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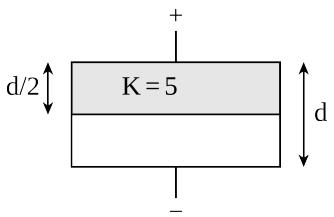
JEE MAIN ELECTROSTATIC POTENTIAL AND CAPACITANCE — EFFECT OF DIELECTRIC ON CAPACITANCE — PYQS

Max. Marks: 36 **Questions:** 9

Section A (MCQ) — 6 questions

Q.1 A parallel plate air capacitor has a capacitance C. When it is half filled as shown in figure with a dielectric constant K = 5, the percentage increase in the capacitance is _____.

[JEE Main 2026 (Online) 2nd April Morning Shift]

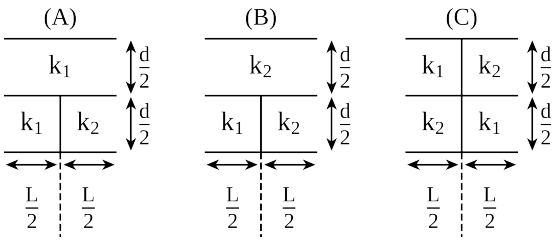


(1) 33.34 (2) 66.67 (3) 200 (4) 400

Scan or tap for the full solution

Q.2 Three parallel plate capacitors each with area A and separation d are filled with two dielectrics (k_1 and k_2) in the following fashion. Which of the following is true?
($k_1 > k_2$)

[JEE Main 2026 (Online) 24th January Evening Shift]



(1) $C_C > C_B > C_A$ (2) $C_B > C_C > C_A$
(3) $C_A > C_C > C_B$ (4) $C_C > C_A > C_B$

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Q.3 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 _____

[JEE Main 2026 (Online) 23rd January Evening Shift]

(1) 1.0 (2) 2.5 (3) 1.5 (4) 2.0

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Q.4 A parallel plate capacitor has capacitance C, when there is vacuum within the parallel plates. A sheet having thickness $\left(\frac{1}{3}\right)^{rd}$ of the separation between the plates and relative permittivity K is introduced between the plates. The new capacitance of the system is :

[JEE Main 2026 (Online) 21st January Morning Shift]

(1) $\frac{3CK^2}{(2K+1)^2}$ (2) $\frac{4KC}{3K-1}$
(3) $\frac{CK}{2+K}$ (4) $\frac{3KC}{2K+1}$

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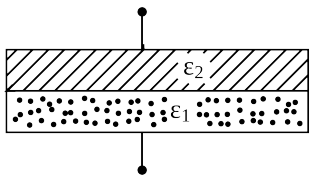
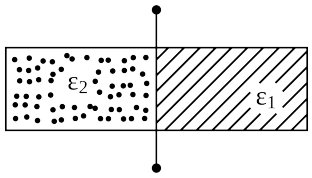
Q.5 A parallel plate capacitor is filled equally (half) with two dielectrics of dielectric constants ε_1 and ε_2, as shown in figures. The distance between the plates is d and area of each plate is A. If capacitance in first configuration and second configuration are C_1 and C_2 respectively, then $\frac{C_1}{C_2}$ is:

First Configuration



Second Configuration

[JEE Main 2025 (Online) 3rd April Morning Shift]



(1) $\frac{\varepsilon_0(\varepsilon_1+\varepsilon_2)}{2}$ (2) $\frac{\varepsilon_1\varepsilon_2^2}{(\varepsilon_1+\varepsilon_2)^2}$
(3) $\frac{4\varepsilon_1\varepsilon_2}{(\varepsilon_1+\varepsilon_2)^2}$ (4) $\frac{\varepsilon_1\varepsilon_2}{\varepsilon_1+\varepsilon_2}$

Scan or tap for the full solution

Q.6 A parallel-plate capacitor of capacitance 40 μF is connected to a 100 V power supply. Now the intermediate space between the plates is filled with a dielectric material of dielectric constant K = 2. Due to the introduction of dielectric material, the extra charge and the change in the electrostatic energy in the capacitor, respectively, are

[JEE Main 2025 (Online) 22nd January Morning Shift]

(1) 8 mC and 2.0 J (2) 4 mC and 0.2 J
(3) 2 mC and 0.2 J (4) 2 mC and 0.4 J

Scan or tap for the full solution

Section B (Numerical) — 3 questions

Q.7 A parallel plate capacitor is having separation between plates 0.885 mm. It has a capacitance of 1 μF when the space between the plates is filled with an insulating material of resistivity 1×10^{13} Ωm and resistance 17.7×10^{14} Ω. Relative permittivity of the insulating material is $\alpha \times 10^{7}$. The value of α is _____.

(Take permittivity of free space $= 8.85 \times 10^{-12}$ F/m)

[JEE Main 2026 (Online) 8th April Evening Shift]

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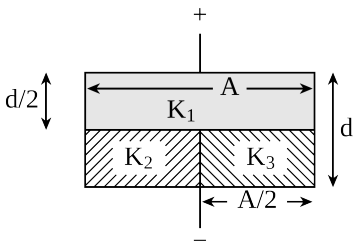
Q.8 The space between the plates of a parallel plate capacitor of capacitance C (without any dielectric) is now filled with three dielectric slabs of dielectric constants $K_1 = 2$, $K_2 = 3$ and $K_3 = 5$ (as shown in figure). If new capacitance is $\frac{n}{3}C$ then the value of n is _____.

[JEE Main 2026 (Online) 23rd January Morning Shift]



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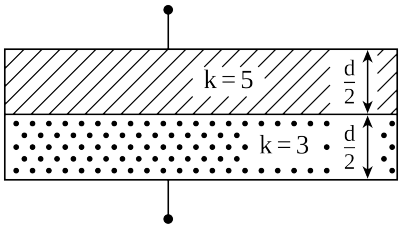
Q.9



Space between the plates of a parallel plate capacitor of plate area 4 cm^2 and separation of 1.77 mm, is filled with uniform dielectric materials with dielectric constants (3 and 5) as shown in figure. Another capacitor of capacitance 7.5 pF is connected in parallel with it. The effective capacitance of this combination is _____ pF.

(Given $\varepsilon_0 = 8.85 \times 10^{-12}$ F/m)

[JEE Main 2025 (Online) 8th April Evening Shift]

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ANSWER KEY

Section A (MCQ) — 6 questions

Ques.	1	2	3	4	5	6					
Ans.	**2**	**3**	**4**	**4**	**3**	**2**					

Section B (Numerical) — 3 questions

Ques.	7	8	9								
Ans.	**2**	**8**	**15**								