Static Electricity

Build-up of electric charges on the surface of objects. The static charges remain on an object until they either bleed off to ground or are quickly neutralized by a discharge.

Electrons can be exchanged

- Electrons can be exchanged between materials on contact.
- Materials with weakly bound electrons tend to lose them (hands, hair, fur, glass, nylon, wool, lead)
- Materials with sparsely filled outer shells tend to gain them (teflon, silicon, vinyl, polypropylene, polyethylene, polyurethane, saran wrap, styrene, polyester, gold)

Two types of charges

- Positive charge (“proton”), 1.6 x 10^(-19) C
- Negative charge (“electron”), -1.6 x 10^(-19) C
- Like charges repel each other
- Unlike charges attract

Electrons are transferred

- Electrons are transferred in charging. One object loses electrons; the other object gains electrons.
- Electric charge is conserved. It cannot be created or destroyed. Therefore, the Law of Conservation of electric charge.

Charge

- Total Charge = Q = n x e

  e = 1.6 x 10^(-19) Coulomb

  n = Integer (no fractions of electrons)

Example

- A balloon has acquired a charge of -4.80 x 10^(-17) coulomb. How many excess electrons does this charge represent?
- Q = n x e = -4.80 x 10^(-17) C
- = n x (1.6 x 10^(-19) C
- n = -4.8 x 10^(-17) / 1.6 x 10^(-19) = 300 excess electrons

Induction vs. Conduction

- Induction involves redistribution of charge within an object without contact. A charged object is brought near the second object and a re-arrangement/redistribution of charges occurs in the second object (still net neutral).
- Conduction involves contact between two objects and transferring excess electrons between them.

Electroscope

- An electroscope detects the presence of an electric charge.
- If the electroscope is uncharged, the two leaves are collapsed; if the electroscope is brought into contact with a charged object, some of the charge is transferred to the two leaves. Since like charges repel, the leaves fly apart from each other.