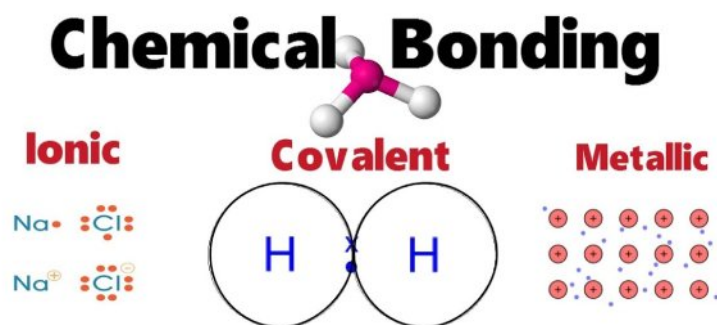


Unit 3. The Chemical Bond

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1 Introduction. Key Concepts



All chemical elements (except noble gases) combine with each other, because in this manner they are more stable.

- A **chemical bond** is an electrical attraction between atoms. Its purpose is obtaining a stable electronic configuration (i.e, 8 electrons in the outer shell (**valence shell**), except for H and Li that are stable with two electrons in the outer shell.).
- **Valence** or **valency of an element** is the number of electrons that the element needs or exceeds to have a stable electronic configuration.

Noble gases

They are called **inert gases** because they do not combine with any other atom, since they have and already **stable electronic configuration** in the valence shell.

Noble gases have **very low melting and boiling points**.

Types of chemical bonds

- **Covalent bonds.** Characterized by the **sharing of pairs of electrons** between **non-metallic atoms**.
- **Ionic bonds.** Characterized by the **loss of one or more of electrons** in **metallic atoms**, that are **gained** by a **non-metallic atom**.
- **Metallic bonds.** Characterized by the **sharing or loss pairs of electrons** between **metallic atoms**.

bond name	covalent	ionic	metallic
atoms involved	non-mettalic	metallic and non-mettalic	mettalic
description	sharing pair of electrons	loss of electrons in the metal, that are gained by the non-metal	losing or sharing electrons

2 The covalent bond

Chemical bonding that is characterized by the **sharing of pairs of electrons** between atoms of **nonmetals** or **hydrogens**.

2.1 Molecular covalent substances

Molecular covalent substances are chemical substances formed by **molecules**. A **molecule** is an electrically neutral group atoms held together by **strong covalent chemical bonds** in a **fixed number**.

2.1.1 Molecular formula

The molecular formula is the **symbolic representation** of its molecules. It shows:

- The **symbols** of the elements.
- The **numerical subscripts**, that indicate the number of atoms of each type.

Molecular formulas	
methane CH_4	benzene C_6H_6
ethane C_2H_6	acetic acid $\text{C}_2\text{O}_2\text{H}_4$
water H_2O	

Figure 1: Examples of chemical formulas

2.2 Relative molecular mass

The relative molecular mass, M_r , is the mass of one of its molecules. It is calculated by adding the atomic masses, A_r , of the atoms that make up the molecule.

$$M_r(\text{H}_2\text{O}) = 2 \times A_r(\text{H}) + A_r(\text{O}) = 2 \times 1 + 16 = 18 \text{ } u$$