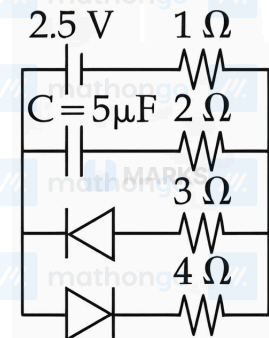


Q1. JEE Main 2026 (21 January Shift 2)

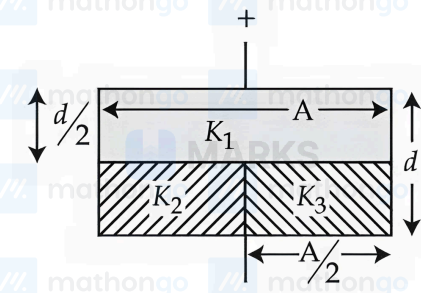
The charge stored by the capacitor C in the given circuit in the steady state is _____ μC .



- (1) 5 (2) 12.5 (3) 10 (4) 7.5

Q2. JEE Main 2026 (23 January Shift 1)

The space between the plates of a parallel plate capacitor of capacitance C (without any dielectric) is now filled with three dielectric slabs of dielectric constants $K_1 = 2$, $K_2 = 3$ and $K_3 = 5$ (as shown in figure). If new capacitance is $\frac{n}{3}C$ then the value of n is _____.



Q3. JEE Main 2026 (28 January Shift 2)

Identify the correct statements :

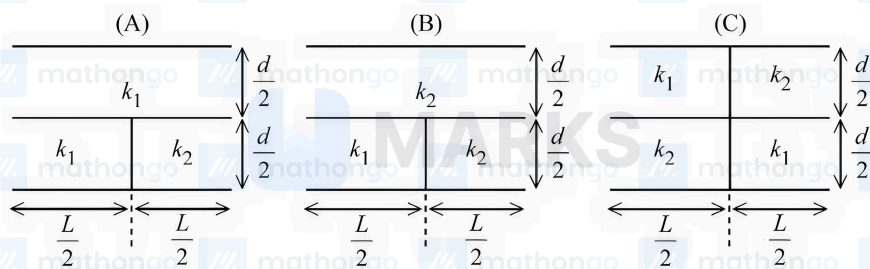
- A. Effective capacitance of a series combination of capacitors is always smaller than the smallest capacitance of the capacitor in the combination.
- B. When a dielectric medium is placed between the charged plates of a capacitor, displacement of charges cannot occur due to insulation property of dielectric.
- C. Increasing of area of capacitor plate or decreasing of thickness of dielectric is an alternate method to increase the capacitance.
- D. For a point charge, concentric spherical shells centered at the location of the charge are equipotential surfaces.

Choose the correct answer from the options given below :

- (1) B and D Only (2) A, B and C Only
(3) C and D Only (4) A, C and D Only

Q4. JEE Main 2026 (24 January Shift 2)

Three parallel plate capacitors each with area A and separation d are filled with two dielectric (k_1 and k_2) in the following fashion. Which of the following is true? ($k_1 > k_2$)



(1) $C_C > C_A > C_B$

(2) $C_C > C_B > C_A$

(3) $C_A > C_C > C_B$

(4) $C_B > C_C > C_A$

Q5. JEE Main 2026 (22 January Shift 2)

A capacitor P with capacitance $10 \times 10^{-6} \text{ F}$ is fully charged with a potential difference of 6.0 V and disconnected from the battery. The charged capacitor P is connected across another capacitor Q with capacitance $20 \times 10^{-6} \text{ F}$.

The charge on capacitor Q when equilibrium is established will be $\alpha \times 10^{-5} C$ (assume capacitor Q does not have any charge initially), the value of α is ____.

Q6. JEE Main 2026 (23 January Shift 2)

A parallel plate capacitor with plate separation 5 mm is charged by a battery. On introducing a mica sheet of 2 mm and maintaining the connections of the plates with the terminals of the battery, it is found that it draws 25% more charge from the battery. The dielectric constant of mica is ____.

(1) 1.0

(2) 2.5

(3) 2.0

(4) 1.5

Q7. JEE Main 2026 (21 January Shift 1)

A parallel plate capacitor has capacitance C , when there is vacuum within the parallel plates. A sheet having thickness $\left(\frac{1}{3}\right)^{\text{rd}}$ of the separation between the plates and relative permittivity K is introduced between the plates. The new capacitance of the system is :

(1) $\frac{4KC}{3K-1}$

(2) $\frac{3CK^2}{(2K+1)^2}$

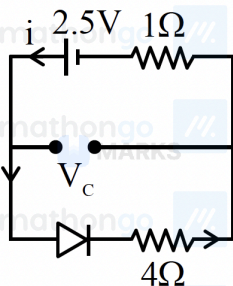
(3) $\frac{3KC}{2K+1}$

(4) $\frac{CK}{2+K}$

ANSWERS AND SOLUTIONS

1. (3) 2. 8 3. (4) 4. (3) 5. 4 6. (3) 7. (3)

1. (3) In steady state:



$$i = 2.5/5 = 0.5 \text{ A}$$

$$V_c = 4 \times 0.5$$

$$V_c = 2 \text{ V}$$

charge

$$Q = CV_c$$

$$= 5 \times 2$$

$$= 10 \mu\text{C}$$

2. (8) The initial capacitance is $C = \frac{\epsilon_0 A}{d}$.

From the figure, the capacitor is divided into three parts.

The bottom half is divided into two capacitors C_2 and C_3 in parallel, each with area $A/2$ and thickness $d/2$.

$$C_2 = \frac{K_2 \epsilon_0 (A/2)}{d/2} = K_2 \frac{\epsilon_0 A}{d} = 3C$$

$$C_3 = \frac{K_3 \epsilon_0 (A/2)}{d/2} = K_3 \frac{\epsilon_0 A}{d} = 5C$$

The equivalent capacitance of the bottom part is $C_{eq, bottom} = C_2 + C_3 = 3C + 5C = 8C$.

The top half is a single capacitor C_1 with area A and thickness $d/2$.

$$C_1 = \frac{K_1 \epsilon_0 A}{d/2} = 2K_1 \frac{\epsilon_0 A}{d} = 2(2)C = 4C.$$

The total capacitance C' is the series combination of C_1 and $C_{eq, bottom}$.

$$\frac{1}{C'} = \frac{1}{C_1} + \frac{1}{C_{eq, bottom}} = \frac{1}{4C} + \frac{1}{8C} = \frac{2+1}{8C} = \frac{3}{8C}$$

$$C' = \frac{8}{3}C$$

Comparing with $C' = \frac{n}{3}C$, we get $n = 8$.

3. (4) A. Effective capacitance of series combination is always smaller than the smallest capacitance - TRUE. For series: $\frac{1}{C_{eff}} = \frac{1}{C_1} + \frac{1}{C_2} + \dots$, therefore $C_{eff} < C_{min}$

B. Dielectric prevents charge displacement - FALSE. A dielectric allows polarization (displacement of bound charges) but prevents free charge movement. It does not prevent displacement of bound charges.

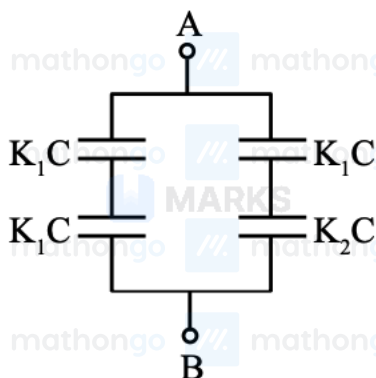
C. Increasing area or decreasing thickness increases capacitance - TRUE. From $C = \frac{\epsilon_0 \epsilon_r A}{d}$, increasing A or

decreasing d increases C .

D. Concentric spherical shells centered at a point charge location are equipotential surfaces - TRUE. For a point charge, the potential at distance r is $V = \frac{kq}{r}$, which depends only on distance, making concentric spheres equipotential surfaces.

Correct statements: A, C, D

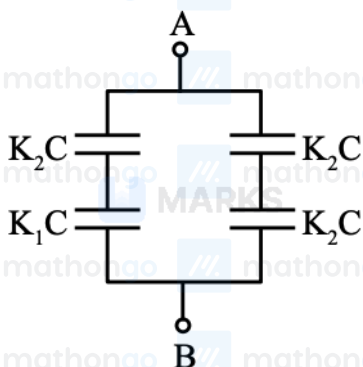
4. (3) For C_A



$$\text{Let } \frac{\epsilon_0 A}{d} = C$$

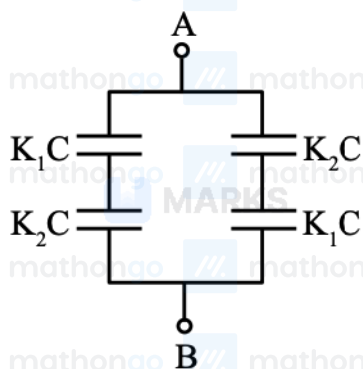
$$\begin{aligned} \therefore C_A &= \frac{K_1 C}{2} + \frac{K_1 K_2 C}{K_1 + K_2} \\ &= K_1 C \left[\frac{K_1 + 2K_2}{2(K_1 + K_2)} \right] \end{aligned}$$

For C_B



$$\begin{aligned} C_B &= \frac{K_2 C}{2} + \frac{K_1 K_2 C}{K_1 + K_2} \\ &= K_2 C \left[\frac{K_1 + 2K_2}{2(K_1 + K_2)} \right] \end{aligned}$$

For C_C



$$\therefore C_C = \frac{2K_1K_2C}{K_1 + K_2}$$

$$C_A > C_C > C_B$$

5. (4) Capacitor P (10×10^{-6} F) is charged to 6.0 V.

$$\text{Initial charge: } Q_P = 10 \times 10^{-6} \times 6 = 60 \times 10^{-6} \text{ C.}$$

When connected to uncharged capacitor Q (20×10^{-6} F), charge redistributes until both reach same potential.

$$\text{Final voltage: } V_f = \frac{Q_{\text{total}}}{C_{\text{total}}} = \frac{60 \times 10^{-6}}{30 \times 10^{-6}} = 2 \text{ V.}$$

$$\text{Charge on Q: } Q_Q = 20 \times 10^{-6} \times 2 = 40 \times 10^{-6} \text{ C} = 4 \times 10^{-5} \text{ C.}$$

Thus $\alpha = 4$.

6. (3) Initial capacitor has plate separation 5 mm with capacitance $C_1 = \epsilon_0 A/5$.

After inserting 2 mm mica sheet, the gap remaining is 3 mm of air. The effective separation becomes:

$d_{\text{eff}} = 3 + 2/k$ where k is the dielectric constant of mica.

$$\text{New capacitance: } C_2 = \frac{\epsilon_0 A}{3 + 2/k}$$

Since battery remains connected, voltage is constant. The charge is: $Q = CV$

$$\text{Ratio of charges: } \frac{Q_2}{Q_1} = \frac{C_2}{C_1} = \frac{\epsilon_0 A/(3 + 2/k)}{\epsilon_0 A/5} = \frac{5}{3 + 2/k}$$

Given that charge increases by 25%: $Q_2 = 1.25Q_1$

$$\frac{5}{3 + 2/k} = 1.25$$

$$5 = 1.25(3 + 2/k)$$

$$5 = 3.75 + 2.5/k$$

$$1.25 = 2.5/k$$

$$k = 2$$

7. (3) Original capacitance: $C = \frac{\epsilon_0 A}{d}$

After inserting dielectric of thickness $\frac{d}{3}$, system becomes two capacitors in series.

$$\text{Vacuum region: } C_1 = \frac{\epsilon_0 A}{2d/3} = \frac{3C}{2}$$

$$\text{Dielectric region: } C_2 = \frac{K\epsilon_0 A}{d/3} = 3KC$$

$$\text{Equivalent capacitance: } \frac{1}{C_{\text{new}}} = \frac{1}{C_1} + \frac{1}{C_2} = \frac{2}{3C} + \frac{1}{3KC} = \frac{2K+1}{3KC}$$

$$C_{\text{new}} = \frac{3KC}{2K+1}$$