Polarization and the 3 Types of Charging:

Polarization - when the charges within an object separate because a charged object is brought near. This is a temporary condition and the charges redistribute when the charged object is removed. The charges are not free to leave. Some materials (like water) are already naturally polar molecules, meaning the charges are already separated on a permanent basis.

Polarization	Start	Process	Finish
(No Net Charge)	1 neutral object & 1 charged	Bringing the charged object next to the neutral shifts electrons in the neutral object.	neutral object with one side positive and one negative.

1. **Friction -** rubbing two objects together, requires contact and friction (electrons are rubbed off one object and onto another one)

2. **Contact or Conduction -** touching two objects together, requires only contact. One object must be a conductor (electrons transfer, flow, from one object to another)

3. **Induction –** involves bring a charged object close to another object and causing the object to become temporarily polarized. (Like charges will repel and opposite charges will attract but no charge is transferred between the two objects)

a) Induction – while in the presence of a strong charge, the polarized material is split into parts resulting in two oppositely charged objects.

b) Induction with grounding - means you leave a path (ground) for charges to move to or from the object. Now when you bring a charged object close the repelled charges have a path to leave the object. Removing the ground, at the appropriate time, will leave a charge on the object

Type of Charging	Start	Process	Finish
1. Friction	start with 2 neutral objects, usually insulators.	Friction strips electrons from one object to another.	Two equal and oppositely charged objects
2. Contact Or Conduction	1 charged Obj. & 1 neutral conductor	Make contact and electrons move between them until they balance out	Two equally charged objects.
3a. Induction	1 Charged & two neutral conductors in contact	Use the charged object to polarize the pair of conductors then separate the conductors	Conductors are equal & opposite
3b. Induction w/ grounding	1 Charged Object & 1 neutral conductor.	Polarize the conductor and ground one side, e^- move to or from the conductor.	The conductor is charged opposite.

The four fundamental forces of Nature's