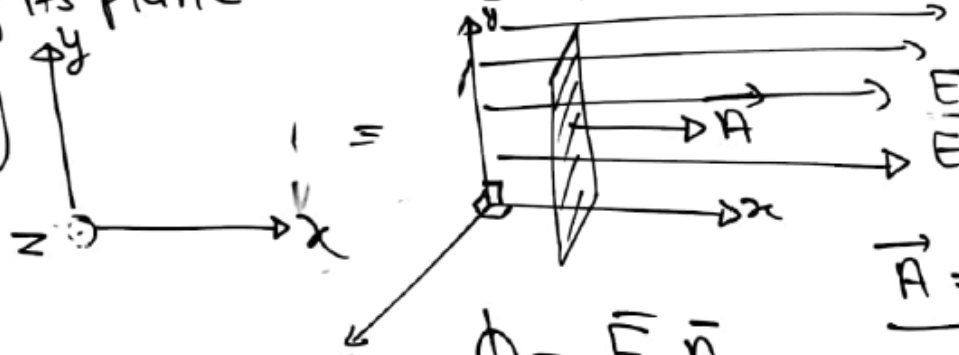
$1cm = 10^{-2}m$ $(1cm)^2 = 10^{-4}m^2$

NICERT :- 15) Consider a uniform electric field. $\vec{E} = 3\times10^3 i$ N/C.

(a) What is the flux of this field through a square of 10 cm on a side whose plane Parallel to YZ plane.

(b) What is the flux through the same square if the normal of its plane makes a 60° angle with the x-axis.

Solve (a)



$\vec{E} = 3\times10^3 i$ N/C

Area = (Side)^2
$= (10cm)^2$
$= 100cm^2$
$= 100\times10^{-4}m^2$
$A = 10^{-2}m^2$

$\vec{A} = 10^{-2} i\ m^2$

$E = 3\times10^3$ N/C
$A = 10^{-2}m^2$
$\theta = 0°$
$\phi = EA\cos0° = 3\times10^3\times10^{-2} = 30$ N-m^2/C

$\phi = \vec{E}\cdot\vec{A}$
$= 3\times10^3\times10^{-2}$ $\frac{N\text{-}m^2}{C}$
$\phi = 30\ \frac{N\text{-}m^2}{C}$

$1cm = 10^{-2}m$ $(1cm)^2 = 10^{-4}m^2$

NICERT : 15) Consider a uniform electric field. $\vec{E} = 3\times10^3 i$ N/C.

(a) What is the flux of this field through a square of 10 cm on a side whose plane Parallel to YZ Plane.

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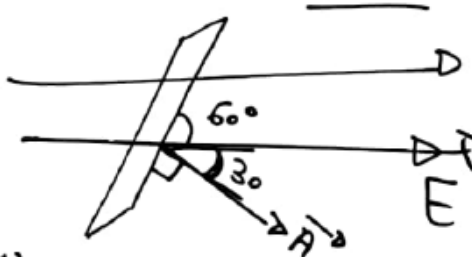
(b-Solve)

$A = 10^{-2} m^2$



$\vec{E} = 3\times10^3 i$ N/C

$\phi = EA\cos\theta$

$= 3\times10^3 \times 10^{-2} \times \cos 30$

$= 30 \times \frac{\sqrt{3}}{2}$

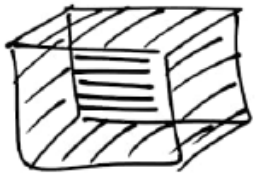
$\phi = 15\sqrt{3}$ N-m²/c

* Plane makes 60° with x-axis (ok) but $\vec{A}$ (Area vector of plane makes 30° with x axis or $\vec{E}$)

(17) Careful measurement of the electric field at the surface of a black box indicates that the net outward flux through the surface of the box is $8 \times 10^{+3}\ N\text{-}m^2/C$

(a) What is the charge inside the box.

(b) If the net outward flux through the surface of the box were zero, could you conclude that there were no charge inside the box? Why or why not.



(a) $\phi = 8 \times 10^{+3}\ N\text{-}m^2/C$

$$\phi = \frac{q_{in}}{\varepsilon_0} \Rightarrow \frac{q_{in}}{8.85 \times 10^{-12}} = 8 \times 10^{3}$$

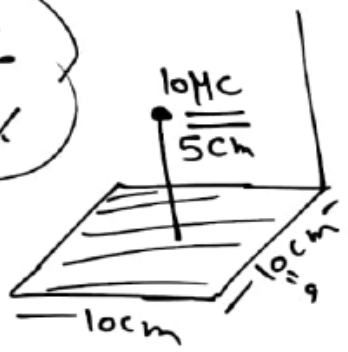
$$q_{in} = 8 \times 10^{3} \times 8.85 \times 10^{-12}$$

$$q_{in} = 8 \times 8.85 \times 10^{-9}\ C$$

NCERT

Q18) A point charge +10μC is at a distance of 5cm directly above the centre of a square of side 10cm, as shown in fig. What is the magnetic flux through the square.

NCERT
NEET – 39 PYQ's
JEE Main = 60%



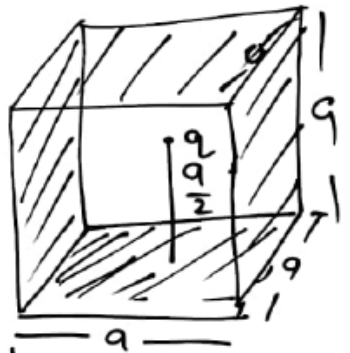
Electric flux → Number of electric field lines passing through a particular area

$$\phi = \frac{q}{6\varepsilon}$$

$$= \frac{10\times10^{-6}\,C}{6\times 8.85\times10^{-12}}$$

$$\phi = \frac{10^{7}}{6\times 8.85}\ N\cdot m^2/C$$

$10\,\mu C = 10^{-5}\,C$



$$\phi_T = \frac{q}{\varepsilon_0}$$

$$6\,\text{Side} = \frac{q}{\varepsilon_0}$$

$$1\,\text{Side} = \frac{q}{6\varepsilon_0}$$

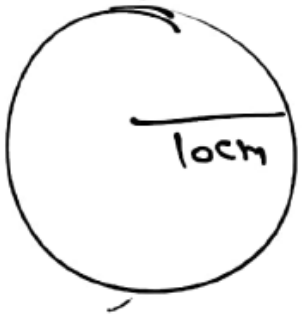
(20) A point charge causes an electric flux of $-1 \times 10^{+3}$ N-m²/C to pass through a spherical Gaussian surface of 10cm radius centred on the charge.

NCERT

(a) If the radius of the Gaussian surface were doubled, how much flux would pass through the surface.

(b) What is the value of the point charge?

(b)



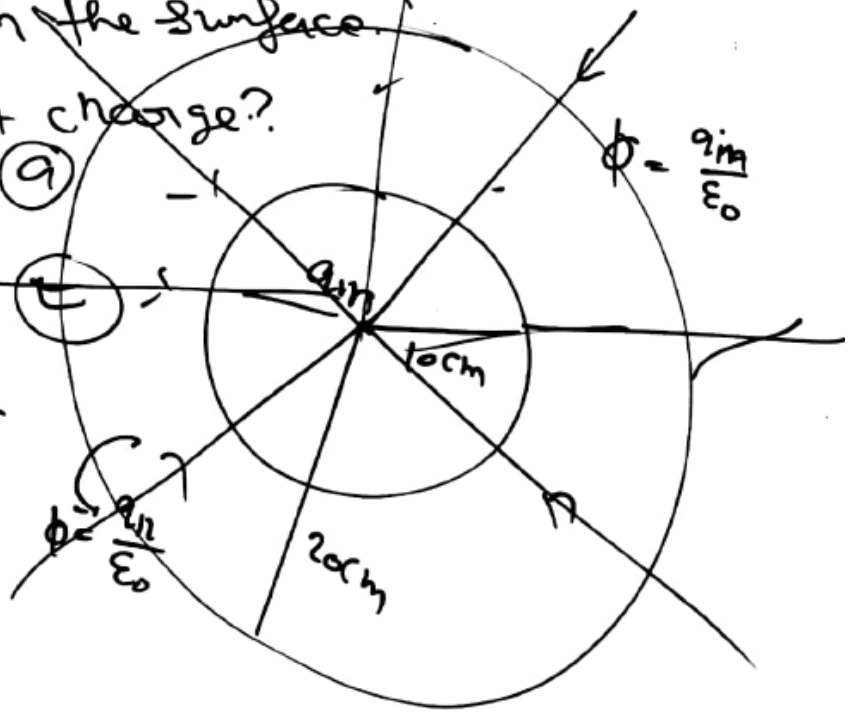
$$\phi = -1 \times 10^3 \text{ N-m}^2/\text{C}$$

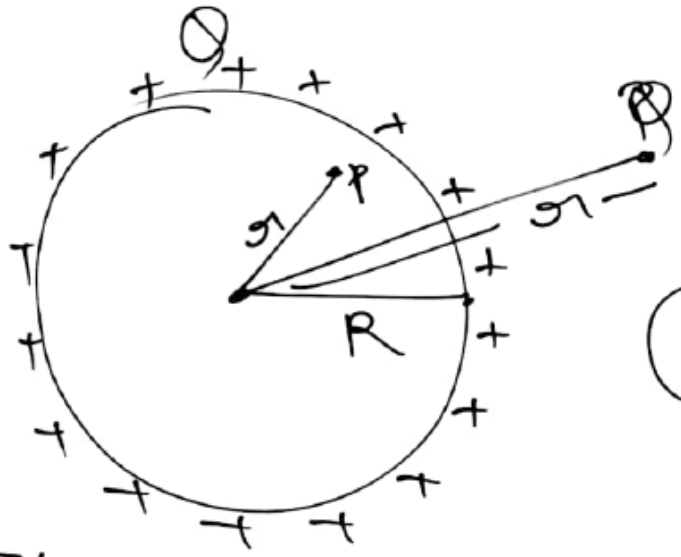
$$\frac{q_{in}}{\varepsilon_0} = -1 \times 10^3 \text{ N-m}^2/\text{C}$$

$$q_{in} = -1 \times 10^3 \times 8.85 \times 10^{-12}$$

$$\boxed{q_{in} = -8.85 \times 10^{-9} \text{ C}}$$

(a)





(a) $r < R$ [inside point]

$E = 0$

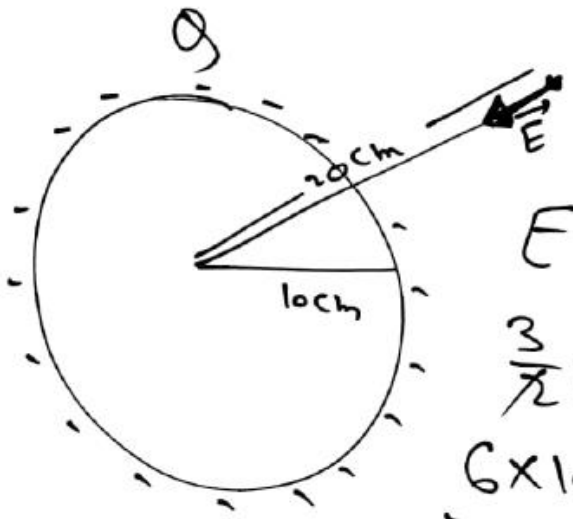
(b) $r > R$ [out point]

$$E = \frac{1}{4\pi\varepsilon_0}\frac{Q}{r^2}$$

Electric field $\Rightarrow$ For outside point sphere behave like a point charge.

(c) $r = R$ $\quad E = \frac{1}{4\pi\varepsilon_0}\frac{Q}{R^2}$

Q24) A Conducting sphere of radius 10cm has an unknow charge. If the Electric field 20cm from the centre of the sphere is 1.5×10^3 N/C & points in radially inward what is the net charge on the sphere



$E = 1.5 \times 10^3$ N/C

$20\text{cm} = 2 \times 10^{-1}$ m

$k = \frac{1}{4\pi\varepsilon_0} = 9 \times 10^9$

$E = \frac{kQ}{r^2} = \frac{9 \times 10^9 \times Q}{(2 \times 10^{-1})^2}$

$\frac{3}{2} \times 10^3 = \frac{9 \times 10^9 \times Q}{2^2 \times 10^{-2}}$

$\frac{6 \times 10^3 \times 10^{-2}}{9 \times 10^9} = Q$

$Q = \frac{2}{3} \times 10^{-8}$ C

$Q = -\frac{2}{3} \times 10^{-8}$ C

H.W NCERT-Q-1 to 25.

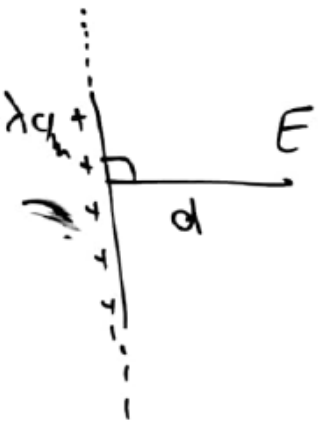
NEET 34 YPYQP

JEE mains — question based on Coulomb's Law & Electric field.

100%

NEET - 180

Q 23) An infinite line charge produces a field of 9×10^4 N/C at a distance 2cm. Calculate linear charge density (λ)



$$E = \frac{2K\lambda}{d} \Rightarrow 9 \times 10^4 = \frac{2 \times 9 \times 10^9 \times \lambda}{2 \times 10^{-2}}$$

$$\frac{10^{+4} \times 10^{-2}}{10^9} = \lambda$$

$$\lambda = 10^{-7} \text{ C/m}$$

$$\lambda = 10^{-7} \text{ C/m}$$