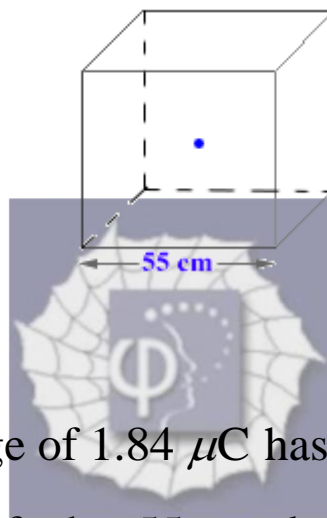


312.

Problem 29.5 (RHK)

A point charge of $1.84 \mu\text{C}$ is at the centre of a cubical Gaussian surface 55 cm on edge. We have to find Φ_E through the surface.



Solution:

As the point charge of $1.84 \mu\text{C}$ has been placed at the centre of a cube of edge 55 cm electric flux through each of its six faces will be equal. Instead of calculating the flux through a face of the cube from the electric field and the definition of flux, we will workout the answer of the problem from the Gauss's law. We have

$$\epsilon_0 \Phi_E = q .$$

Therefore,

$$\begin{aligned}\Phi_E &= \frac{q}{\epsilon_0} = \frac{1.84 \times 10^{-6} \text{ C}}{8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}} \\ &= 2.08 \times 10^5 \text{ N m}^2 \text{ C}^{-1} \\ &= 208 \text{ kN m}^2 \text{ C}^{-1}.\end{aligned}$$

