



01

CHAPTER

BASICS OF ELECTRICITY

أساسيات الكهرباء

TOPICS

Basics of electricity



Scientific content prepared by
Booknerd Team



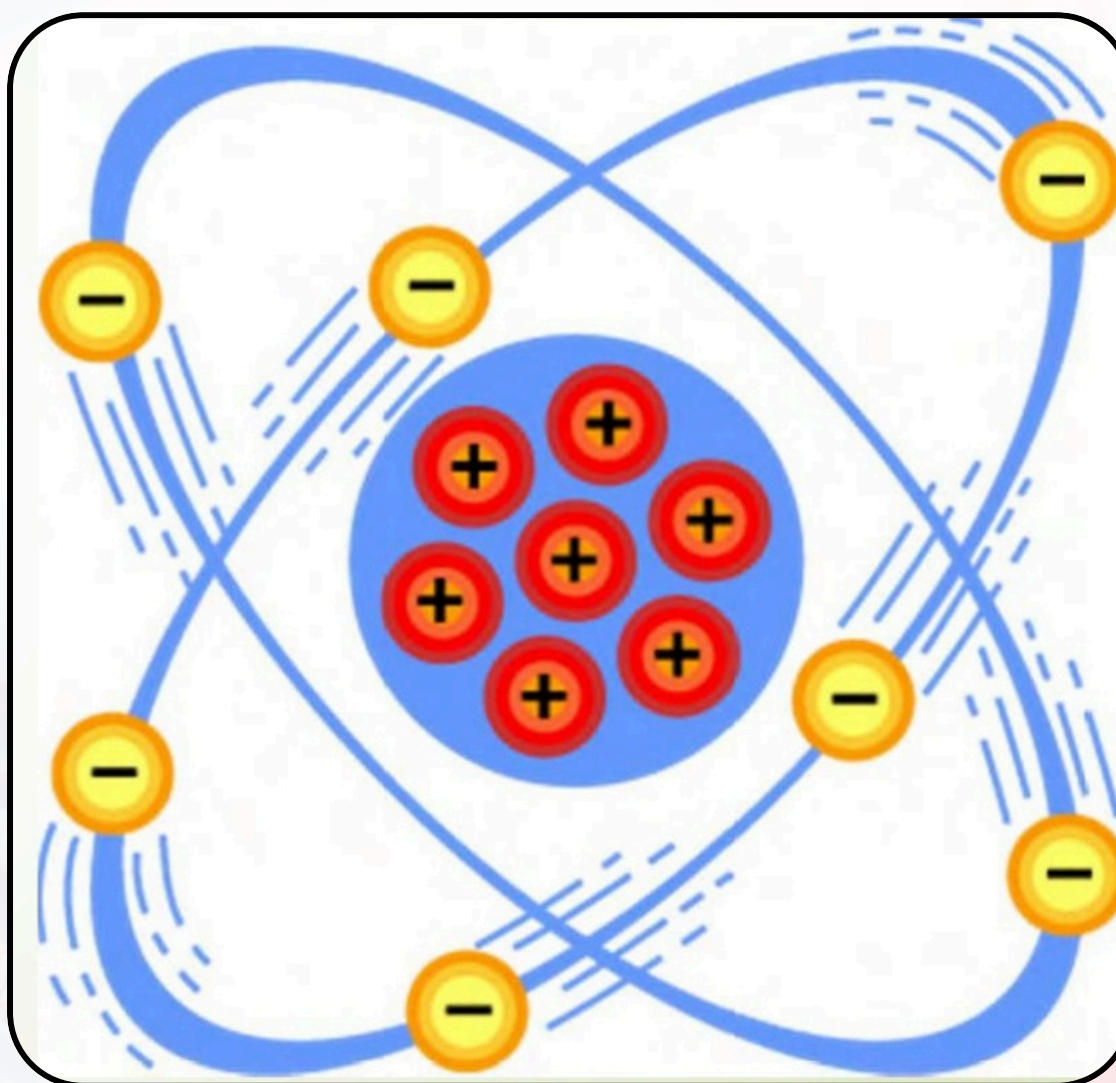
01092318718

DENT - 6 OCT





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**.

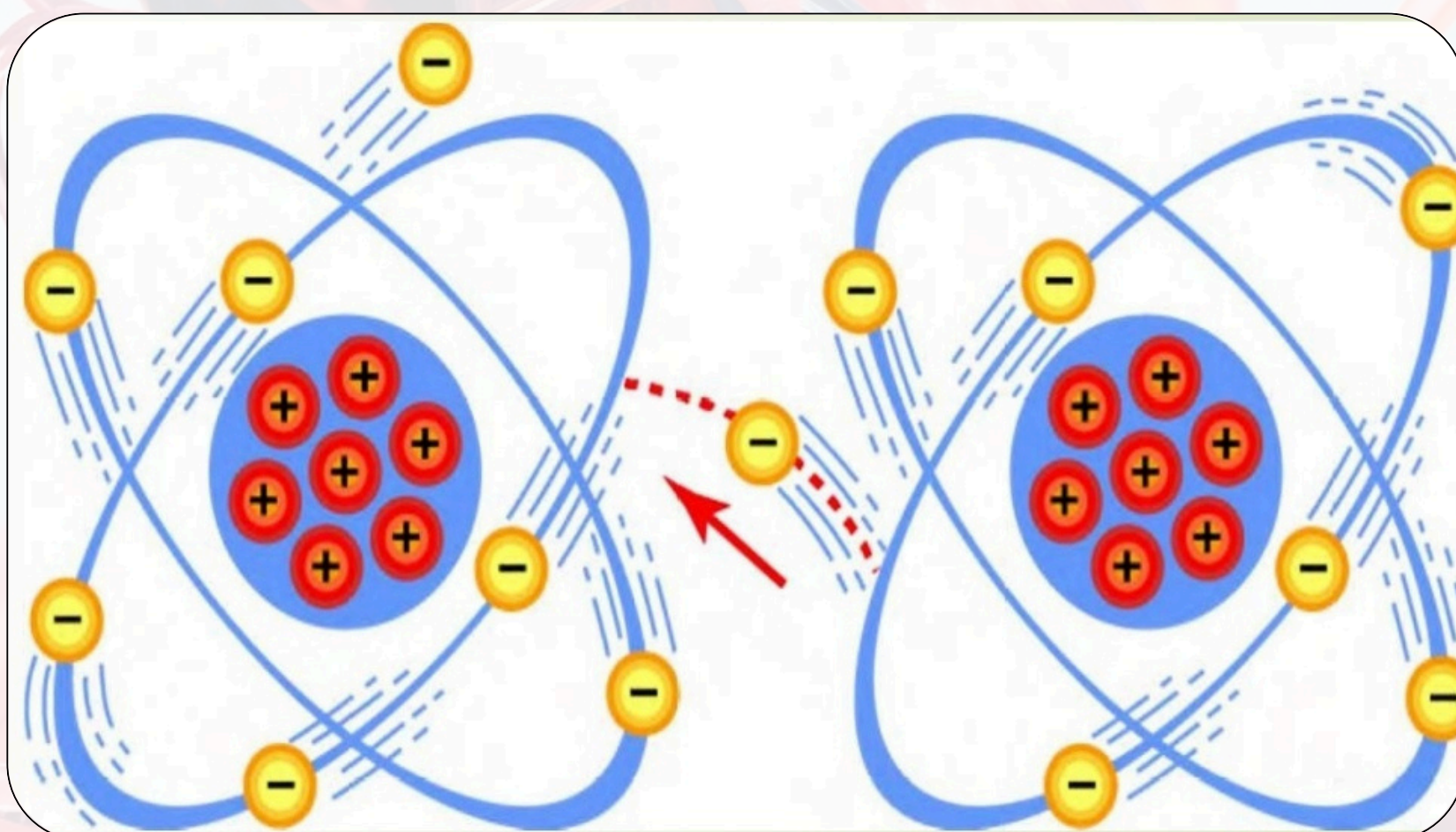
- Most atoms have an **equal** number of electrons and protons.
- **Electrons** have a **negative** charge (-).
- **Protons** have a **positive** charge (+).
- **Neutrons** are **neutral**.

- 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**.

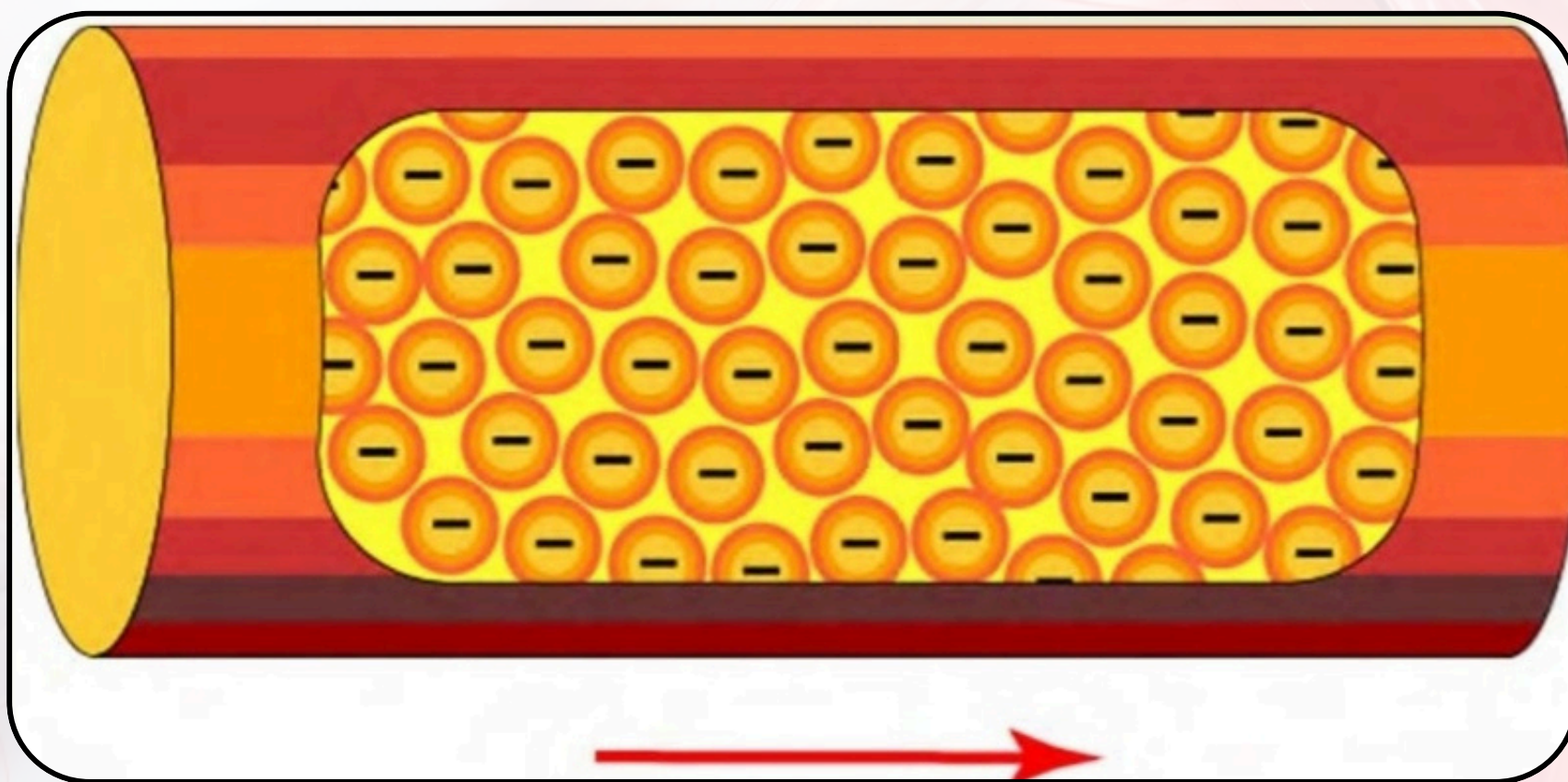
- Electrons in the **outer band** can become free of their orbit by the application of some **external force** such as **movement** through a magnetic field, friction, or chemical action.

- These are referred to as **free electrons**.

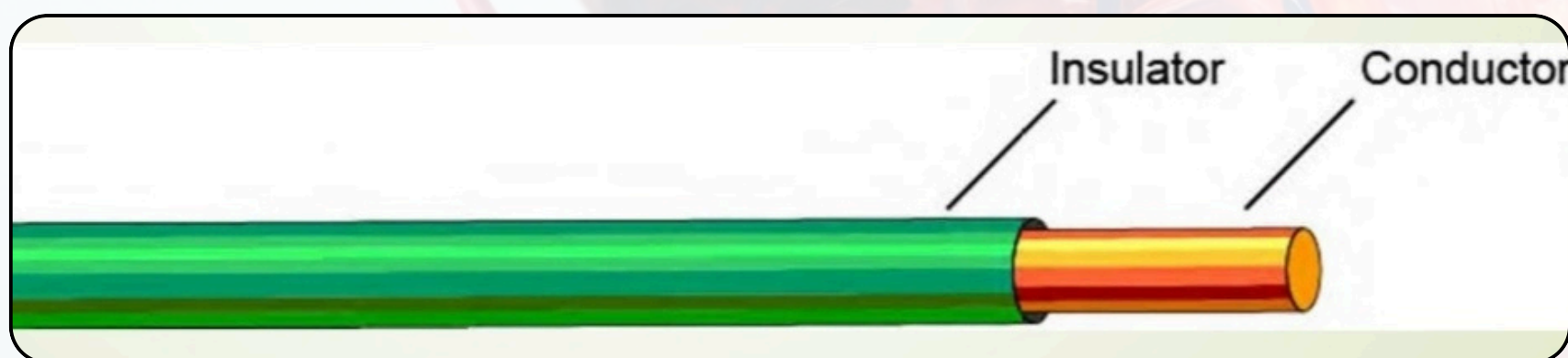




- A free electron leaves a void which can be filled by an electron forced out of orbit from another atom.
- As free electrons move from one atom to the next an electron flow is produced.
- This is the basis of electricity.

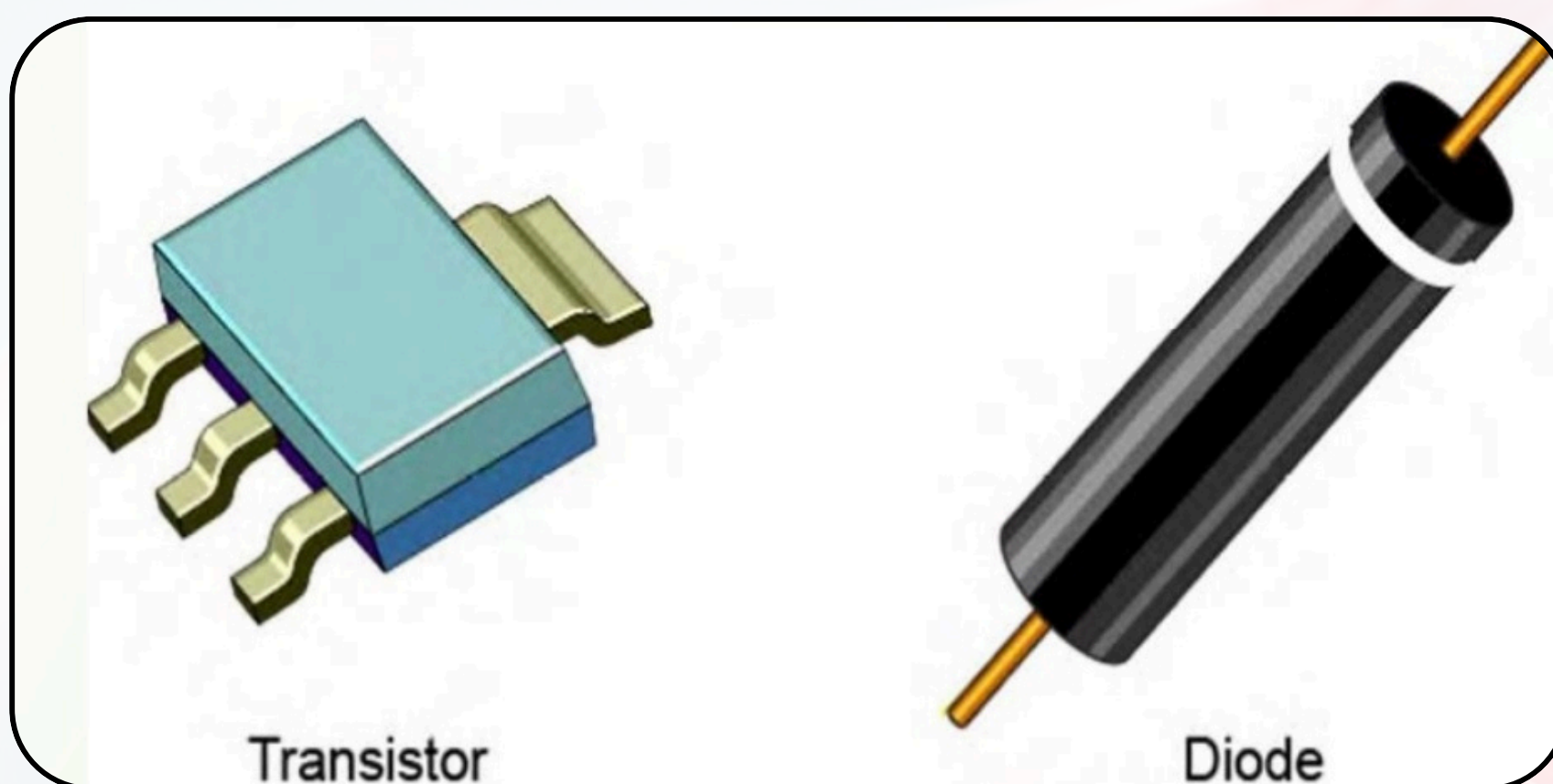


- An electric current is produced when free electrons move from one atom to the next.
- Materials that permit many electrons to move freely are called conductors.
- Copper, gold, silver, and aluminium are examples of materials that are good conductors.
- Copper is widely used as a conductor because it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





Transistor

Diode

- **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.**

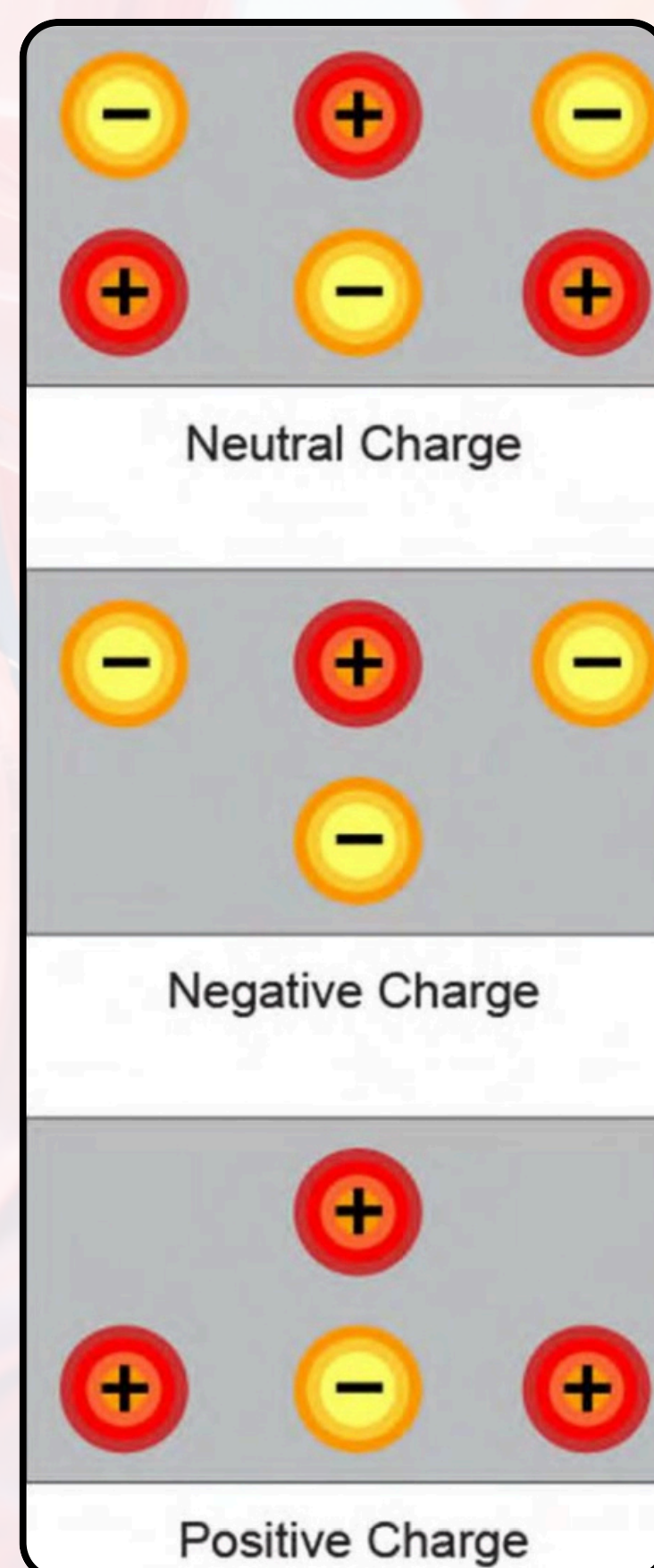
- **A hydrogen atom, for example, has only one electron and one proton.**

- **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

