

Answer on Question #52672-Physics-Electrodynamics

A charge q is placed at one corner of a cube. The electric flux through any of the three faces adjacent to the charge is zero. The flux through any one of the other three faces is

- a) $q/3\epsilon_0$
- b) $q/6\epsilon_0$
- c) $q/12\epsilon_0$
- d) $q/24\epsilon_0$

Solution

The other three sides, by symmetry, have the same flux. We can compute it by imagining 7 other identical cubes, with the charge at one corner of each, so that the 8 cubes together form one big cube of side length $2d$. Then the flux through each side of this big cube is $\Phi_E = \frac{q}{6\epsilon_0}$. But clearly the flux through one of the non-adjacent sides of the original cube is just 1/4th of this, so

$$\Phi_E = \frac{1}{4} \frac{q}{6\epsilon_0} = \frac{q}{24\epsilon_0}.$$

Answer: d) $q/24\epsilon_0$.