

JEE MAIN MOVING CHARGES AND MAGNETISM — PYQS

Max. Marks: 140

Questions: 35

Section A (MCQ) — 27 questions

- Q.1** A current carrying circular loop of radius 2 cm with unit normal $\hat{n} = \frac{\hat{k} + \hat{i}}{\sqrt{2}}$ is placed in a magnetic field, $\vec{B} = B_0(3\hat{i} + 2\hat{k})$. If $B_0 = 4 \times 10^{-3}$ T and current $I = 100\sqrt{2}$ A, the torque experienced by the loop is _____ Wb.A. ($\pi = 3.14$)

[JEE Main 2026 (Online) 8th April Evening Shift]

- (1) $16 \times 10^{-5} \hat{k}$ (2) $5024 \times 10^{-7} \hat{k}$
 (3) $5024 \times 10^{-7} \hat{i}$ (4) $5024 \times 10^{-7} \hat{j}$

Scan or tap for the full solution



- Q.2** A small cube of side 1 mm is placed at the centre of a circular loop of radius 10 cm carrying a current of 2 A. The magnetic energy stored inside the cube is $\alpha \times 10^{-14}$ J. The value of α is _____. ($\mu_0 = 4\pi \times 10^{-7}$ Tm/A, $\pi = 3.14$)

[JEE Main 2026 (Online) 6th April Morning Shift]

- (1) 6.28 (2) 6.28×10^{-6}
 (3) 628 (4) 6.28×10^{-4}

Scan or tap for the full solution



- Q.3** A current of 30 A each flows in opposite directions in two conducting wires, placed parallel to each other at a distance of 8 cm. The magnetic field at the mid point between the two wires is _____ μ T. ($\frac{\mu_0}{4\pi} = 10^{-7}$ N/A²)

[JEE Main 2026 (Online) 6th April Evening Shift]

- (1) 30 (2) 300 (3) 150 (4) 0.0

Scan or tap for the full solution



- Q.4** The magnetic field at the centre of a current carrying circular loop of radius R is 16 μ T. The magnetic field at a distance $x = \sqrt{3}R$ on its axis from the centre is _____ μ T.

[JEE Main 2026 (Online) 28th January Morning Shift]

- (1) 8 (2) 2 (3) 4 (4) $2\sqrt{2}$

Scan or tap for the full solution



- Q.5** A particle of charge q and mass m is projected from origin with an initial velocity $\vec{v} = \left(\frac{v_0}{\sqrt{2}} \hat{x} + \frac{v_0}{\sqrt{2}} \hat{y} \right)$.

There exists a uniform magnetic field $\vec{B} = B_0 \hat{z}$ and a space varying electric field $\vec{E} = E_0 e^{-\lambda x} \hat{x}$ within the region $0 \leq x \leq L$. After travelling a distance such that x -coordinate has changed from $x = 0$ to $x = L$, the change in the kinetic energy is _____.

[JEE Main 2026 (Online) 5th April Evening Shift]

- (1) $\frac{qE_0}{\lambda} [1 - e^{-\lambda L}]$
 (2) $\left(\frac{v_0 q B_0}{2\lambda} \right) [2 - e^{-2\lambda L}]$
 (3) $\frac{qE_0}{\lambda} [1 + e^{-\lambda L}]$
 (4) $q \left(\frac{E_0 + v_0 B_0}{\lambda} \right) [1 - e^{-\lambda L/2}]$

Scan or tap for the full solution



- Q.6** A voltmeter with internal resistance of $x \Omega$ can be used to measure up to 20 V. In order to increase its measuring range to 30 V, the required modification is to _____.

[JEE Main 2026 (Online) 4th April Morning Shift]

- (1) connect resistor of $\frac{x}{2} \Omega$, in series with voltmeter.
 (2) connect resistor of $\frac{x}{2} \Omega$, in parallel to voltmeter.
 (3) connect a resistor of $x \Omega$ in series with voltmeter.
 (4) connect resistor of $2x \Omega$ in parallel to voltmeter.

Scan or tap for the full solution



- Q.7** An insulated wire is wound so that it forms a flat coil with $N = 200$ turns. The radius of the innermost turn is $r_1 = 3$ cm, and of the outermost turn $r_2 = 6$ cm. If 20 mA current flows in it then the magnetic moment will be $\alpha \times 10^{-2}$ A m². The value of α is _____.

[JEE Main 2026 (Online) 4th April Morning Shift]

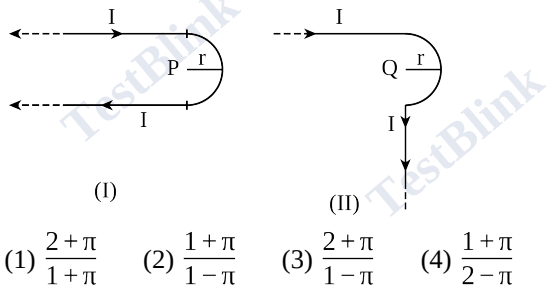
- (1) 4.4 (2) 2.64 (3) 3.25 (4) 1.2

Scan or tap for the full solution



- Q.8** Two identical long current carrying wires are bent into the shapes shown in the following figures. If the magnitude of magnetic fields at the centres P and Q of a semicircular arc are B_1 and B_2 respectively, then the ratio $\frac{B_1}{B_2}$ is _____.

[JEE Main 2026 (Online) 2nd April Morning Shift]



Scan or tap for the full solution

- Q.9** A particle having charge 10^{-9} C moving in x-y plane in fields of $0.4\hat{j}$ N/C and $4 \times 10^{-3}\hat{k}$ T experiences a force of $(4\hat{i} + 2\hat{j}) \times 10^{-10}$ N. The velocity of the particle at that instant is _____ m/s.

[JEE Main 2026 (Online) 2nd April Evening Shift]

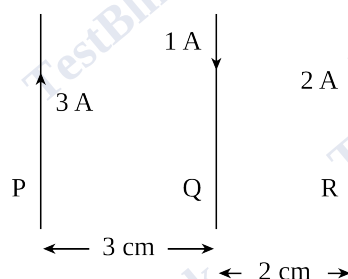
- (1) $50\hat{i} + 100\hat{j}$ (2) $100\hat{i} + 50\hat{j}$
(3) $-50\hat{i} + 100\hat{j}$ (4) $50\hat{i} - 100\hat{j}$

Scan or tap for the full solution

- Q.10** Three long straight wires carrying current are arranged mutually parallel as shown in the figure. The force experienced by 15 cm length of wire Q is _____.

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

[JEE Main 2026 (Online) 28th January Morning Shift]



- (1) 6×10^{-6} N towards P (2) 6×10^{-6} N towards R
(3) 6×10^{-7} N towards P (4) 6×10^{-7} N towards R

Scan or tap for the full solution

- Q.11** A long cylindrical conductor with large cross section carries an electric current distributed uniformly over its cross-section. Magnetic field due to this current is:
- A. maximum at either ends of the conductor and minimum at the midpoint
B. maximum at the axis of the conductor
C. minimum at the surface of the conductor

- D. minimum at the axis of the conductor
E. same at all points in the cross-section of the conductor
- Choose the **correct** answer from the options given below:

[JEE Main 2026 (Online) 28th January Evening Shift]

- (1) B, C Only (2) E Only
(3) A, D Only (4) D Only

Scan or tap for the full solution

- Q.12** A moving coil galvanometer of resistance 100Ω shows a full scale deflection for a current of 1 mA. The value of resistance required to convert this galvanometer into an ammeter, showing full scale deflection for a current of 5 mA, is _____ Ω

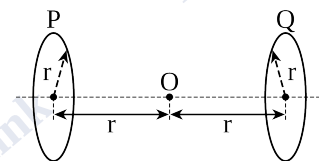
[JEE Main 2026 (Online) 24th January Evening Shift]

- (1) 25 (2) 2.5 (3) 0.5 (4) 10

Scan or tap for the full solution

- Q.13** Two identical circular loops P and Q each of radius r are lying in parallel planes such that they have common axis. The currents through P and Q are I and $4I$ respectively in clockwise direction as seen from O. The net magnetic field at O is :

[JEE Main 2026 (Online) 24th January Evening Shift]



- (1) $\frac{\mu_0 I}{4\sqrt{2}r}$ towards Q (2) $\frac{3\mu_0 I}{4\sqrt{2}r}$ towards Q
(3) $\frac{3\mu_0 I}{4\sqrt{2}r}$ towards P (4) $\frac{\mu_0 I}{4\sqrt{2}r}$ towards P

Scan or tap for the full solution

- Q.14** The current passing through a conducting loop in the form of equilateral triangle of side $4\sqrt{3}$ cm is 2 A. The magnetic field at its centroid is $\alpha \times 10^{-5}$ T. The value of α is _____.

(Given: $\mu_0 = 4\pi \times 10^{-7}$ SI units)

[JEE Main 2026 (Online) 23rd January Evening Shift]

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

Scan or tap for the full solution

- Q.15** A current carrying solenoid is placed vertically and a particle of mass m with charge Q is released from rest. The particle moves along the axis of solenoid. If g is acceleration due to gravity then the acceleration (a) of the charged particle will satisfy :

[JEE Main 2026 (Online) 21st January Morning Shift]

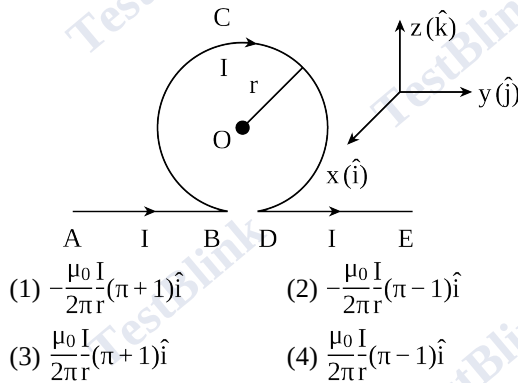
- (1) $a > g$ (2) $a = 0$
 (3) $0 < a < g$ (4) $a = g$

Scan or tap for the full solution



Q.16 An infinitely long straight wire carrying current I is bent in a planar shape as shown in the diagram. The radius of the circular part is r . The magnetic field at the centre O of the circular loop is :

[JEE Main 2026 (Online) 21st January Evening Shift]

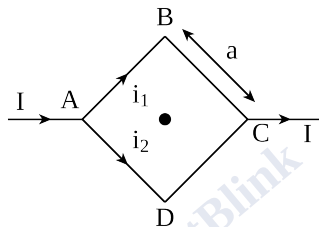


Scan or tap for the full solution



Q.17 Figure shows a current carrying square loop ABCD of edge length 'a' lying in a plane. If the resistance of the ABC part is r and that of ADC part is $2r$, then the magnitude of the resultant magnetic field at centre of the square loop is

[JEE Main 2025 (Online) 8th April Evening Shift]

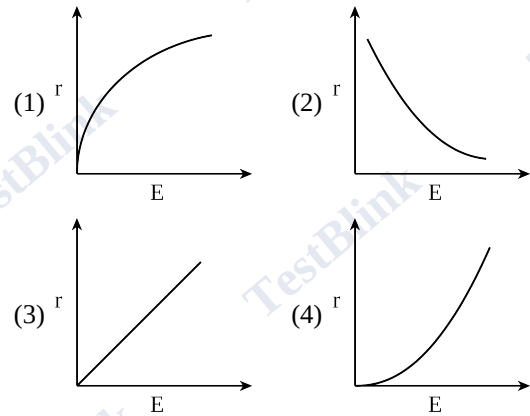


- (1) $\frac{2\mu_0 I}{3\pi a}$ (2) $\frac{\sqrt{2}\mu_0 I}{3\pi a}$
 (3) $\frac{3\pi\mu_0 I}{\sqrt{2}a}$ (4) $\frac{\mu_0 I}{2\pi a}$

Scan or tap for the full solution



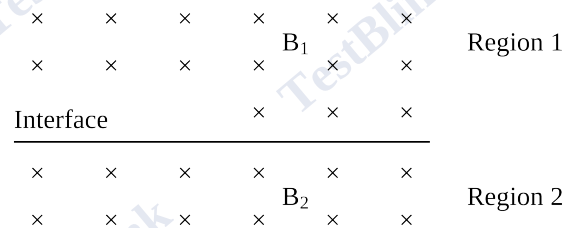
Q.18 A particle of charge q , mass m and kinetic energy E enters a magnetic field perpendicular to its velocity and undergoes a circular arc of radius (r). Which of the following curves represents the variation of r with E ? [JEE Main 2025 (Online) 7th April Morning Shift]



Scan or tap for the full solution



Q.19 Uniform magnetic fields of different strengths (B_1 and B_2), both normal to the plane of the paper exist as shown in the figure. A charged particle of mass m and charge q , at the interface at an instant, moves into the region 2 with velocity v and returns to the interface. It continues to move into region 1 and finally reaches the interface. What is the displacement of the particle during this movement along the interface?



(Consider the velocity of the particle to be normal to the magnetic field and $B_2 > B_1$)

[JEE Main 2025 (Online) 7th April Morning Shift]

- (1) $\frac{mv}{qB_1} \left(1 - \frac{B_1}{B_2}\right) \times 2$ (2) $\frac{mv}{qB_1} \left(1 - \frac{B_2}{B_1}\right) \times 2$
 (3) $\frac{mv}{qB_1} \left(1 - \frac{B_2}{B_1}\right)$ (4) $\frac{mv}{qB_1} \left(1 - \frac{B_1}{B_2}\right)$

Scan or tap for the full solution



Q.20 Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**.
Assertion (A): If oxygen ion (O^{2-}) and hydrogen ion (H^+) enter normal to the magnetic field with equal momentum, then the path of O^{2-} ion has a smaller radius of curvature than that of H^+ .
Reason (R): A proton with same linear momentum as an electron will form a path of smaller radius of curvature on entering a uniform magnetic field perpendicularly.

In the light of the above statements, choose the correct answer from the options given below

[JEE Main 2025 (Online) 3rd April Evening Shift]

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

Scan or tap for the full solution



- Q.21** A monochromatic light of wavelength λ is incident on a metallic plate having work function ϕ . An electron, emitted normally to the plate from a point A with maximum kinetic energy, enters a constant magnetic field, perpendicular to the initial velocity of electron. The electron passes through a curve and hits back the plate at a point B. The distance between A and B is : (Given : The magnitude of charge of an electron is e and mass is m , h is Planck's constant and c is velocity of light. Take the magnetic field exists throughout the path of electron)

[JEE Main 2025 (Online) 2nd April Morning Shift]

- (1) $\sqrt{2m\left(\frac{hc}{\lambda} - \phi\right)}/eB$ (2) $\sqrt{8m\left(\frac{hc}{\lambda} - \phi\right)}/eB$
 (3) $\sqrt{m(hc/\lambda - \phi)}/eB$ (4) $2\sqrt{m(hc/\lambda - \phi)}/eB$

Scan or tap for the full solution



- Q.22** Let B_1 be the magnitude of magnetic field at center of a circular coil of radius R carrying current I . Let B_2 be the magnitude of magnetic field at an axial distance 'x' from the center. For $x:R = 3:4$, $\frac{B_2}{B_1}$ is :

[JEE Main 2025 (Online) 2nd April Morning Shift]

- (1) 64:125 (2) 25:16 (3) 4:5 (4) 16:25

Scan or tap for the full solution



- Q.23** In a moving coil galvanometer, two moving coils M_1 and M_2 have the following particulars :
 $R_1 = 5 \Omega$, $N_1 = 15$, $A_1 = 3.6 \times 10^{-3} \text{ m}^2$, $B_1 = 0.25 \text{ T}$
 $R_2 = 7 \Omega$, $N_2 = 21$, $A_2 = 1.8 \times 10^{-3} \text{ m}^2$, $B_2 = 0.50 \text{ T}$
 Assuming that torsional constant of the springs are same for both coils, what will be the ratio of voltage sensitivity of M_1 and M_2 ?

[JEE Main 2025 (Online) 2nd April Evening Shift]

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

Scan or tap for the full solution



- Q.24** An electron with mass 'm' with an initial velocity ($t=0$) $\vec{v} = v_0 \hat{i}$ ($v_0 > 0$) enters a magnetic field $\vec{B} = B_0 \hat{j}$. If the initial de Broglie wavelength at $t=0$ is λ_0 then its value after time 't' would be :

[JEE Main 2025 (Online) 2nd April Evening Shift]

- (1) $\frac{\lambda_0}{\sqrt{1 - \frac{e^2 B_0^2 t^2}{m^2}}}$ (2) λ_0
 (3) $\lambda_0 \sqrt{1 + \frac{e^2 B_0^2 t^2}{m^2}}$ (4) $\frac{\lambda_0}{\sqrt{1 + \frac{e^2 B_0^2 t^2}{m^2}}}$

Scan or tap for the full solution



- Q.25** Consider a long straight wire of a circular cross-section (radius a) carrying a steady current I . The current is uniformly distributed across this cross-section. The distances from the centre of the wire's cross-section at which the magnetic field [inside the wire, outside the wire] is half of the maximum possible magnetic field, any where due to the wire, will be :

[JEE Main 2025 (Online) 29th January Morning Shift]

- (1) $[a/2, 3a]$ (2) $[a/4, 3a/2]$
 (3) $[a/2, 2a]$ (4) $[a/4, 2a]$

Scan or tap for the full solution



- Q.26** Consider a long thin conducting wire carrying a uniform current I . A particle having mass "m" and charge "q" is released at a distance "a" from the wire with a speed v_0 along the direction of current in the wire. The particle gets attracted to the wire due to magnetic force. The particle turns round when it is at distance x from the wire. The value of x is [μ_0 is vacuum permeability]

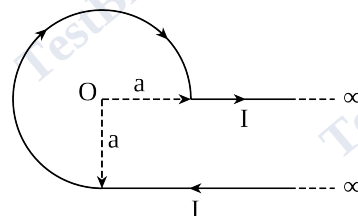
[JEE Main 2025 (Online) 28th January Morning Shift]

- (1) $a \left[1 - \frac{mv_0}{2q\mu_0 I} \right]$ (2) $a e^{\frac{4\pi m v_0}{q\mu_0 I}}$
 (3) $a \left[1 - \frac{mv_0}{q} \mu_0 I \right]$ (4) $\frac{a}{2}$

Scan or tap for the full solution



Q.27



An infinite wire has a circular bend of radius a , and carrying a current I as shown in the figure. The magnitude of magnetic field at the origin O of the arc is given by:

[JEE Main 2025 (Online) 28th January Evening Shift]

(1) $\frac{\mu_0 I}{2\pi a} \left[\frac{\pi}{2} + 2 \right]$

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

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

(4) $\frac{\mu_0 I}{4\pi a} \left[\frac{3\pi}{2} + 2 \right]$

Scan or tap for the full solution

**Section B (Numerical) — 8 questions**

- Q.28** A 5 mg particle carrying a charge of $5\pi \times 10^{-6}$ C is moving with velocity of $(3\hat{i} + 2\hat{k}) \times 10^{-2}$ m/s in a region having magnetic field $\vec{B} = 0.1\hat{k}$ Wb/m². It moves a distance of α meter along $\hat{k}$ when it completes 5 revolutions. The value of α is _____.

[JEE Main 2026 (Online) 8th April Evening Shift]

Scan or tap for the full solution



- Q.29** A moving coil of galvanometer when shunted with $2\ \Omega$ resistance gives a full scale deflection for a current of 500 mA. When a resistance of $470\ \Omega$ is connected in series it gives a full scale deflection for 10 V potential applied on it. The value of resistance of galvanometer coil is _____ Ω .

[JEE Main 2026 (Online) 6th April Evening Shift]

Scan or tap for the full solution



- Q.30** The charged particle moving in a uniform magnetic field of $(3\hat{i} + 2\hat{j})$ T has an acceleration $(4\hat{i} - \frac{x}{2}\hat{j})$ m/s². The value of x is _____.

[JEE Main 2026 (Online) 5th April Morning Shift]

Scan or tap for the full solution



- Q.31** A circular coil of radius 2 cm and 125 turns carries a current of 1 A. The coil is placed in a uniform magnetic field of magnitude 0.4 T. The axis of the coil makes an angle of 30° with the direction of the magnetic field. The torque acting on the coil is $\alpha \times 10^{-4}$ N m. The value of α is _____.

 $(\pi = 3.14)$

[JEE Main 2026 (Online) 4th April Evening Shift]

Scan or tap for the full solution



- Q.32** $1\ \mu\text{C}$ charge moving with velocity $\vec{v} = (\hat{i} - 2\hat{j} + 3\hat{k})$ m/s in the region of magnetic field $\vec{B} = (2\hat{i} + 3\hat{j} - 5\hat{k})$ T. The magnitude of force acting on it is $\sqrt{\alpha} \times 10^{-6}$ N. The value of α is _____.

[JEE Main 2026 (Online) 2nd April Morning Shift]

Scan or tap for the full solution



- Q.33** A particle of charge $1.6\ \mu\text{C}$ and mass $16\ \mu\text{g}$ is present in a strong magnetic field of 6.28 T. The particle is then fired perpendicular to magnetic field. The time required for the particle to return to original location for the first time is _____ s (rounded off to the nearest integer). ($\pi = 3.14$)

[JEE Main 2025 (Online) 4th April Evening Shift]

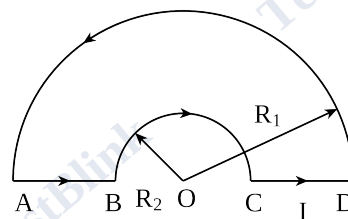
Scan or tap for the full solution



- Q.34** A loop ABCDA, carrying current $I = 12$ A, is placed in a plane, consists of two semi-circular segments of radius $R_1 = 6\pi$ m and $R_2 = 4\pi$ m. The magnitude of the resultant magnetic field at center O is $k \times 10^{-7}$ T. The value of k is _____.

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

[JEE Main 2025 (Online) 3rd April Morning Shift]



Scan or tap for the full solution



- Q.35** A 4.0 cm long straight wire carrying a current of 8 A is placed perpendicular to a uniform magnetic field of strength 0.15 T. The magnetic force on the wire is _____ mN.

[JEE Main 2025 (Online) 3rd April Morning Shift]

Scan or tap for the full solution

**ANSWER KEY****Section A (MCQ) — 27 questions**

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	4	1	2	2	1	1	2	1	1	2	4
Ques.	12	13	14	15	16	17	18	19	20	21	22
Ans.	1	2	1	4	2	2	1	1	3	2	1
Ques.	23	24	25	26	27						
Ans.	1	2	3	2	2						

Section B (Numerical) — 8 questions

Ques.	28	29	30	31	32	33	34
Ans.	2	50	12	314	171	0	1
Ques.	35						
Ans.	48						