



01

CHAPTER

BASICS OF ELECTRICITY

أساسيات الكهرباء

TOPICS

Basics of electricity



Scientific content prepared by
Booknerd Team

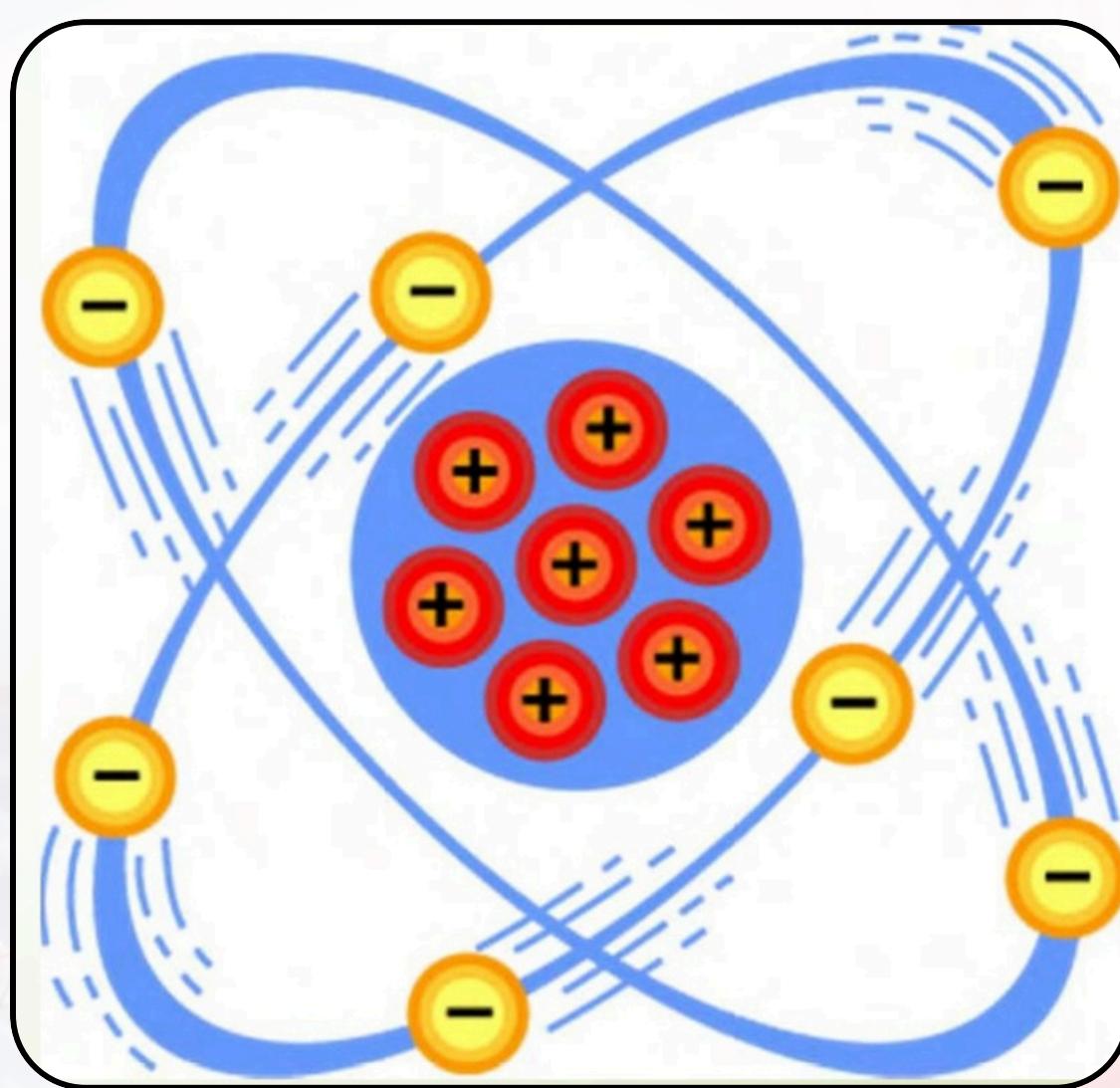


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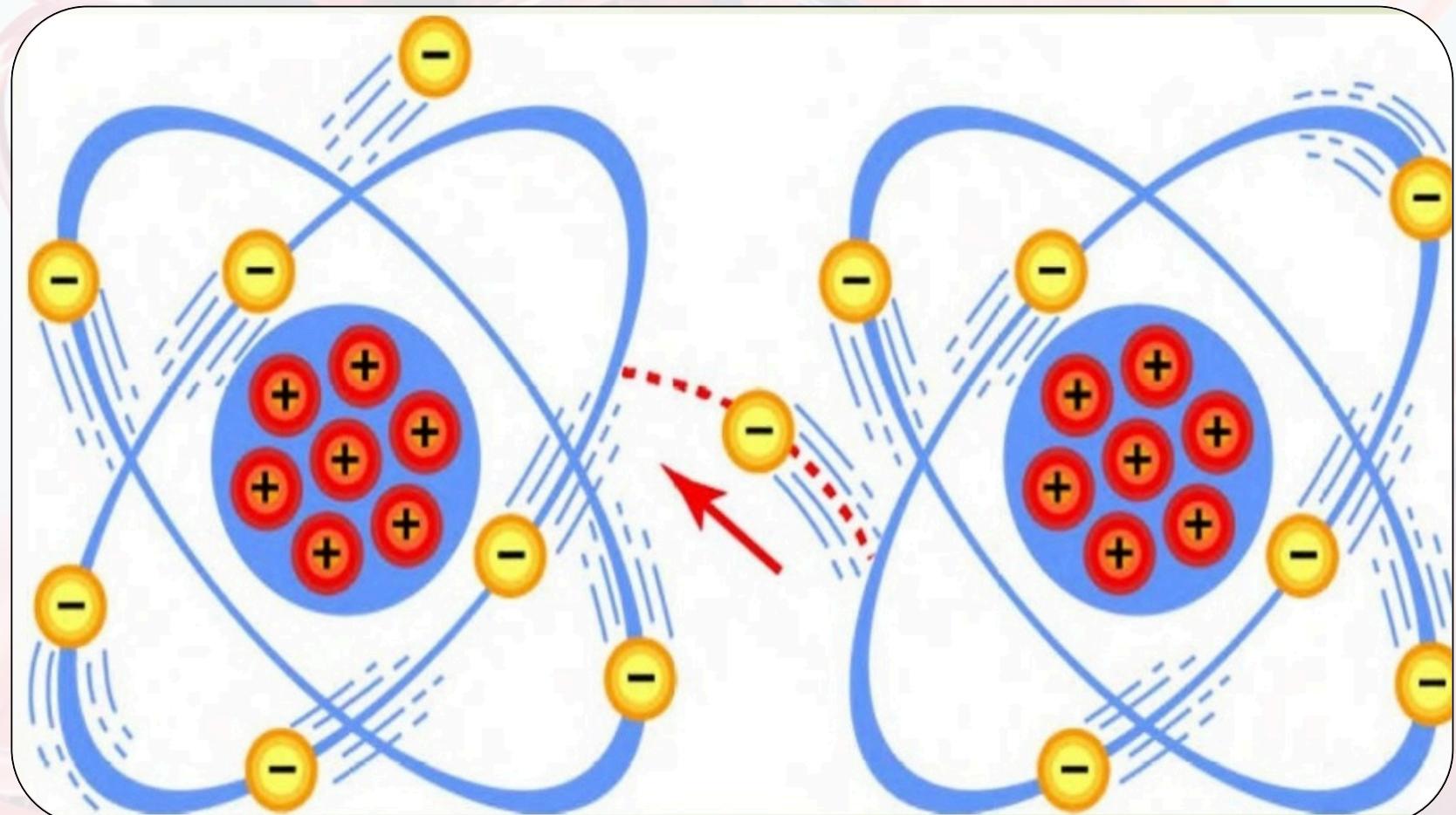


Basics of electricity



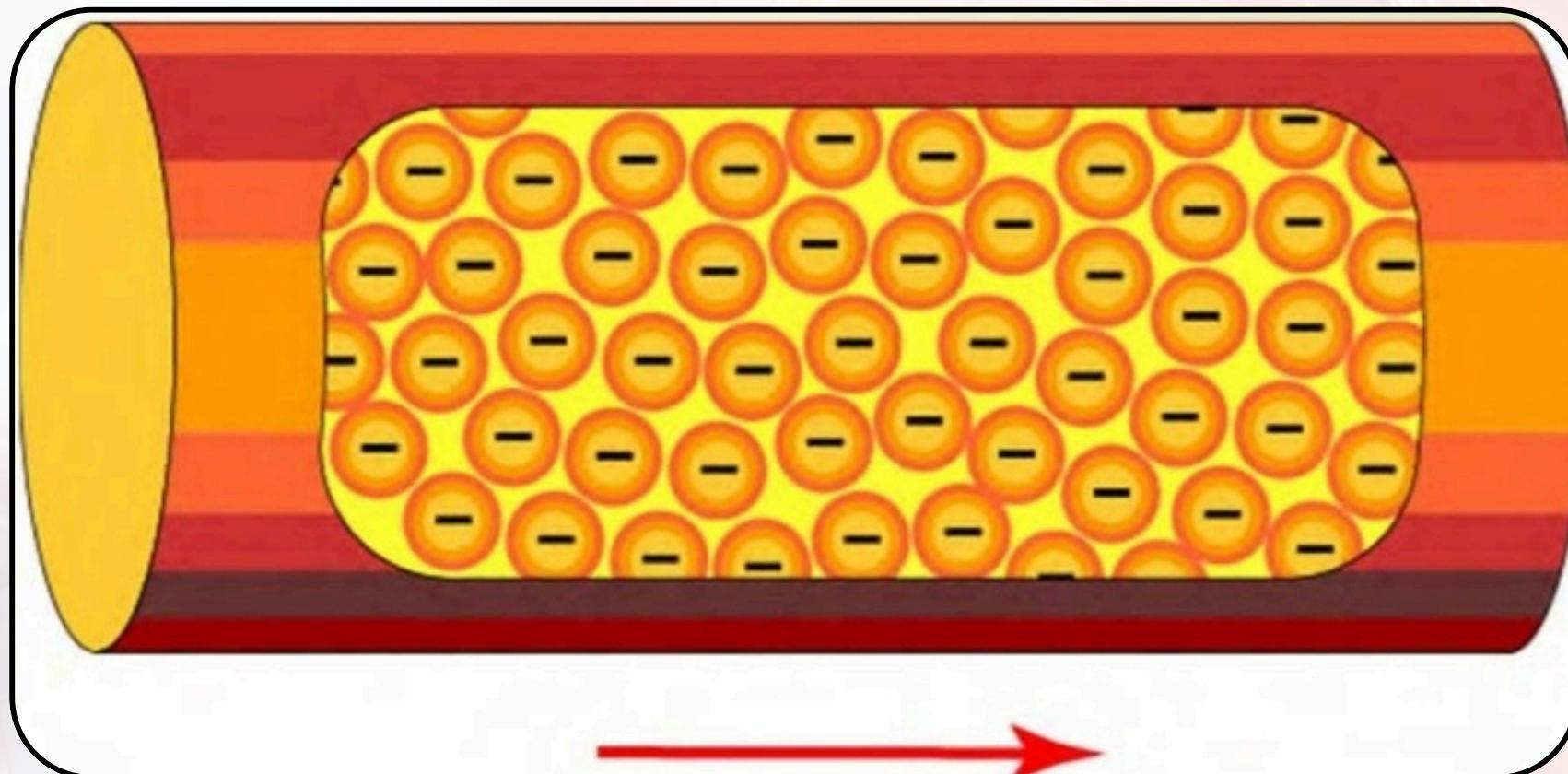
- All matter is composed atoms.
- Atoms have a nucleus with electrons moving around it.
- The nucleus is composed of protons and neutrons.
- Most atoms have an equal number of electrons and protons.
- Electrons have a negative charge (-).
- Protons have a positive charge (+).
- Neutrons are neutral.
- The negative charge of the electrons is balanced by the positive charge of the protons.
- Electrons are bound in their orbit by the attraction of the protons.
- These are referred to as bound electrons.

- Electrons in the outer band can become free of their orbit by the application of some external force such as movement through a magnetic field, friction, or chemical action.
- These are referred to as free electrons.

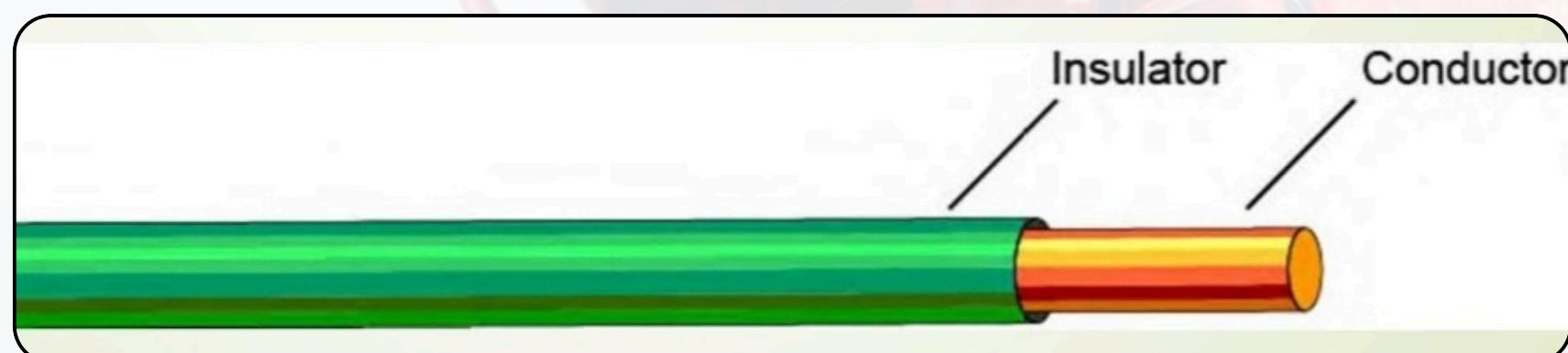




- A free electron leaves a void which can be filled by an electron forced out of orbit from another atom.
- As free electrons move from one atom to the next an electron flow is produced.
- This is the basis of electricity.

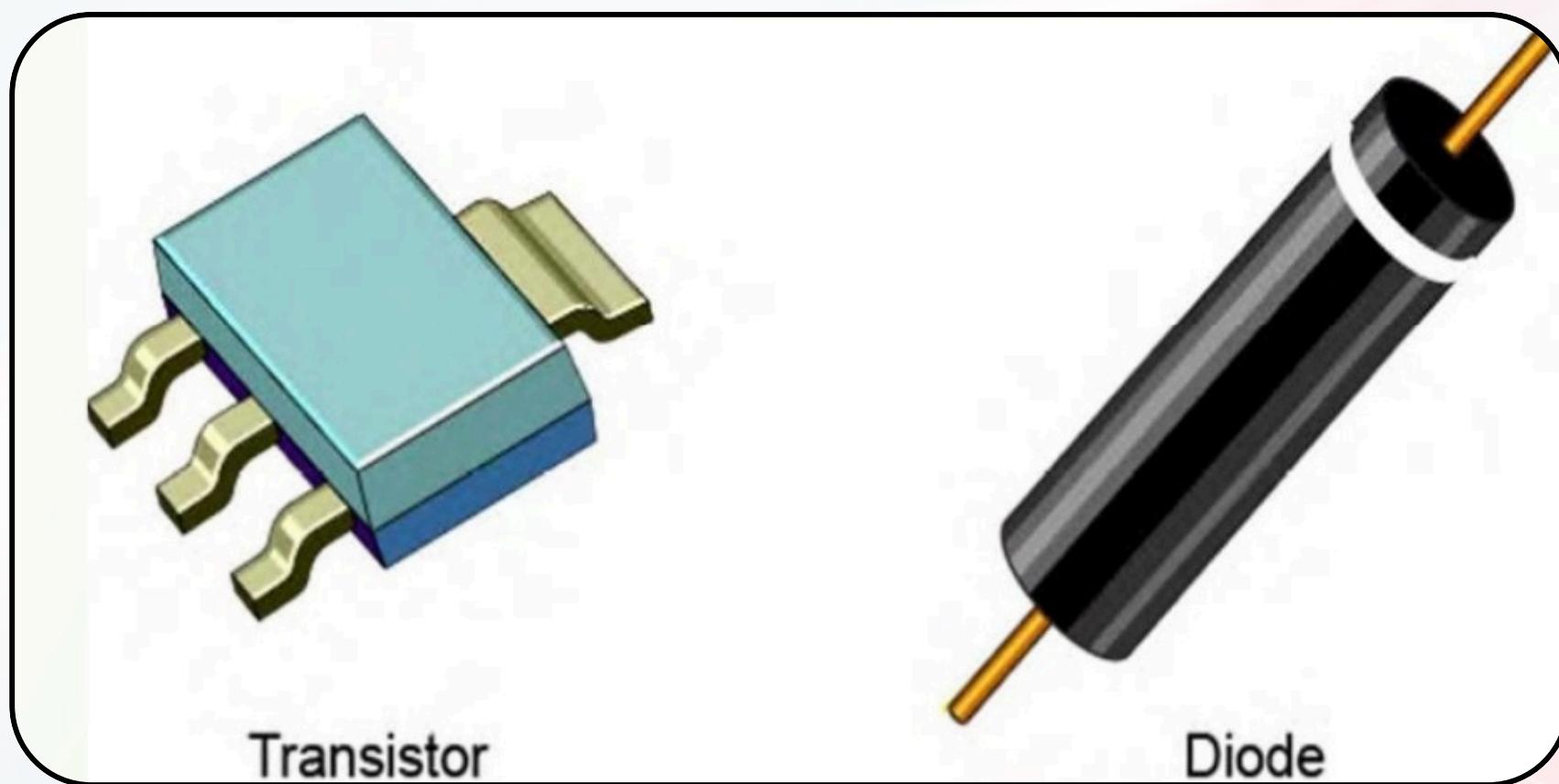


- An electric current is produced when free electrons move from one atom to the next.
- Materials that permit many electrons to move freely are called conductors.
- Copper, gold, silver, and aluminium are examples of materials that are good conductors.
- Copper is widely used as a conductor because it is one of the best conductors and is relatively inexpensive.



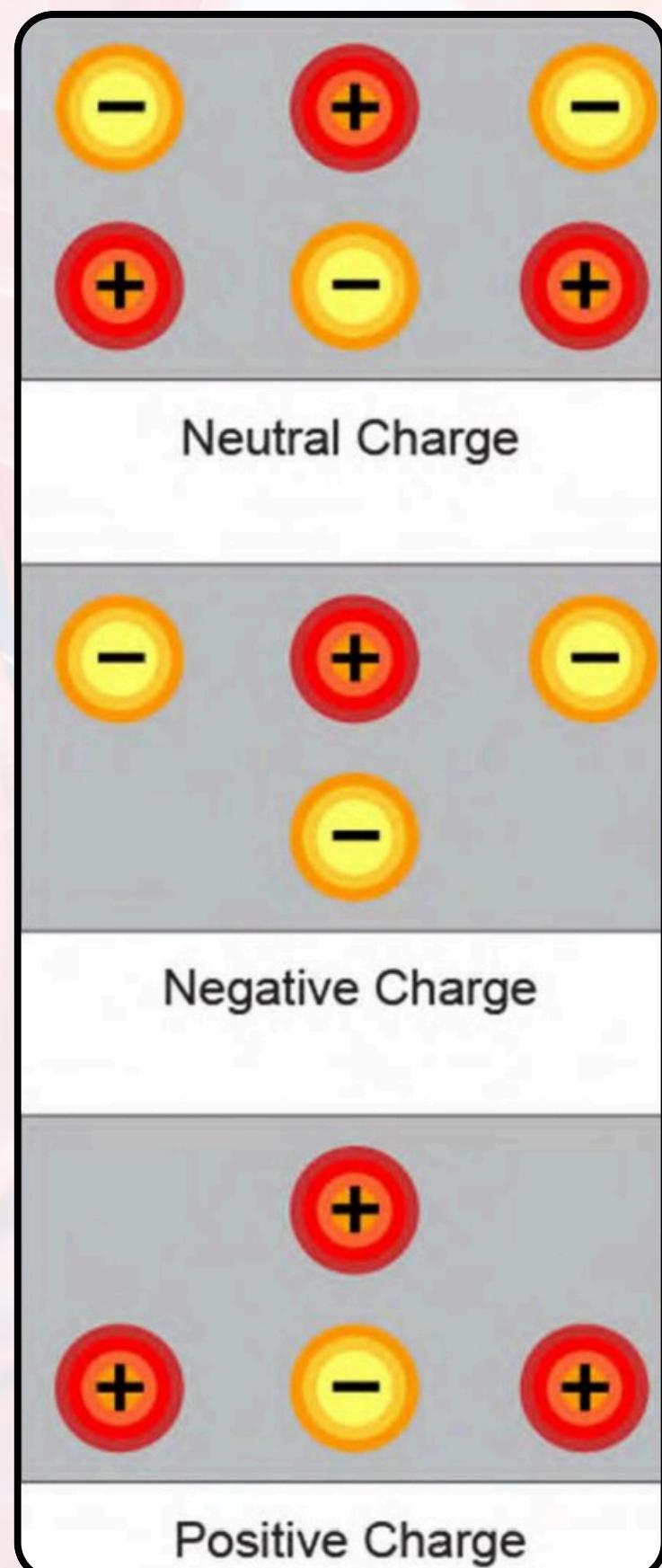
- Materials that allow few free electrons are called insulators.
- Materials such as plastic, rubber, glass, mica, and ceramic are examples of materials that are good insulators.
- An electrical cable is one example of how conductors and insulators are used together.
- Electrons flow along a copper conductor in a circuit and the insulator around the outside of the copper conductor keeps electrons in the conductor.





- Semiconductor materials, such as silicon, can be used to manufacture devices that have characteristics of both conductors and insulators.
- Many semiconductor devices act like a conductor when an external force is applied in one direction and like an insulator when an external force is applied in the opposite direction.
- This principle is basic to the operation of transistors, diodes, and other solid state electronic devices.

- Elements are defined by the number of electrons in orbit around the nucleus of an atom and by the number of protons in the nucleus.
- A hydrogen atom, for example, has only one electron and one proton.
- An aluminium atom has 13 electrons and 13 protons.
- An atom with an equal number of electrons and protons is said to be electrically neutral.
- Electrons in the outer band of an atom are easily displaced by the application of some external force.
- Electrons which are forced out of their orbits can result in a lack of electrons where they leave and an excess of electrons where they come to rest.



- A material with **more protons than electrons** has a **net positive charge**, and a material with **more electrons than protons** has a **net negative charge**.
- A positive or negative charge is caused by an absence or excess of electrons, because the number of protons in an atom remains constant

