (3) |
| 8. | (4) | 9. | (4) | 10. | (2) | 11. | (2) | 12. | (3) | 13. | (3) | 14. | (1) |
| 15. | (3) | 16. | (3) | 17. | (4) | 18. | (2) | 19. | (1) | 20. | (1) | 21. | (1) |
| 22. | (1) | 23. | (3) | 24. | (4) | 25. | (2) | 26. | (1) | 27. | (3) | 28. | (3) |
| 29. | (1) | 30. | (1) | 31. | (2) | 32. | (2) | 33. | (2) | 34. | (2) | 35. | (1) |
| 36. | (4) | 37. | (1) | 38. | (2) | 39. | (1) | 40. | (3) | 41. | (1) | 42. | (2) |
| 43. | (3) | 44. | (3) | 45. | (2) | 46. | (1) | 47. | (1) | 48. | (4) | 49. | (3) |
| 50. | (1) | 51. | (1) | 52. | (1) | 53. | (2) | 54. | (2) | 55. | (2) | 56. | (1) |
| 57. | (1) | 58. | (1) | 59. | (4) | 60. | (1) | 61. | (1) | 62. | (2) | 63. | (4) |
| 64. | (1) | 65. | (1) | 66. | (1) | 67. | (3) | 68. | (1) | 69. | (3) | 70. | (3) |
| 71. | (1) | 72. | (4) | 73. | (3) | 74. | (2) | 75. | (2) | 76. | (4) | 77. | (2) |
| 78. | (1) | 79. | (2) | 80. | (2) | 81. | (3) | 82. | (2) | 83. | (4) | 84. | (3) |

❑ ❑ ❑