

Tuesday January 14

PHYS 232

Engineering Physics
(Continued)

T/TH 1:10 – 4:20

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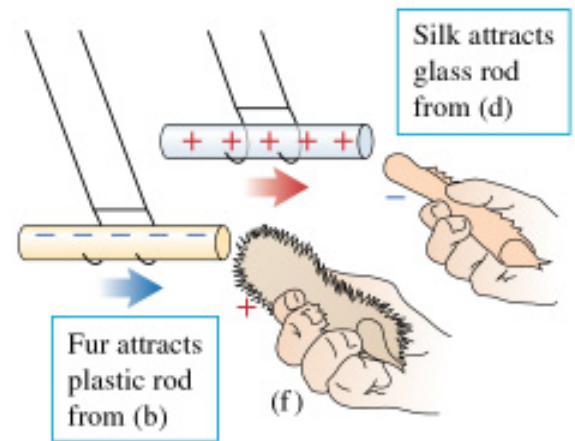
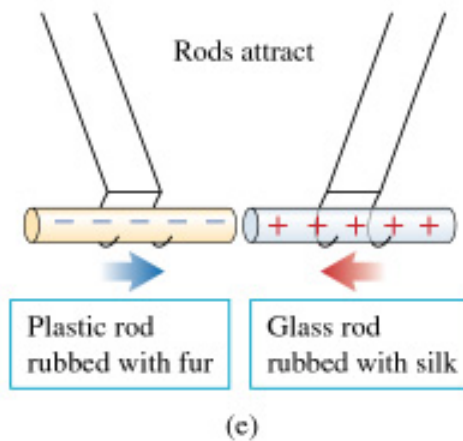
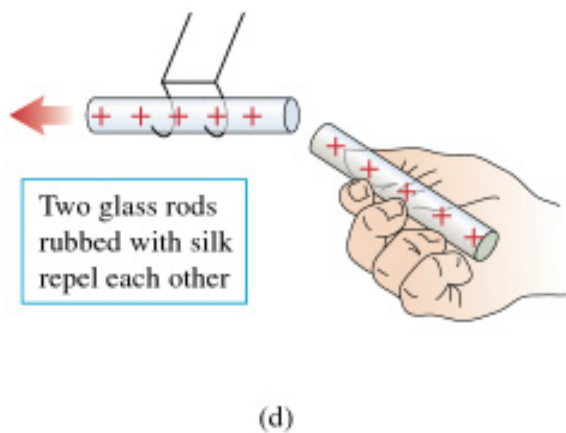
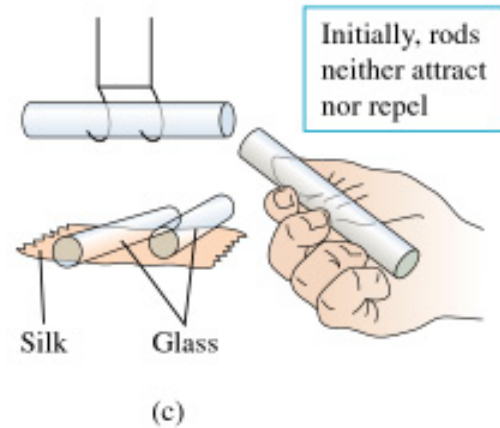
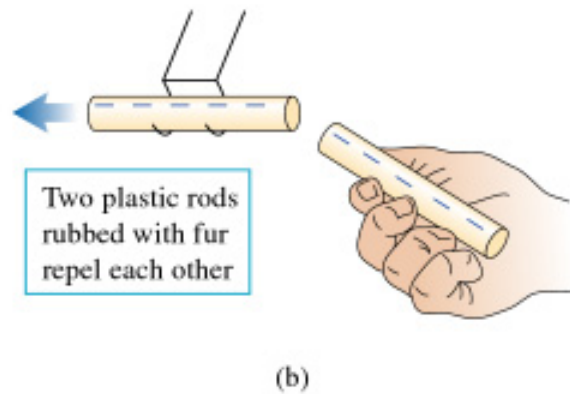
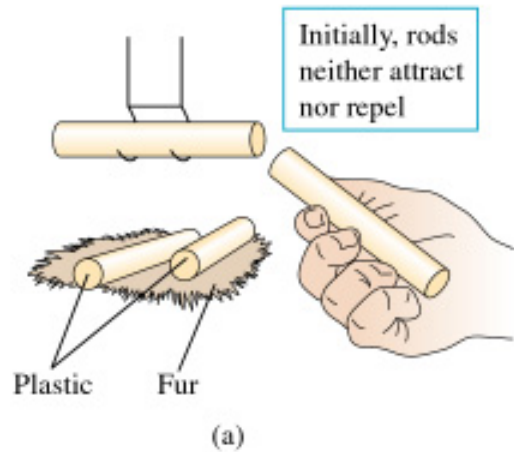
Syllabus

Homework

Website Information
(Handout)

Class Roster

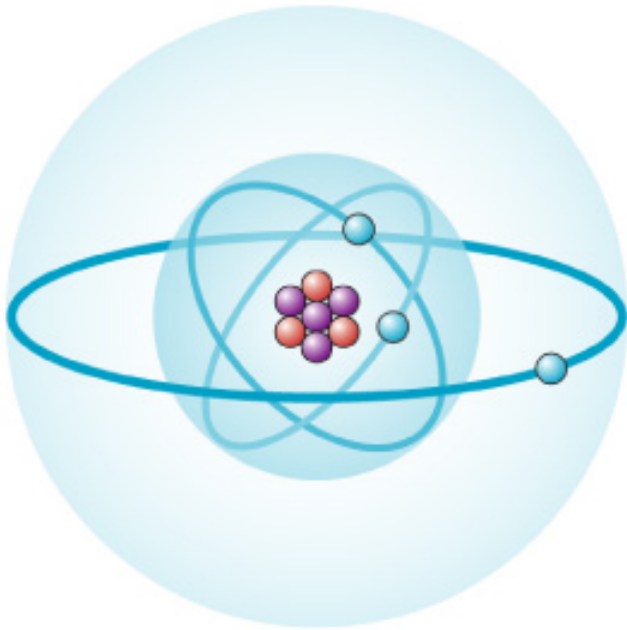
Charge!



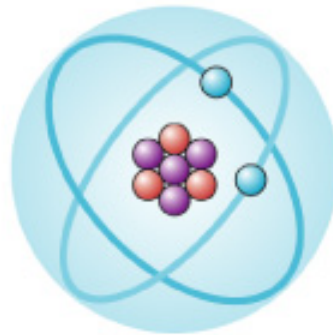
Observations...

- All matter carries charge
 - Positive
 - Negative
 - Neutral
- Likes repel, Opposites Attract
 - Neutral tends to attract positive or negative
- Charge is Quantized
 - $1.602 \times 10^{-19} \text{ C}$ (Units are Coulombs)
- Charge is Conserved

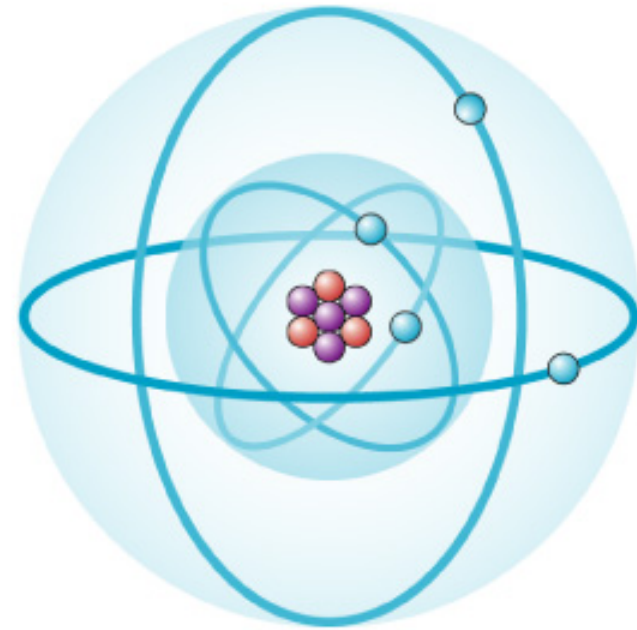
These observations give rise to the **atomic model**



(a) Neutral lithium atom (Li):
Nucleus has three protons (red)
and four neutrons (purple);
three electrons (blue) orbit nucleus



(b) Positive lithium ion (Li^+):
Made by removing an electron
from neutral lithium atom



(c) Negative lithium ion (Li^-):
Made by adding an electron
to neutral lithium atom

Excess Charge

The excess charge of an object is a function of the number (N) of charge carriers present.

Mathematically, the total excess charge of an object is equivalent to the product of the number of excess charge carriers and the charge (e) carried by each of them.

$$q = Ne$$

Quick Example...

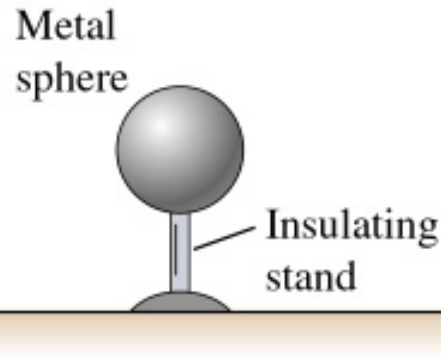
A metal sphere has a net charge of -0.513 C .
How many excess electrons are on the sphere?

Insulators and Conductors

- Materials through which charge can move easily are called *conductors*.
- Materials through which charge cannot easily move are *insulators*.

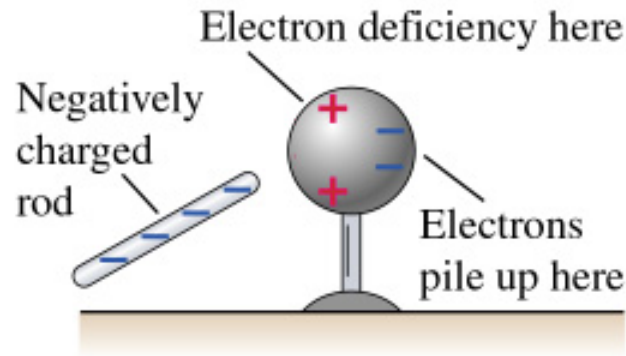
Charging by Induction

(Lab Thursday)



(a) Metal sphere is initially uncharged

Charging by Induction

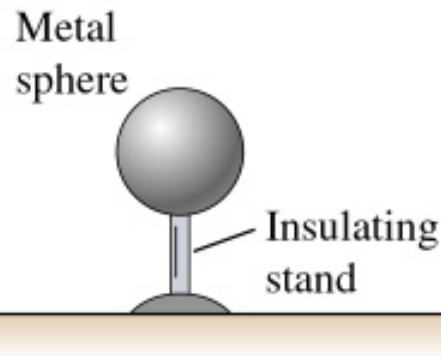


(b) Charged rod brought nearby

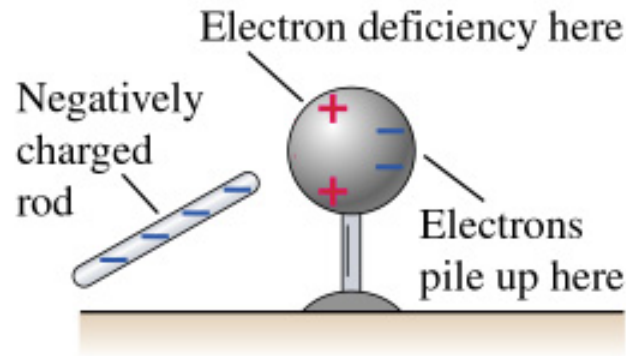
What makes the charges move?

Its called the **Coulomb Force**
(more about that next time...)

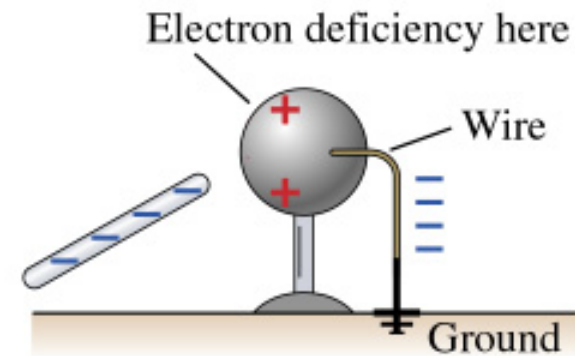
Charging by Induction



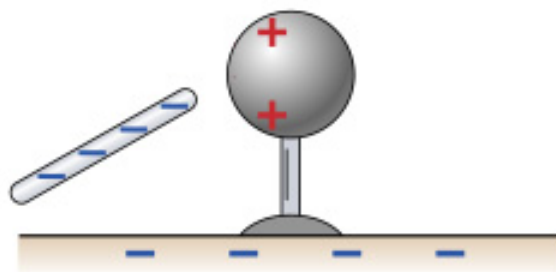
(a) Metal sphere is initially uncharged



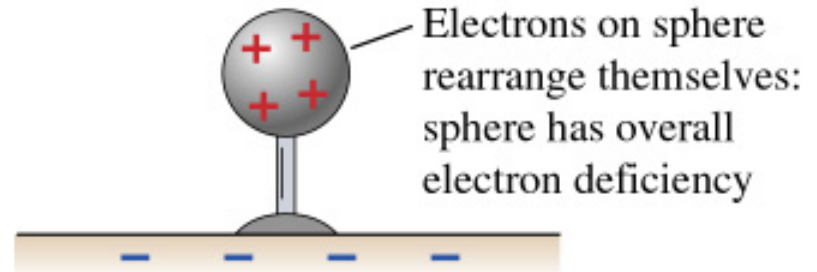
(b) Charged rod brought nearby



(c) Wire allows piled-up electrons to flow to ground



(d) Wire is disconnected from sphere



(e) Charged rod is removed