

PART 1 - PHYSICS

Topic : Moving charges and magnetism

SECTION-A : (Maximum Marks : 16)

- This section contains **FOUR** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks	: +4	ONLY if (all) the correct option(s) is(are) chosen;
Partial Marks	: +3	If all the four options are correct but ONLY three options are chosen;
Partial Marks	: +2	If three or more options are correct but ONLY two options are chosen, both of which are correct;
Partial Marks	: +1	If two or more options are correct but ONLY one option is chosen and it is a correct option;
Zero Marks	: 0	If none of the options is chosen (i.e. the question is unanswered);
Negative Marks	: -1	In all other cases.
- For example, in a question, if **(A), (B) and (D)** are the ONLY three options corresponding to correct answers, then choosing ONLY (A), (B) and (D) will get +4 marks; choosing ONLY (A) and (B) will get +2 marks; choosing ONLY (A) and (D) will get +2 marks; choosing ONLY (B) and (D) will get +2 marks; choosing ONLY (A) will get +1 mark; choosing ONLY (B) will get +1 mark; choosing ONLY (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get -1 marks.

1. In a vacuum chamber, a particle of charge $1 \mu\text{C}$ and mass 1 mg is projected with a velocity $(\hat{i} + 2\hat{j}) \text{ m s}^{-1}$ from the XZ plane at time $t = 0$ in an electric field of $1\hat{i} \text{ V m}^{-1}$. At $t = 0.2 \text{ s}$, the electric field is switched off and a magnetic field of $6\hat{j} \text{ T}$ is switched on. The acceleration due to gravity is $-10\hat{j} \text{ m s}^{-2}$. Correct option(s) is/are: [JEE Advanced 2026 Paper 2]
- (A) The vertical distance of the particle from the XZ plane at $t = 0.3 \text{ s}$ is 15 cm .
 (B) The vertical distance of the particle from the XZ plane at $t = 0.4 \text{ s}$ is 10 cm .
 (C) The radius of the trajectory of the particle for $t > 0.2 \text{ s}$ is 20 cm .
 (D) The particle will be in the XZ plane at $t = 0.35 \text{ s}$.

Scan or tap for the full solution



2. An infinitely long wire, located on the z-axis, carries a current I along the +z-direction and produces the magnetic field $\vec{B}$. The magnitude of the line integral $\int \vec{B} \cdot d\vec{l}$ along a straight line from the point $(-\sqrt{3}a, a, 0)$ to $(a, a, 0)$ is given by [JEE Advanced 2024 Paper 1]
- $[\mu_0 \text{ is the magnetic permeability of free space.}]$
- (A) $7\mu_0 I/24$ (B) $7\mu_0 I/12$ (C) $\mu_0 I/8$ (D) $\mu_0 I/6$

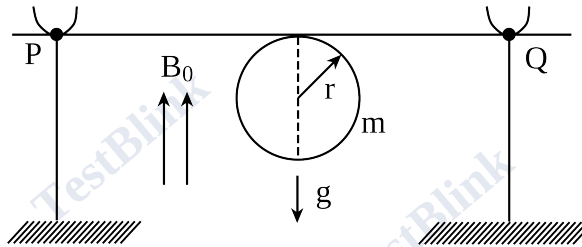
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Space for Rough Work

3. A thin stiff insulated metal wire is bent into a circular loop with its two ends extending tangentially from the same point of the loop. The wire loop has mass m and radius r and it is in a uniform vertical magnetic field B_0 , as shown in the figure. Initially, it hangs vertically downwards, because of acceleration due to gravity g , on two conducting supports at P and Q. When a current I is passed through the loop, the loop turns about the line PQ by an angle θ given by

[JEE Advanced 2024 Paper 2]



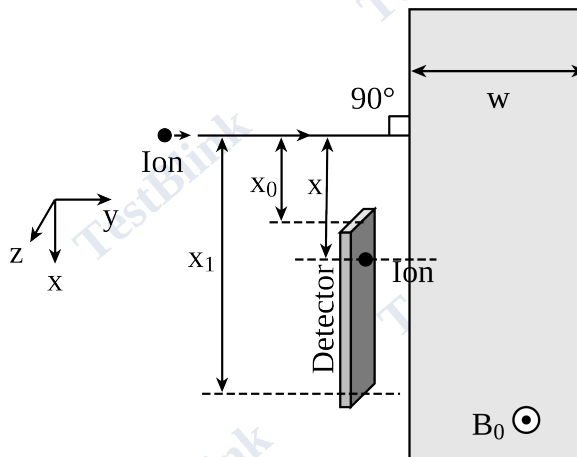
- (A) $\tan \theta = \pi r I B_0 / (mg)$ (B) $\tan \theta = 2\pi r I B_0 / (mg)$ (C) $\tan \theta = \pi r I B_0 / (2mg)$ (D) $\tan \theta = mg / (\pi r I B_0)$

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4. A positive, singly ionized atom of mass number A_M is accelerated from rest by the voltage 192 V. Thereafter, it enters a rectangular region of width w with magnetic field $\vec{B}_0 = 0.1\hat{k}$ Tesla, as shown in the figure. The ion finally hits a detector at the distance x below its starting trajectory.

[Given: Mass of neutron/proton = $(5/3) \times 10^{-27}$ kg, charge of the electron = 1.6×10^{-19} C.]



Which of the following option(s) is(are) correct?

[JEE Advanced 2024 Paper 2]

- (A) The value of x for H^+ ion is 4 cm.
 (B) The value of x for an ion with $A_M = 144$ is 48 cm.
 (C) For detecting ions with $1 \leq A_M \leq 196$, the minimum height $(x_1 - x_0)$ of the detector is 55 cm.
 (D) The minimum width w of the region of the magnetic field for detecting ions with $A_M = 196$ is 56 cm.

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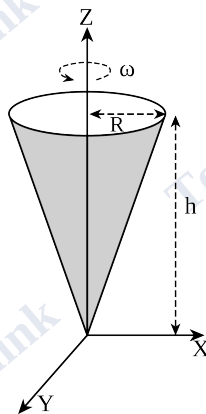


Space for Rough Work

SECTION-B : (Maximum Marks : 8)

- This section contains **TWO** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer (in decimal notation, truncated / rounded-off to the **SECOND DECIMAL PLACE**; e.g. 6.25, 7.00, -0.33, -0.30, 30.27, -127.30) in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme :
 Full Marks : +4 If **ONLY** the correct answer is entered;
 Zero Marks : 0 In all other cases.

5. A hollow, right circular cone of base radius R and height h , with its tip at the origin is rotating about the Z -axis with an angular velocity ω , as shown in the figure. The cone carries a total charge Q uniformly distributed on its curved surface. The magnitude of magnetic field at a point $(0, 0, z)$, where $z \gg R$ and $z \gg h$, is $\frac{n\mu_0 QR^2\omega}{4\pi z^3}$. The value of n is: [JEE Advanced 2026 Paper 1]



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6. A conducting solid sphere of radius R and mass M carries a charge Q . The sphere is rotating about an axis passing through its center with a uniform angular speed ω . The ratio of the magnitudes of the magnetic dipole moment to the angular momentum about the same axis is given as $\alpha \frac{Q}{2M}$. The value of α is ____ [JEE Advanced 2025 Paper 2]

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Space for Rough Work

JEE ADVANCED MOVING CHARGES AND MAGNETISM — PYQS

Test Pattern : JEE (Advanced)

ANSWER KEY

SECTION-A

[illegible]

SECTION-B

[illegible]