DPP – 1 (Capacitor)

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Q 1. In a parallel plate capacitor, the capacity increases if:
(a) area of the plate is decreased
(b) distance between the plates increases
(c) area of the plate is increased
(d) none of these

Q 2. Calculate capacitance of a parallel plate capacitor with area of each plate 1 cm^2 and separation 1 mm.
(a) 9 pF (b) 0.9 pF
(c) 99 pF (d) 90 pF

Q 3. Area of a parallel plate capacitor of capacitance 2F and separation between the plates 0.5 cm will be
(a) $1.13 \times 10^9\ m^2$ (b) $1.13 \times 10^6\ m^2$
(c) $10^8\ m^2$ (d) $1.13\ m^2$

Q 4. The capacitance of a parallel plate capacitor is 12μF. If the distance between the plates is doubled and area is halved, then new capacitance will
(a) 8 μF (b) 48 μF
(c) 4 μF (d) 3 μF

Q 5. How does the electric field (E) between the plates of a charged cylindrical capacitor vary with the distance r from the axis of the cylinder ?

(a) $E \propto \frac{1}{r^2}$ (b) $E \propto \frac{1}{r}$
(c) $E \propto r^2$ (d) $E \propto r$

Q 6. A cylindrical capacitor is constructed using two coaxial cylinders of the same length 10cm of radii 2mm and for 4mm.

(a) 8 pF (b) 4 pF
(c) 40 pF (d) 60 pF

Q 7. The net charge on a capacitor is
(a) Infinite (b) Zero
(c) Finite (d) Depends on size of capacitor

Q 8. A capacitor of capacitance C=2.0 ± 0.1μF is charged to a voltage V=20 ± 0.2V. What will be the charge Q on the capacitor ?
(a) $(40 \pm 2.4) \times 10^{-6}$ C (b) $(10 \pm 2.1) \times 10^{-6}$ C
(c) $(40 \pm 2.1) \times 10^{-6}$ C (d) $(10 \pm 2.4) \times 10^{-6}$ C

Q 9. A capacitor of 0.75μF is charged to a voltage of 16 V. What is the magnitude of the charge on each plate of the capacitor ?
(a) 12 μC (b) 10 μC
(c) 18 μC (d) 8 μC

Q 10. A spherical capacitor has an inner sphere of radius 9 cm and an outer sphere of radius 10 cm. the outer sphere is earthed and the inner sphere is charged. What is the capacitance of the capacitor?
(a) 100 pF (b) 10 pF
(c) 50 pF (d) 90 pF

Q 11. The capacitance of spherical conductor of radius r is proportional to :
(a) $\frac{1}{r}$ (b) r
(c) $\frac{1}{r^2}$ (d) r^2

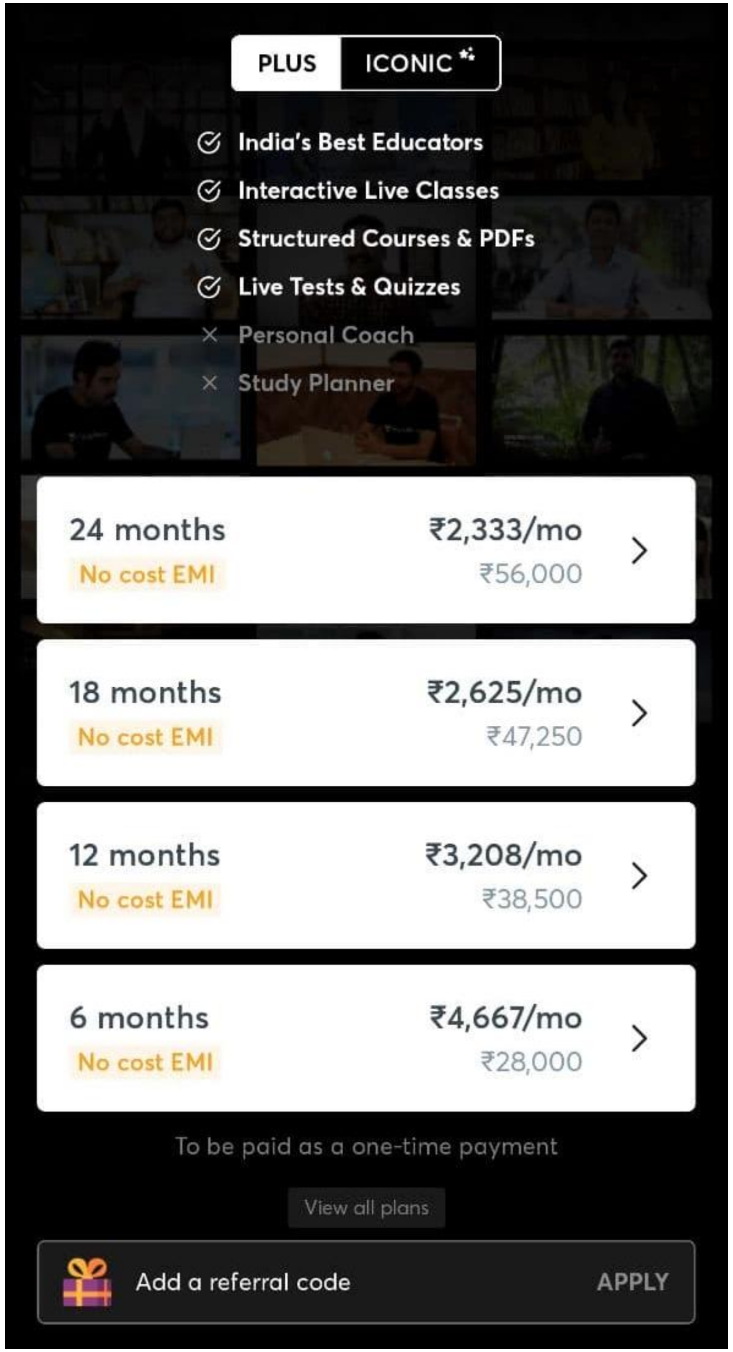
Q 12. The capacitance of a metallic sphere is 1μF, then it's radius is nearly
(a) 1.11 m (b) 10 m
(c) 9 km (d) 1.11 cm

Q 13. What is value of capacitance of earth when it is considered to be spherical conductor? (Radius of earth = 6400 km)
(a) 711 μF (b) 422 μF
(c) 688 μF (d) 544 μF

Q 14. What is the potential differences across a 64.0 microfarad capacitor if the charge on the positive plate is +16.0 micro coulombs?
(a) 4 V (b) 0.25 V
(c) 1024 V (d) 2 V

Answer Key

Q.1 c	Q.2 b	Q.3 a	Q.4 d	Q.5 b
Q.6 a	Q.7 b	Q.8 a	Q.9 a	Q.10 a
Q.11 b	Q.12 c	Q.13 a	Q.14 b	



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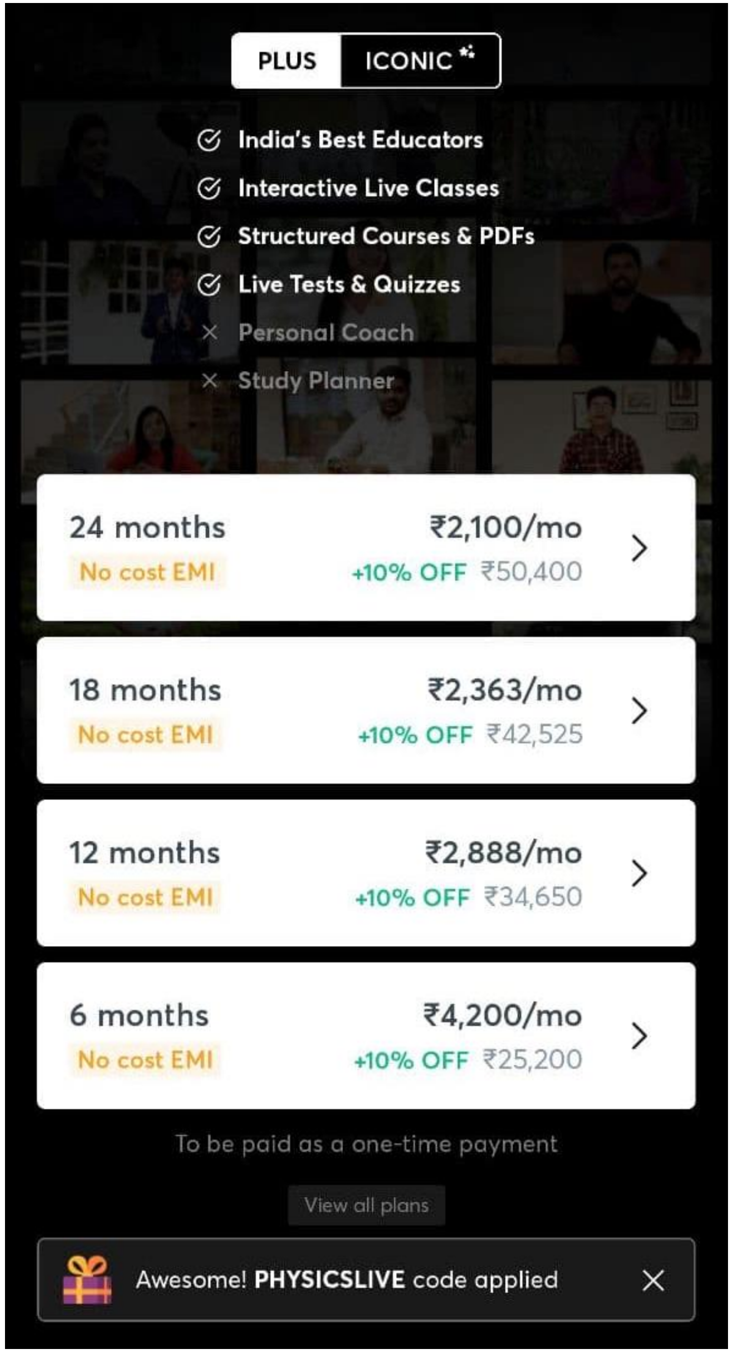

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Written Solution

DPP 1 - Capacitor: Capacitance and Charge on Capacitor

By Physicsaholics Team

Solution: 1

in a parallel plate capacitor:-

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

$C \propto A$; if $A\uparrow \Rightarrow C\uparrow$

$C \propto \frac{1}{d}$; if $d\uparrow \Rightarrow C\downarrow$

Ans. c

Solution: 2

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

$$C = \frac{8.85 \times 10^{-12} \times (1 \times 10^{-4} m^2)}{(1 \times 10^{-3} m)}$$

$$C = 8.85 \times 10^{-13}$$

$$C = 0.885 \times 10^{-12} F$$

$$\boxed{C = 0.9 \ pF}$$ Ans

Ans. b

Solution: 3

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

$$2 = \frac{8.85\times10^{-12}\times A}{0.5\times10^{-2}}$$

$$A = \frac{2\times0.5\times10^{-2}}{8.85\times10^{-12}}$$

$$= \frac{10^{10}}{8.85}$$

$$A = \frac{10}{8.85}\times10^{9}$$

$$\boxed{A = 1.13\times10^{9}\ m^2}$$ Ans

Ans. a

Solution: 4

$$c = \frac{\epsilon_0 A}{d}$$

if $A_1 = A$, then $A_2 = \frac{A}{2}$

& $d_1 = d$, then $d_2 = 2d$

$c_1 = 12\mu F$, $c = ?$

$$\frac{c_1}{c_2} = \frac{A_1}{A_2} \cdot \frac{d_2}{d_1} = \frac{A}{A/2} \cdot \frac{2d}{d}$$

$$\frac{12\mu F}{c_2} = \frac{2}{1} \times \frac{2}{1} = 4$$

$$\boxed{c_2 = 3\mu F}$$ Ans

Ans. d

Solution: 5

Electric field between the cylinders; $E = \frac{\lambda}{2\pi\epsilon_0 r}$

$E \propto \frac{1}{r}$ Ans

Ans. b

Solution: 6

$$C = \frac{2\pi\epsilon_0 l}{\ln\left(\frac{b}{a}\right)}$$

$$C = \frac{2\times 3.14\times 8.85\times 10^{-12}\times 10\times 10^{-2}}{\ln\left(\frac{4\,mm}{2\,mm}\right)}$$

$$C = \frac{6.28\times 8.85\times 10^{-13}}{\ln 2}$$

$$= \frac{6.28\times 8.85\times 10^{-13}}{0.693}$$

$$C = 80.2\times 10^{-13}$$

$$C = 8.02\times 10^{-12}\ F$$

$$\boxed{C = 8\ pF}$$ Ans

Ans. a

Solution: 7

$q_{net} = +Q + (-Q)$

$q_{net} = Q - Q$

$\boxed{q_{net} = 0}$ Ans

Ans. b

Solution: 8

$$Q = CV$$

$$Q = 2 \times 20 = 40\ \mu C$$

$$\frac{\Delta Q}{Q} = \frac{\Delta C}{C} + \frac{\Delta V}{V}$$

$$\frac{\Delta Q}{40} = \frac{0.1}{2} + \frac{0.2}{20} = 0.05 + 0.01$$

$$\frac{\Delta Q}{40} = 0.06$$

$$\Delta Q = 2.4\ \mu C$$

so, $q = Q \pm \Delta Q$

$$q = 40 \pm 2.4\ \mu C$$

$$q = (40 \pm 2.4) \times 10^{-6}\ C$$ Ans

Ans. a

Solution: 9

$$Q = CV$$

$$Q = 0.75\,\mu F \times 16\,V$$

$$Q = 12.00\,\mu C$$

$$\boxed{Q = 12\,\mu C}$$

Ans. a

Solution: 10

$$C = \frac{4\pi\epsilon_0 (ab)}{b-a}$$

$$C = \frac{4 \times 3.14 \times 8.85 \times 10^{-12} \times (9\times10^{-2} \times 10\times10^{-2})}{(10\times10^{-2} - 9\times10^{-2})}$$

$$= \frac{12.56 \times 8.85 \times 9 \times 10^{-15}}{1 \times 10^{-2}}$$

$$= 12.56 \times 8.85 \times 9 \times 10^{-13}$$

$$= 1000 \times 10^{-13}$$

$$C = 100 \times 10^{-12}$$

$$\boxed{C = 100\ pF}$$ Ans

Ans. a

Solution: 11

$C = 4\pi\epsilon_0 r$

$C \propto r$ Ans

Ans. b

Solution: 12

$$C = 4\pi\epsilon_0 r$$

$$1\,\mu F = 4\pi\epsilon_0 r$$

$$10^{-6}\,F = 4\times 3.14 \times 8.85 \times 10^{-12}\, r$$

$$r = \frac{10^{-6}}{4\times 3.14 \times 8.85 \times 10^{-12}}$$

$$r = \frac{10^{6}}{4\times 3.14 \times 8.85} = \frac{1000 \times 10^{3}}{12.56 \times 8.85}$$

$$r = 8.99 \times 10^{3}$$

$$r \simeq 9 \times 10^{3}\, m$$

$$\boxed{r \simeq 9\, km}$$ Ans

Ans. c

Solution: 13

$$C = 4\pi\epsilon_0 R$$

$$C = 4 \times 3.14 \times 8.85 \times 10^{-12} \times (6400 \times 10^{3}\ m)$$

$$C = 12.56 \times 8.85 \times 64 \times 10^{-7}$$

$$C = 7113.984 \times 10^{-7}\ F$$

$$C = 711.39 \times 10^{-6}\ F$$

$$\boxed{C \simeq 711\ \mu F}$$ Ans

Ans. a

Solution: 14

$$Q = CV$$

$$16\,\mu C = 64\,\mu F \times V$$

$$V = \frac{16}{64}$$

$$V = \frac{1}{4}\ \text{volt}$$

Ans. b

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Chalo Niklo