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NEET MOVING CHARGES AND MAGNETISM — PYQS

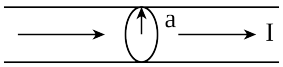
Max. Marks: 360 **Questions:** 90

Section A (MCQ) — 90 questions

Q.1 A 100-turn closely wound circular coil of radius 5 cm has a magnetic field of 3.14×10^{-3} T at its centre. The current flowing through the coil, and the magnitude of the magnetic moment of this coil are, respectively :
(Take $\mu_0 = 4\pi \times 10^{-7}$ T m/A) [NEET (UG) 2026]
(1) 2.5 A, 20 A m^2 (2) 2 A, 4 A m^2
(3) 2.5 A, 2 A m^2 (4) 2 A, 10 A m^2

Scan or tap for the full solution

Q.2 The figure given below shows a long straight solid wire of circular cross-section of radius 'a' carrying steady current I. The current I is uniformly distributed across its cross-section. The plot which correctly represents the variation of magnetic field (B) with distance (r) from the axis of the conductor in the region is : [NEET (UG) 2026]



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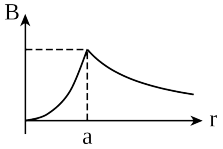

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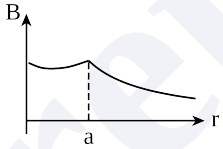

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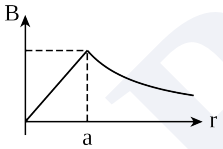

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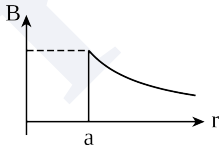
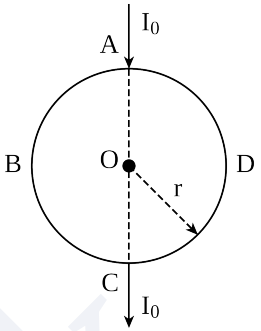


Scan or tap for the full solution

Q.3 A galvanometer of resistance 100 Ω gives full scale deflection for a current of 1 mA. It is converted into an ammeter of range 0 – 10 A. The shunt required is : [NEET (UG) 2026]
(1) 0.001 Ω (2) 0.10 Ω
(3) 1.0 Ω (4) 0.01 Ω

Solution

Q.4 A current I_0 flows through a metallic circular loop of radius r as shown in the figure. Resistance of the segment ABC is half that of ADC. Magnitude of magnetic field at the centre O of the loop is : [RE-NEET (UG) 2026]



(1) $\frac{\mu_0 I_0}{2\pi r}$ (2) $\frac{\mu_0 I_0}{12r}$ (3) $\frac{\mu_0 I_0}{4r}$ (4) $\frac{\mu_0 I_0}{2r}$

Scan or tap for the full solution

Q.5 Two infinitely long parallel conducting wires A and B carry currents I and 2I, respectively, in the same direction. The wire A has uniform mass per unit length λ and lies on an insulated floor. The wire B is kept fixed at a height h above the floor. The minimum magnitude of h so that the wire A does not rise from the floor is:
[g is the acceleration due to gravity and μ_0 is the permeability of free space.] [RE-NEET (UG) 2026]
(1) $\frac{4\mu_0 I^2}{\pi\lambda g}$ (2) $\frac{\mu_0 I^2}{2\pi\lambda g}$ (3) $\frac{\mu_0 I^2}{\pi\lambda g}$ (4) $\frac{2\mu_0 I^2}{\pi\lambda g}$

Scan or tap for the full solution

Q.6 A model for quantized motion of an electron in a uniform magnetic field B states that the flux passing through the orbit of the electron is n(h/e) where n is an integer, h is Planck's constant and e is the magnitude of electron's charge. According to the model, the magnetic moment of an electron in its lowest energy state will be (m is the mass of the electron) [NEET (UG) 2025]
(1) $\frac{heB}{\pi m}$ (2) $\frac{heB}{2\pi m}$ (3) $\frac{he}{\pi m}$ (4) $\frac{he}{2\pi m}$

Scan or tap for the full solution

Q.7 A 2 amp current is flowing through two different small circular copper coils having radii ratio 1:2. The ratio of their respective magnetic moments will be [NEET (UG) 2025]
(1) 2:1 (2) 4:1 (3) 1:4 (4) 1:2

Scan or tap for the full solution

Q.8 An electron (mass 9×10^{-31} kg and charge 1.6×10^{-19} C) moving with speed c/100 (c = speed of light) is injected into a magnetic field $\vec{B}$ of magnitude 9×10^{-4} T perpendicular to its direction of motion. We wish to apply a uniform electric field $\vec{E}$ together with the magnetic field so that the electron does not deflect from its path. Then (speed of light $c = 3 \times 10^{8}$ m s^{-1}) [NEET (UG) 2025]

(1) $\vec{E}$ is parallel to $\vec{B}$ and its magnitude is 27×10^{2} V m^{-1}

(2) $\vec{E}$ is parallel to $\vec{B}$ and its magnitude is 27×10^{4} V m^{-1}

(3) $\vec{E}$ is perpendicular to $\vec{B}$ and its magnitude is 27×10^{4} V m^{-1}

(4) $\vec{E}$ is perpendicular to $\vec{B}$ and its magnitude is 27×10^{2} V m^{-1}

Scan or tap for the full solution

Q.9 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): [NEET (UG) 2024]

(1) 44 mT (2) 4.4 T (3) 4.4 mT (4) 44 T

Scan or tap for the full solution

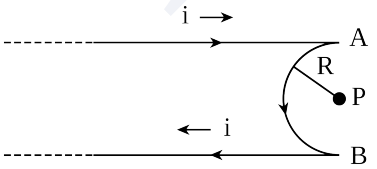
Q.10 A wire carrying a current I along the positive x-axis has length L. It is kept in a magnetic field $\vec{B} = (2\hat{i} + 3\hat{j} - 4\hat{k})$ T. The magnitude of the magnetic force acting on the wire is : [NEET (UG) 2023]

(1) $\sqrt{5}$ IL (2) 5 IL

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

Solution

Q.11 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 : [NEET (UG) 2023]



(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

Scan or tap for the full solution

Q.12 A long solenoid of radius 1 mm has 100 turns per mm. If 1 A current flows in the solenoid, the magnetic field strength at the centre of the solenoid is [NEET (UG) 2022]

(1) 6.28×10^{-2} T (2) 12.56×10^{-2} T

(3) 12.56×10^{-4} T (4) 6.28×10^{-4} T

Scan or tap for the full solution

Q.13 Given below are two statements:

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

Statement-I: Biot-Savart's law gives us the expression for the magnetic field strength of an infinitesimal current element (I dl) 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, I dl while the latter being produced by a vector source, q. [NEET (UG) 2022]

(1) Both Statement-I and Statement-II are correct

(2) Both Statement-I and Statement-II are incorrect

(3) Statement-I is correct and Statement-II is incorrect

(4) Statement-I is incorrect and Statement-II is correct

Scan or tap for the full solution

Q.14 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 [NEET (UG) 2022]

(1) Uniform and remains constant for both the regions.

(2) A linearly increasing function of distance upto the boundary of the wire and then linearly decreasing for the outside region.

(3) A linearly increasing function of distance r upto the boundary of the wire and then decreasing one with $\frac{1}{r}$ dependence for the outside region.

(4) A linearly decreasing function of distance upto the boundary of the wire and then a linearly increasing one of the outside region.

Scan or tap for the full solution

Q.15 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 [NEET (UG) 2022 (Phase 2)]

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

Scan or tap for the full solution

Q.16 The shape of the magnetic field lines due to an infinite long, straight current carrying conductor is [NEET (UG) 2022 (Phase 2)]

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

Scan or tap for the full solution

Q.17 Two very long, straight, parallel conductors A and B carry current of 5 A and 10 A 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) [NEET (UG) 2022 (Phase 2)]

(1) 1×10^{-4} N m^{-1} and is repulsive
(2) 2×10^{-4} N m^{-1} and is attractive
(3) 2×10^{-4} N m^{-1} and is repulsive
(4) 1×10^{-4} N m^{-1} and is attractive

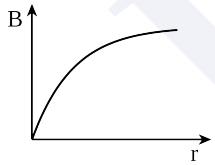
Solution

Q.18 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 : [NEET (UG) 2022 (Phase 2)]

(1) 6.28×10^{-4} T (2) 3.14×10^{-7} T
(3) 6.28×10^{-7} T (4) 3.14×10^{-4} T

Scan or tap for the full solution

Q.19 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 : [NEET (UG) 2021]

(1)


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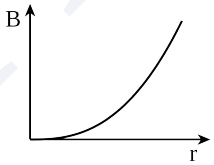

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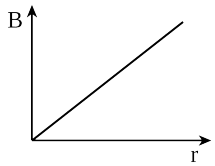

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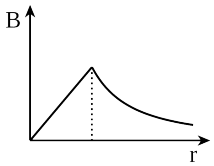
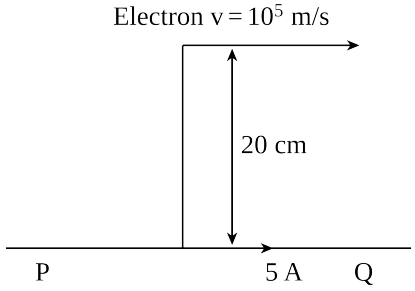


Scan or tap for the full solution

Q.20 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. [NEET (UG) 2021]



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

Scan or tap for the full solution

Q.21 In the product

$\vec{F} = q(\vec{v} \times \vec{B})$

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

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 $\vec{B}$? [NEET (UG) 2021]

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

Scan or tap for the full solution

Q.22 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 : [NEET (UG) 2021]

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

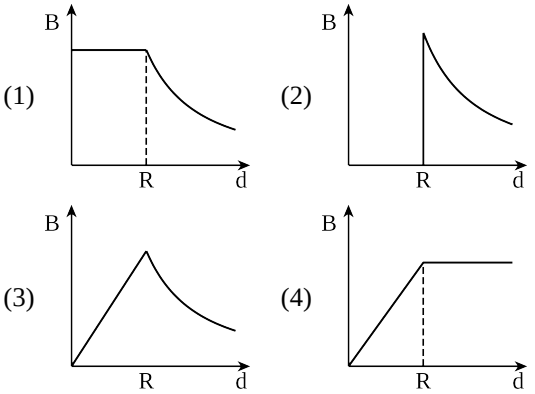
Scan or tap for the full solution

Q.23 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}) [NEET (UG) 2020]

(1) 3.14×10^{-4} T (2) 6.28×10^{-5} T
(3) 3.14×10^{-5} T (4) 6.28×10^{-4} T

Scan or tap for the full solution

Q.24 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 : [NEET (UG) 2019]



Scan or tap for the full solution

Q.25 Ionized hydrogen atoms and α-particles with same momenta enter perpendicular to a constant magnetic field, B. The ratio of their radii of their paths $r_H:r_\alpha$ will be : [NEET (UG) 2019]

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

Scan or tap for the full solution

Q.26 A metallic rod of mass per unit length 0.5 kg m^{-1} is lying horizontally on a smooth inclined plane which makes an angle of 30° with the horizontal. The rod is not allowed to slide down by flowing a current through it when a magnetic field of induction 0.25 T is acting on it in the vertical direction. The current flowing in the rod to keep it stationary is [NEET 2018]

(1) 7.14 A (2) 5.98 A
(3) 14.76 A (4) 11.32 A

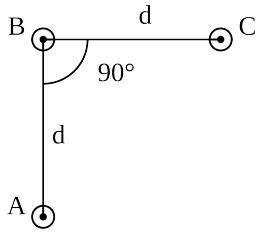
Scan or tap for the full solution

Q.27 Current sensitivity of a moving coil galvanometer is 5 div/mA and its voltage sensitivity (angular deflection per unit voltage applied) is 20 div/V. The resistance of the galvanometer is [NEET 2018]

(1) 40 Ω (2) 25 Ω (3) 250 Ω (4) 500 Ω

Scan or tap for the full solution

Q.28 An arrangement of three parallel straight wires placed perpendicular to plane of paper carrying same current 'I' along the same direction as shown in figure. Magnitude of force per unit length on the middle wire 'B' is given by [NEET 2017]



(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) $\frac{\mu_0 I^2}{2\pi d}$

Scan or tap for the full solution

Q.29 A 250-turn rectangular coil of length 2.1 cm and width 1.25 cm carries a current of 85 μA and subjected to a magnetic field of strength 0.85 T. Work done for rotating the coil by 180° against the torque is [NEET 2017]

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

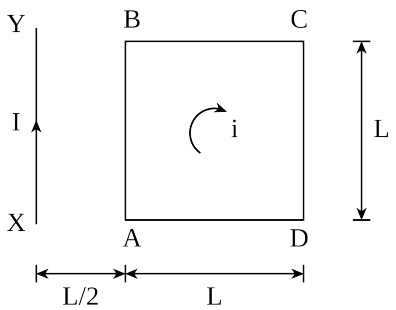
Scan or tap for the full solution

Q.30 A long straight wire of radius a carries a steady current I. The current is uniformly distributed over its cross-section. The ratio of the magnetic fields B and B', at radial distance $\frac{a}{2}$ and 2a respectively, from the axis of the wire is [NEET 2016 (Phase 1)]

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

Scan or tap for the full solution

Q.31 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 [NEET 2016 (Phase 1)]



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

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

Scan or tap for the full solution

Q.32 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 [NEET 2016 (Phase 2)]

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

Scan or tap for the full solution

Q.33 An electron is moving in a circular path under the influence of a transverse magnetic field of 3.57×10^{-2} T. If the value of e/m is 1.76×10^{11} C kg^{-1}, the frequency of revolution of the electron is [NEET 2016 (Phase 2)]

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

Scan or tap for the full solution

Q.34 A circuit contains an ammeter, a battery of 30 V and a resistance 40.8 ohm all connected in series. If the ammeter has a coil of resistance 480 ohm and a shunt of 20 ohm, the reading in the ammeter will be [AIPMT 2015]

(1) 2 A (2) 1 A (3) 0.5 A (4) 0.25 A

Scan or tap for the full solution

Q.35 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 [AIPMT 2015]

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

Scan or tap for the full solution

Q.36 A rectangular coil of length 0.12 m and width 0.1 m 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 2 A. 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 [AIPMT 2015]

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

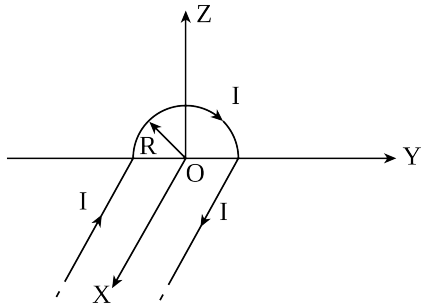
Scan or tap for the full solution

Q.37 An electron moving in a circular orbit of radius r makes n rotations per second. The magnetic field produced at the centre has magnitude [AIPMT 2015 (Cancelled)]

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

Scan or tap for the full solution

Q.38 A wire carrying current I has the shape shown in adjoining figure.



Linear parts of the wire are very long and parallel to X-axis while semicircular portion of radius R is lying in Y-Z plane. Magnetic field at point O is [AIPMT 2015 (Cancelled)]

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

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

Scan or tap for the full solution

Q.39 In an ammeter 0.2% of main current passes through the galvanometer. If resistance of galvanometer is G, the resistance of ammeter will be [AIPMT 2014]

(1) $\frac{1}{499}G$ (2) $\frac{499}{500}G$ (3) $\frac{1}{500}G$ (4) $\frac{500}{499}G$

Scan or tap for the full solution

Q.40 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 [AIPMT 2014]

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

Scan or tap for the full solution

Q.41 When a proton is released from rest in a room, it starts with an initial acceleration a_0 towards west. When it is projected towards north with a speed v_0 it moves with an initial acceleration $3a_0$ towards west. The electric and magnetic fields in the room are [NEET 2013]

(1) $\frac{ma_0}{e}$ east, $\frac{3ma_0}{ev_0}$ up

(2) $\frac{ma_0}{e}$ east, $\frac{3ma_0}{ev_0}$ down

(3) $\frac{ma_0}{e}$ west, $\frac{2ma_0}{ev_0}$ up

(4) $\frac{ma_0}{e}$ west, $\frac{2ma_0}{ev_0}$ down

Solution

Q.42 A current loop in a magnetic field [NEET 2013]

(1) can be in equilibrium in two orientations, both the equilibrium states are unstable.

(2) can be in equilibrium in two orientations, one stable while the other is unstable.

(3) experiences a torque whether the field is uniform or non uniform in all orientations.

(4) can be in equilibrium in one orientation.

Scan or tap for the full solution

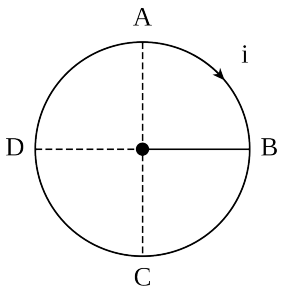
Q.43 A long straight wire carries a certain current and produces a magnetic field 2×10^{-4} Wb m^{-2} at a perpendicular distance of 5 cm from the wire. An electron situated at 5 cm from the wire moves with a velocity 10^7 m/s towards the wire along perpendicular to it. The force experienced by the electron will be (charge on electron 1.6×10^{-19} C) [NEET 2013 (Karnataka)]

(1) 3.2 N (2) 3.2×10^{-16} N

(3) 1.6×10^{-16} N (4) zero

Scan or tap for the full solution

Q.44 A circular coil ABCD carrying a current 'i' is placed in a uniform magnetic field. If the magnetic force on the segment AB is $\vec{F}$, the force on the remaining segment BCDA is [NEET 2013 (Karnataka)]



(1) $-\vec{F}$ (2) $3\vec{F}$ (3) $-3\vec{F}$ (4) $\vec{F}$

Scan or tap for the full solution

Q.45 A proton carrying 1 MeV kinetic energy is moving in a circular path of radius R in uniform magnetic field. What should be the energy of an α-particle to describe a circle of same radius in the same field? [AIPMT 2012 (Mains)]

(1) 2 MeV (2) 1 MeV

(3) 0.5 MeV (4) 4 MeV

Solution

Q.46 Two similar coils of radius R are lying concentrically with their planes at right angles to each other. The currents flowing in them are I and 2I, respectively. The resultant magnetic field induction at the centre will be [AIPMT 2012 (Prelims)]

(1) $\frac{\sqrt{5}\mu_0 I}{2R}$ (2) $\frac{\sqrt{5}\mu_0 I}{R}$

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

Scan or tap for the full solution

Q.47 A millivoltmeter of 25 millivolt range is to be converted into an ammeter of 25 ampere range. The value (in ohm) of necessary shunt will be [AIPMT 2012 (Prelims)]

(1) 0.001 (2) 0.01 (3) 1 (4) 0.05

Scan or tap for the full solution

Q.48 An alternating electric field, of frequency ν, is applied across the dees (radius = R) of a cyclotron that is being used to accelerate protons (mass = m). The operating magnetic field (B) used in the cyclotron and the kinetic energy (K) of the proton beam, produced by it, are given by [AIPMT 2012 (Prelims)]

(1) $B = \frac{m\nu}{e}$ and $K = 2m\pi^2\nu^2R^2$

(2) $B = \frac{2\pi m\nu}{e}$ and $K = m^2\pi\nu R^2$

(3) $B = \frac{2\pi m\nu}{e}$ and $K = 2m\pi^2\nu^2R^2$

(4) $B = \frac{m\nu}{e}$ and $K = m^2\pi\nu R^2$

Solution

Q.49 A galvanometer of resistance, G, is shunted by a resistance S ohm. To keep the main current in the circuit unchanged, the resistance to be put in series with the galvanometer is [AIPMT 2011 (Mains)]

(1) $\frac{G}{(S+G)}$ (2) $\frac{S^2}{(S+G)}$

(3) $\left(\frac{SG}{S+G}\right)$ (4) $\frac{G^2}{(S+G)}$

Scan or tap for the full solution

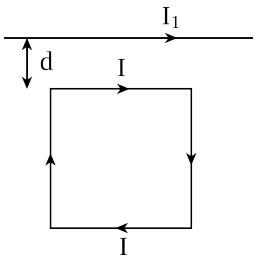
Q.50 Charge q is uniformly spread on a thin ring of radius R. The ring rotates about its axis with a uniform frequency f Hz. The magnitude of magnetic induction at the centre of the ring is

[AIPMT 2011 (Mains)]

(1) $\frac{\mu_0 qf}{2\pi R}$ (2) $\frac{\mu_0 qf}{2R}$ (3) $\frac{\mu_0 q}{2fR}$ (4) $\frac{\mu_0 q}{2\pi fR}$

Scan or tap for the full solution

Q.51 A square loop, carrying a steady current I, is placed in a horizontal plane near a long straight conductor carrying a steady current I_1 at a distance d from the conductor as shown in figure. The loop will experience [AIPMT 2011 (Mains)]



(1) a net attractive force towards the conductor

(2) a net repulsive force away from the conductor

(3) a net torque acting upward perpendicular to the horizontal plane

(4) a net torque acting downward normal to horizontal plane

Scan or tap for the full solution

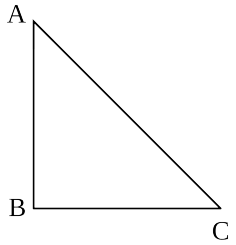
Q.52 A thermocouple of negligible resistance produces an e.m.f. of 40 μV/°C in the linear range of temperature. A galvanometer of resistance 10 ohm whose sensitivity is 1 μA/division, is employed with the thermocouple. The smallest value of temperature difference that can be detected by the system will be

[AIPMT 2011 (Mains)]

(1) 1°C (2) 0.5°C (3) 0.1°C (4) 0.25°C

Scan or tap for the full solution

Q.53 A current carrying closed loop in the form of a right angle isosceles triangle ABC is placed in uniform magnetic field acting along AB. If the magnetic force on the arm BC is $\vec{F}$, the force on the arm AC is [AIPMT 2011 (Prelims)]



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

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

Scan or tap for the full solution

Q.54 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 [AIPMT 2011 (Prelims)]

(1) will turn towards right of direction of motion

(2) speed will decrease

(3) speed will increase

(4) will turn towards left of direction of motion

Scan or tap for the full solution

Q.55 A current loop consists of two identical semicircular parts each of radius R, one lying in the x-y plane and the other in x-z plane. If the current in the loop is i. The resultant magnetic field due to the two semicircular parts at their common centre is

[AIPMT 2010 (Mains)]

(1) $\frac{\mu_0 i}{2\sqrt{2}R}$ (2) $\frac{\mu_0 i}{2R}$

(3) $\frac{\mu_0 i}{4R}$ (4) $\frac{\mu_0 i}{\sqrt{2}R}$

Scan or tap for the full solution

Q.56 A closely wound solenoid of 2000 turns and area of cross-section 1.5×10^{-4} m^2 carries a current of 2.0 A. It is suspended through its centre and perpendicular to its length, allowing it to turn in a horizontal plane in a uniform magnetic field 5×10^{-2} tesla making an angle of 30° with the axis of the solenoid. The torque on the solenoid will be

[AIPMT 2010 (Mains)]

(1) 3×10^{-3} N m (2) 1.5×10^{-3} N m

(3) 1.5×10^{-2} N m (4) 3×10^{-2} N m

Scan or tap for the full solution

Q.57 A particle having a mass of 10^{-2} kg carries a charge of 5×10^{-8} C. The particle is given an initial horizontal velocity of 10^5 m s^{-1} in the presence of electric field $\vec{E}$ and magnetic field $\vec{B}$. To keep the particle moving in a horizontal direction, it is necessary that

Which one of the following pairs of statements is possible ?

A. $\vec{B}$ should be perpendicular to the direction of velocity and $\vec{E}$ should be along the direction of velocity

B. Both $\vec{B}$ and $\vec{E}$ should be along the direction of velocity

C. Both $\vec{B}$ and $\vec{E}$ are mutually perpendicular and perpendicular to the direction of velocity.

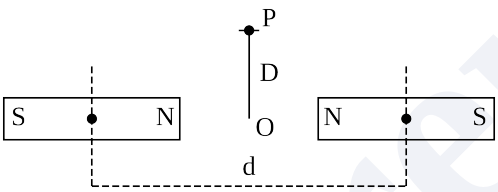
D. $\vec{B}$ should be along the direction of velocity and $\vec{E}$ should be perpendicular to the direction of velocity [AIPMT 2010 (Mains)]

(1) A and C only (2) C and D only

(3) B and C only (4) B and D only

Scan or tap for the full solution

Q.58 Two identical bar magnets are fixed with their centers at a distance d apart. A stationary charge Q is placed at P in between the gap of the two magnets at a distance D from the centre O as shown in the figure



The force on the charge Q is [AIPMT 2010 (Mains)]

(1) zero

(2) directed along OP

(3) directed along PO

(4) directed perpendicular to the plane of paper

Scan or tap for the full solution

Q.59 Charge q is uniformly spread on a thin ring of radius R. The ring rotates about its axis with a uniform frequency f Hz. The magnitude of magnetic induction at the center of the ring is

[AIPMT 2010 (Prelims)]

(1) $\frac{\mu_0 qf}{2\pi R}$ (2) $\frac{\mu_0 qf}{2R}$ (3) $\frac{\mu_0 q}{2fR}$ (4) $\frac{\mu_0 q}{2\pi fR}$

Scan or tap for the full solution

Q.60 A galvanometer has a coil of resistance 100 ohm and gives a full scale deflection for 30 mA current. If it is to work as a voltmeter of 30 volt range, the resistance required to be added will be

[AIPMT 2010 (Prelims)]

(1) 900 Ω (2) 1800 Ω (3) 500 Ω (4) 1000 Ω

Scan or tap for the full solution

Q.61 A galvanometer has a coil of resistance 100 ohm and gives a full scale deflection for 30 mA current. If it is to work as a voltmeter of 30 volt range, the resistance required to be added will be

[AIPMT 2010 (Prelims)]

(1) 900 Ω (2) 1800 Ω (3) 500 Ω (4) 1000 Ω

Scan or tap for the full solution

Q.62 A square current carrying loop is suspended in a uniform magnetic field acting in the plane of the loop. If the force on one arm of the loop is $\vec{F}$, the net force on the remaining three arms of the loop is

[AIPMT 2010 (Prelims)]

(1) $3\vec{F}$ (2) $-\vec{F}$ (3) $-3\vec{F}$ (4) $\vec{F}$

Scan or tap for the full solution

Q.63 A beam of cathode rays is subjected to crossed electric (E) and magnetic fields (B). The fields are adjusted such that the beam is not deflected. The specific charge of the cathode rays is given by

(Where V is the potential difference between cathode and anode) [AIPMT 2010 (Prelims)]

(1) $\frac{B^2}{2VE^2}$ (2) $\frac{2VB^2}{E^2}$ (3) $\frac{2VE^2}{B^2}$ (4) $\frac{E^2}{2VB^2}$

Scan or tap for the full solution

Q.64 A galvanometer having a coil resistance of 60 Ω shows full scale deflection when a current of 1.0 amp passes through it. It can be converted into an ammeter to read currents up to 5.0 amp by

[AIPMT 2009]

(1) putting in series a resistance of 15 Ω

(2) putting in series a resistance of 240 Ω

(3) putting in parallel a resistance of 15 Ω

(4) putting in parallel a resistance of 240 Ω

Scan or tap for the full solution

Q.65 The magnetic force acting on a charged particle of charge −2 μC in a magnetic field of 2 T acting in y direction, when the particle velocity is $(2\hat{i} + 3\hat{j}) \times 10^6$ m s^{-1}, is [AIPMT 2009]

(1) 4 N in z direction (2) 8 N in y direction
(3) 8 N in z direction (4) 8 N in −z direction

Scan or tap for the full solution

Q.66 Under the influence of a uniform magnetic field, a charged particle moves with constant speed v in a circle of radius R. The time period of rotation of the particle [AIPMT 2009]

(1) depends on R and not on v
(2) is independent of both v and R
(3) depends on both v and R
(4) depends on v and not on R

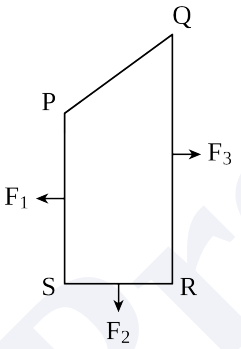
Solution

Q.67 A particle of mass m, charge Q and kinetic energy T enters a transverse uniform magnetic field of induction $\vec{B}$. After 3 seconds the kinetic energy of the particle will be [AIPMT 2008]

(1) T (2) 4 T (3) 3 T (4) 2 T

Scan or tap for the full solution

Q.68 A closed loop PQRS carrying a current is placed in a uniform magnetic field. If the magnetic forces on segments PS, SR and RQ are F_1, F_2 and F_3 respectively and are in the plane of the paper and along the directions shown, the force on the segment QP is [AIPMT 2008]



(1) $\sqrt{(F_3 - F_1)^2 - F_2^2}$ (2) $F_3 - F_1 + F_2$
(3) $F_3 - F_1 - F_2$ (4) $\sqrt{(F_3 - F_1)^2 + F_2^2}$

Scan or tap for the full solution

Q.69 A galvanometer of resistance 50 Ω is connected to a battery of 3 V along with a resistance of 2950 Ω in series. A full scale deflection of 30 divisions is obtained in the galvanometer. In order to reduce this deflection to 20 divisions, the resistance in series should be [AIPMT 2008]

(1) 6050 Ω (2) 4450 Ω (3) 5050 Ω (4) 5550 Ω

Scan or tap for the full solution

Q.70 Under the influence of a uniform magnetic field, a charged particle moves with constant speed v in a circle of radius R. The time period of rotation of the particle [AIPMT 2007]

(1) depends on R and not on v
(2) is independent of both v and R
(3) depends on both v and R
(4) depends on v and not on R

Solution

Q.71 The resistance of an ammeter is 13 Ω and its scale is graduated for a current upto 100 amps. After an additional shunt has been connected to this ammeter it becomes possible to measure currents upto 750 amperes by this meter. The value of shunt-resistance is [AIPMT 2007]

(1) 2 Ω (2) 0.2 Ω (3) 2 kΩ (4) 20 Ω

Scan or tap for the full solution

Q.72 A charged particle (charge q) is moving in a circle of radius R with uniform speed v. The associated magnetic moment μ is given by [AIPMT 2007]

(1) qvR^2 (2) $qvR^2/2$ (3) qvR (4) qvR/2

Scan or tap for the full solution

Q.73 A beam of electron passes undeflected through mutually perpendicular electric and magnetic fields. If the electric field is switched off, and the same magnetic field is maintained, the electrons move [AIPMT 2007]

(1) in a circular orbit (2) along a parabolic path
(3) along a straight line (4) in an elliptical orbit

Scan or tap for the full solution

Q.74 In a mass spectrometer used for measuring the masses of ions, the ions are initially accelerated by an electric potential V and then made to describe semicircular paths of radius R using a magnetic field B. If V and B are kept constant, the ratio $\left(\frac{\text{charge on the ion}}{\text{mass of the ion}}\right)$ will be proportional to [AIPMT 2007]

(1) $1/R^2$ (2) R^2 (3) R (4) 1/R

Scan or tap for the full solution

Q.75 When a charged particle moving with velocity $\vec{v}$ is subjected to a magnetic field of induction $\vec{B}$, the force on it is non-zero. This implies that [AIPMT 2006]

(1) angle between $\vec{v}$ and $\vec{B}$ is either zero or 180°
(2) angle between $\vec{v}$ and $\vec{B}$ is necessarily 90°
(3) angle between $\vec{v}$ and $\vec{B}$ can have any value other than 90°

(4) angle between $\vec{v}$ and $\vec{B}$ can have any value other than zero and 180°

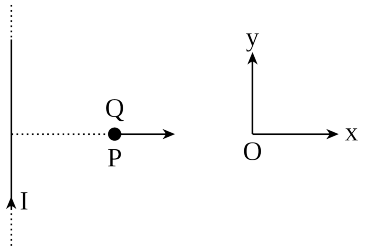
Scan or tap for the full solution

Q.76 Two circular coils 1 and 2 are made from the same wire but the radius of the 1st coil is twice that of the 2nd coil. What ratio of potential difference in volts should be applied across them so that the magnetic field at their centres is the same? [AIPMT 2006]

(1) 2 (2) 3 (3) 4 (4) 6

Scan or tap for the full solution

Q.77 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 force on the charge is [AIPMT 2005]



(1) along Oy (2) opposite to Oy
(3) along Ox (4) opposite to Ox

Scan or tap for the full solution

Q.78 An electron moves in a circular orbit with a uniform speed v. It produces a magnetic field B at the centre of the circle. The radius of the circle is proportional to [AIPMT 2005]

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

Solution

Q.79 A coil in the shape of an equilateral triangle of side l is suspended between the pole pieces of a permanent magnet such that $\vec{B}$ is in plane of the coil. If due to a current i in the triangle a torque τ acts on it, the side l of the triangle is [AIPMT 2005]

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

Scan or tap for the full solution

Q.80 A galvanometer of 50 ohm resistance has 25 divisions. A current of 4×10^{-4} ampere gives a deflection of one division. To convert this galvanometer into a voltmeter having a range of 25 volts, it should be connected with a resistance of [AIPMT 2004]

(1) 2500 Ω as a shunt (2) 2450 Ω as a shunt
(3) 2550 Ω in series (4) 2450 Ω in series

Scan or tap for the full solution

Q.81 To convert a galvanometer into a voltmeter one should connect a [AIPMT 2004]

(1) high resistance in series with galvanometer
(2) low resistance in series with galvanometer
(3) high resistance in parallel with galvanometer
(4) low resistance in parallel with galvanometer

Scan or tap for the full solution

Q.82 A charged particle moves through a magnetic field in a direction perpendicular to it. Then the [AIPMT 2003]

(1) speed of the particle remains unchanged
(2) direction of the particle remains unchanged
(3) acceleration remains unchanged
(4) velocity remains unchanged

Scan or tap for the full solution

Q.83 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 [AIPMT 2003]

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

Scan or tap for the full solution

Q.84 To convert a galvanometer into a voltmeter one should connect a [AIPMT 2002]

(1) high resistance in series with galvanometer
(2) low resistance in series with galvanometer
(3) high resistance in parallel with galvanometer
(4) low resistance in parallel with galvanometer.

Scan or tap for the full solution

Q.85 A charge q moves in a region where electric field and magnetic field both exist, then force on it is [AIPMT 2002]

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

Scan or tap for the full solution

Q.86 The magnetic field of given length of wire for single turn coil at its centre is B then its value for two turns coil for the same wire is [AIPMT 2002]

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

Scan or tap for the full solution

Q.87 If number of turns, area and current through a coil is given by n, A and i respectively then its magnetic moment will be [AIPMT 2001]

(1) niA (2) n^2iA (3) niA^2 (4) $\frac{ni}{\sqrt{A}}$

Scan or tap for the full solution

Q.88 An electron having mass m and kinetic energy E enters a uniform magnetic field B perpendicularly, then its frequency will be [AIPMT 2001]

(1) $\frac{eE}{qvB}$ (2) $\frac{2\pi m}{eB}$ (3) $\frac{eB}{2\pi m}$ (4) $\frac{2m}{eBE}$

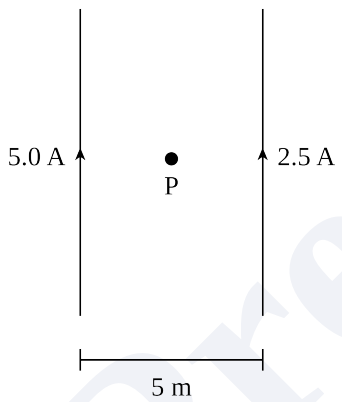
Scan or tap for the full solution

Q.89 In Thomson mass spectrograph, if $\vec{E} \perp \vec{B}$, then the velocity of electron beam will be [AIPMT 2001]

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

Scan or tap for the full solution

Q.90 The magnetic field at centre, P will be [AIPMT 2000]



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

Scan or tap for the full solution

ANSWER KEY

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	3	3	4	2	3	4	3	4	3	2	2
Ques.	12	13	14	15	16	17	18	19	20	21	22
Ans.	2	3	3	1	3	4	2	4	1	3	2
Ques.	23	24	25	26	27	28	29	30	31	32	33
Ans.	4	3	4	4	3	3	4	1	3	2	1
Ques.	34	35	36	37	38	39	40	41	42	43	44
Ans.	3	2	4	2	1	3	4	4	2	2	1
Ques.	45	46	47	48	49	50	51	52	53	54	55
Ans.	2	1	1	3	4	2	1	4	2	2	1
Ques.	56	57	58	59	60	61	62	63	64	65	66
Ans.	3	3	1	2	1	1	2	4	3	4	2

Ques.	67	68	69	70	71	72	73	74	75	76	77
Ans.	1	4	2	2	1	4	1	1	4	3	1
Ques.	78	79	80	81	82	83	84	85	86	87	88
Ans.	3	2	4	1	1	2	1	2	3	1	3
Ques.	89	90									
Ans.	1	3									

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