Al-Zahraa University for women
College of health and medical technologies
Radiology department
The first stage

Atom and Structure of an atom

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Contents

- atom and its structure of atom.
- molecule and the element .
- the chemical bonds:

❖ A covalent bond

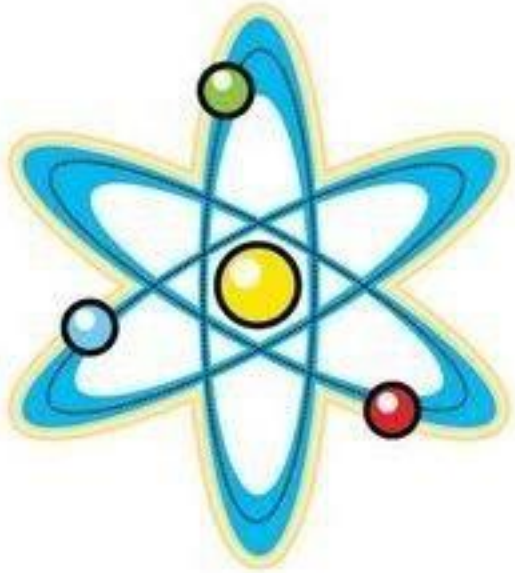
❖ ionic bonds

❖ Metallic bonds

Aims of Lecture

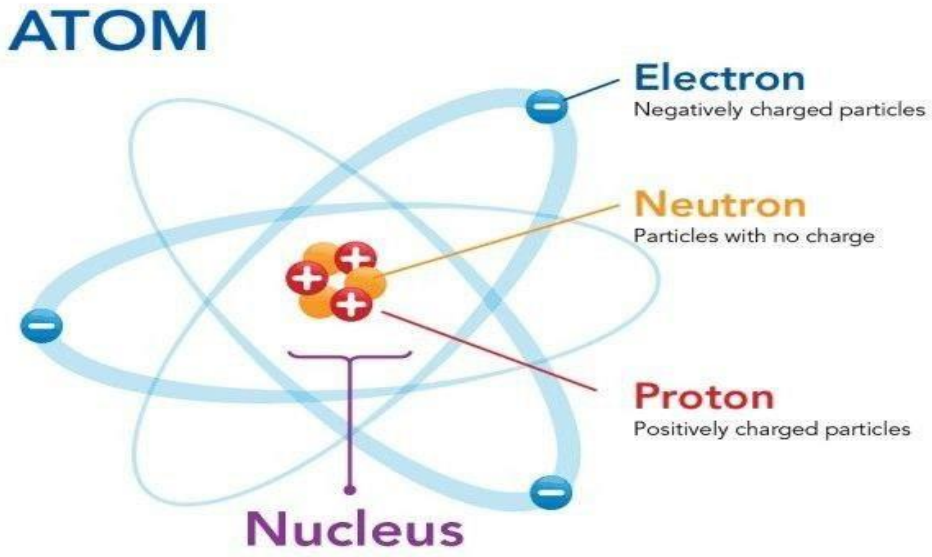
- The student should learn about the atom and its structure.
- The student should learn about the molecule and the element .
- The student should compare the atom, the molecule and the element.
- The student should learn about the chemical bonds between the atom, the molecule and the elemen.

What does this picture mean to you?



Atom

An atom is the smallest unit of matter that retains all of the chemical properties of an element.

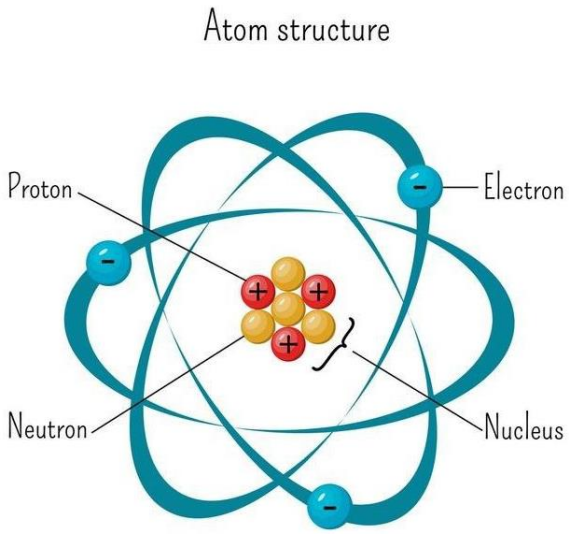


They are submicroscopic, meaning they are so small they cannot be seen with a microscope. They are composed of smaller subatomic particles known as protons, neutrons, and electrons.

The number of protons is called the atomic number. This number uniquely identifies each chemical element..

A molecule is formed when two or more atoms of any kind of element are joined together chemically

Structure of an atom

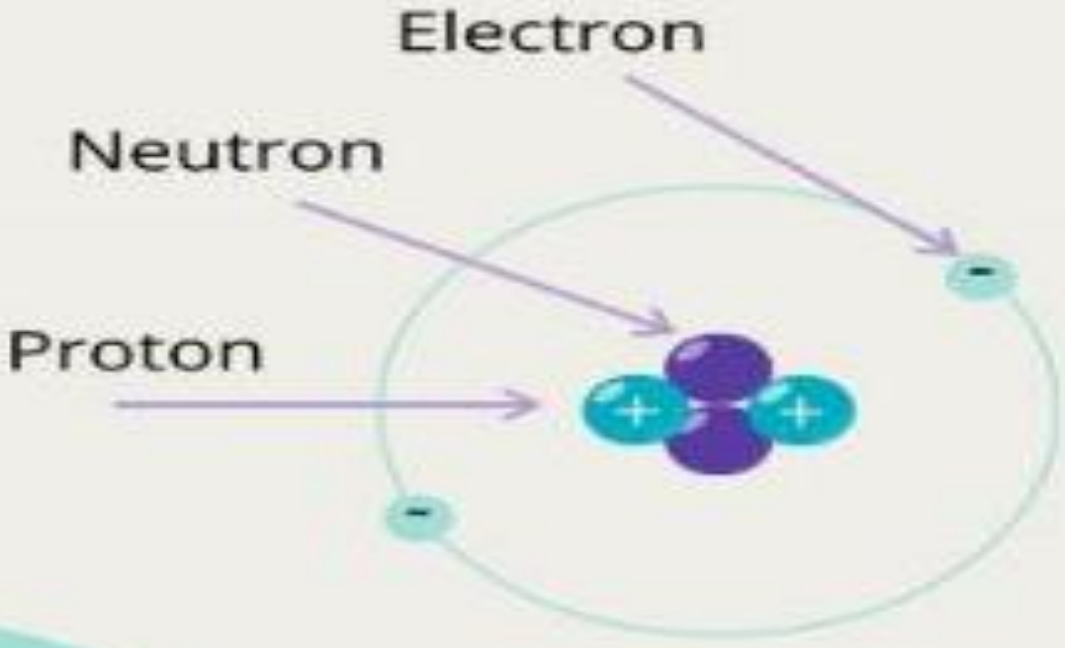


3 kinds of sub-atomic particles

- **Protons**: positively charged, in nucleus
- **Neutrons**: neutrally charged, in nucleus
- **Electrons**: negatively charged, in cloud around nucleus

How to Calculate Atomic and mass number

ATOMIC NUMBER VS MASS NUMBER



Mass number is the number of protons plus neutrons

$^{4}_{2}He$

Helium

Atomic number is the number of protons

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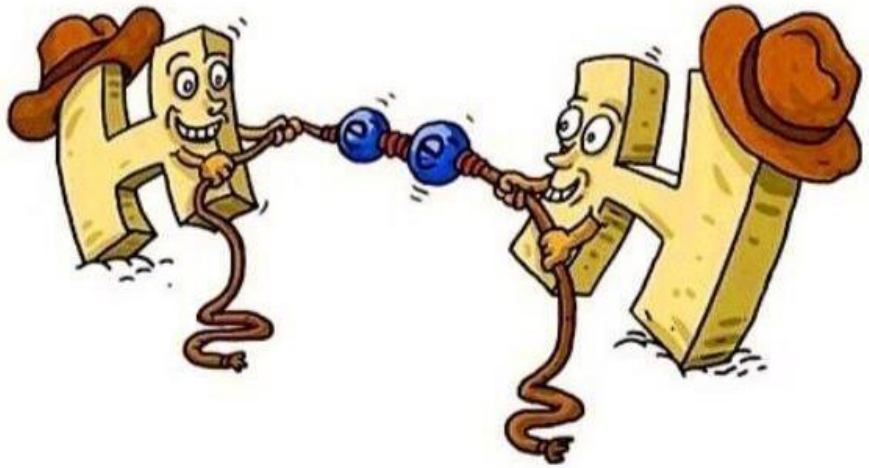
Molecule

A molecule: is two or more atoms connected by chemical bonds which form the smallest unit of a substa



H_2
O_2
N_2
F_2
Cl_2
Br_2
I_2

Element

A element is a pure substance made of one type of atom

- Elements are divided into metals and non- metals

❖ **Examples of non-metal elements** include carbon, oxygen, hydrogen, and nitrogen

❖ **Examples of metal elements** include aluminum, iron, copper, and gold.

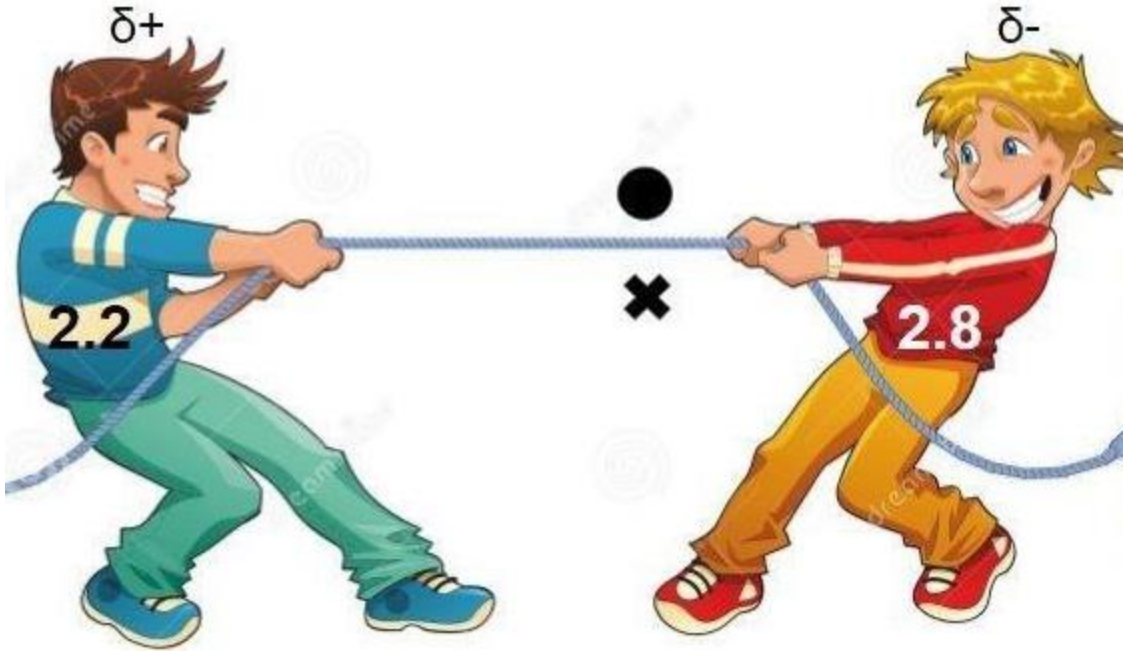
Group activity

What is the difference between an atom, a molecule, and an elemen?

What is the difference between an atom, a molecule, and an elemen?

Atom	Molecule	Element
Atom is a smallest particle of an element.	Molecule is a group of two or more atoms combined together.	Element is a pure substance that cannot be converted into simpler substance by any chemical or physical means.
It consists of nucleus (containing protons and neutrons) and electrons.	It consists of combination of two or more same or different atoms chemically bound together. e.g. H_2,	It is made up of atoms of only one kind.

What does this picture mean to you?



Chemical bonds

Chemical bonds: The phenomenon of cohesion of atoms in a molecule, crystal, etc.

All chemical bonds are due to the interaction of electrons present in the atom

There are three main types of chemical bonds:

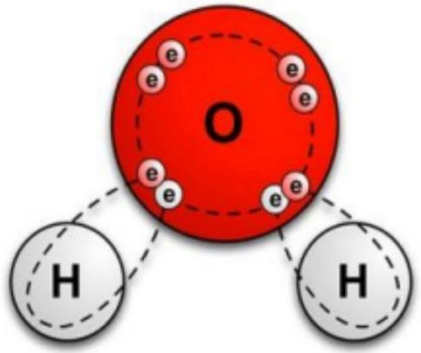
1. **covalent bonds**, which usually form between nonmetals.
2. **ionic bonds**, which usually form between metals and nonmetals.
3. **metallic bonds**, which form between metals.

- Valence electrons, or outer electrons, are the electrons responsible for forming these different types of chemical bonds.

A covalent bond

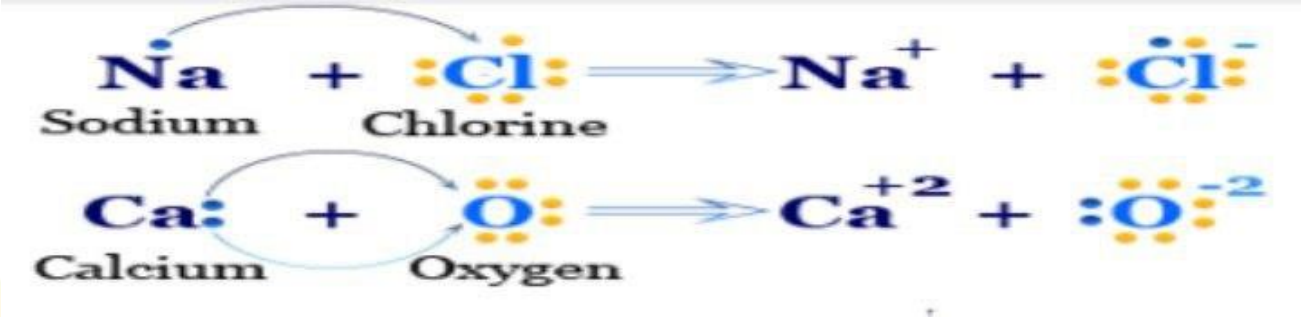
A covalent bond: is defined as a chemical bond wherein two or more atoms share one or more electron pairs. A covalent bond is formed by the sharing of electrons between atoms of two elements, such as between two non-metals

Example: A water molecule consists of two hydrogen (H) and one oxygen (O) atom. Oxygen has a valency of two, and hydrogen has only one electron in its orbital. So, each hydrogen atom will share its electron and covalently bond with the oxygen. As a result, there will be two single bonds



ionic bonds

Ionic bonds: occur between a metal and a non-metal. An ionic bond results from the transfer of electrons from a metal to a non-metal in order to obtain a full valence shell for both atoms. Atoms that gain electrons make negatively charged ions (called anions). Atoms that lose electrons make positively charged ions (called cations)

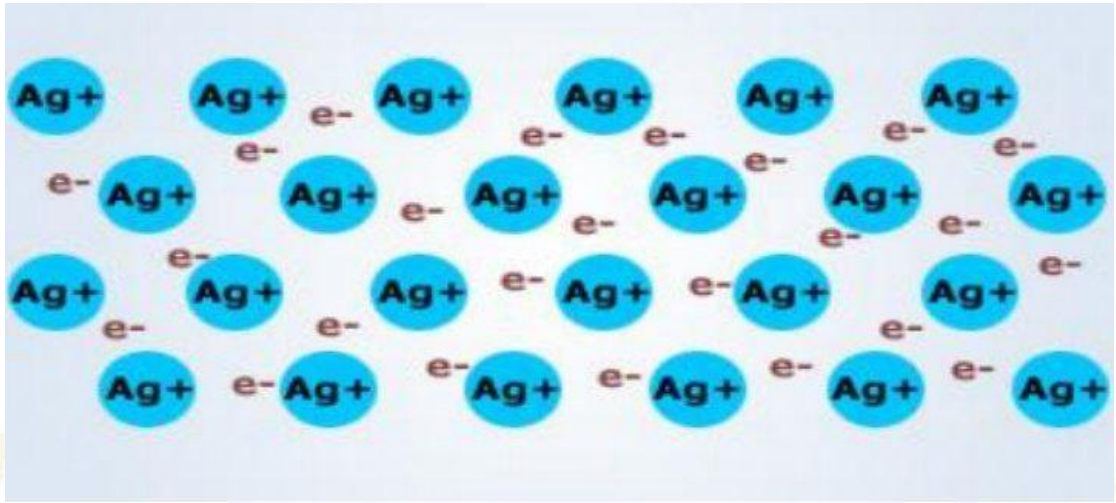


Metallic bonds

Metallic bond:

Always formed between to two metals (pure metals)

Solid gold, silver, lead, etc



Conclusion

The atom, molecular structure, and chemical bonds were discussed in this lecture. And the comparison between them

The types of chemical bonds were identified: covalent, ionic, and metallic

Determining the properties of matter and its reactions.

Electronic distribution plays a vital role in forming chemical bonds.