

CLASS 12

PHYSICS

NCERT SOLUTIONS

NCERT Solutions for Class 12 Physics Chapter 2: Electrostatic Potential and Capacitance – Free PDF Download

Complete, verified solutions to the NCERT Class 12 Physics Chapter 2 (Electrostatic Potential and Capacitance) exercise questions.

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NCERT Exercise Solutions

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NCERT Exercise Solutions

2.1 Two charges 5×10^{-8} C and -3×10^{-8} C are located 16 cm apart. At what point(s) on the line joining the two charges is the electric potential zero?

Ans: Between the charges, at distance x from the $+5\mu\text{C}$ charge: $5/x = 3/(16-x) \Rightarrow x = 10$ cm. Outside the charges, on the side of the smaller ($-3\mu\text{C}$) charge, at distance y from it: $5/(16+y) = 3/y \Rightarrow y = 24$ cm from the $-3\mu\text{C}$ charge.

2.2 A regular hexagon of side 10 cm has a charge $5\mu\text{C}$ at each vertex. Calculate the potential at the centre.

Ans: Distance of each vertex from centre = side = 0.1 m. $V = 6kq/r = 6 \times (9 \times 10^9)(5 \times 10^{-8})/0.1 = 2.7 \times 10^6$ V.

2.3 Two charges $2\mu\text{C}$ and $-2\mu\text{C}$ are placed at A and B, 6 cm apart. (a) Identify an equipotential surface. (b) Direction of field on it?

Ans: (a) The plane perpendicular to AB, passing through its midpoint (the perpendicular bisector plane), is an equipotential surface at 0 V. (b) The electric field at every point on this surface is normal (perpendicular) to the surface, directed from the positive to the negative charge (along AB direction).

2.4 A spherical conductor of radius 12 cm has a charge of 1.6×10^{-7} C. (a) Field at surface? (b) Field at 18 cm from centre? (c) Field at centre?

Ans: (a) $E = kq/r^2 = (9 \times 10^9)(1.6 \times 10^{-7})/(0.12)^2 = 10^5$ N/C. (b) At 18 cm (outside): $E = kq/r^2 = (9 \times 10^9)(1.6 \times 10^{-7})/(0.18)^2 \approx 4.4 \times 10^4$ N/C, directed radially outward. (c) Field inside a conductor is zero.

2.5 A parallel plate capacitor with air between the plates has capacitance 8 pF. What will be the capacitance if the distance is reduced by half and the space filled with a substance of dielectric constant 6?

Ans: $C' = K \times C / (d'/d) = K \times C \times (d/d') = 6 \times 8 \times 2 = 96$ pF (since halving d doubles C , and dielectric multiplies by $K=6$).

2.6 Three capacitors 2pF, 3pF, 4pF connected in parallel. (a) Total capacitance. (b) Determine charge on each if the combination is connected to a 100V supply.

Ans: (a) $C = 2+3+4=9$ pF. (b) Each has full 100V: $Q_1=200$ pC, $Q_2=300$ pC, $Q_3=400$ pC.

2.7 Three capacitors 2pF, 3pF, 4pF connected in series to a 100V supply. Determine (a) total capacitance, (b) charge and voltage on each.

Ans: (a) $1/C = 1/2 + 1/3 + 1/4 = 13/12$, $C = 12/13 \approx 0.92$ pF. (b) In series, same charge Q on each = $C \times V = (12/13) \times 100 \approx 92.3$ pC. Voltages: $V_1 = Q/2 \approx 46.2$ V, $V_2 = Q/3 \approx 30.8$ V, $V_3 = Q/4 \approx 23.1$ V (sum ≈ 100 V).

2.8 A parallel plate capacitor, plate area 6×10^{-3} m², separation 3mm. (a) Capacitance. (b) Charge on each plate if 100V applied.

Ans: (a) $C = \epsilon_0 A/d = (8.85 \times 10^{-12})(6 \times 10^{-3})/(3 \times 10^{-3}) \approx 1.77 \times 10^{-11}$ F ≈ 17.7 pF. (b) $Q = CV = 17.7 \text{ pF} \times 100 \text{ V} = 1.77 \times 10^{-9}$ C.

2.9 Explain what happens when a dielectric slab is introduced between the plates of a charged (isolated) capacitor.

Ans: With charge Q constant (isolated), capacitance increases ($C' = KC$), so voltage decreases ($V' = V/K$) and stored energy decreases ($U' = U/K$), since energy is used to partially polarise/pull in the dielectric.

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