Lecture 2 (12-1)

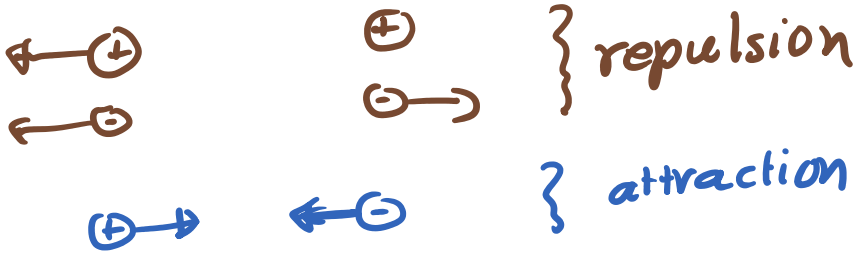
Thursday, February 25, 2021 12:00 PM

Ch.23: Electric Fields

23.1 Properties of Electric Charges.

positive charge (+)

negative charge (−)



glass rod

electrically neutral
+ charge = − charge
Net charge = 0

→ If rubbed with silk ⇒

rubber rod

If rubbed
wool

* The electric charge is conserved in an isolated system.

- Electron's charge ⇒ $|q_e| = 1.6 \times 10^{-19}$ C (Coulomb)
- The electric charge is quantized.

$$\Rightarrow q = \pm N|q_e|$$

(N: integer)

→ + → when an object loses electrons

" " gains electrons

gains electrons

electrically neutral

Q: An object gained 2×10^{13} electrons. What is the charge of the object?

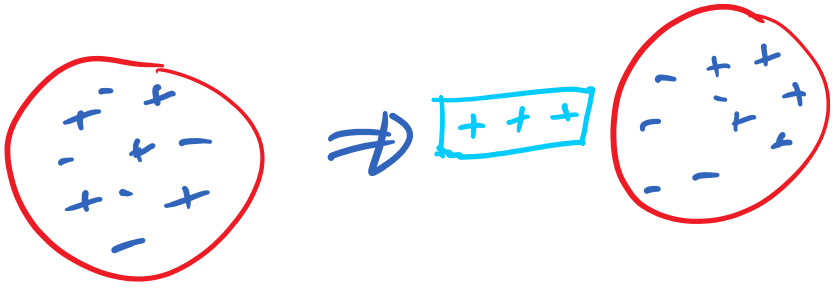
gained

$$\text{Charge} = -N|e| = -2 \times 10^{13} \times 1.6 \times 10^{-19}$$

$$= -3.2 \times 10^{-6} C = -3.2 \mu C$$

23.2 Charging Objects by Induction

- Conductors: Some electrons are free electrons
  - ↳ copper, silver.
- Insulators: All electrons are bound to atoms
  - ↳ rubber
- Semiconductors: In between conductors and insulators → silicon



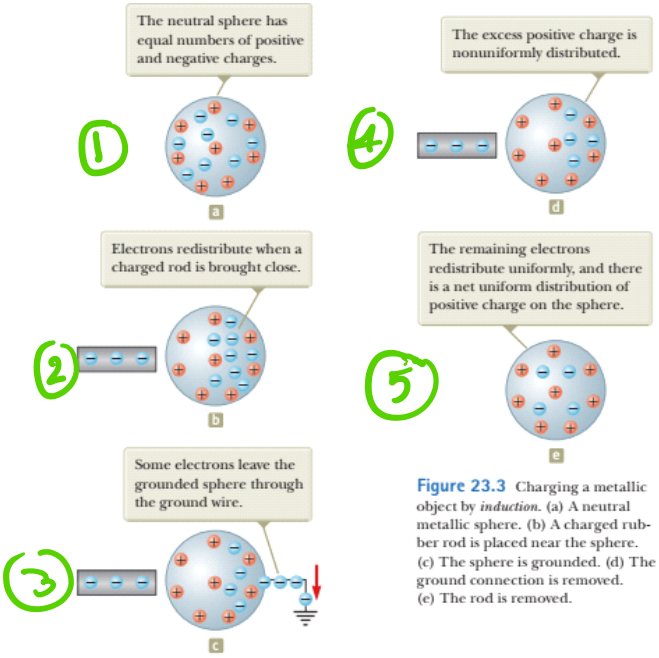


Figure 23.3 Charging a metallic object by *induction*. (a) A neutral metallic sphere. (b) A charged rubber rod is placed near the sphere. (c) The sphere is grounded. (d) The ground connection is removed. (e) The rod is removed.

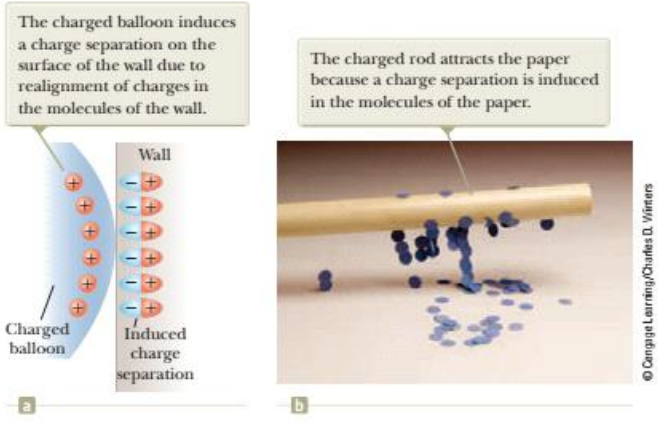


Figure 23.4 (a) A charged balloon is brought near an insulating wall. (b) A charged rod is brought close to bits of paper.