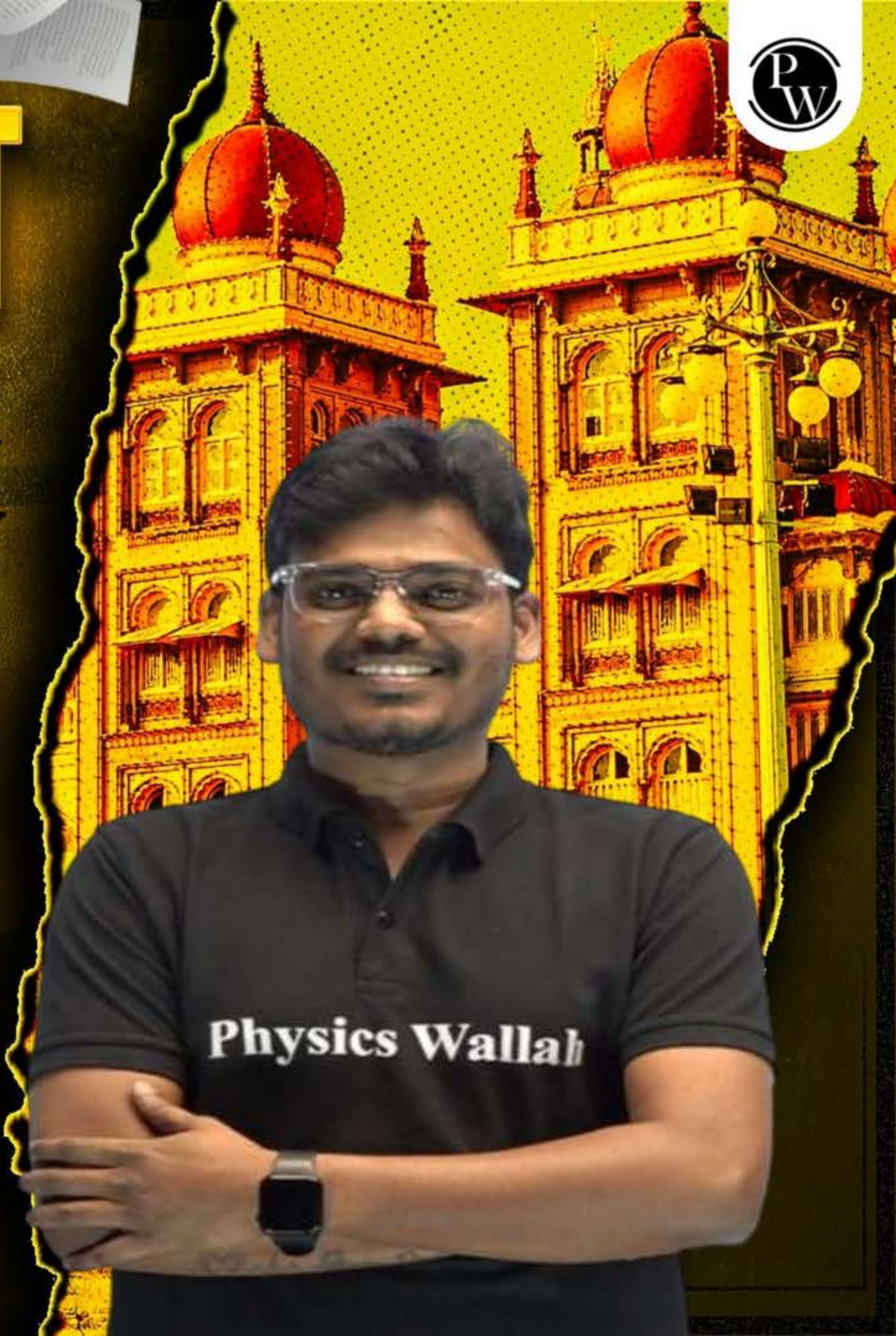
ULTIMATE KCET

CRASH COURSE 2026

PHYSICS | Lecture - 02

ELECTROSTATIC POTENTIAL AND CAPACITANCE

By – AK SIR



Recap of previous lecture

1. ELECTRIC POTENTIAL AND POTENTIAL DIFFERENCE
2. ELECTRIC POTENTIAL DUE TO A POINT CHARGE
3. ELECTRIC POTENTIAL DUE TO A SYSTEM OF CHARGES
4. ELECTRIC POTENTIAL DUE TO A ELECTRIC DIPOLE

Topics *to be covered*

1. EQUIPOTENTIAL SURFACES
2. CAPACITANCE OF A CAPACITOR
3. PARALLEL PLATE CAPACITOR
4. COMBINATION OF CAPACITOR

same

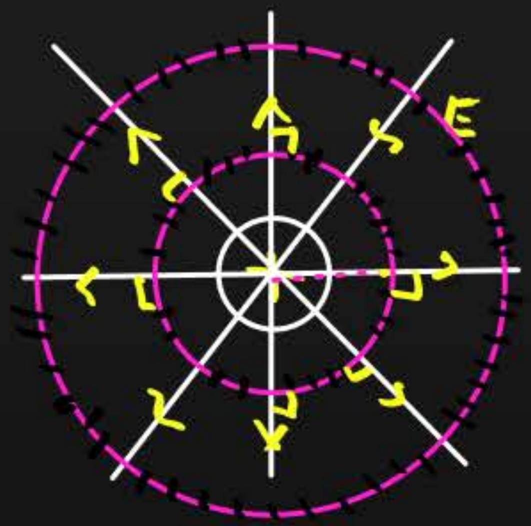
Equipotential Surfaces

potential

Any surface over which the electric potential is same everywhere is called an equipotential surface.

$$W = q\,\Delta V$$
$$W = q\,(V_f - V_i)$$
$$W = q\,(V_B - V_A)$$

Ex: Surface of charged conductor.



$$W = q\,(5-5)$$

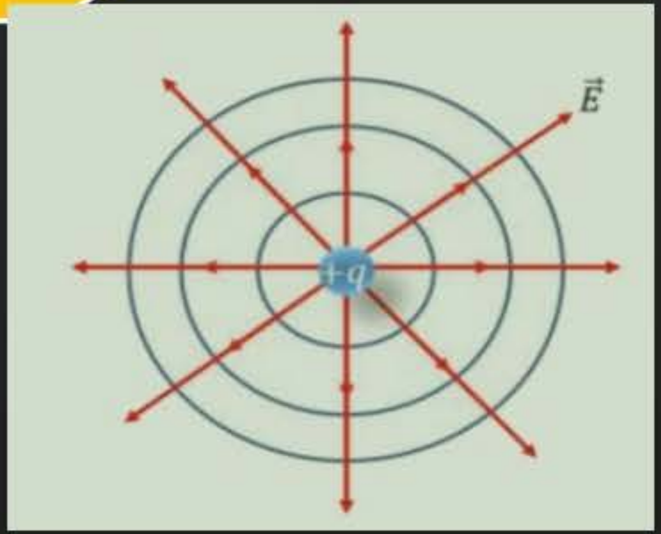
$$V = \text{constant} = \text{same}$$

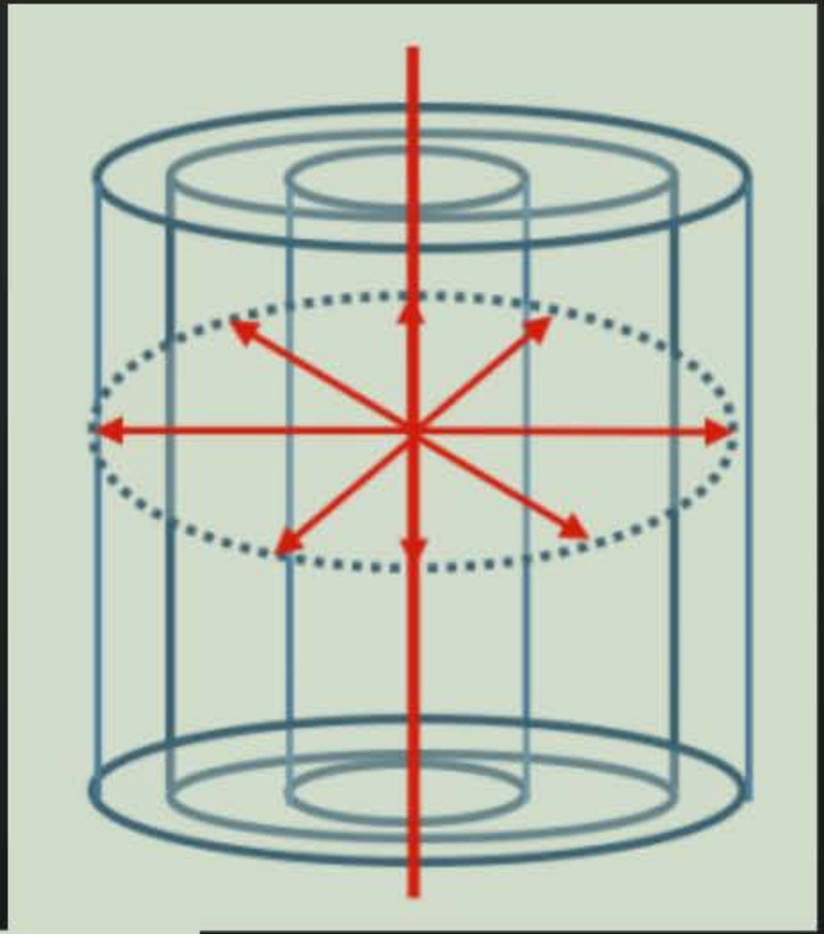
$$\boxed{W = 0}$$

$$\Delta V = V_f - V_i = 0$$

Equipotential Surfaces

✓ EPS of point charge is spherical in shape.

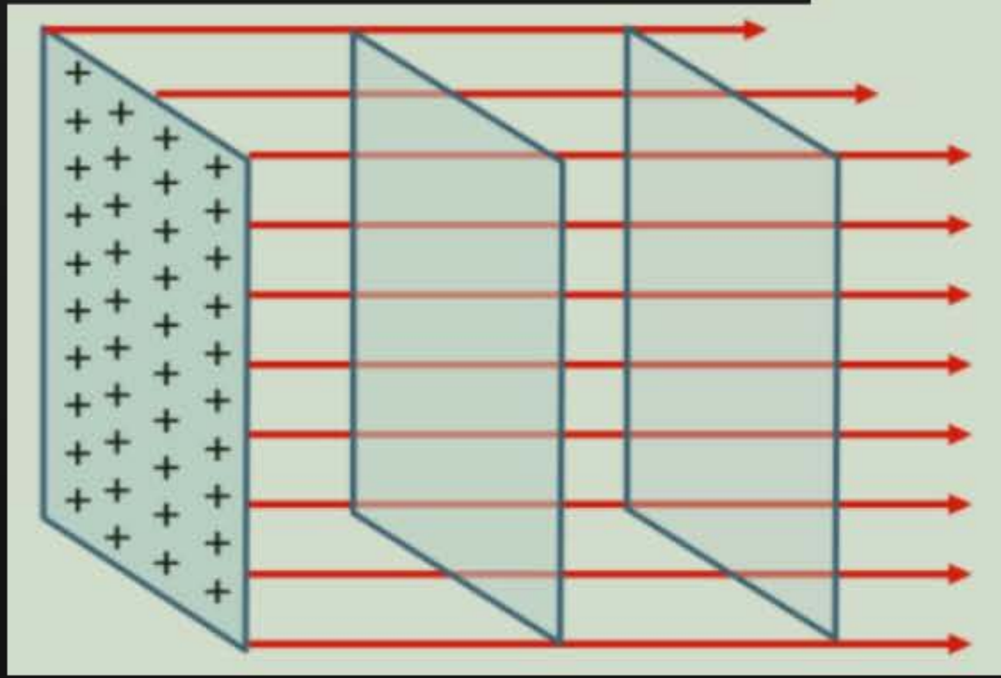


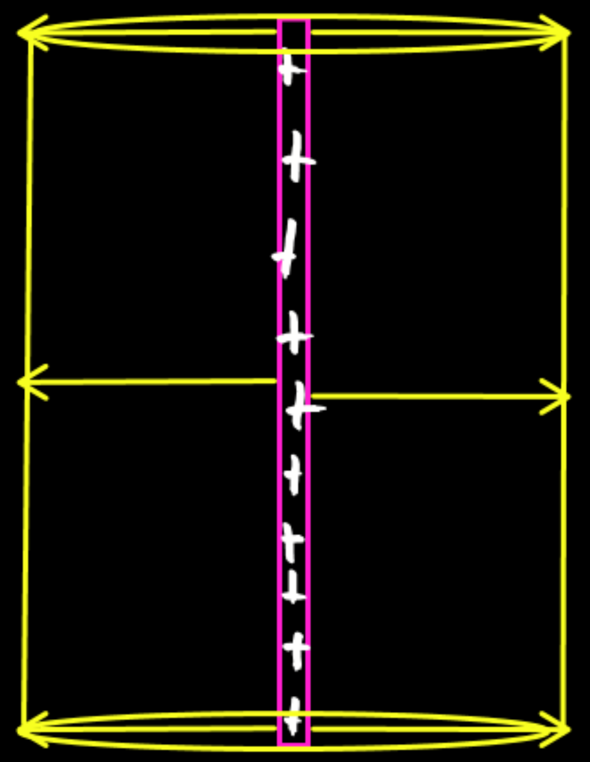


✓ EPS of line charge is cylindrical in shape.

✓ EPS of large plane sheet is plane in shape.

Uniform Electric Field } plane





Properties of EPS

✓Work done in moving a charge from one point of EPS to other point of same EPS is always zero.

$$\boxed{W = 0}$$

✓Electric field intensity is always perpendicular to EPS.

$$W = FS\cos\theta$$
$$W = qEx\cos\theta$$
$$0 = qEx\cos\theta$$

$$\cos\theta = 0 = \cos 90^\circ$$
$$\boxed{\theta = 90^\circ = \frac{\pi}{2}}$$

✓Two EPS can never intersect each other.

Question

$V = \text{const} \quad \Delta V = 0$

The work done to move a charge on an $\boxed{\text{equipotential surface}}$ is

$W = q\Delta V$

$W = 0$

A Infinity

B Less than 1

C Greater than 1

D $\boxed{\text{Zero}}$

Question

Which of the following statements is $\boxed{\text{not true?}}$

A Equipotential surfaces for a uniform electric field are $\boxed{\text{parallel}}$ and equidistant from each other.

B Electric field is always $\boxed{\text{perpendicular}}$ to an equipotential surface.

C Work done to move a charge on an equipotential surface is $\boxed{\text{not zero.}}$

D Equipotential surfaces are the surfaces where the potential is $\boxed{\text{constant.}}$

Question

The angle between the electric lines of force and the equipotential surface is:

(A) 180°

(B) 0°

(C) 45°

(D) $\boxed{90^\circ}$

Question

Nature of equipotential surface for a $\boxed{\text{point charge}}$ is

(A) Ellipsoid with charge at foci ✗

(B) Sphere with charge at the centre of the sphere ✓

(C) Sphere with charge on the surface of the sphere ✗

(D) Plane with charge on the surface ✗

Question

A thin spherical shell is charged by some source. The potential difference between the two points C and P (in V) shown in the given is: (. Take $\frac{1}{4\pi\epsilon_0} = 9 \times 10^{\circ}$ SI units)

(A) 0.5×10^5

(B) zero

(C) 3×10^5

(D) 4×10^5

$r > R, \quad V = \frac{Kq}{r}$

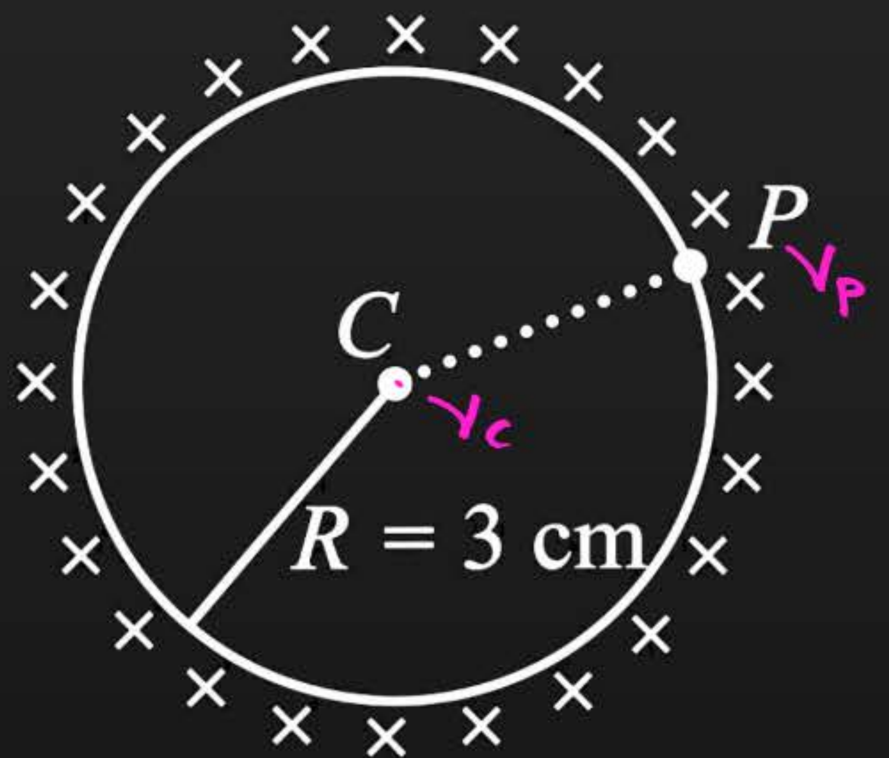
$r = R, \quad V_P = \frac{Kq}{R}$

$r < R, \quad V_c = V_P = \frac{Kq}{R}$

$\underline{r < R}$

$V_{in} = V_{surf}$

$$\boxed{V_c - V_P = \frac{Kq}{R} - \frac{Kq}{R} = 0}$$



$q = 1\ \mu C$

Question

Charge q_2 is at the centre of a circular path with radius r . Work done in carrying charge q_1, once around this equipotential path, would be

$\Delta V = 0$

$V = \text{const}$

$W = q\Delta V$

$\boxed{W = 0}$

(A) $\frac{1}{4\pi\varepsilon_0} \times \frac{q_1 q_2}{r^2}$

(B) $\frac{1}{4\pi\varepsilon_0} \times \frac{q_1 q_2}{r}$

(C) Zero

(D) Infinite

Question

Six charges $+q, -q, +q, -q, +q$ and $-q$ are fixed at the corners of a hexagon of side d as shown in the figure. The work done in bringing a charge q_0 to the centre of the hexagon from infinity is: (ε_θ-permittivity of free space)

A $\frac{-q^2}{4\pi\varepsilon_0 d}\left(6 - \frac{1}{\sqrt{2}}\right)$

B Zero

C $\frac{-q^2}{4\pi\varepsilon_0 d}$

D $\frac{-q^2}{4\pi\varepsilon_0 d}\left(3 - \frac{1}{\sqrt{2}}\right)$

$W = q_0 \Delta V$

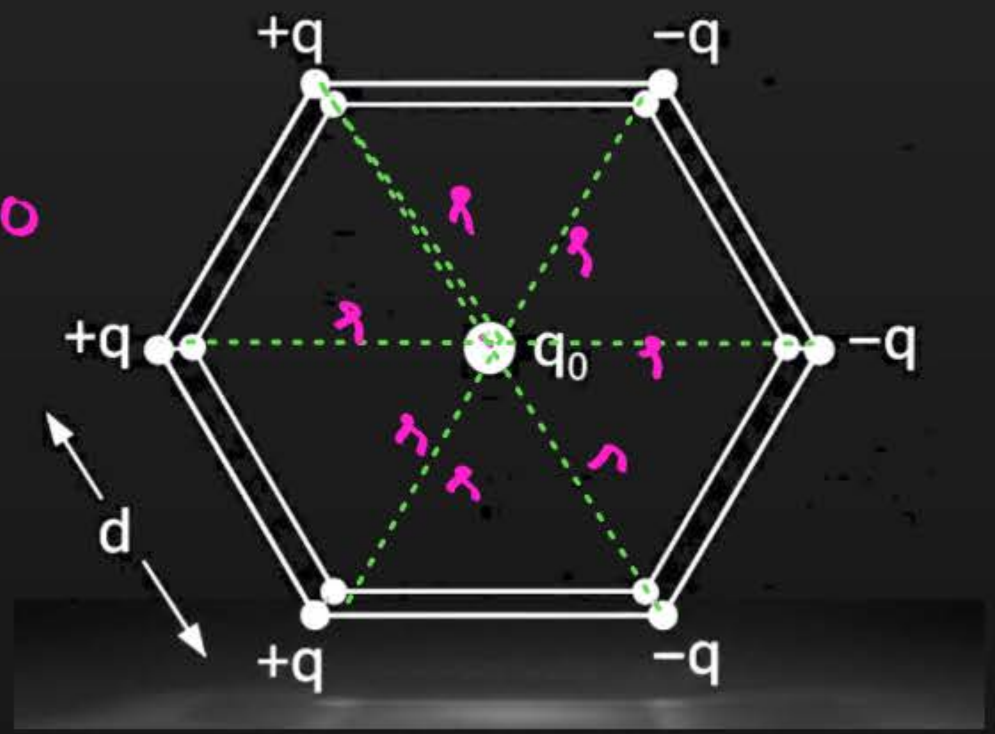
$\Delta V = V_f - V_i$

$\Delta V = V_f - V_i$, $V_i \to 0$

$\Delta V = V_f$

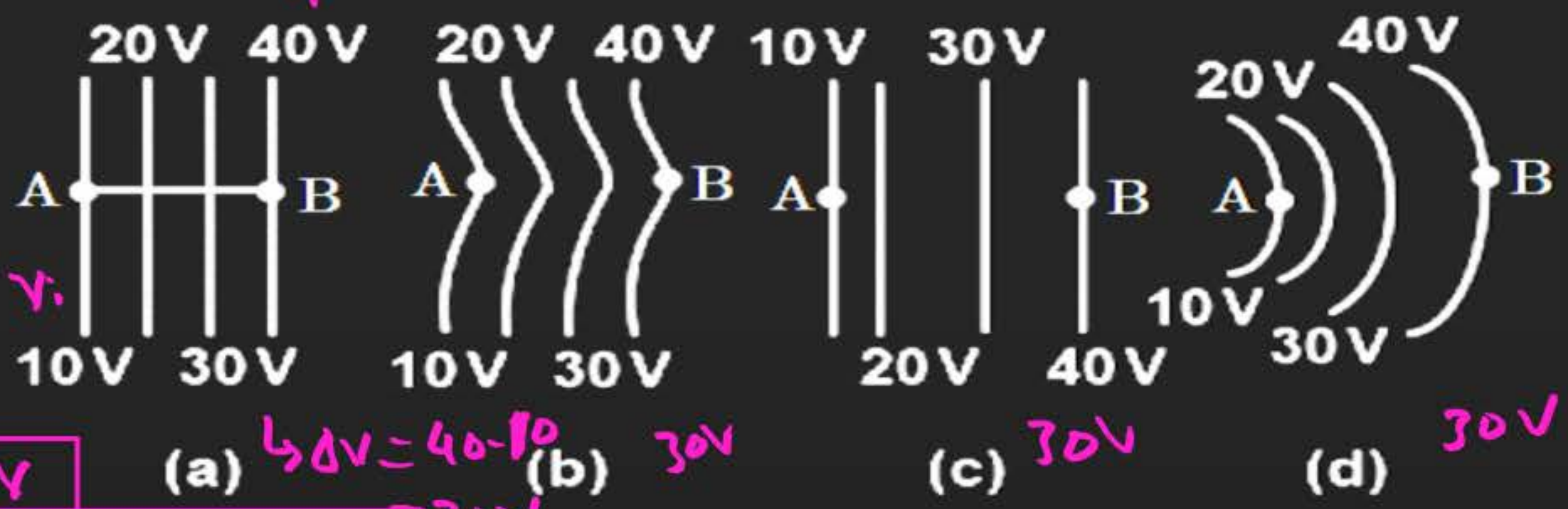
$V_f = \frac{3Kq}{r} - \frac{3Kq}{r} = 0$, $\Delta V = 0$

$\boxed{W = 0}$



Question

The diagrams below show regions of equipotential



V_f V_i

$W = q\,\Delta V = q \times 30$

$\boxed{W = 30q\ J =}$ $\boxed{30\,eV}$

$\Delta V = 40 - 10 = 30V$

30V 30V 30V

A In all the four cases the work done is the same.

B Minimum work is required to move q in figure (a)

C Maximum work is required to move q in figure (b)

D Maximum Work is required to move q in figure (c)

Relation between electrostatic field (E) and potential (V)

$$\boxed{\vec{E} = -\frac{dV}{dr}.}$$

$$\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$$

$$E = \frac{V}{d}$$

$$\frac{d\vec{r}}{dt} = \frac{dx}{dt}\hat{i} + \frac{dy}{dt}\hat{j} + \frac{dz}{dt}\hat{k}$$

$$\vec{E} = E_x\hat{i} + E_y\hat{j} + E_z\hat{k}$$

$$E_x = -\frac{\partial V}{\partial x} \quad E_y = -\frac{\partial V}{\partial y} \quad E_z = -\frac{\partial V}{\partial z}$$

i.e. Negative gradient of electric potential is equal to electric field. Since electric field is negative gradient of potential, thus potential decreases in the direction of E

Question

Figure shows three points A, B and C in a region of uniform electric field E. The line AB is perpendicular and BC is parallel to the field lines. Then, which of the following holds good? (V_A, V_B and V_c represent the electric potential at points A, B and C, respectively

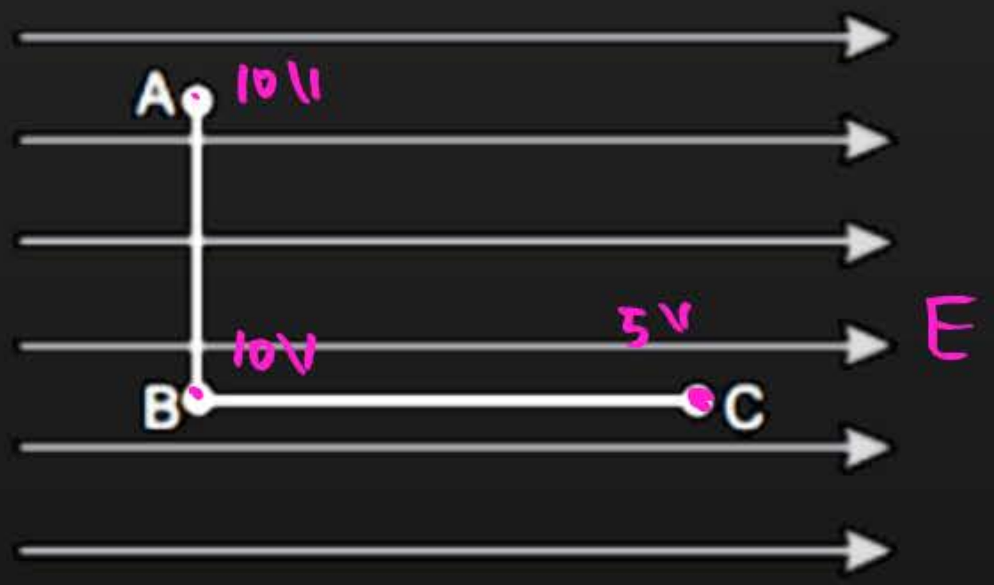
(A) $V_A = V_B = V_C$

(B) $\boxed{V_A = V_B > V_C}$

(C) $V_A = V_B < V_C$

(D) $V_A > V_B = V_C$

$\boxed{V_A = V_B > V_C}$



Finding V when E is given

As we know : $\vec{E} = -\frac{dV}{dr}$

$dV = -\vec{E} \cdot dr$

On Integration

$V = \int_{r_1}^{r_2} -\vec{E} \cdot dr$.

$V_x = -\int_{x_1}^{x_2} \vec{E}(x) \cdot dx$

$V_y = -\int_{y_1}^{y_2} \vec{E}(y) \cdot dy$

$V_z = -\int_{z_1}^{z_2} \vec{E}(z) \cdot dz$.

Question

If $V = x^2y + y^2xz + 5$, find the electric field at $(1,1,0)$

(x, y, z)

$$\vec{E} = -\frac{dv}{dx}$$

$$\vec{E} = E_x\hat{i} + E_y\hat{j} + E_z\hat{k}$$

$$V = x^2y + y^2xz + 5$$

(i) $E_x = -\frac{\partial v}{\partial x} = -(2xy + y^2(1)z + 0)$

$E_x = -[(2\times1\times1 + (1)^2(1)(0))$

$$\boxed{E_x = -2}$$

(ii) $E_y = -\frac{\partial v}{\partial y}$

$E_y = -[x^2(1) + 2yxz + 0]$

$E_y = -[1^2(1) + 2(1)(1)(0) + 0]$

$$\boxed{E_y = -1}$$

(iii) $E_z = -\frac{\partial v}{\partial z} = -[0 + y^2x(1) + 0]$

$E_z = -[1^2\times1(1)] = -1$

$$\boxed{E_z = -1}$$

$$\boxed{\vec{E} = -2\hat{i} - \hat{j} - \hat{k}}$$

Question

If $\vec{E} = \frac{40}{x^2}\hat{\imath}$, Then find the potential difference between the points x=2 m and x= 4m.

$$V = -\int_{x_1}^{x_2} \vec{E} \cdot dx$$

$$V = -\int_{2}^{4} 40 \cdot x^{-2} \cdot dx$$

$$V = -40 \int_{2}^{4} x^{-2} \cdot dx$$

$$V = -40 \left[\frac{x^{-2+1}}{-2+1}\right]_2^4$$

$$V = -40 \times \left[\frac{x^{-1}}{-1}\right]_2^4$$

$$V = 40 \times \left[\frac{1}{x}\right]_2^4$$

$$V = 40\left[\frac{1}{4} - \frac{1}{2}\right]$$

$$V = 40 \times \left[\frac{1}{4} - \frac{2}{4}\right]$$

$$V = 40 \times \left(-\frac{1}{4}\right)$$

$$\boxed{V = -10V}$$

Question

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

(A) $0.5\ \text{N/C}$

(B) $1\ \text{N/C}$

(C) $5\ \text{N/C}$

(D) $\boxed{\text{Zero}}$

$E = -\frac{dv}{ds}$

$V = 5V = \text{const}$

$\frac{dv}{ds} = 0$

$\boxed{E = 0}$

Question

If potential (in volts) in a region is expressed as $V(x, y, z) = 6xy - y + 2yz$, the electric field (in N/C) at pond (1, 1, 0) is: [H.W]

(A) $-(6\hat{i} + 9\hat{j} + \hat{k})$

(B) $-(3i + 5j + 3\hat{k})$

(C) $-(6\hat{i} + 5\hat{j} + 2\hat{k})$

(D) $-(2\hat{i} + 3\hat{j} + \hat{k})$

Question

$F = qE = 2 \times 2\sqrt{35} = 4\sqrt{35}\,N$

In a region, the potential is represented by $V(x,y,z) = 6x - 8xy - 8y + 6yz$, where V is in volts and x,y,z are in meters. The electric force experienced by a charge of 2 coulomb situated at point (1,1,1) is:

x, y, z

(A) $6\sqrt{5}$ N

(B) 30 N

(C) 24 N

(D) $\boxed{4\sqrt{35}\text{ N}}$

$V = 6x - 8xy - 8y + 6yz$

$E_x = -\frac{\partial V}{\partial x} = -(6(1) - 8(1)y - 0 + 0)$

$E_x = -\frac{\partial V}{\partial x} = -[6 - 8(1)] = +2$

$\boxed{E_x = 2}$

$E_y = -\frac{\partial V}{\partial y} = -[0 - 8x(1) - 8(1) + 6(1)z]$

$E_y = -[-8 - 8 + 6z]$

$= -[-16 + 6]$

$\boxed{E_y = +10}$

$E_z = -\frac{\partial V}{\partial z} = -[0 - 0 - 0 + 6(1)] = -6$

$\vec{E} = E_x\hat{i} + E_y\hat{j} + E_z\hat{k}$

$\vec{E} = 2\hat{i} + 10\hat{j} - 6\hat{k}$

$|\vec{E}| = E = \sqrt{2^2 + 10^2 + (-6)^2} = \sqrt{4 + 100 + 36} = \sqrt{140} = \sqrt{35 \times 4} = 2\sqrt{35}$

Question

The electric potential at any point x, y, z in metres is given by $V = 3x^2$. The electric field at a point (2, 0, 1) is [H.W]

A. $12\ \mathrm{Vm^{-1}}$

B. $-6\ \mathrm{Vm^{-1}}$

C. $6\ \mathrm{Vm^{-1}}$

D. $-12\ \mathrm{Vm^{-1}}$

Question

An electric dipole of moment 'p' is placed in an electric field of intensity ' E '. The dipole acquires a position such that axis of the dipole makes an angle θ with the direction of E . Assuming that the potential energy of the dipole to zero when $\theta=90^{\circ}$, the torque and the potential energy of B, dipole will respectively be:

θ_1

$\theta_2 = 0$

(A) $\boxed{\mathrm{pE}\sin\theta, -\mathrm{pE}\cos\theta}$

$\tau = pE\sin\theta$

$U = -pE\cos\theta$

(B) $\mathrm{pE}\sin\theta, -2\mathrm{pE}\cos\theta$

(C) $\mathrm{pE}\sin\theta, 2\mathrm{pE}\cos\theta$

(D) $\mathrm{pE}\cos\theta, -\mathrm{pE}\cos\theta$

Capacitance of capacitor

→ conductor
↳ capacity to store charge

The capacitance of a capacitor is defined as the ratio of the charge given to a plate of the capacitor to the potential difference produced between the plates.

$Q \propto V$

$Q = CV$

↳ capacitance

$\boxed{C = \frac{Q}{V}}$

$1\,mF = 10^{-3}\,F$

$1\,\mu F = 10^{-6}\,F$

$1\,nF = 10^{-9}\,F$

$1\,pF = 10^{-12}\,F$

Formula :

Unit : $\Rightarrow \frac{C}{V} \Rightarrow \boxed{1F = 1CV^{-1}}$

Dimensional formula :

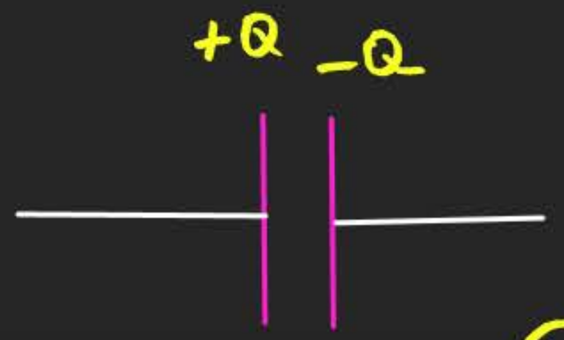
$\boxed{\text{(1) Dimensional Formula of capacitance}}$

$$C = \frac{Q}{V} = \frac{Q}{\frac{W}{Q}} = \frac{Q^2}{W}$$

$$C = \frac{[A^1T^1]^2}{[M^1L^2T^{-2}]} = \frac{[A^2T^2]}{[M^1L^2T^{-2}]}$$

$$\boxed{C = [M^{-1}L^{-2}T^4A^2]}$$

Capacitance of capacitor



$Q_T = +Q - Q = 0$

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

Note :

- The net charge on any capacitor is always zero.

↳ Geometry.

- The capacitance of a capacitor does not depends on charge (Q) and on the PD (V).
- Each conductor is like a capacitor whose other plate lies at infinity.
- A capacitor in an electrical circuit is represented by the symbols

C

Type of capacitors

1. Spherical capacitor
2. $\boxed{\text{Parallel plate capacitor}}$
3. Cylindrical capacitor

Question

Find out the capacitance of the earth? (Radius of the earth = 6400 km)

$$C = \frac{Q}{V} = \frac{\cancel{Q}}{\frac{K\cancel{Q}}{R}} \qquad V = \frac{KQ}{R}$$

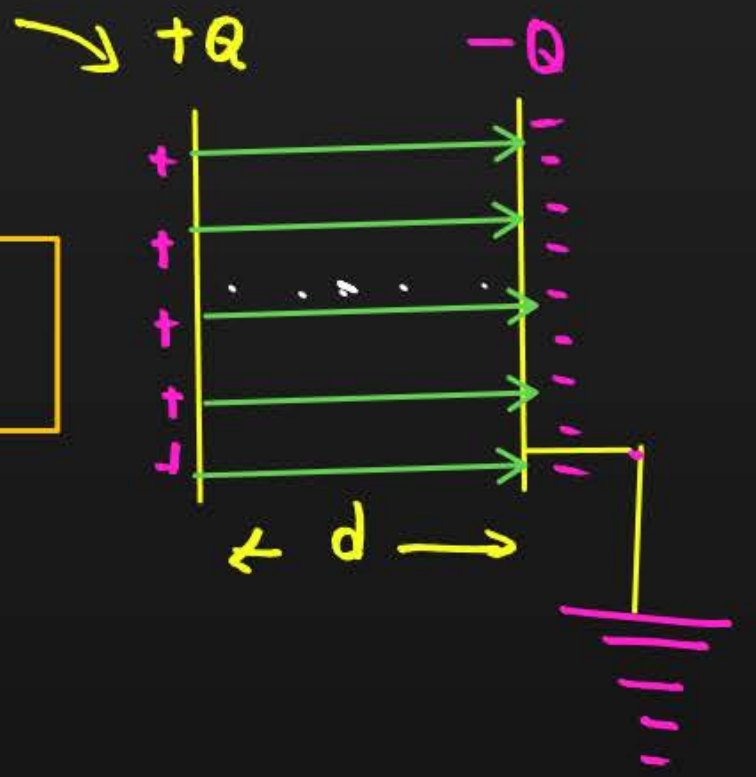
$$\boxed{C = \frac{R}{K} = 4\pi\varepsilon_0 R}$$

$$C = \frac{6400 \times 10^3}{9 \times 10^9} = 711.11 \times 10^{-6}$$

$$\boxed{C = 711.11\,\mu F}$$

Parallel plate capacitor

Parallel plate capacitor is a capacitor with two identical plane parallel plates separated by a small distance and the space between them is filled by an air or vacuum.



✓ Electric field between plates $\vec{E}_1 = \frac{\sigma}{2\varepsilon_0}\hat{i}$ $\vec{E}_2 = \frac{\sigma}{2\varepsilon_0}\hat{i}$

$\vec{E} = \vec{E}_1 + \vec{E}_2 = \frac{\sigma}{\varepsilon_0}\hat{i}$, $\boxed{E = \frac{\sigma}{\varepsilon_0} = \frac{Q}{A\varepsilon_0}}$

✓ P.D in terms E.F, $\boxed{V = E \cdot d}$

Force, $F = QE = Q \times \frac{Q}{2A\varepsilon_0}$

✓ Capacitance * $\boxed{C = \frac{A\varepsilon_0}{d}}$ ⇒ Air

$\boxed{F = \frac{Q^2}{2A\varepsilon_0}}$

$$C = \frac{A\varepsilon_0}{d} \rightarrow \text{Air}$$

$$C_m = \frac{A\varepsilon_m}{d} \rightarrow \text{Dielectric medium.}$$

$$K = \frac{\varepsilon_m}{\varepsilon_0} \Rightarrow \varepsilon_m = K\varepsilon_0$$

$$C_m = \frac{AK\varepsilon_0}{d}$$

$$C_m = K\frac{A\varepsilon_0}{d} \Rightarrow C_m = KC_0$$

$$\boxed{K = \frac{C_m}{C_0} = \frac{\varepsilon_m}{\varepsilon_0}}$$

Parallel plate capacitor

Parallel plate capacitor with dielectric slab

$$C = \frac{A\varepsilon_0}{d} \rightarrow \text{Air.}$$

$$C_m = K\frac{A\varepsilon_0}{d} = KC_0 \rightarrow \text{completely filled}$$

$$E_0 = \frac{\sigma}{\varepsilon_0} = \frac{Q}{A\varepsilon_0}$$

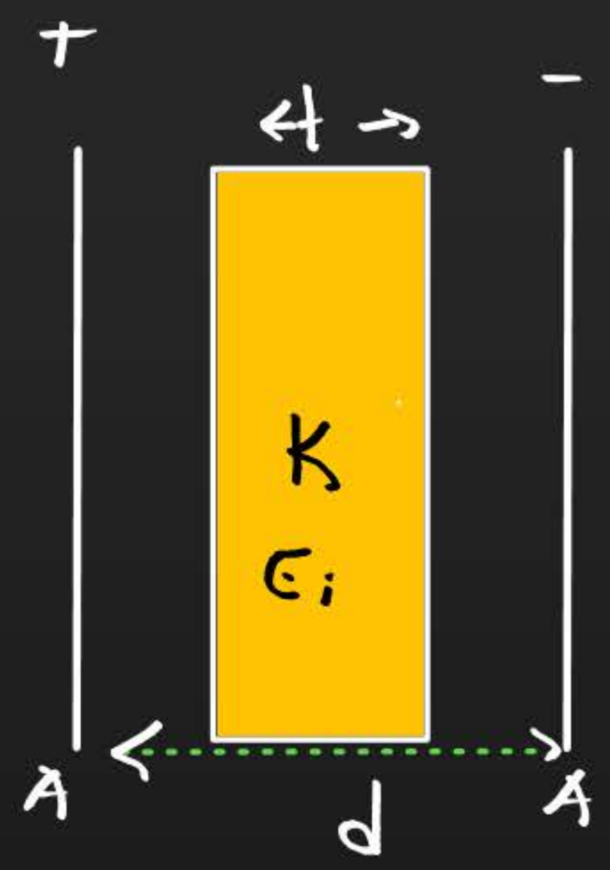
$$E_i = \frac{E_0}{K}$$

$$V = E \cdot d \Rightarrow V_0 = E_0 d$$

$$V_m = V_0 + V_m$$

$$V_m = E_0(d-t) + E_i t$$

$$\boxed{V_m = E_0(d-t) + \frac{E_0 t}{K}}$$



Partially Filled

$$\boxed{C_m = \frac{A\varepsilon_0}{d - t + \frac{t}{K}}}$$

Question

The electrostatic force between the metal plates of an isolated parallel plate capacitor C having a charge Q and area A is:

$$\boxed{F = \frac{Q^2}{2A\varepsilon_0}}$$

A. Independent of the distance between the plates.

B. Linearly proportional to the distance between the plates.

C. Proportional to the square root of the distance between the plates.

D. Inversely proportional to the distance between the plates

Question

The capacitance of a capacitor with charge q and a potential difference V depends on

(A) both q and V

(B) $\boxed{\text{the geometry of the capacitor}}$

(C) q Only

(D) V only

$$C = \frac{A\varepsilon_0}{d}$$

Question

The distance between the two plates of a parallel plate capacitor is doubled, and the area of each plate is halved. If C is its initial capacitance, its final capacitance is equal to

(A) $2C$

(B) C

(C) $4C$

(D) $\boxed{C/4}$

$$C = \frac{A\varepsilon_0}{d}$$

$$d' = 2d$$

$$A' = \frac{A}{2}$$

$$C' = \frac{A'\varepsilon_0}{d'} = \frac{A}{2} \times \frac{\varepsilon_0}{2d} = \frac{1}{4}\left(\frac{A\varepsilon_0}{d}\right)$$

$$\boxed{C' = \frac{C}{4}}$$

Question

$C = C_0$

The capacitance of a parallel plate capacitor with air as a medium is 6 μF With the introduction of a dielectric medium, the capacitance becomes 30 μF. The permittivity of the medium is ($\varepsilon_0 = 8.85 \times 10^{-12}$ $C^2 N^{-1} m^{-2}$) $\varepsilon_m = ?$ C_m

(A) 1.77×10^{-12} C^2 N^{-1} m^{-2}

(B) $\boxed{0.44 \times 10^{-10}\ C^2 N^{-1} m^{-2}}$

(C) $5.00 C^2 N^{-2} m^{-2}$

(D) 0.44×10^{-13} $C^2 N^{-1} m^{-2}$

$$K = \frac{C_m}{C_0} = \frac{30}{6} = 5$$

$$K = 5$$

$$K = \varepsilon_r = \frac{\varepsilon_m}{\varepsilon_0}$$

$$\varepsilon_m = K\varepsilon_0 = 5 \times 8.85 \times 10^{-12}$$

$$\boxed{\varepsilon_m = 44.27 \times 10^{-12} = 0.442 \times 10^{-10}}$$

Question

A parallel plate capacitor with cross-sectional area A and separation d has air between d the plates. An insulating slab of the same area but the thickness of $d/2$ is inserted between the plates as shown in the figure, having a dielectric constant, $K = 4$. The ratio of the new capacitance to its original capacitance will be

(A) 2 : 1

(B) $\boxed{8 : 5}$

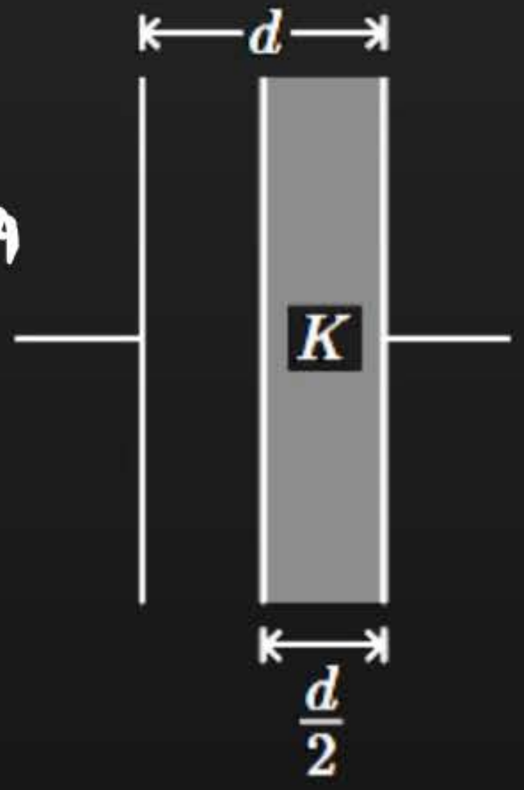
(C) 6 : 5

(D) 4 : 1

$$C_0 = \frac{A\varepsilon_0}{d} \qquad C_m = \frac{A\varepsilon_0}{d - t + \frac{t}{K}} = \frac{A\varepsilon_0}{d - \frac{d}{2} + \frac{d}{2\times 4}}$$

$$C_m = \frac{A\varepsilon_0}{d - \frac{d}{2} + \frac{d}{8}} = \frac{A\varepsilon_0}{\frac{8d - 4d + d}{8}} = \frac{8A\varepsilon_0}{5d}$$

$$\boxed{\frac{C_m}{C_0} = \frac{8\cancel{A\varepsilon_0}}{5\cancel{d}} \times \frac{\cancel{d}}{\cancel{A\varepsilon_0}} = \frac{8}{5}}$$



Question

t

If a slab of insulating material (conceptual). 4×10^{-3} m thick is introduced between the plates of a parallel plate capacitor, the separation between the plates has to be increased by 3.5×10^{-3}m to restore the capacity to original value. The dielectric constant of the material will be

(A) 6

(B) $\boxed{8}$

(C) 10

(D) 12

$$C = \frac{A\varepsilon_0}{d}$$

$$C_m = \frac{A\varepsilon_0}{d - t + \frac{t}{K}}$$

$$\Downarrow$$

$$C_m = \frac{A\varepsilon_0}{d + 3.5 - 4 + \frac{4}{K}}$$

$$= \frac{A\varepsilon_0}{d - 0.5 + \frac{4}{K}}$$

$$C_m = C_0$$

$$\frac{\cancel{A\varepsilon_0}}{d - 0.5 + \frac{4}{K}} = \frac{\cancel{A\varepsilon_0}}{d}$$

$$d - 0.5 + \frac{4}{K} = d$$

$$-0.5 + \frac{4}{K} = d - d = 0$$

$$\frac{4}{K} = 0.5$$

$$\boxed{K = \frac{4}{0.5} = 8}$$

Question

K

A dielectric slab of dielectric constant 3 having the same area of cross-section as that of a parallel plate capacitor but of thickness $3^{th}/4$ of the separation of the plates is inserted into the capacitor. The ratio of potential difference across the plates without dielectric to that with dielectric is:

t

(A) 1:2

(B) 2:3

(C) 3:2

(D) $\boxed{2:1}$

$V = E_0 d \quad - (1)$

$V_m = E_0(d-t) + \frac{E_0 t}{K}$

$V_m = E_0\left(d - \frac{3d}{4}\right) + \frac{E_0 \times \cancel{3}d}{4 \times \cancel{3}}$

$V_m = E_0 \times \frac{d}{4} + \frac{E_0 d}{4}$

$V_m = \frac{2E_0 d}{4} = \frac{E_0 d}{2}$

$\boxed{\frac{V}{V_m} = \frac{E_0 d}{\frac{E_0 d}{2}} = \frac{2}{1}}$

Question

A parallel plate capacitor having area A and separated by distance d is filled by copper plate of thickness b. The new capacity is

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

(B) $\frac{\varepsilon_0 A}{2d}$

(C) $\boxed{\frac{\varepsilon_0 A}{d-b}}$

(D) $\frac{2\varepsilon_0 A}{d+\frac{b}{2}}$

$$C = \frac{A\varepsilon_0}{d - t + \frac{t}{K}} = \frac{A\varepsilon_0}{d - b + \frac{b}{\infty}}\ 0$$

$$\boxed{C = \frac{A\varepsilon_0}{d-b}}$$

$K = \infty$

Water $K \simeq 80\text{-}82$

Air $K = 1$

Question

A parallel plate air capacitor has capacitance C, the distance of separation between plates is d and potential difference V is applied between the plates. The force of attraction between the plates of the parallel plate air capacitor is:

(A) $\frac{C^2V^2}{2d}$

(B) $\boxed{\frac{CV^2}{2d}}$

(C) $\frac{CV^2}{d}$

(D) $\frac{C^2V^2}{2d^2}$

$$F = \frac{Q^2}{2\frac{A\varepsilon_0}{d} \times d} = \frac{Q^2}{2Cd}$$

$$F = \frac{(CV)^2}{2Cd} = \frac{C^2V^2}{2Cd} = \boxed{\frac{CV^2}{2d}}$$

Question

A parallel plate capacitor has a capacitance 50 μF in air and 110 μF when immersed in an oil. The dielectric constant 'K' of the oil is

(A) 0.45

(B) 0.55

(C) 1.10

(D) $\boxed{2.20}$

$$K = \frac{C_m}{C_o} \qquad K = \frac{\varepsilon_m}{\varepsilon_o}$$

$$K = \frac{110}{50}$$

$$\boxed{K = 2.20}$$

Thank

You