

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



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**.

Space for Rough Work

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]

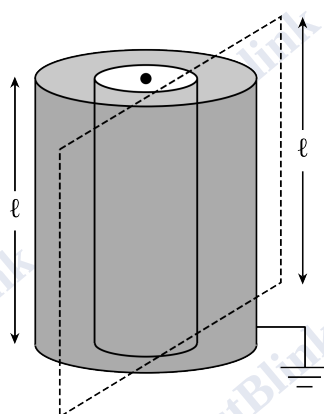


Fig. 1

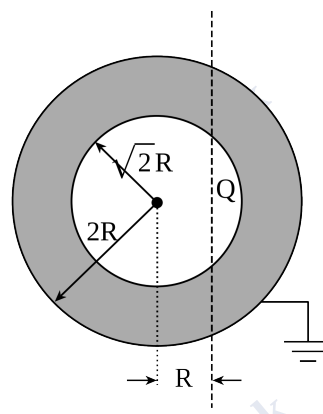


Fig. 2

Space for Rough Work

(A) $\frac{Q}{30\epsilon_0}$

(B) $\frac{Q}{15\epsilon_0}$

(C) $\frac{Q}{60\epsilon_0}$

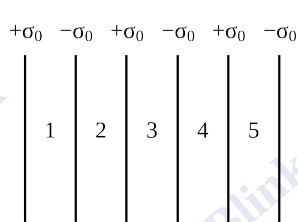
(D) $\frac{Q}{120\epsilon_0}$

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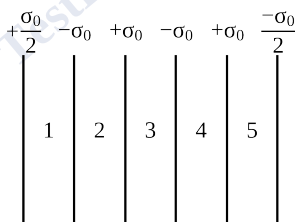


4. Six infinitely large and thin non-conducting sheets are fixed in configurations I and II. As shown in the figure, the sheets carry uniform surface charge densities which are indicated in terms of σ_0 . The separation between any two consecutive sheets is $1 \mu\text{m}$. The various regions between 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



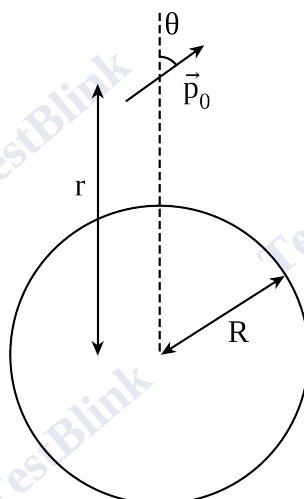
Configuration II

- (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.

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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.



Space for Rough Work

PYQSide

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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full solution



Space for Rough Work

SECTION-B : (Maximum Marks : 4)

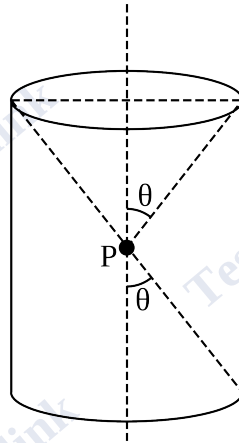
- This section contains **ONE** question.
- The answer to each question is a **NON-NEGATIVE INTEGER**.
- For each question, enter the correct integer corresponding to the answer in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking 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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Space for Rough Work

JEE ADVANCED ELECTRIC CHARGES AND FIELDS — PYQS

Test Pattern : **JEE (Advanced)**

ANSWER KEY

SECTION-A

[illegible]

SECTION-B

[illegible]