Qno : 07

Lighting rods are taller

Lightning rods are always taller than the buildings, because in case a flash of lightning comes near, it is directed to rod and grounded rather than flowing in the building. Thus it protects buildings from severe affects of lightning.

Qno : 05

Electric field points away —?

In case of proton, field lines are considered to be moving away from proton. while for electron, lines move towards charges. Direction of electric field vector is actually the direction of electric field lines Hence $\vec{E}$ points away from proton.

Qno : 1

charge transferred by $\bar{e}$

Since protons are tightly bound in nucleus and are not free to move. But electrons revolve around nucleus and can move from one level to other. That's why they are termed as 'charge carriers.

Qno : 6

Find voltage

$q = 0.0001 \, C$

$E = W = 0.3125 \times 10^{19} eV$

$(\because 1 \, eV = 1.602 \times 10^{-19} J)$

Hence $\quad E = W = 0.50 \, J$

$\because \quad V = W/q$

$V = 0.50/0.0001$

$\rightarrow V = 5000 \, V$

Qno: 04

Find net charge

$$q_A = 2.5 \times 10^{-7} C$$

$$q_B = -2.5 \times 10^{-7} C$$

net charge $Q = q_A + q_B$

$$= (2.5 \times 10^{-7}) + (-2.5 \times 10^{-7})$$

$$\rightarrow Q = 0 \, C$$

dipole moment

distance b/w q_A and q_B

$$d = 0.15 + 0.15 = 0.3 \, m$$

Electric dipole moment $(p) = q_A \times d$

$$= 2.5 \times 10^{-7} \times 0.3$$

$$= 7.5 \times 10^{-8} \, Cm \text{ (along positive}$$
$$\text{z-axis)}$$

Qno : 03

Find intensity

$$q = -3 \, \mu C = -3 \times 10^{-6} C$$

$$\vec{E} = \quad ?$$

$$\vec{F} = 13\hat{i} + 9\hat{j} \; N$$

$$F = \sqrt{(13)^2 + (9)^2} = \sqrt{169 + 81}$$

$$F = 15.8 N$$

$$\because E = F/q$$

$$= 15.8 / .3 \times 10^{-6}$$

$$E = -5.2 \times 10^{-6} NC^{-1}$$

direction of $E (\theta) = \tan^{-1}\left(\dfrac{F_y}{F_x}\right)$

$$= \tan^{-1}(9/13)$$

$$\rightarrow \theta = 34.6°$$

Qno : 8

→ Symmetry

It is physical or mathematical feature of system that is preserved or changed under transformation.

It means that one shape is exactly like the other when moved, flipped etc.

→ Spherical :-

A sphere has rotational symmetry around an axis through centre and reflection symmetry across any plane.

→ planar :-

It is symmetry of pattern that is transformation of plane that carries any unidirectional lines to lines and preserved many distances
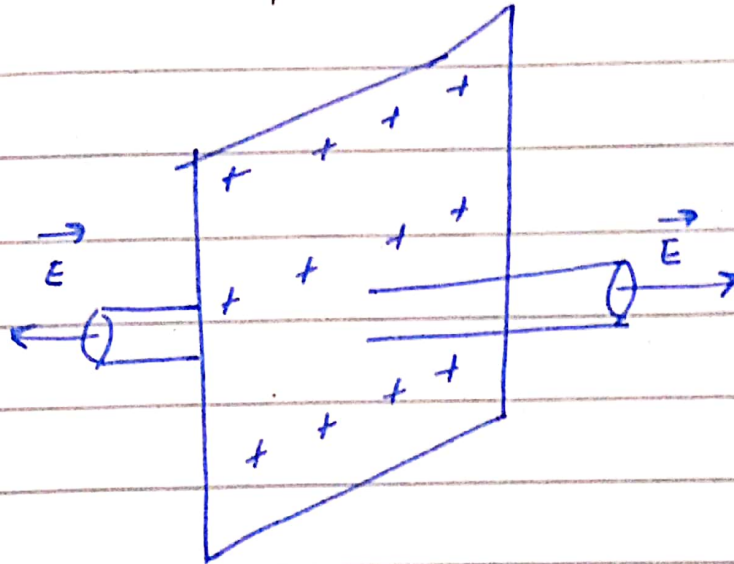
→ cylindrical :-

In this symmetry, there is only one axis of rotation and is always vertical.
It is commonly found in towers, columns and domes.

Gauss's Law

→ consider guassian surface as cylinder

→ no flux through curved surface bcz lines and plane of area are parallel

→ flux at two ends is EA and EA.

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total ϕ = EA + EA + 0

ϕ = 2EA