

## Chapter 22 – Gauss Law

- Charge and Electric flux
- Electric Flux Calculations
- Gauss's Law and applications
- Charges on Conductors

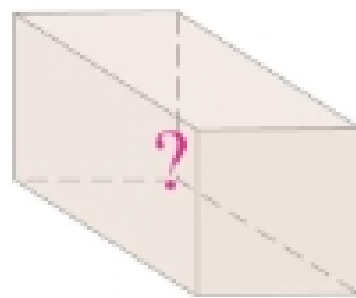


Child acquires electric charge by touching a charged metal sphere. Electrons coat each individual hair fiber and then repel each other.

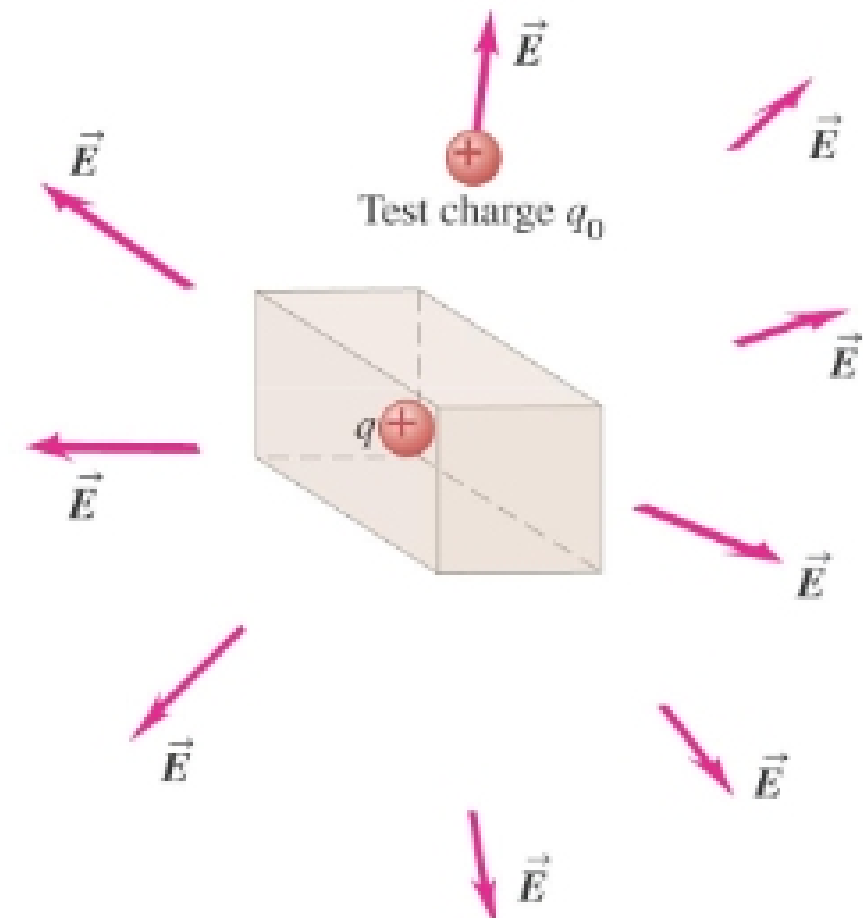
# 1. Charge and Electric Flux

- A charge distribution produces an electric field ( $\vec{E}$ ), and  $\vec{E}$  exerts a force on a test charge ( $q_0$ ). By moving  $q_0$  around a closed box that contains the charge distribution and measuring  $\vec{F}$  one can make a 3D map of  $\vec{E} = \vec{F}/q_0$  outside the box. From that map, we can obtain the value of  $q$  inside box.

(a) A box containing an unknown amount of charge

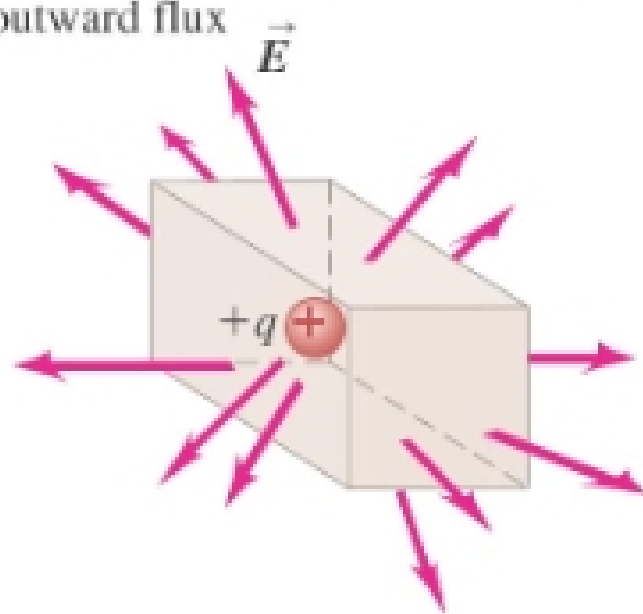


(b) Using a test charge outside the box to probe the amount of charge inside the box

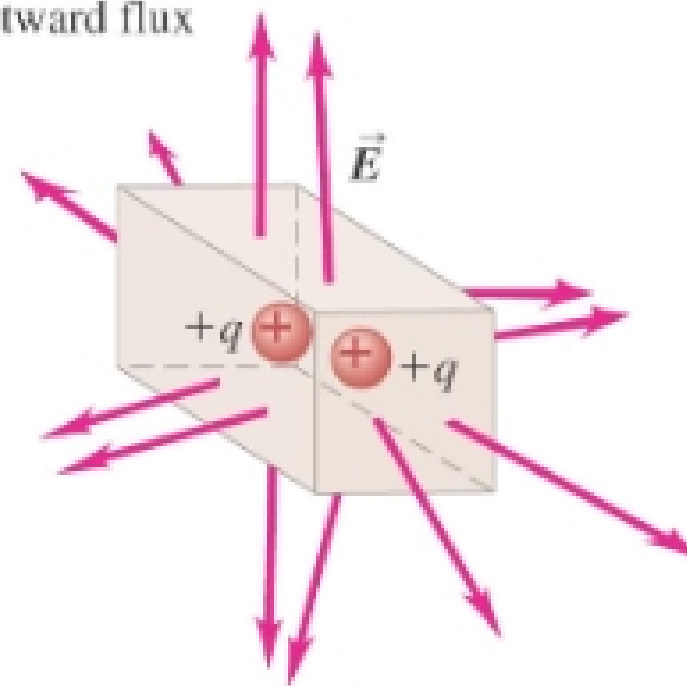


- If we construct a boundary around a charge, we can think of the flow coming out from the charge like water through a screen surrounding a sprinkler.

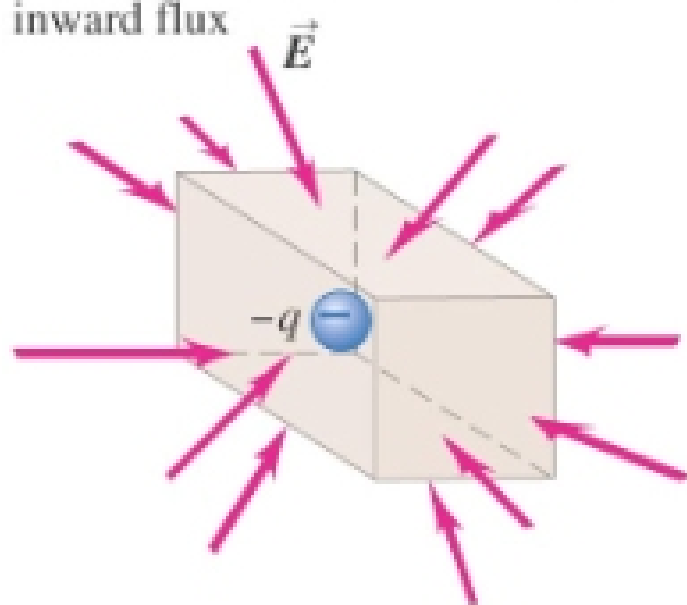
(a) Positive charge inside box,  
outward flux



(b) Positive charges inside box,  
outward flux



(c) Negative charge inside box,  
inward flux



(d) Negative charges inside box,  
inward flux

