Chemical bonds

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The covalent bond

Non-covalent bonds

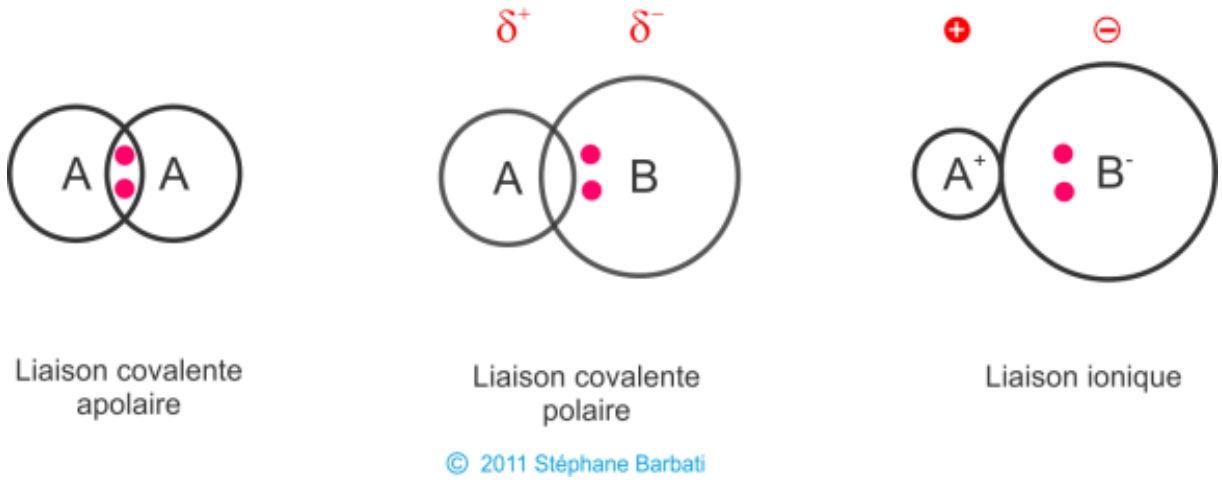
- Ionic bonds
- Hydrogen bonds
- Van der Waals attractions
- Hydrophobic interactions

The covalent bond

❑A molecule is an electrically neutral combination of atoms. The atoms are linked by strong covalent bonds, which are formed through the sharing of electrons

➢The single bond (–C–C–; two shared electrons)
➢The double bond (O=O; four shared electrons)
➢The triple bond (N≡N; six shared electrons).

❑A covalent bond between two atoms can be polar or nonpolar

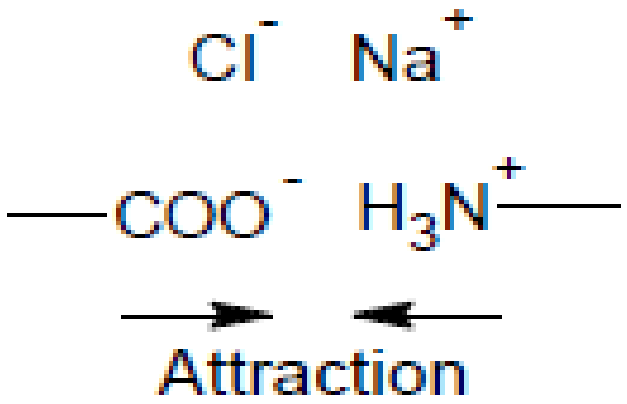


Non-covalent bonds

- Non-covalent bonds are low-energy bonds that form between atoms of different molecules (intermolecular interactions) or atoms within the same molecule (intramolecular interactions).
- These bonds play a crucial role in determining the three-dimensional structure of molecules, as well as their function, and are also responsible for the physical state of matter (gas, liquid, solid).

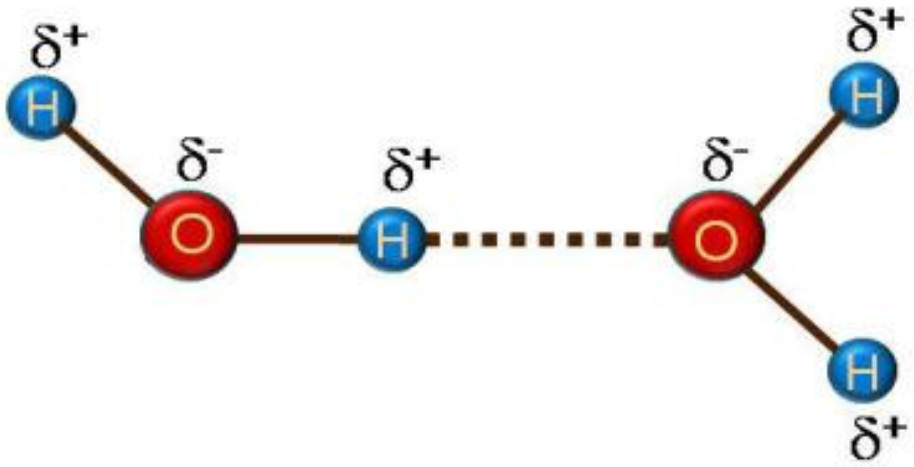
Ionic bonds

❑These are forces of attraction between two chemical species with opposite charges: one positive and the other negative. The bond strength is 20 KJ/mol



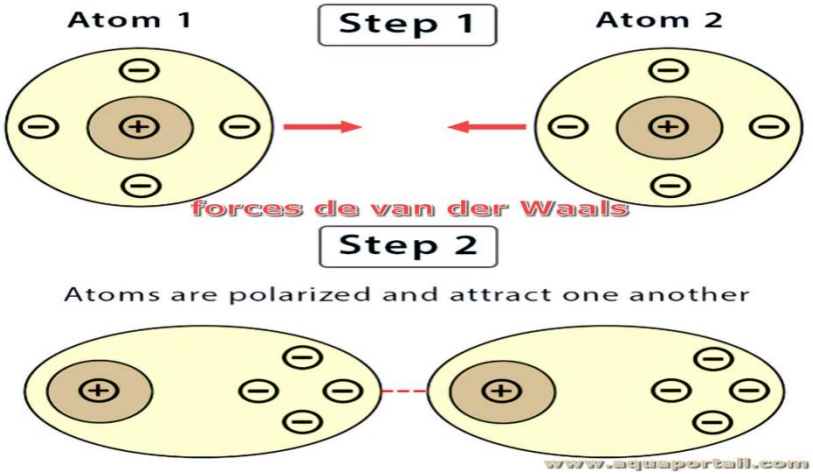
Hydrogen bonds

- Hydrogen bonds form between an electronegative atom (hydrogen acceptor)—most often oxygen or nitrogen—and a hydrogen atom covalently bonded to another electronegative atom (hydrogen donor)—most often oxygen or nitrogen.
- These are low-energy bonds (12–30 kJ/mol), yet they are of great importance in molecular interactions.



Van der Waals attractions

- Electrons surrounding an atom are constantly vibrating, leading to an uneven distribution of electric charges.
- This creates a momentary dipole, which in turn influences a nearby atom and induces a second dipole.
- The two dipoles thus created attract each other up to a specific distance.
- These low-energy forces (0.4–4.0 kJ/mol) are known as Van der Waals attractions and manifest at short distances between atoms.



Hydrophobic interactions

- It is a property of hydrophobic groups to cluster together to avoid the hydrophilic environment (water); the strength of these interactions is less than 40 kJ/mol.

