O. P. JINDAL SCHOOL, SAVITRI NAGAR

Periodic Test – I (Round – I)

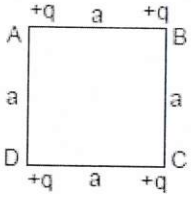
2025 – 2026

Class - XII **Max.Marks : 20**

Subject: Physics **Max.Time: 1 Hr.**

General Instructions: *All questions are compulsory.*

1. Four equal charges q are placed at the four corners A, B, C, D of a square of length a. The magnitude of the force on the charge at B will be 1



(a) $\frac{3q^2}{4\pi\varepsilon_0 a^2}$ (b) $\frac{4q^2}{4\pi\varepsilon_0 a^2}$

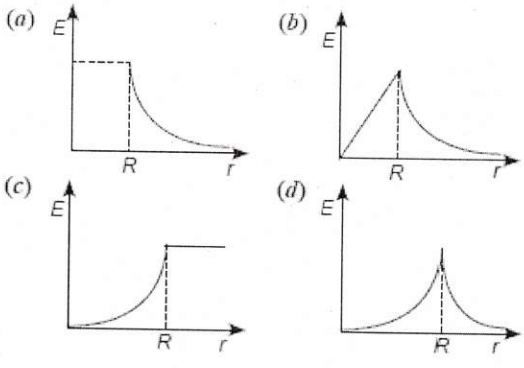
(c) $\frac{(1+2\sqrt{2})q^2}{2\times 4\pi\varepsilon_0 a^2}$ (d) $\frac{\left(\frac{2+1}{\sqrt{2}}\right)q^2}{4\pi\varepsilon_0 a^2}$

2. An electric charge q is placed at the centre of a cube of side a. The electric flux on one of its faces will be

(a) $\frac{q}{6\varepsilon_0}$ (b) $\frac{q}{\varepsilon_0 a^2}$

(c) $\frac{q}{4\pi\varepsilon_0 a^2}$ (d) $\frac{q}{\varepsilon_0}$ 1

3. Which of the following graphs shows the variation of electric field E due to a hollow spherical conductor of radius R as a function of distance from the centre of the sphere?



1

4. An electric dipole of moment p is placed in the position of stable equilibrium in uniform electric field of intensity E. It is rotated through an angle θ from the initial position. The potential energy of electric dipole in the final position is 1

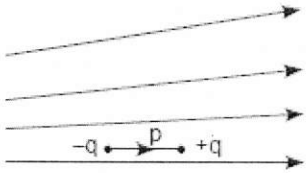
(a) pE cos θ

(b) pE sin θ

(c) pE(1 – cos θ)

(d) –pE cos θ

5. Figure shows electric field lines in which an electric dipole p is placed as shown. Which of the following statements is correct? 1



(a) The dipole will not experience any force.

(b) The dipole will experience a force towards right.

(c) The dipole will experience a force towards left.

(d) The dipole will experience a force upwards.

6. For the following question, two statements are given–one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Both A and R are true and R is the correct explanation of A.

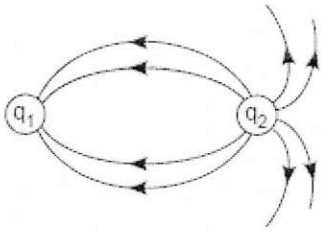
(b) Both A and R are true but R is NOT the correct explanation of A.

(c) A is true but R is false.

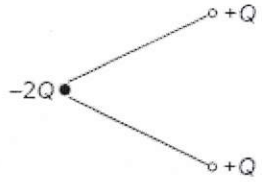
(d) A is false and R is also false.

Assertion: In the given figure q_1 is positive and q_2 is negative. 1

Reason: Electric field lines emerge from positive and terminate at negative charge.

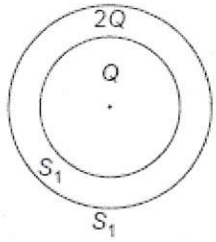


7. Sketch the electric field lines for the following system of charges. 2



8. Plot a graph showing the variation of coulomb force (F) versus $\left(\frac{1}{r^2}\right)$, where r is the distance between the two charges of each pair of charges: (1μC, 2μC) and (2μC, –3μC). Interpret the graphs obtained. 2

9. S_1 and S_2 are two hollow concentric spheres enclosing charge Q and $2Q$ respectively as shown in figure.

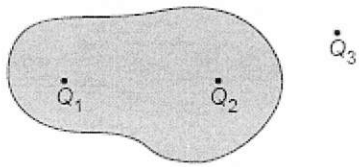


2

(i) What is the ratio of the electric flux through S_1 and S_2?
(ii) How will the electric flux through the sphere S_1 change, if a medium of dielectric constant 5 is introduced in the space inside S_1 in place of air

10. Define the term 'electric dipole moment'. Is it a scalar or vector?
Deduce an expression for the electric field at a point on the equatorial plane of an electric dipole of length $2a$. 3

11. Three charges Q_1, Q_2 and Q_3 are placed inside and outside a closed Gaussian surface as shown in the figure.



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Answer the following:
(a) Which charges contribute to the electric field at any point on the Gaussian surface?
(b) Which charges contribute to the net flux through this surface?
(c) If $Q_1 = -Q_2$, will electric field on the surface be zero?

12. Use the Gauss's law to derive an expression for the electric field between two uniformly charged large parallel sheets with surface charge densities σ and – σ respectively. 3

(a) Draw a graph of E versus r for r >> a.

(b) If this dipole were kept in a uniform external electric field E_0, diagrammatically represent the position of the dipole in stable and unstable equilibrium and write the expressions for the torque acting on the dipole in both the cases.