

# Covalent Bonding

## How does a covalent bond form?

- A **covalent bond** forms when two atoms **share** one or more pairs of electrons.
- Atoms in covalent bonds typically have **similar electronegativities** and are **usually non-metals**.
- The shared electrons allow each atom to achieve a full outer electron shell, similar to the noble gas configuration.

## Types of Covalent Bonds

- **Single Bond:** One pair of electrons is shared (e.g.,  $\text{H}_2$ ,  $\text{Cl}_2$ ).
- **Double Bond:** Two pairs of electrons are shared (e.g.,  $\text{O}_2$ ,  $\text{CO}_2$ ).
- **Triple Bond:** Three pairs of electrons are shared (e.g.,  $\text{N}_2$ ).



## Dot-and-Cross Diagrams

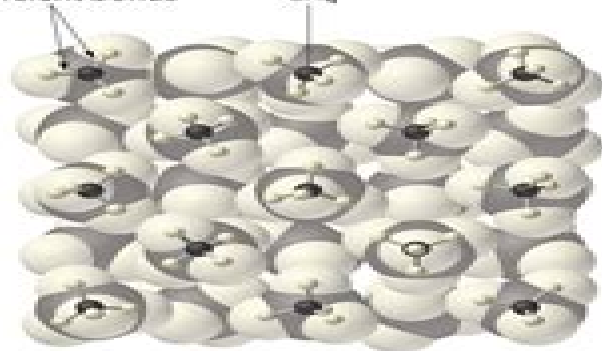
- Only the outer electron shells (valence electrons) are shown.
- Shared pairs of electrons between atoms are shown as pairs of dots and crosses.
- It represents how the atoms bond and achieve stable electron configurations.

## Example: Water $\text{H}_2\text{O}$



Covalent bonds

$\text{CH}_4$



## Properties of Covalent Compounds

- **Molecular Structure:** They are made up of discrete molecules with **weak intermolecular forces**.
- **Melting and Boiling Points:** Generally **lower** than ionic compounds because the forces between molecules are weaker.
- **Electrical Conductivity:** **Poor conductors** of electricity in all states, as they do not have free ions or electrons.
- **Solubility:** Often **soluble in nonpolar solvents** and may be insoluble in water, depending on their polarity.

# Covalent Bonding Study Guide

**K. Peter C. Vollhardt, Neil E. Schore**

A red circular graphic with a gradient, appearing as a partial circle or a stylized arrow pointing to the right, located on the right side of the slide.

## Covalent Bonding Study Guide:

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*Student Study Guide/Solutions Manual for Essentials of General, Organic, and Biochemistry* Denise Guinn, Rebecca Brewer, Rachel C. Lum, 2009-09-15 The Student Study Guide and Solutions Manual provides students with a combined manual designed to help them avoid common mistakes and understand key concepts After a brief review of each section's critical ideas students are taken through stepped out worked examples try it yourself examples and chapter quizzes all structured to reinforce chapter objectives and build problem solving techniques The solutions manual includes detailed solutions to all odd numbered exercises in the text

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