

ELECTRICITY

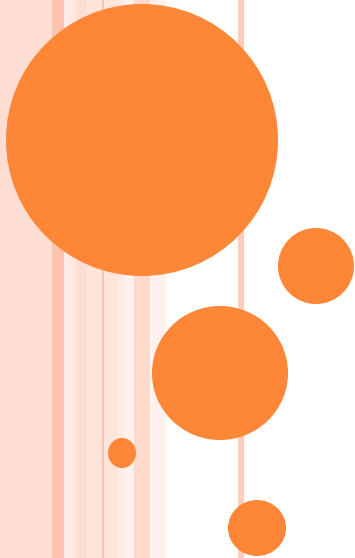
CHAPTER 12



CLASS 10TH

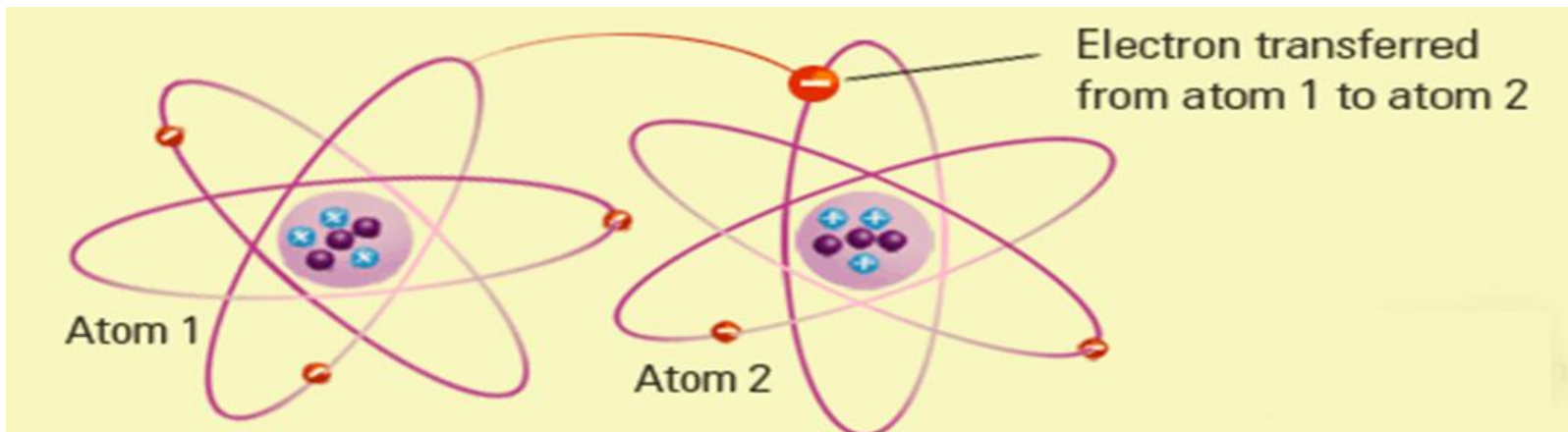
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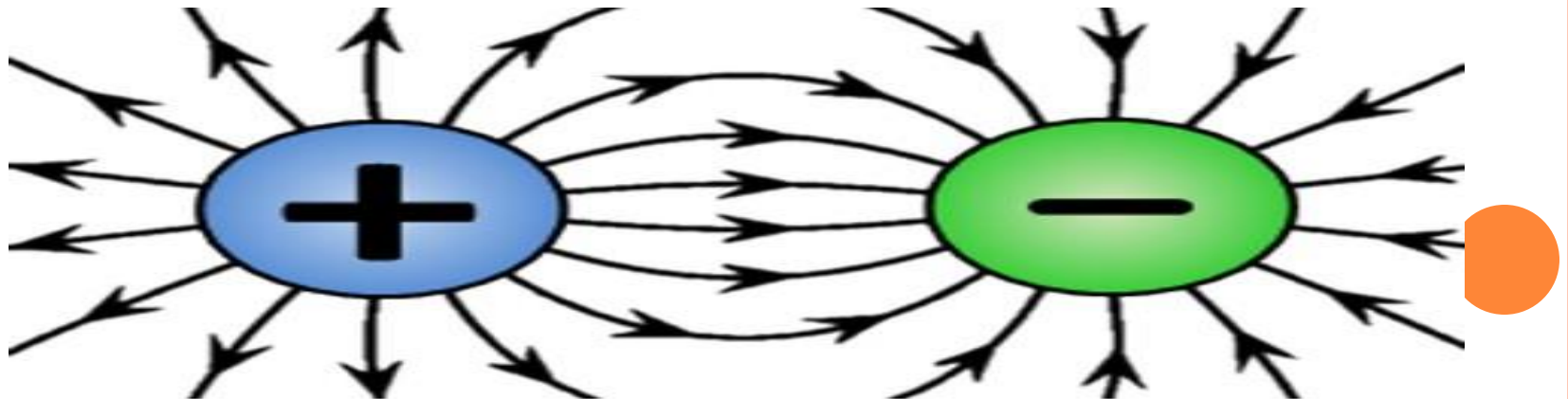
WHAT IS ELECTRICITY?

- Electricity is a form of energy.
- It is simply the flow of electrons a fundamental form of energy observable in positive and negative forms that occurs naturally (as in lightning) or is produced (as in a generator) and that is expressed in terms of the movement and interaction of electrons.



ELECTRIC CHARGE

- **Electric charge** is the physical property of matter that causes it to experience
- A force when placed in an electromagnetic field. There are two types of **electric charge**: positive and negative (commonly carried by protons and electrons respectively). Like **charges** repel each other and unlike **charges** attract each other.
- **S.I unit of electric charge**: S.I unit of electric charge is coulomb



S.I UNIT OF ELECTRIC CHARGE

- S.I unit of charge is Coulomb
- An Electron possess a negative charge of 1.6×10^{-19} C.
- S.I unit of one Coulomb is equivalent to the charge containing 6.25×10^{18} .



CONDUCTORS

- What are Conductors?
- Defined as materials that allow electricity to flow through them easily. This property of conductors that allow them to conduct electricity is known as *conductivity*.
- The flow of electrons in a conductor is known as the *electric current*. The force required to make that current flow through the conductor is known as *voltage*.
- When a charge is transferred to such an element, it gets distributed across the entire surface of the object, which results in the movement of electrons in the object.
- The charges transferred to an electrical conductor distribute until the force of repulsion between electrons in areas of excess electrons is decreased to the minimum value. When such an object is brought in contact with another conductor, the charge gets transferred from the first conductor to the other until the overall repulsion due to charge is minimized.
- Examples of conductor
 - Graphite, the human body and the earth are good conductors of electricity. Some of the common conductor examples include metals such as:
 - Copper
 - Gold
 - Iron



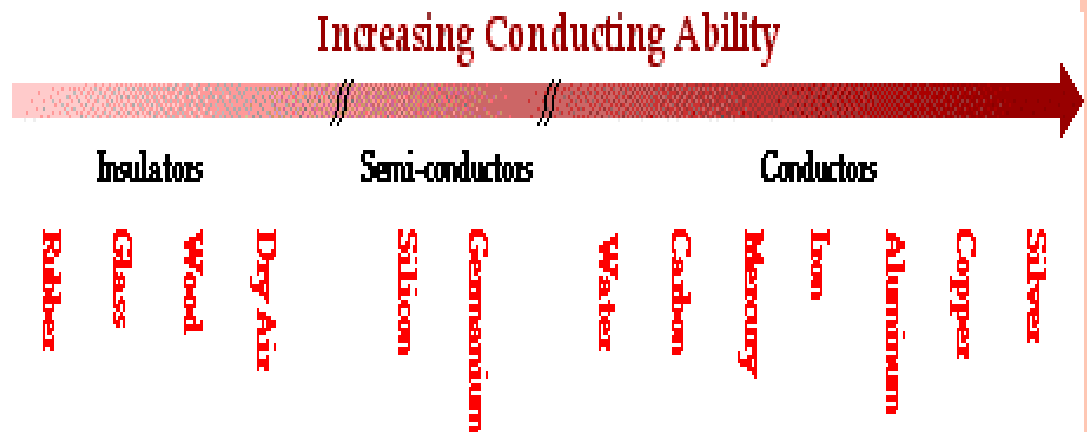
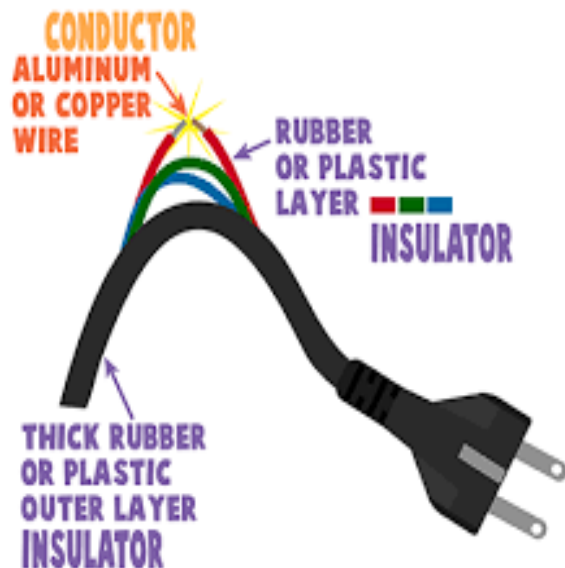
INSULATORS

- Insulators are materials that hinder the free flow of electrons from one particle of the element to another.
- If we transfer some amount of charge to such an element at any point, the charge remains at the initial location and does not get distributed across the surface.
- *Some of the common insulator examples are given below:*
 - Plastic
 - Wood
 - Glass



DIFFERENCE BETWEEN CONDUCTORS & INSULATORS

	CONDUCTORS	INSULATORS
1	These substances have the property to conduct electricity through them.	These substance have the property to obstruct the flow of electricity
2	They have free or Lossely held electron that helps in conducting electricity	They donot have free electrons present in them.
3	Example- Metals like Copper, Silver, Gold	Example- Rubber insulation, Plastic, Wood



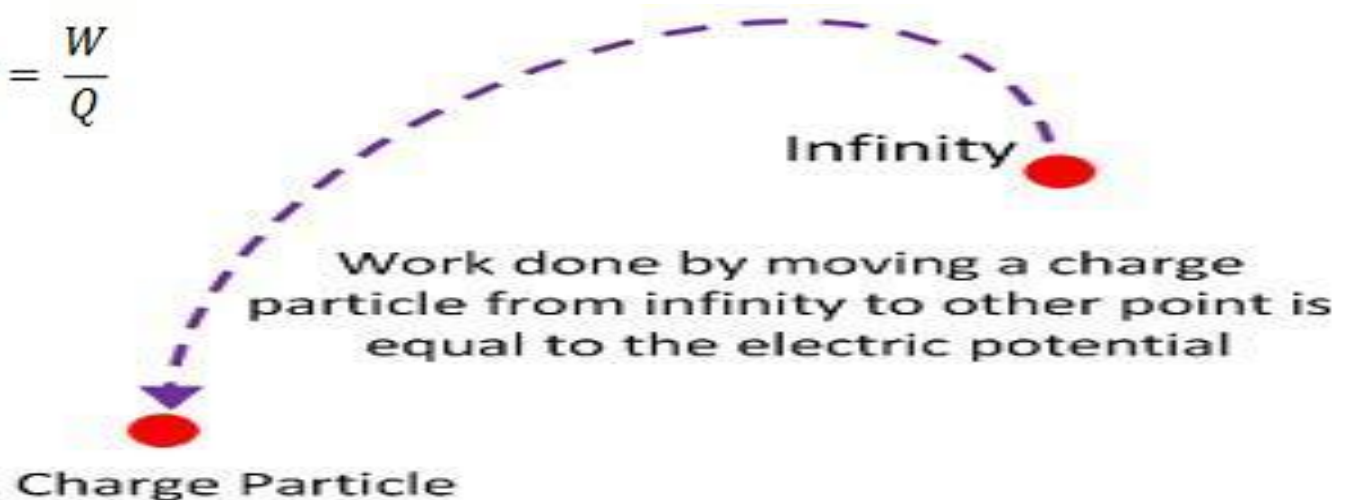
ELECTRIC POTENTIAL & POTENTIAL DIFFERENCE

○ ELECTRIC POTENTIAL

- The electrical potential is defined as the capability of the charged body to do work.
- When the body is charged, either electric electrons are supplied to it, or they are removed from it. In both the cases, the work is done. This work is stored in the body in the form of electric potential. Thus, the body can do the work by exerting a force of attraction or repulsion on the other charged particles.

$$\text{electric potential} = \frac{\text{Work Done}}{\text{Charge}}$$

$$V = \frac{W}{Q}$$



○ POTENTIAL DIFFERENCE

- The electrical potential difference is defined as the amount of work done to carrying a unit charge from one point to another in an electric field. In other words, the potential difference is defined as the difference in the electric potential of the two charged bodies.
- **Unit:** The S.I unit of potential difference is **volt**.
- Potential difference V is found with following Formula

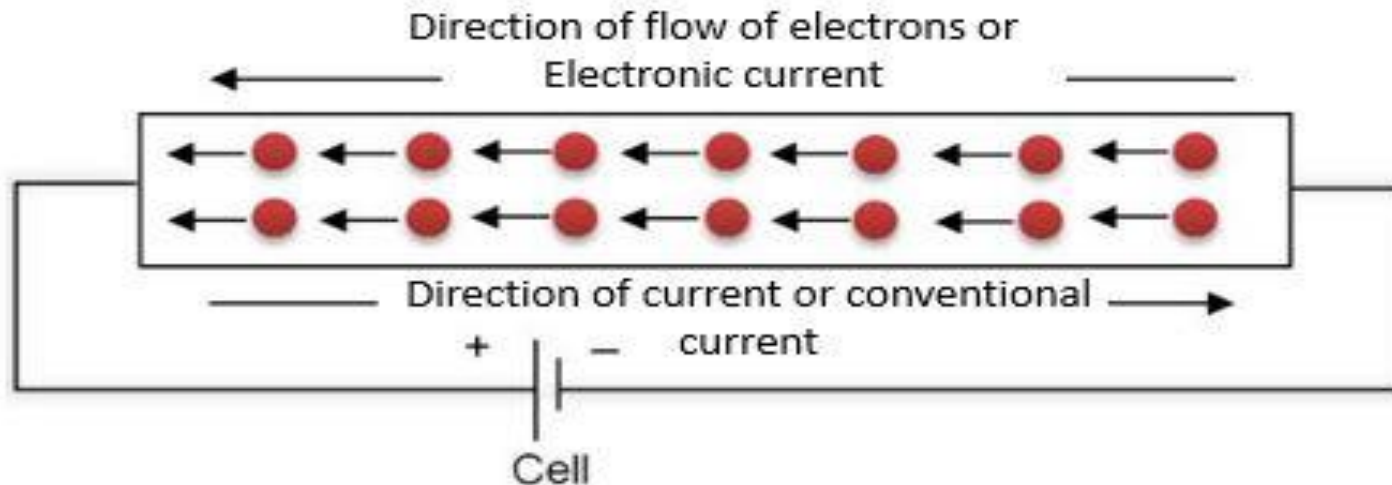
$$V = \frac{W}{Q}$$

Where V is Potential Difference, W is Work Done & Q is Electric current.



ELECTRIC CURRENT

- **Definition:** Electric current is defined as the rate of flow of negative charges of the conductor. In other words, the continuous flow of electrons in an electric circuit is called an electric current.
- The conducting material consists a large number of free electrons which move from one atom to the other at random.

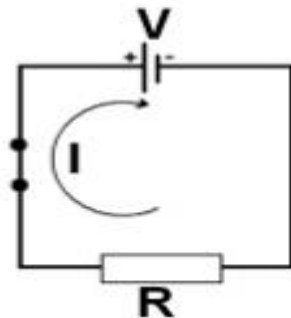


OHM'S LAW

- Ohm's law states that the voltage or potential difference between two points is directly proportional to the current or electricity passing through the resistance, and directly proportional to the resistance of the circuit.
- The formula for Ohm's law is **$V=IR$** .
- This relationship between current, voltage, and relationship was discovered by German scientist Georg Simon Ohm.



Georg Simon Ohm (1789-1854)
físico y matemático alemán



$$R = \frac{V}{I}$$

$$I = \frac{V}{R}$$

$$V = R \cdot I$$



- **Ohm's Law Formula**

- Voltage= Current× Resistance

$$V = I \times R$$

V= voltage, I= current and R= resistance

- The SI unit of resistance is **ohms** and is denoted by **Ω**
- This law is one of the most basic laws of electricity. It helps to calculate the power, efficiency, current, voltage, and resistance of an element of an electrical circuit.



ELECTRICAL RESISTANCE

- The **electrical resistance** of an object is a measure of its opposition to the flow of electric current.
- Flow of electrons in a conductor is electric current. The particles of conductor create hindrance to flow of electrons; because of attraction between them. This hindrance is the **cause of resistance** in the flow of electricity.
- Symbol of resistance



- Resistance is the characteristic of a material which opposes the flow of electric current. It depends on the following factors.

i) **Length of the conductor (l) :**

R is directly proportional to "l"

ii) **Area of cross -section (A):** R is inversely proportional to "A"

iii) **Nature of the material**

iv) **Temperature**

From i) and ii), R is directly proportional to "l/A"

rho = Resistivity of a material

Resistivity depends only on the nature of the material

So, if the length is doubled of a conductor, the nature of the material will not be affected and hence, resistivity will not be changed.

$$R = \frac{\rho L}{A}$$

ρ = resistivity
 L = length
 A = cross sectional area



HEATING EFFECT OF ELECTRIC CURRENT

- When electric current flows through a wire, the wire gets heated. This is called the heating effect of electric current.
- Factors affecting the amount of heat produced are as follows:
 - 1) The strength of Electric current
 - 2) Resistance of the heating Element(Nature of Material, Length & thickness of wire).
 - 3) Time for which Electric current flows.





THANK YOU

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