CHARGE

- CHARGE [ELECTRIC CURRENT • TIME] ≡ q
  - UNITS ⟶ A • S ≡ C
    - A → AMP
    - S → SECOND
    - C → COULOMB
- CHARGE COMES IN 2 VARIETIES (POSITIVE AND NEGATIVE)
  - EFFECTS CAN CANCEL OUT (+q AND −q AT SAME LOCATION HAVE SAME EFFECT AS IF THERE WAS NO CHARGE AT ALL; NEUTRAL OBJECTS)
- CHARGE IS QUANTIZED (COMES IN BUNDLES, QUANTA)
  - FUNDAMENTAL QUANTA OF CHARGE ≡ $e = 1.6\times10^{-19}C$

$$q = Ne$$

(N: # OF POSITIVE, # NEGATIVE)

$$Q_{TOTAL} = N_+e - N_-e = e(N_+ - N_-)$$

$$= e(N_{PROTONS} - N_{ELECTRONS})$$

- ELECTRON ≡ e^-

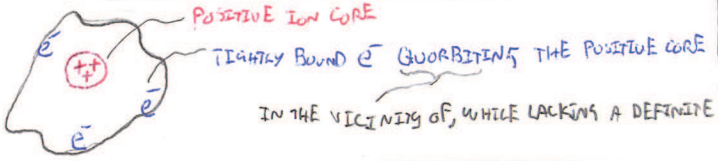
CHARGE OF e^- = $-1.6\times10^{-19}C = -e$

- CHARGE IS CONSERVED (ISOLATED SYSTEM)
  - CAN NOT CREATE OR DESTROY BUT CAN TRANSFER
  - TRANSFER CHARGE, USUALLY ELECTRONS, IF ONE OBJECT GAINS CHARGE THE OTHER OBJECT LOSES CHARGE

$$\Delta Q = 0$$

- INTERACTIONS BETWEEN CHARGES
  - UNLIKE CHARGES ATTRACT
  - LIKE CHARGES REPEL

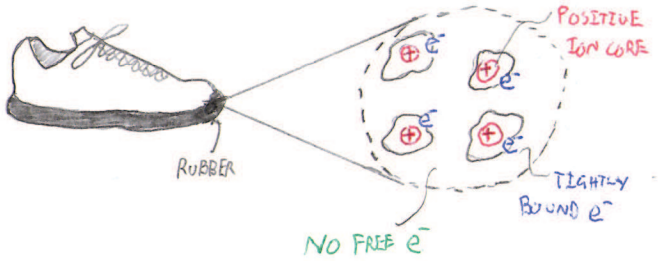
MICROSCOPIC MODEL OF CHARGE AND MATTER



TIGHTLY BOUND e^- ORBITING THE POSITIVE CORE IN THE VICINITY OF, WHILE LACKING A DEFINITE LOCATION "ELECTRON CLOUD"

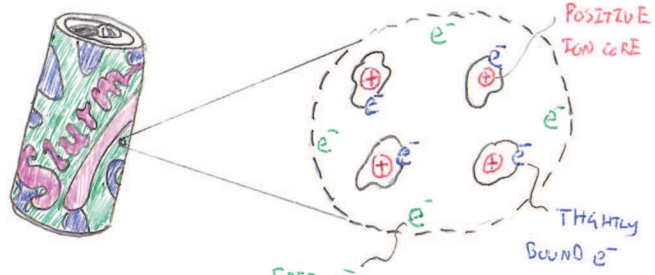
INSULATORS

- EXAMPLES: RUBBER, GLASS, DRY AIR, DRY WOOD, PLASTIC .....



CONDUCTORS

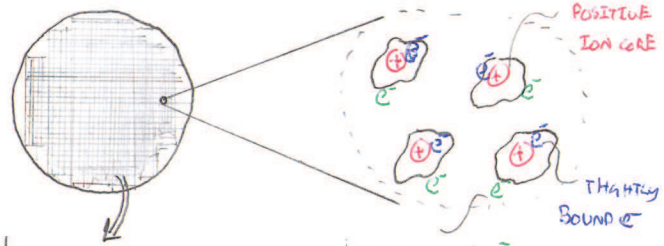
- EXAMPLES: SALT WATER, METALS .....

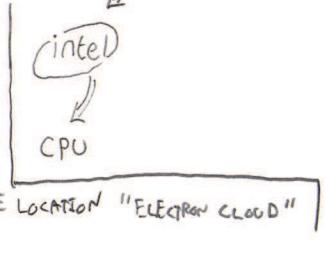


NOT BOUND BY ANY ONE PARTICULAR ATOM

SEMICONDUCTORS

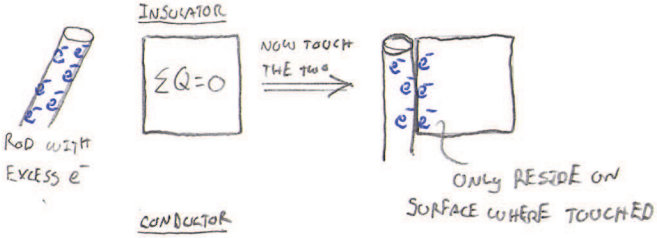
- EXAMPLES: SILICON, GERMANIUM, GALLIUM ARSENIDE ...

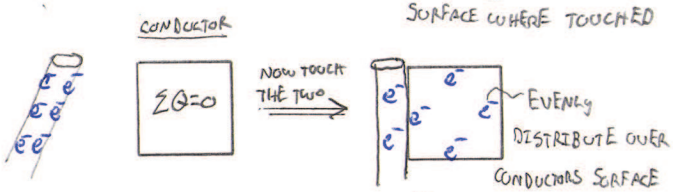




CHARGING AND DISCHARGING BY CONTACT

EXAMPLE:

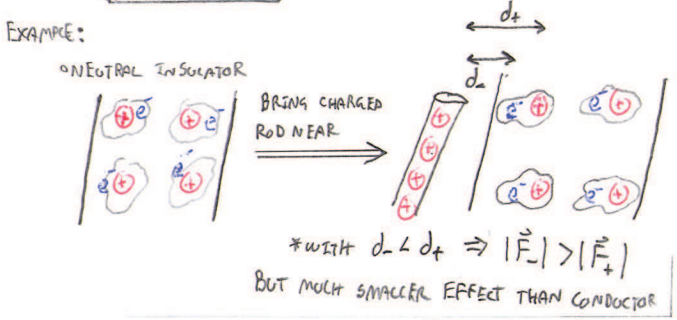


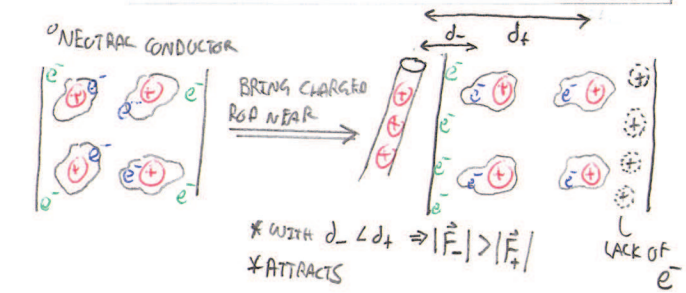


BECAUSE FREE e^- CAN MOVE

POLARIZATION

EXAMPLE:





CHARGE BY INDUCTION