EngineeringRise

Electric potential and equipotentials

Formulas and units, JEE Main. Status: Reviewed on 2026-11-20.

Result	Formula	Units or note
Potential of a point charge	V = k q/r (zero at infinity) Valid when: point charge, zero of potential taken at infinity	V = J/C
System of charges	V = sum of k q_i/r_i (scalar sum) Valid when: point charges, zero of potential at infinity; add signed values, no components	V
Work by the field	W = q (V_A - V_B) Valid when: any static field; V_A - V_B is the potential drop from A to B	J
Pair potential energy	U = k q1 q2/r Valid when: point charges with zero of energy at infinity	J
Speed after acceleration	v = sqrt(2 q V/m) Valid when: charge q from rest, speed small compared with light, no other forces	m/s
Ring on its axis	V = k Q/sqrt(R^2 + x^2) Valid when: point on the axis of a uniformly charged ring, x from its centre	V
Thin shell	V = k Q/r outside; V = k Q/R inside and on it Valid when: uniformly charged thin conducting or non-conducting shell, zero of potential at infinity	V
Uniform field	E = V/d between equipotential planes Valid when: uniform field, d measured perpendicular to the equipotential planes	V/m
Dipole potential and energy	V = k p cos(theta)/r^2; U = -p E cos(theta) Valid when: short dipole at distance r much larger than its length; uniform field for the energy, theta from p	V (J)

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/physics/electrostatics/electric-potential-and-equipotentials

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