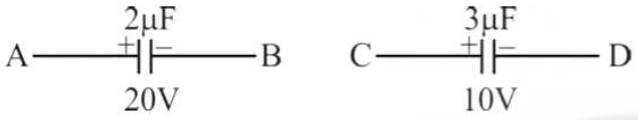
Prayas JEE (2025)

Physics

Capacitor

DPP: 5

Q1 Find out the following if A is connected with C and B is connected with D.
(i) How much charge flows in the circuit.
(ii) How much heat is produced in the circuit.

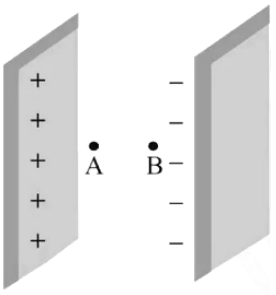


Q2 In a charged capacitor, the energy resides
(A) The positive charges
(B) Both the positive and negatives charges
(C) In the field between the plates
(D) Around the edge of the capacitor plates

Q3 64 drops each having the capacity C and potential V are combined to form a big drop. If the charge on the small drop is q, then the charge on the big drop will be
(A) 2q (B) 4q
(C) 16q (D) 64q

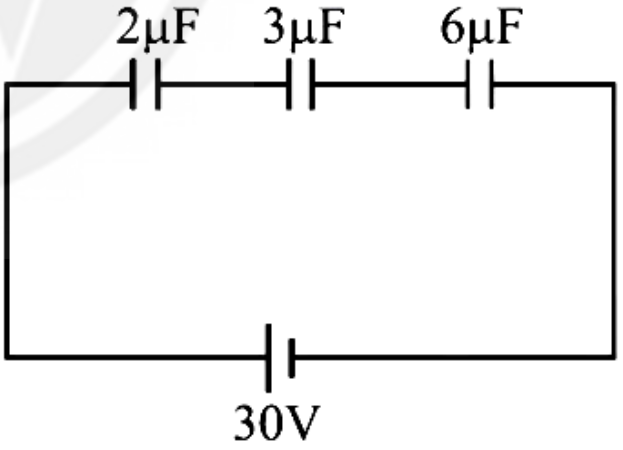
Q4 Force of attraction between the plates of parallel plate capacitor is
(A) $\frac{q^2}{2\varepsilon_0 AK}$
(B) $\frac{q^2}{\varepsilon_0 AK}$
(C) $\frac{q}{2\varepsilon_0 A}$
(D) $\frac{q^2}{2\varepsilon_0 A^2 K}$

Q5 Two protons A and B are placed in space between plates of a parallel capacitor charged upto V volts. Forces on protons are $\mathrm{F_A}$ and $\mathrm{F_B}$, then

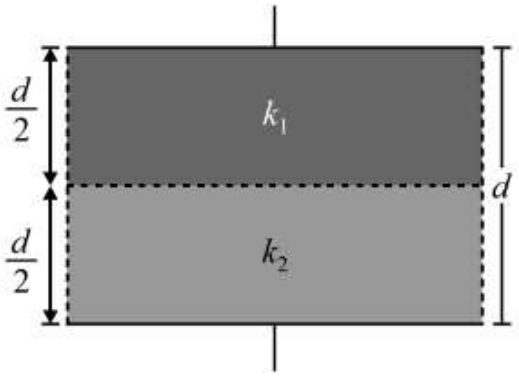


(A) $\mathrm{F_A} > \mathrm{F_B}$
(B) $\mathrm{F_A} < \mathrm{F_B}$
(C) $\mathrm{F_A} = \mathrm{F_B}$
(D) Nothing can be said

Q6 Three initially uncharged capacitors are connected in series as shown in circuit with a battery of emf $30\ \mathrm{V}$. Find out following
(i) Charge flow through the battery
(ii) Potential energy in $3\mu\mathrm{F}$ capacitor
(iii) $\mathrm{U_{total}}$ in capacitors



Q7 Two dielectric slabs of constant k_1 and k_2 have been filled in between the plates of a capacitor as shown below. What will be the capacitance of the capacitor:



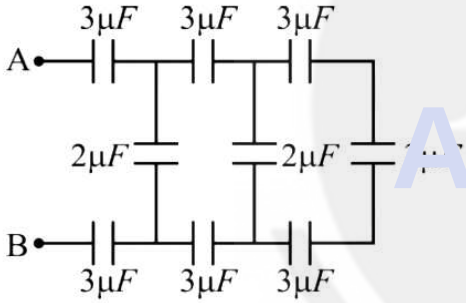
(A) $\frac{2\varepsilon_0 A}{d}(k_1 + k_2)$

(B) $\frac{2\varepsilon_0 A}{d}\left(\frac{k_1+k_2}{k_1\times k_2}\right)$

(C) $\frac{4\varepsilon_0 A}{d}\left(\frac{k_1\times k_2}{k_1+k_2}\right)$

(D) $\frac{2\varepsilon_0 A}{d}\left(\frac{k_1\times k_2}{k_1+k_2}\right)$

Q8 The resultant capacitance between A and B in the following figure is equal to



(A) $1\ \mu\mathrm{F}$

(B) $3\ \mu\mathrm{F}$

(C) $2\ \mu\mathrm{F}$

(D) $1.5\ \mu\mathrm{F}$

Q9 A parallel plate capacitor has plates of area $4\ \mathrm{m}^2$ separated by distance of $0.5\ \mathrm{mm}$. The capacitor is connected across a cell of emf $100\ \mathrm{V}$.

(a) Find the capacitance, charge and energy stored in the capacitor.

(b) A dielectric slab of thickness $0.5\ \mathrm{mm}$ is inserted inside this capacitor after it has been disconnected from the cell. Find the answer to part (a) if $k = 3$.

Q10 If a dielectric slab of thickness t and area A is inserted in between the plates of a parallel plates capacitor of plate area A and distance between the plates $\mathrm{d}(\mathrm{d} > t)$ then find out capacitance of system. What do you predict about the dependence of capacitance on location of slab?

Answer Key

Q1 **(i) 12 uC**
(ii) 60 uJ

Q2 **C**

Q3 **D**

Q4 **A**

Q5 **C**

Q6 $(i)\ 30\ \mu C\ (ii)\ 150\ \mu J\ (iii)\ 450\ \mu J$

Q7 **D**

Q8 **A**

Q9 **(a) C=** $7.08 \times 10^{-8}\ \mathrm{F}$ **,Q=** $7.08 \times 10^{-6}\ \mathrm{C}$ **,U=** $3.54 \times 10^{-4}\ \mathrm{J}$

(b) C= $2.124 \times 10^{-7}\ \mathrm{F}$ **,Q=** $7.08 \times 10^{-6}\ \mathrm{C}$**, U=** $118 \times 10^{-6}\ \mathrm{J}$

Q10 $\dfrac{\varepsilon_0 A}{d - t\left(1 - \frac{1}{k}\right)}$