

PART 1 - PHYSICS

Topic : Electric charges and fields

SECTION-A : (Maximum Marks : 20)

This section contains **FIVE** 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. Consider an electric dipole comprising two charges $+q$ and $-q$ each with mass m , separated by a fixed distance d and initially at rest with its dipole moment pointing along $\hat{i}$. A uniform electric field $E\hat{j}$ is turned on at time $t = 0$ and it is turned off at $t = t_f$, when the dipole moment makes an angle θ_f with $\hat{i}$. Neglecting any sources of energy loss, correct option(s) is/are:

[JEE Advanced 2026 Paper 2]

(A) The center of mass of the dipole is deflected towards $\hat{j}$ in the presence of the field.

(B) If the magnitude of the final angular velocity $\omega_f = \sqrt{\frac{2qE}{md}}$, then $\theta_f = \frac{\pi}{6}$.

(C) If $\theta_f = \pi/3$, then the change in kinetic energy of the dipole is given by $2\sqrt{3} qEd$.

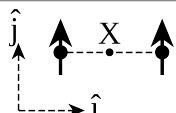
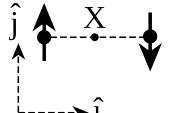
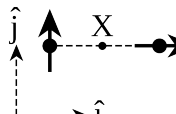
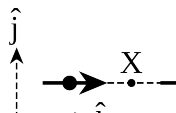
(D) For $\theta_f = \pi/4$, the dipole rotates around its center of mass with a constant angular velocity after $t > t_f$.

Scan or tap for the
full solution



Space for Rough Work

2. **List-I** shows four configurations, each consisting of a pair of ideal electric dipoles. Each dipole has a dipole moment of magnitude p , oriented as marked by arrows in the figures. In all the configurations the dipoles are fixed such that they are at a distance $2r$ apart along the x direction. The midpoint of the line joining the two dipoles is X . The possible resultant electric fields $\vec{E}$ at X are given in **List-II**.

List-I		List-II	
P.		1.	$\vec{E} = 0$
Q.		2.	$\vec{E} = -\frac{p}{2\pi\epsilon_0 r^3} \hat{j}$
R.		3.	$\vec{E} = -\frac{p}{4\pi\epsilon_0 r^3} (\hat{i} - \hat{j})$
S.		4.	$\vec{E} = \frac{p}{4\pi\epsilon_0 r^3} (2\hat{i} - \hat{j})$
		5.	$\vec{E} = \frac{p}{\pi\epsilon_0 r^3} \hat{i}$

Choose the option that describes the correct match between the entries in List-I to those in List-II. [JEE Advanced 2025 Paper 1]

- (A) $P \rightarrow 3, Q \rightarrow 1, R \rightarrow 2, S \rightarrow 4$ (B) $P \rightarrow 4, Q \rightarrow 5, R \rightarrow 3, S \rightarrow 1$
 (C) $P \rightarrow 2, Q \rightarrow 1, R \rightarrow 4, S \rightarrow 5$ (D) $P \rightarrow 2, Q \rightarrow 1, R \rightarrow 3, S \rightarrow 5$

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3. Two co-axial conducting cylinders of same length ℓ with radii $\sqrt{2}R$ and $2R$ are kept, as shown in Fig. 1. The charge on the inner cylinder is Q and the outer cylinder is grounded. The annular region between the cylinders is filled with a material of dielectric constant $\kappa = 5$. Consider an imaginary plane of the same length ℓ at a distance R from the common axis of the cylinders. This plane is parallel to the axis of the cylinders. The cross-sectional view of this arrangement is shown in Fig. 2. Ignoring edge effects, the flux of the electric field through the plane is (ϵ_0 is the permittivity of free space): [JEE Advanced 2025 Paper 2]

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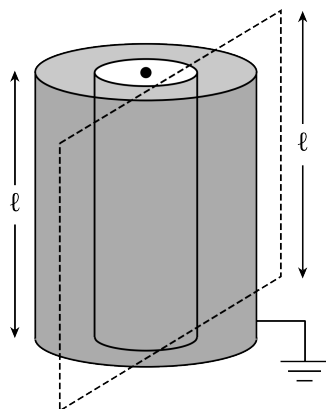


Fig. 1

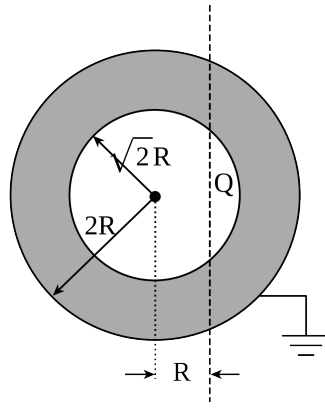


Fig. 2

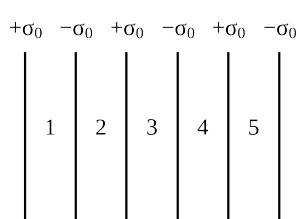
- (A) $\frac{Q}{30\epsilon_0}$ (B) $\frac{Q}{15\epsilon_0}$ (C) $\frac{Q}{60\epsilon_0}$ (D) $\frac{Q}{120\epsilon_0}$

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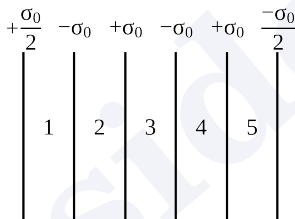


4. Six infinitely large and thin non-conducting sheets are fixed in configurations I and II. As shown in the figure, the sheets carry uniform surface charge densities which are indicated in terms of σ_0 . The separation between any two consecutive sheets is $1 \mu\text{m}$. The various regions between the sheets are denoted as 1, 2, 3, 4 and 5. If $\sigma_0 = 9 \mu\text{C}/\text{m}^2$, then which of the following statements is/are correct: (Take permittivity of free space $\epsilon_0 = 9 \times 10^{-12} \text{ F/m}$)

[JEE Advanced 2025 Paper 2]



Configuration I



Configuration II

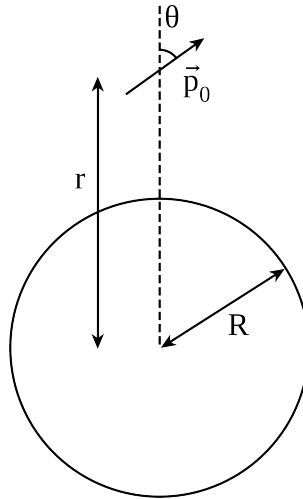
- (A) In region 4 of the configuration I, the magnitude of the electric field is zero.
 (B) In region 3 of the configuration II, the magnitude of the electric field is $\frac{\sigma_0}{\epsilon_0}$.
 (C) Potential difference between the first and the last sheets of the configuration I is 5 V.
 (D) Potential difference between the first and the last sheets of the configuration II is zero.

Scan or tap for the full solution



5. A small electric dipole $\vec{p}_0$, having a moment of inertia I about its center, is kept at a distance r from the center of a spherical shell of radius R . The surface charge density σ is uniformly distributed on the spherical shell. The dipole is initially oriented at a small angle θ as shown in the figure. While staying at a distance r , the dipole is free to rotate about its center.

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If released from rest, then which of the following statement(s) is(are) correct?

[ϵ_0 is the permittivity of free space.]

[JEE Advanced 2024 Paper 2]

(A) The dipole will undergo small oscillations at any finite value of r .

(B) The dipole will undergo small oscillations at any finite value of $r > R$.

(C) The dipole will undergo small oscillations with an angular frequency of $\sqrt{\frac{2\sigma p_0}{\epsilon_0 I}}$ at $r = 2R$.

(D) The dipole will undergo small oscillations with an angular frequency of $\sqrt{\frac{\sigma p_0}{100\epsilon_0 I}}$ at $r = 10R$.

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SECTION-B : (Maximum Marks : 4)

This section contains **ONE** question.

The answer to each question is a **NON-NEGATIVE INTEGER**.

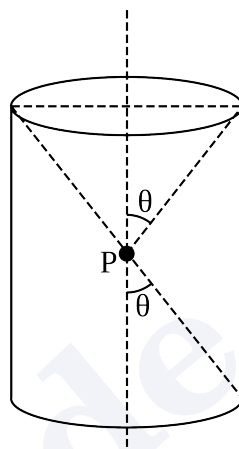
For each question, enter the correct integer corresponding to the answer in the place designated to enter the answer.

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.

6. A charge is kept at the central point P of a cylindrical region. The two edges subtend a half-angle θ at P, as shown in the figure. When $\theta = 30^\circ$, then the electric flux through the curved surface of the cylinder is Φ . If $\theta = 60^\circ$, then the electric flux through the curved surface becomes $\Phi/\sqrt{n}$, where the value of n is _____. [JEE Advanced 2024 Paper 2]



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JEE ADVANCED ELECTRIC CHARGES AND FIELDS — PYQS

Test Pattern : **JEE (Advanced)**

ANSWER KEY

SECTION-A

[illegible]

SECTION-B

[illegible]