

Chapter 2: Electrostatic Potential and Capacitance

Short • Exam-ready • CBSE 2026–27 syllabus focused

Core ideas

- Potential at a point = work done per unit positive test charge in bringing it from infinity.
- Potential is scalar; electric field is related by $E = -dV/dr$ along a radial direction.
- Equipotential surface: no work is done moving a charge along it; E is perpendicular to it.

Key formulas

- Point charge: $V = (1/4\pi\epsilon_0)q/r$.
- System of charges: $V = (1/4\pi\epsilon_0) \sum (q_i/r_i)$.
- Dipole potential: $V = (1/4\pi\epsilon_0) p \cos\theta/r^2$ (far point).
- Potential energy of two charges: $U = (1/4\pi\epsilon_0)q_1q_2/r$.
- Dipole in uniform field: $U = -pE \cos\theta$.
- Capacitance: $C = Q/V$; parallel plate: $C = \epsilon_0 A/d$; with dielectric K : $C = K\epsilon_0 A/d$.
- Series: $1/C_{eq} = \sum (1/C_i)$. Parallel: $C_{eq} = \sum C_i$.
- Energy stored: $U = 1/2 CV^2 = Q^2/(2C) = 1/2 QV$.

Conductors & dielectrics

- Inside an electrostatic conductor: $E = 0$; potential is constant.
- Dielectric polarisation reduces the effective electric field and increases capacitance by factor K for a fully inserted dielectric.

Exam focus

- Series/parallel capacitor combinations; dielectric effects; energy changes; potential-energy questions; equipotential concepts.

Revision tip: learn the formula, understand the symbols, then practise 2–3 application questions from NCERT/CBSE-style problems.