Physics | NEET

Class 12 Physics - Electrostatics

NEET track | Short Notes + 5 CBSE-based questions + 5 NEET PYQ-based questions with solutions

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Format: Quick revision + solved practice	Chapter scope: Class 12 Physics

1. Quick Short Notes

- Coulomb's law: F = (1 / 4*pi*epsilon0) * (q1*q2 / r^2). Force acts along the line joining the charges.
- Electric field due to a point charge: E = kq / r^2. Direction is radially outward for +q and inward for -q.
- Electric potential due to a point charge: V = kq / r. Potential is a scalar quantity.
- For a dipole, dipole moment p = q x (2a), directed from -q to +q. Torque in field: tau = pE sin(theta).
- Potential energy of a dipole in uniform field: U = -pE cos(theta).
- Gauss's law: total electric flux through a closed surface = q_enclosed / epsilon0.
- Parallel plate capacitor: C = epsilon*A/d. If dielectric constant is K, new capacitance becomes KC.
- Capacitors in series: 1/Ceq = sum(1/Ci). Capacitors in parallel: Ceq = sum(Ci).
- Energy stored in a capacitor: U = (1/2)CV^2 = Q^2/(2C) = (1/2)QV.
- Board tip: always show sign, direction, and SI unit clearly in electrostatics numericals.

2. CBSE-based Board Practice

Q1. Define electric dipole moment. State its SI unit.

Solution: Electric dipole moment is the product of magnitude of one charge and separation vector from -q to +q. p = q x 2a. SI unit: coulomb-metre (C m).

Q2. Find the electric field at a point 0.30 m away from a point charge of 2 microC in vacuum.

Solution: E = kq/r^2 = (9 x 10^9 x 2 x 10^-6)/(0.30)^2 = 2.0 x 10^5 N/C.

Q3. A 4 microF and a 6 microF capacitor are connected in series across a 12 V battery. Find equivalent capacitance, charge on each capacitor and potential across each capacitor.

Solution: Ceq = (4 x 6)/(4 + 6) = 2.4 microF. Q = Ceq V = 2.4 x 12 = 28.8 microC. V1 = Q/C1 = 28.8/4 = 7.2 V. V2 = Q/C2 = 28.8/6 = 4.8 V.

Q4. State Gauss's law. Using it, write the expression for electric field outside a charged spherical shell of total charge Q.

Solution: Gauss's law: integral(E.dA) over a closed surface = q_enclosed/epsilon0. For a spherical shell, field outside behaves like a point charge at the centre: E = (1 / 4*pi*epsilon0) x Q/r^2.

Q5. A dipole of moment 3 x 10^-8 C m is kept in a uniform electric field of 2 x 10^4 N/C at 30 degrees. Find the torque acting on it.

Solution: tau = pE sin(theta) = 3 x 10^-8 x 2 x 10^4 x sin30 degrees = 3 x 10^-4 N m.

3. NEET PYQ-based Practice

Q1. The SI unit of electric field is:

Solution: Electric field is force per unit charge, so its SI unit is N/C. It can also be written as V/m.

Q2. A 3 microF and a 6 microF capacitor are connected in parallel. Find the equivalent capacitance.

Solution: For parallel combination, capacitances add directly. Ceq = 3 + 6 = 9 microF.

Q3. What is the electric potential inside a conductor in electrostatic equilibrium?

Solution: It is constant throughout the conductor. Hence there is no electric field inside the conductor.

Q4. For what orientation of an electric dipole in a uniform field is the torque zero?

Solution: tau = pE sin(theta). Therefore torque is zero when theta = 0 degrees or 180 degrees, i.e. dipole parallel or antiparallel to the field.

Q5. If the distance between two point charges is doubled, how does the Coulomb force change?

Solution: Since F is proportional to 1/r^2, on doubling the distance the force becomes one-fourth of the original value.

Practice tip: First revise the short notes, then attempt CBSE board questions in written format, and finally solve the exam-specific section in timed mode.