

Topic 5A: Electric Charge, Fields and Force

Skill 33: Transfer of charge

Objects become electrically charged when an imbalance exists between protons and electrons. ONLY Electrons can be transferred (they are on the outside of the atom) occurs due to friction.

- Loss of electrons means "less negative, or more positive"
 - Gain of electrons means "more negative or less positive"
- } charge is **CONSERVED**
So one object's loss is another's gain

• Objects can possess

- a temporary charge imbalance due to induction (Presence of a nearby charged object)

This causes a charged object to attract an object that is overall neutral

- "Permanent" charge due to conduction of electrons (Flow of electrons onto or off object by contact)

- A "Permanent" charge due to induction with grounding (electrons flow to or from Earth in an attempt to balance)

• Conductors allow electrons to flow easily

• Insulators allow very limited electron movement, allows for polarization

Skill 34: Coulombs vs Elementary Charge

Charge is a scalar quantity represented "q" measured in

- Coulombs (C)
- or
- elementary charge (e) only for small objects

You must pay attention to Coulomb's vs elementary charge other units are based on units of Charge being in "e" or "C"

The smallest possible stable charge is 1e or 1 elementary charge i.e. the charge of an electron or proton. (You can't break these into smaller stable particles)

$$1e = 1.6 \times 10^{-19} \text{C} \text{ (so this is the smallest charge in Coulombs)}$$

You can only have charge in whole[#] multiples of 1e or $1.6 \times 10^{-19} \text{C}$

$2e$ or $3.2 \times 10^{-19} \text{C}$ allowed

BUT $2.5e$ or $4 \times 10^{-19} \text{C}$ (not allowed)

} To find possible charges
convert to e and
eliminate any partial charges

To convert from "e" to "C" multiply by $1.6 \times 10^{-19} \text{C}$ or $\left(\frac{1.6 \times 10^{-19} \text{C}}{1e} \right)$

To convert from "C" to "e" divide by 1.6×10^{-19} or $\left(\times \frac{1e}{1.6 \times 10^{-19} \text{C}} \right)$

1 Coulomb contains 6.25×10^{18} elementary charges (That's a lot of particles)