

9. Let A be the area of one face of the cube, E_u be the magnitude of the electric field at the upper face, and E_ℓ be the magnitude of the field at the lower face. Since the field is downward, the flux through the upper face is negative and the flux through the lower face is positive. The flux through the other faces is zero, so the total flux through the cube surface is $\Phi = A(E_\ell - E_u)$. The net charge inside the cube is given by Gauss' law:

$$\begin{aligned} q &= \varepsilon_0 \Phi = \varepsilon_0 A(E_\ell - E_u) = (8.85 \times 10^{-12} \text{ C}^2/\text{N}\cdot\text{m}^2)(100 \text{ m})^2(100 \text{ N/C} - 60.0 \text{ N/C}) \\ &= 3.54 \times 10^{-6} \text{ C} = 3.54 \mu\text{C} . \end{aligned}$$