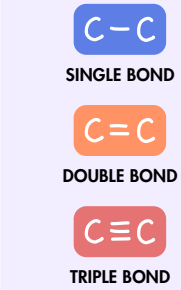
Covalent Bonding

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

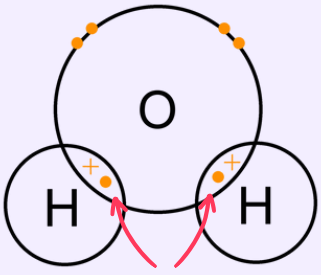
- **Single Bond:** One pair of electrons is shared (e.g., H_2, Cl_2).
- **Double Bond:** Two pairs of electrons are shared (e.g., O_2, CO_2).
- **Triple Bond:** Three pairs of electrons are shared (e.g., N_2).

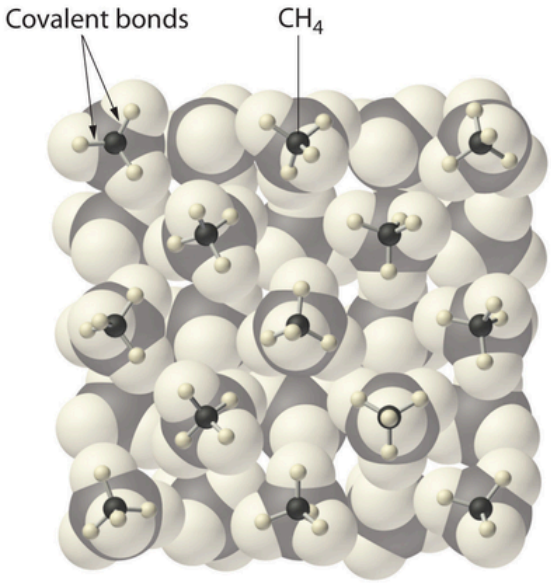


Dot-and-Cross Diagrams

- 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 H_2O





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.