

### Static Electricity...

It was once thought that ringing church bells during a thunderstorm would protect the community against lightning. So strong was this belief, that the words, Fulgura frango, "I break the lightning" were inscribed on church bells. It was believed that the ringing church bells would ward off the evil spirits associated with the lightning, and that the sound from the bells would cause the lightning to disperse.

Nature was not impressed. In fact, not only did it storm anyway, but bell ringing became a very dangerous profession. Over a thirty-three year period during the mid-1700s, 386 church towers were struck by lightning, and 103 bell ringers were killed on the job.



**Electrostatics** is the study of charges at rest. They may move from one object to another but they are not flowing as in current electricity - that comes later...

### **The Basics... !**

The basics of Electric Charge - the Atom :

- atoms consist of protons (p), electrons (e) and neutrons (n). The p and n are fixed in the nucleus and ***never*** move, while the electrons orbit the nucleus in energy levels or shells and are more free to move around.
- neutral objects have an equal number of p and e
- positive objects have a deficit of e
- negative objects have a surplus of e
- in their natural state, most objects start off neutral

**\*protons never move!**

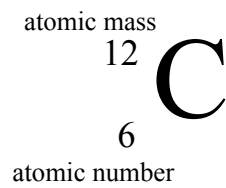
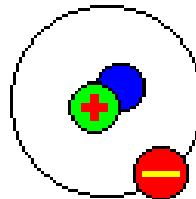
Electric charge is always caused by a surplus(extra) or deficit of (not enough) e

We will represent negative charges as (-) and positive charges as (+)

p are +   e are -   n are neutral

# p = atomic number

# p and #n = atomic mass



# p = atomic #

# e = atomic #

# n = atomic mass - atomic #

Law of Electric Charges :

- Opposite charges attract each other
- Like charges repel each other
- Charged objects will sometimes attract neutral ones

Properties of the Electric Force

- The force decreases as the distance increases.
- The electric force can act through a vacuum.
- The electric force is much larger than the gravitational force.

*Electrostatic Series*



Electroscope: (p. 529)

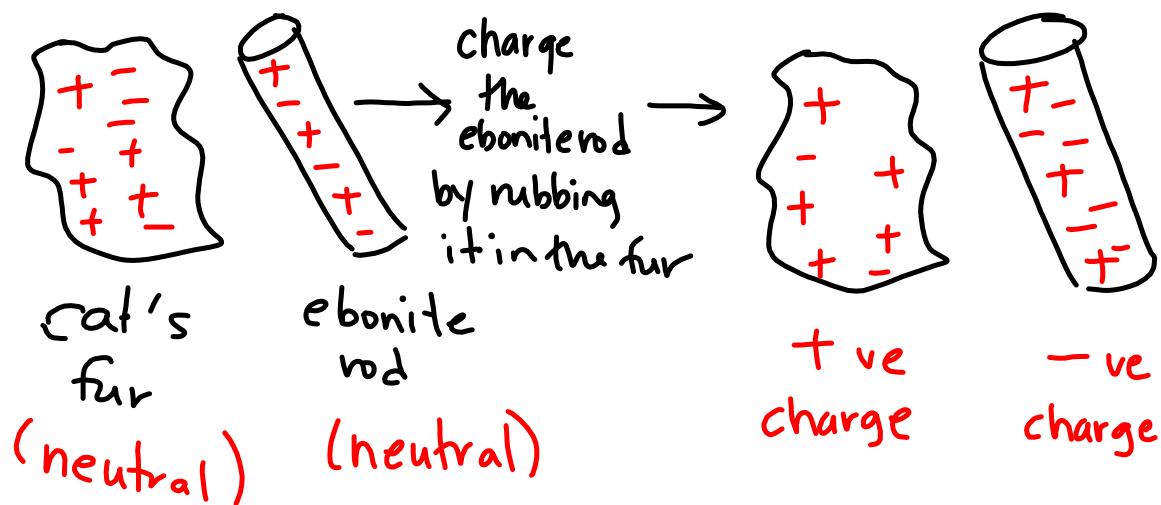
- An electroscope is any object that will allow us to detect electric charge.

\* *Note that the leaves will move apart regardless of whether the charge is (-) or (+)*

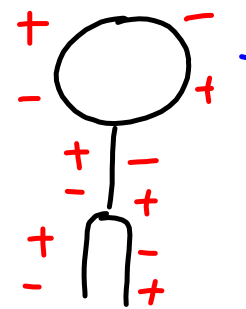
Creation and Transfer of Electric Charge

- Since all objects begin neutral, we must have some way of creating a charged object. There are three ways, friction, contact(conduction), and induction

Charging by Friction

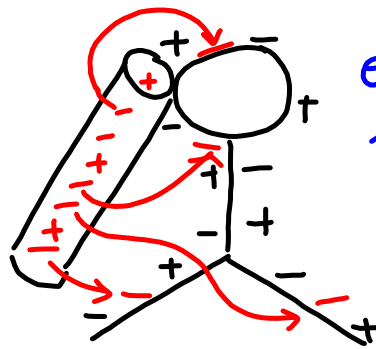


Charging by Conduction(Contact)



neutral electroscope

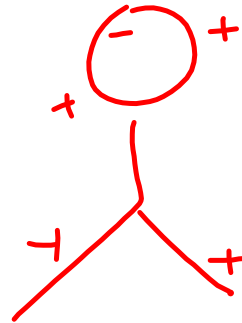
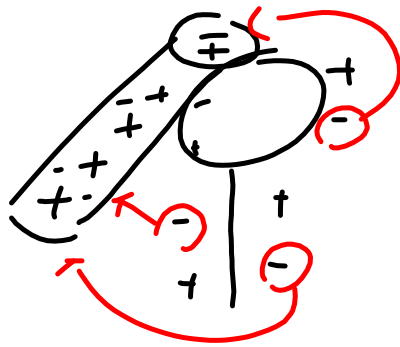
→ charge an ebonite rod by friction (with rats fur)



e<sup>-</sup> moved from the rod to the electroscope

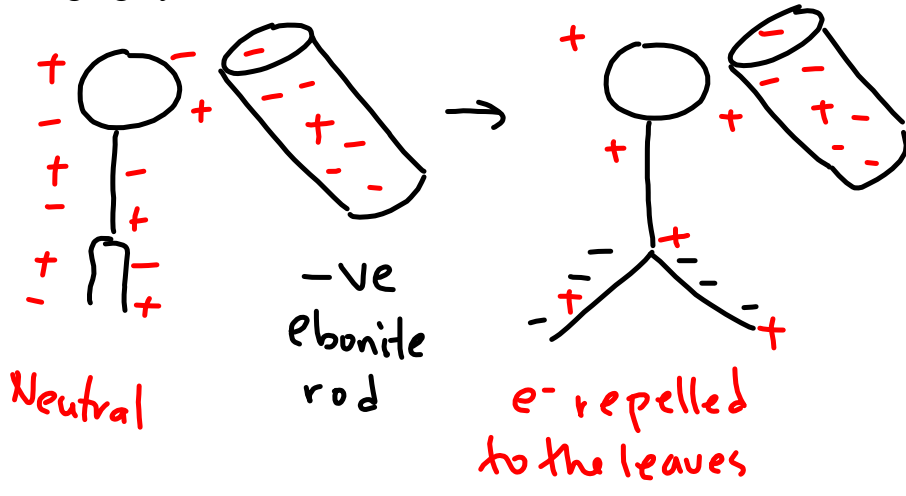
negative electroscope

\* remove ebonite rod

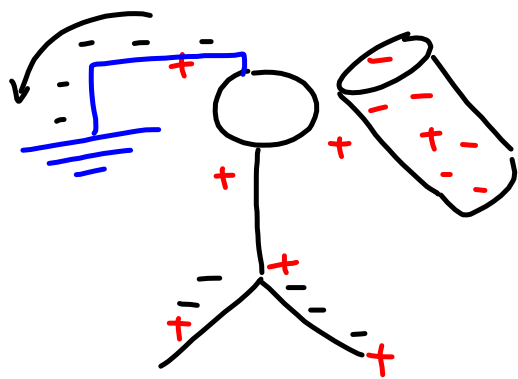




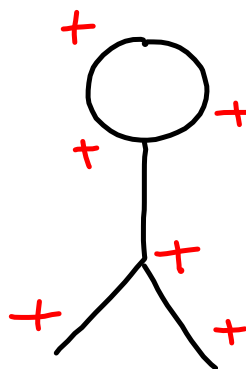
Charging by Induction



\* temporary rearrangement of charges \*



- ground the electroscope
- $e^-$  come of the electroscope



- remove grounding and the ebonite rod

Assign read p. 527 - p. 532  
Problems p. 579 #'s 1 - 6