

Electrostatic Potential and Capacitance

NEET previous year questions · Physics

9 questions from the official papers: NEET 2026 (3), Re-NEET 2026 (3), NEET 2020 (3). Each is followed by its answer and a worked solution written by BrainIt. Generated on 23 October 2026.



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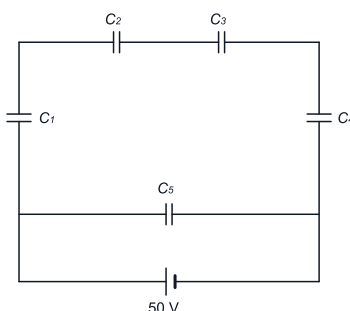
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1. NEET 2026 · Q12

Five capacitors of capacitances $C_1 = C_2 = C_3 = C_4 = 10 \mu F$ and $C_5 = 2.5 \mu F$ are connected as shown, along with a battery of 50 V.

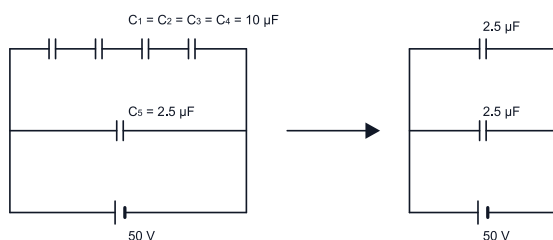


The equivalent capacitance and the charges on each capacitor respectively are:

- (1) $5 \mu F$, $125 \mu C$ on C_1 to C_4 and $25 \mu C$ on C_5
- (2) $5 \mu F$, $125 \mu C$ on all capacitors
- (3) $5 \mu F$, $250 \mu C$ on all capacitors
- (4) $4 \mu F$, $250 \mu C$ on C_1 to C_4 and $125 \mu C$ on C_5

Answer (2)

Sol. The four $10 \mu F$ capacitors are in series, giving $\frac{10}{4} = 2.5 \mu F$, and this branch is in parallel with $C_5 = 2.5 \mu F$, so $C_{eq} = 2.5 + 2.5 = 5 \mu F$. Each branch has 50 V across it, so the series branch carries $q = 2.5 \times 50 = 125 \mu C$ (the same charge flows through C_1 to C_4) and C_5 also holds $2.5 \times 50 = 125 \mu C$. Every capacitor therefore stores $125 \mu C$, option (2).



2. NEET 2026 · Q23

Consider two uncharged capacitors of equal capacitance 200 pF. One of them is charged by a 100 V supply and disconnected. Now this capacitor is connected to the uncharged capacitor. The amount of electrostatic energy lost in the process is:

- (1) $0.5 \times 10^{-6} \text{ J}$
- (2) 1.0 J
- (3) $1.0 \times 10^{-6} \text{ J}$
- (4) 0.5 J

Answer (1)

Sol. When a charged capacitor shares its charge with an identical uncharged one, the energy dissipated is $\frac{1}{2} \frac{C_1 C_2}{C_1 + C_2} V^2$. With $C_1 = C_2 = 200 \text{ pF}$ and $V = 100 \text{ V}$, this equals $\frac{1}{2} (200 \text{ pF})(100)^2 = 0.5 \times 10^{-6} \text{ J}$ (option (1)). The loss is real and independent of the connecting-wire resistance; answers in whole joules mishandle the pico-farad factor.

3. NEET 2026 · Q41

Which of the following statements are correct? Choose the correct answer from the options given below.

Statement I: Inside a conductor, the electrostatic field is zero.

Statement II: Electric field at the surface of a charged conductor does not depend on its surface charge density.

Statement III: The interior of a charged conductor can have no excess charge in the static situation.

Statement IV: At the surface of a charged conductor, the electrostatic field must be normal to the surface at every point.

Statement V: The electrostatic potential is zero everywhere inside a charged conductor.

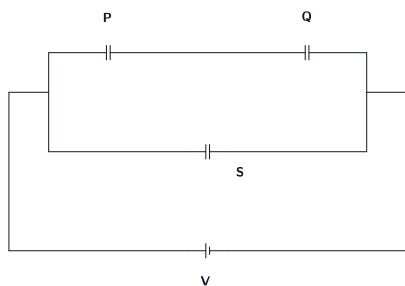
- (1) I, II and IV only
- (2) I, III and V only
- (3) I, III and IV only
- (4) III, IV and V only

Answer (3)

Sol. In electrostatic equilibrium, the electric field inside a conductor is zero, and any excess charge lies on its surface. The field just outside is normal to the surface and depends on the local surface charge density, $E = \frac{\sigma}{\epsilon_0} \hat{n}$. The potential is constant inside but need not be zero. Therefore internal statements I, III and IV hold; II and V do not.

4. Re-NEET 2026 · Q9

Three identical capacitors, P , Q and S , each of the capacitance C , are connected to a battery of voltage V , as shown in the figure. If the energy stored in the capacitor P and total energy stored in the system are U_P and U_T , respectively, then the ratio $\frac{U_P}{U_T}$ is:



- (1) $2/3$ (2) $1/3$ (3) $1/2$ (4) $1/6$

Answer (4)

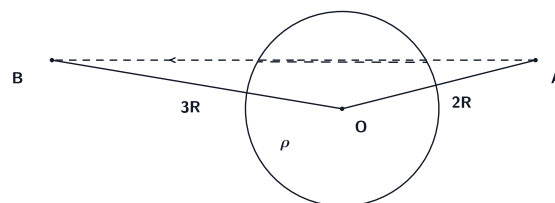
Sol. P and Q form a series branch of equivalent capacitance $C/2$, and that branch sits in parallel with S across the battery, so $C_{eq} = \frac{C}{2} + C = \frac{3C}{2}$ and $U_T = \frac{1}{2} \left(\frac{3C}{2}\right) V^2 = \frac{3}{4} CV^2$. Identical capacitors in series split the voltage equally, so P holds $V/2$ and $U_P = \frac{1}{2} C \left(\frac{V}{2}\right)^2 = \frac{CV^2}{8}$. The ratio is $\frac{CV^2/8}{3CV^2/4} = \frac{1}{6}$.
NCERT Class 12, Electrostatic Potential and Capacitance.

Why the other options are wrong:

- (1) treats all three capacitors as being in parallel, so each stores an equal third and P plus Q gives $2/3$
- (2) assumes the three capacitors share the energy equally, ignoring that P sees only half the battery voltage
- (3) computes the ratio of U_P to the energy of the series branch alone, forgetting to include S in the total

5. Re-NEET 2026 · Q21

A unit positive point charge is taken slowly through an infinitesimally thin tube that is inside a charged dielectric sphere of radius R , having uniform positive charge density ρ , as shown in the figure. The initial and final positions of the charge are marked by A and B at distance $2R$ and $3R$ respectively, from the centre of the sphere. In this process, the magnitude of the total work done on the point charge is $\frac{\rho R^2}{n\epsilon_0}$. The value of n is : (ϵ_0 is the permittivity of vacuum)



- (1) 2 (2) 6 (3) 9 (4) 18

Answer (4)

Sol. Work done in moving a charge slowly is path-independent and depends only on the endpoint potentials, so the detour through the tube is a red herring. Both A and B lie OUTSIDE the sphere, where $V(r) = \frac{Q}{4\pi\epsilon_0 r}$ with $Q = \frac{4}{3}\pi R^3 \rho$. Then $|W| = |V_B - V_A| = \frac{Q}{4\pi\epsilon_0 R} \left| \frac{1}{3} - \frac{1}{2} \right| = \frac{\rho R^2}{18\epsilon_0}$, giving $n = 18$.
NCERT Class 12, Electrostatic Potential and Capacitance.

Why the other options are wrong:

- (1) uses only the $\frac{1}{2}$ from position A and drops the $\frac{4}{3}\pi R^3$ volume factor
- (2) computes $\frac{1}{2} - \frac{1}{3} = \frac{1}{6}$ but forgets the $\frac{1}{3}$ carried by the sphere's total charge
- (3) integrates the internal field along the tube as if the endpoints were inside the sphere

6. Re-NEET 2026 · Q34

Consider a fixed uniformly charged insulating sphere with radius R and total charge $+Q$. A point charge $-q$ ($q \ll Q$) with mass m is released from rest at a distance of $3R$ from the centre of the charged sphere. When the point charge reaches the surface of the sphere, its speed is: (ϵ_0 is the permittivity of vacuum, neglect gravitational forces).

- (1) $\sqrt{\frac{3Qq}{4\pi\epsilon_0 mR}}$
 (2) $\sqrt{\frac{2Qq}{3\pi\epsilon_0 mR}}$
 (3) $\sqrt{\frac{Qq}{3\pi\epsilon_0 mR}}$
 (4) $\sqrt{\frac{Qq}{4\pi\epsilon_0 mR}}$

Answer (3)

Sol. Outside the sphere the potential energy of the attracting pair is $U(r) = -\frac{Qq}{4\pi\epsilon_0 r}$. Energy conservation from $r = 3R$ (at rest) to $r = R$ gives $\frac{1}{2}mv^2 = \frac{Qq}{4\pi\epsilon_0 R} \left(1 - \frac{1}{3}\right) = \frac{Qq}{6\pi\epsilon_0 R}$. Solving, $v = \sqrt{\frac{Qq}{3\pi\epsilon_0 mR}}$. NCERT Class 12, Electrostatic Potential and Capacitance.

7. NEET 2020 · Q140

In a certain region of space with volume 0.2 m^3 , the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :

- (1) 0.5 N/C (2) 1 N/C (3) 5 N/C (4) zero

Answer (4)

Sol. Electric field is the negative spatial gradient of potential. A constant 5 V everywhere in the region has zero gradient, so the field is zero. Chapter: Electrostatic Potential and Capacitance.

8. NEET 2020 · Q158

A short electric dipole has a dipole moment of $16 \times 10^{-9} \text{ C m}$. The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of 60° with the dipole axis is $(1/(4\pi\epsilon_0) = 9 \times 10^9 \text{ N m}^2 \text{ C}^{-2})$

- (1) 200 V (2) 400 V (3) zero (4) 50 V

Answer (1)

Sol. The electric potential due to a dipole is given by $V = \frac{1}{4\pi\epsilon_0} \frac{p \cos \theta}{r^2}$. Substituting the values, $V = \frac{9 \times 10^9 \times 16 \times 10^{-9} \times \cos 60^\circ}{(0.6)^2} = \frac{9 \times 16 \times 0.5}{0.36} = 200 \text{ V}$. Chapter: Electrostatic Potential and Capacitance.

9. NEET 2020 · Q164

The capacitance of a parallel plate capacitor with air as medium is $6 \mu\text{F}$. With the introduction of a dielectric medium, the capacitance becomes $30 \mu\text{F}$. The permittivity of the medium is ($\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$)

- (1) $1.77 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
 (2) $0.44 \times 10^{-10} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
 (3) $5.00 \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
 (4) $0.44 \times 10^{-13} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$

Answer (2)

Sol. The dielectric constant is $30/6 = 5$. Therefore $\epsilon = 5\epsilon_0 = 4.425 \times 10^{-11} = 0.4425 \times 10^{-10} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$, matching option (2). Chapter: Electrostatic Potential and Capacitance.

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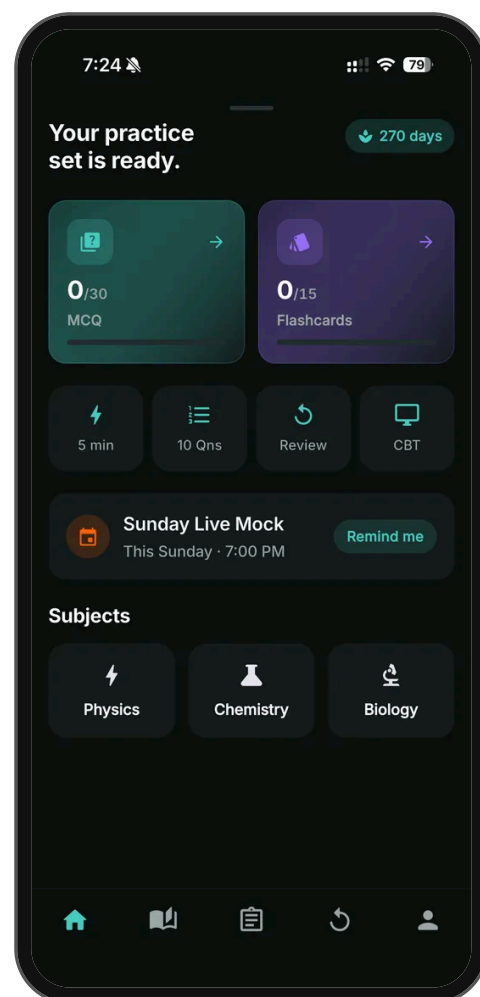
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