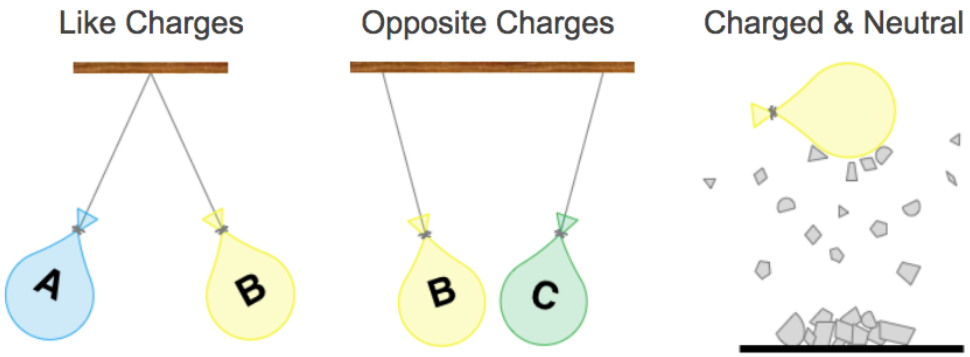
Polarization
Lesson Notes

Focus Questions:

- What is polarization?
- How does polarization occur for conductors and insulators?
- How does polarization explain the interaction of charged and neutral objects?

Review: Charge Interactions

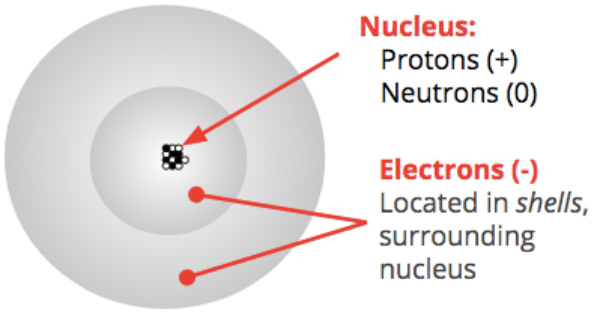
There are three observed types of charge interactions. One goal of this video is to understand why charged and neutral objects attract each other.



The Migrant Electrons

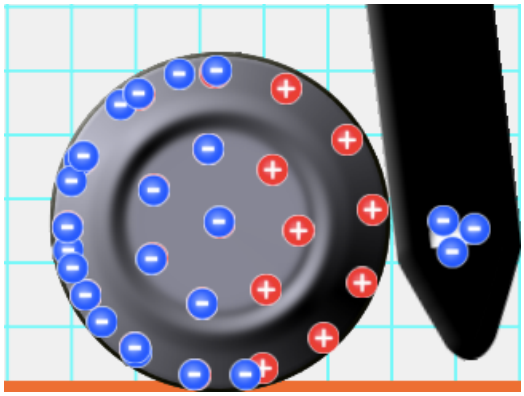
Matter consists of atoms. And atoms consist of a nucleus of protons (+) and neutrons, surrounded by shells or clouds of electrons (-).

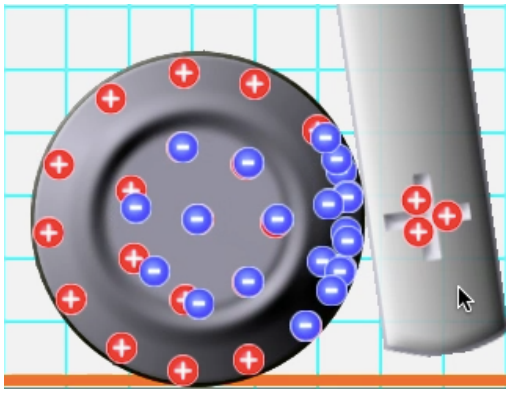
- Atoms of a **conductor** don't "own" their electrons.
- So electrons can move about the surface of a conductor.
- These mobile electrons are governed by the rule that opposites attract and likes repel.



Polarization of Conductors

Definition of Polarization: separation of a collection of items into opposites.

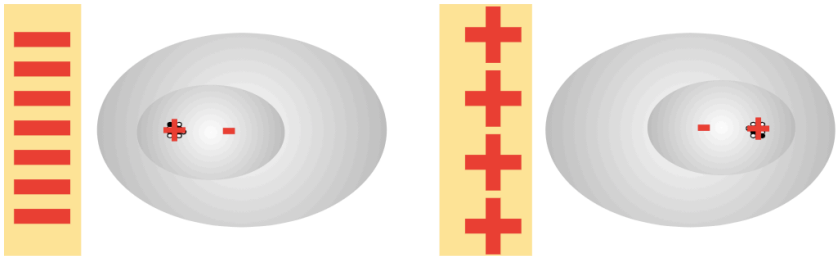




Electrons migrate towards + objects and away from - objects. This migration **polarizes** the pop can - separates the + from the -.

Polarization of Insulators

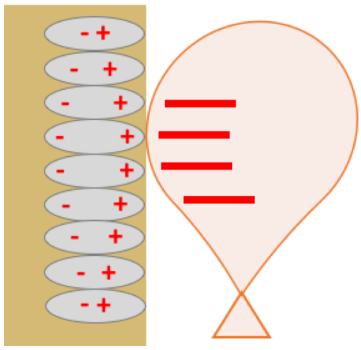
The presence of a nearby charged object causes electron clouds on the nearest atoms of insulators to be distorted.



The Balloon and the Wall

Why do neutral and charged objects attract each other? Because ...

1. **Likes Repel**: The - balloon repels electrons in the wall, distorting the e^- clouds of nearest atoms
2. **Neutral Objects Can Be Polarized**: Particles of the wall become polarized, with + centers of charge located nearest the balloon.
3. **Opposites Attract:** The - balloon and the + part of the wall particles attract each other.



Polarization ≠ Charging

Charging a neutral object involves moving electrons onto or off of the object. Polarization doesn't involve this.

Polarization involves the movement of electrons within the object from one side to the other side. Electrons never leave or enter the object.

Before: no centers of excess + or - charge. Overall neutral.

After: electrons move from left to right side of can, giving rise to excess + and - charge. Overall neutral.