PART 1 - PHYSICS

Topic : Moving charges and magnetism

SECTION–1 : (Maximum Marks : 6)

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

Full Marks	: +3	If ONLY the correct option is chosen;
Zero Marks	: 0	If none of the options is chosen (i.e. the question is unanswered);
Negative Marks	: −1	In all other cases.

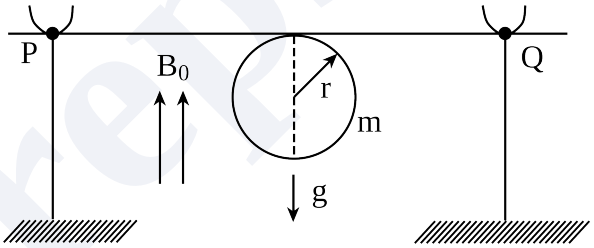
1. An infinitely long wire, located on the z-axis, carries a current I along the +z-direction and produces the magnetic field $\vec{B}$. The magnitude of the line integral $\int \vec{B}\cdot d\vec{l}$ along a straight line from the point $(-\sqrt{3}a, a, 0)$ to (a, a, 0) is given by

[μ_0 is the magnetic permeability of free space.] [JEE Advanced 2024 Paper 1]

(A) $7\mu_0 I/24$ (B) $7\mu_0 I/12$ (C) $\mu_0 I/8$ (D) $\mu_0 I/6$

Solution

2. 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) $\tan\theta = mg/(\pi r I B_0)$

Scan or tap for the full solution

Space for Rough Work

SECTION–2 : (Maximum Marks : 8)

- This section contains **TWO** 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	: −2	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 −2 marks.

3. In a vacuum chamber, a particle of charge 1 μC and mass 1 mg is projected with a velocity $(\hat{i}+2\hat{j})\ \mathrm{m\,s^{-1}}$ from the XZ plane at time t = 0 in an electric field of $1\hat{i}\ \mathrm{V\,m^{-1}}$. At t = 0.2 s, the electric field is switched off and a magnetic field of $6\hat{j}$ T is switched on. The acceleration due to gravity is $-10\hat{j}\ \mathrm{m\,s^{-2}}$. 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 s is 15 cm.

(B) The vertical distance of the particle from the XZ plane at t = 0.4 s is 10 cm.

(C) The radius of the trajectory of the particle for t > 0.2 s is 20 cm.

(D) The particle will be in the XZ plane at t = 0.35 s.

Solution

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) × 10^{-27} kg, charge of the electron = 1.6 × 10^{-19} C.]

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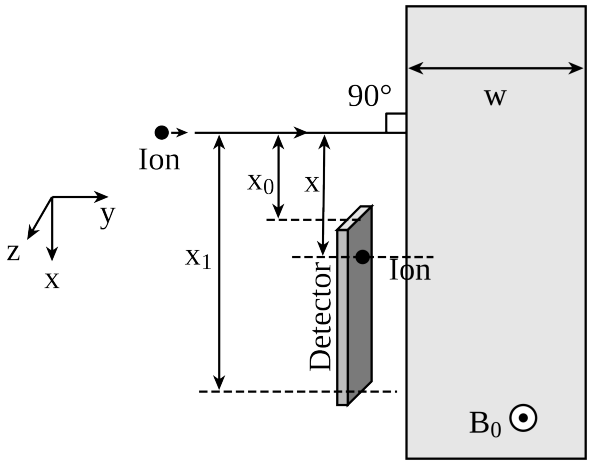

Which of the following option(s) is(are) correct? [JEE Advanced 2024 Paper 2]

(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 $1 \le A_M \le 196$, 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.

Scan or tap for the full solution

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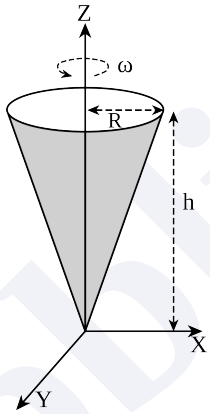
Space for Rough Work

SECTION–3 : (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, −.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 $\frac{n\mu_0}{4\pi}\frac{QR^2\omega}{z^3}$. 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–1

Ques.	1	2
Ans.	A	A

SECTION–2

Ques.	3	4
Ans.	A, C	A, B

SECTION–3

Ques.	5	6
Ans.	0.50	1.65 to 1.67

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