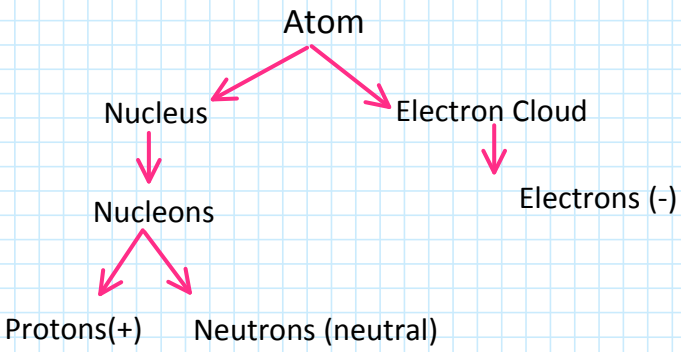
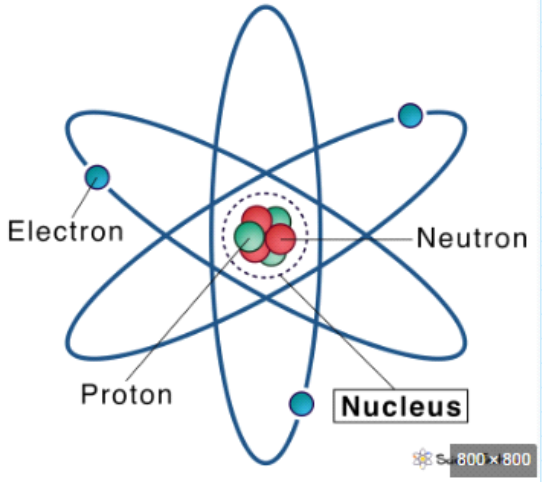
Phy "Electrostatics" Summary

Saturday, January 14, 2023 12:48 PM

1.





→ **Charge of 1 electron:** $q_{e^-} = -1.6 \times 10^{-19} C$

→ **Charge of 1 proton:** $q_{p} = +1.6 \times 10^{-19} C$

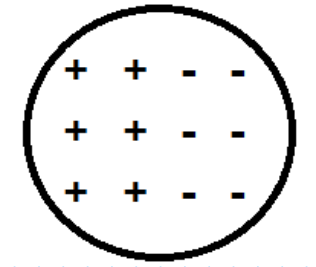
REMARK!!!

$e = 1.6 \times 10^{-19}$

↓ Elementary charge

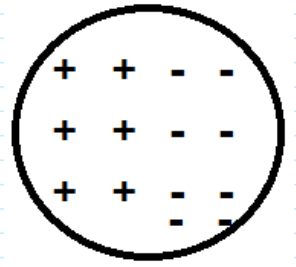
→ Like charges repel each other (++ or --)

→ Unlike charges attract each other (+-)



: Neutral ball

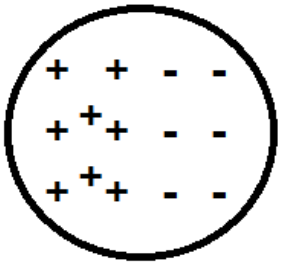
Number of protons = number of electrons



: Negatively charged ball

✓ Number of electrons > number of protons

✓ Excess electrons



: Positively charged ball

- ✓ Number of protons > number of electrons
- ✓ Suffers from deficiency of electrons

REMARK!!!

- ✓ Protons are immobile
- ✓ Electrons are mobile

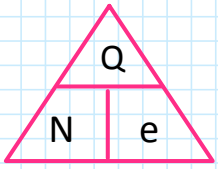
2. Quantity of Charge of an Object:

→ Deficit in electrons, excess in protons

$Q = +N \times e$

→ Excess in electrons:

$Q = -N \times e$



4. Conductors:

- ✓ Have free electrons on their surface.
- ✓ Allow the passage of electric current.

5. Insulators:

- ✓ Don't have free electrons on their surface.
- ✓ Don't allow the passage of electric current.

6. Electrification:

i. By friction:

- ✓ Two neutral objects (insulators)
- ✓ One of the objects will gain electrons (-vely charged)
- ✓ The other one will lose the same number of electrons (+vely charged)

ii. By contact:

- ✓ 2 objects (conductors)
- ✓ One of them should have a charge.
- ✓ Electrons are transferred from one object to another, until electrical equilibrium is obtained .

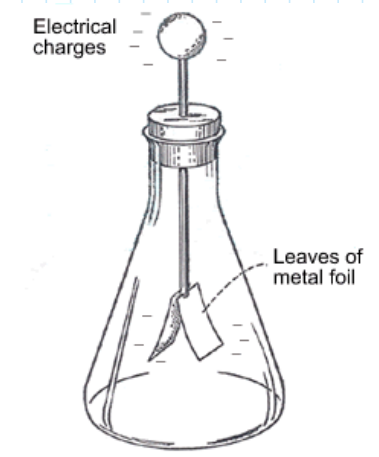
Law of conservation of electrons:

Charges are neither created nor destroyed, they are only transformed from one object to another.

$$Q_{\text{before contact}} = Q_{\text{after contact}}$$

iii. **By induction (influence):**

- ✓ +ve and -ve charges are separated inside a conductor, due to the motion of electrons.
- ✓ No physical contact.
- ✓ The net charge of the object remains constant.



7. **Metal Leaf Electroscope:**

Device used to detect the presence of electric charges .

Parts of the metal leaf electroscope:

→ Knob
→ Stem
→ Leaves (made of aluminum or gold)
→ Glass jar (insulator)

8. **Coulomb's Law:**

$$F = \frac{K \times |q_A \times q_B|}{d^2}$$

Where:

→ q_A and q_B are in coulombs(C)
→ D is in meter (m)
→ F is in Newton (N)

REMARK!!!

To neutralize object use grounding method.

$$Cm \xrightarrow{\div 10^2} m$$

$$mm \xrightarrow{\div 10^3} m$$

$$\mu C \xrightarrow{\times 10^{-6}} C$$