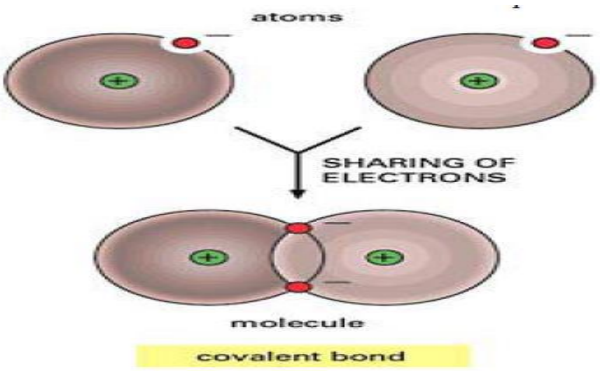
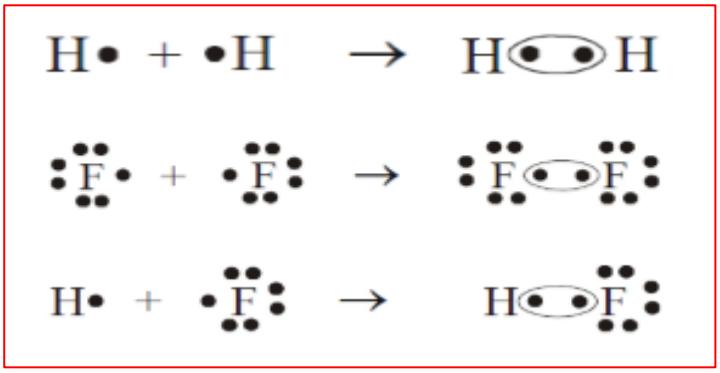
Covalent Bond

• It is a strong bond formed between two atoms by sharing two valence electrons, one from each atom.

• A covalent bond usually occurs between two **non-metals** atoms.

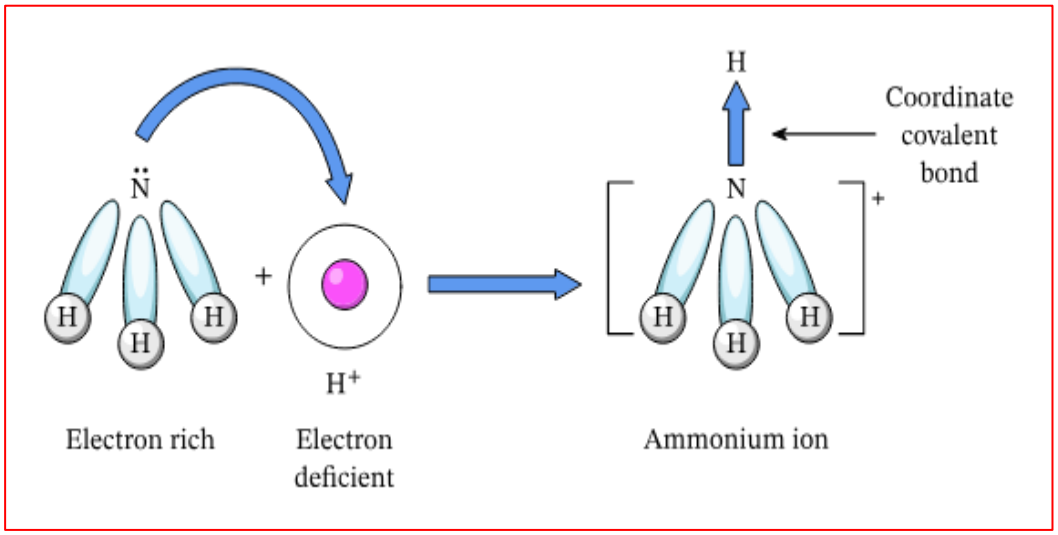


Covalent bonds are found in molecular elements(ex **H_2, F_2, Cl_2, O_3**). And molecular compounds (ex **H_2O, CO_2, C_3H_8, HF**).

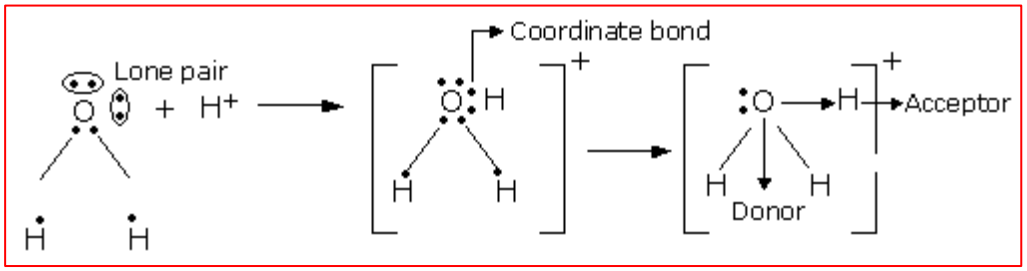


Coordinate bond

• It's a type of **covalent** bond that formed when one atom **donates both of the shared electrons** to the other atom to make the bond.

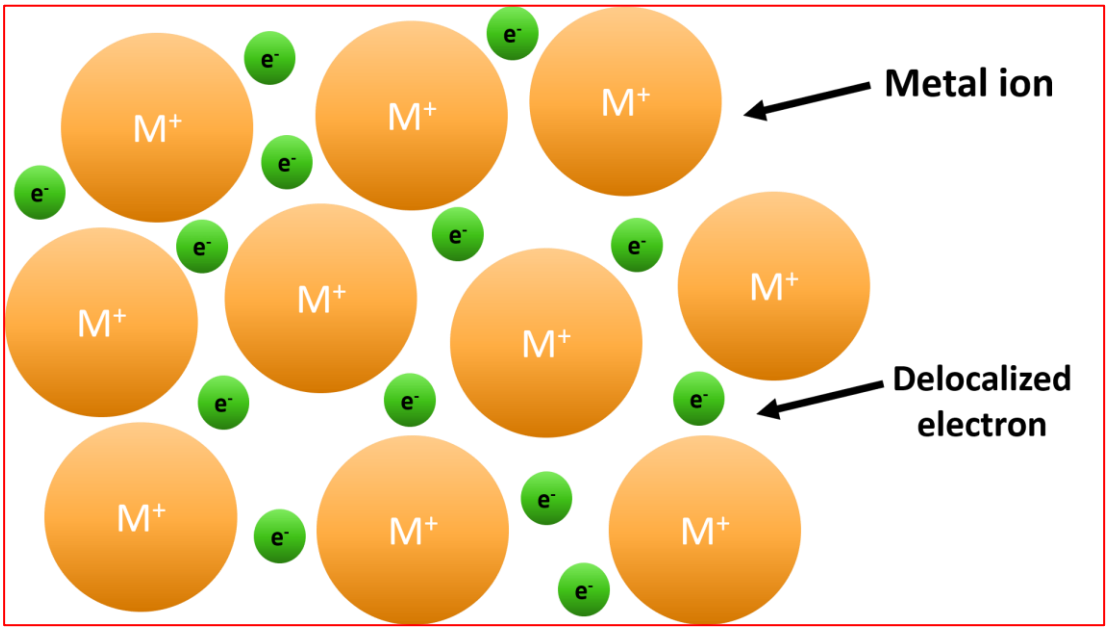


This is different from a covalent bond because both electrons **come from one atom or molecule** but are **shared as in a typical covalent** bond.



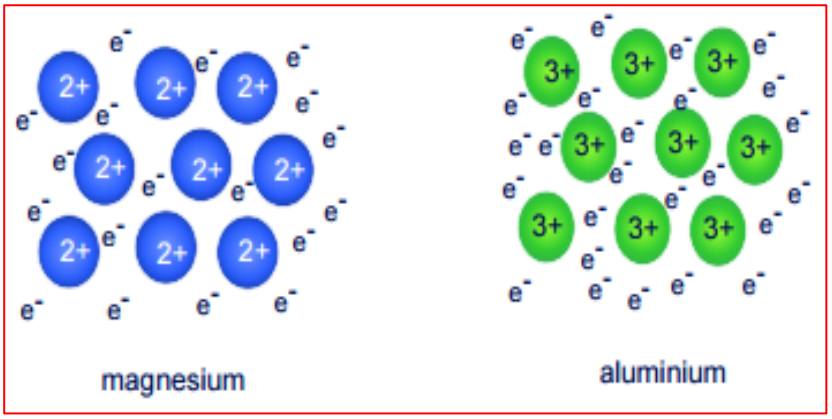
Metallic bond

Is the type of bonding found in metallic crystals, that formed by the **attraction** between the **metal positive ion and delocalized electrons.**



- The free movement of electrons make metals good conductors of heat and electricity.

• Aluminum more conduct electricity more than magnesium because it has more electrons delocalized.

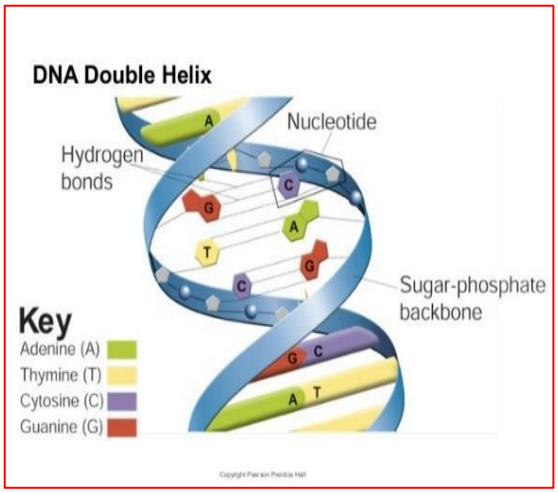


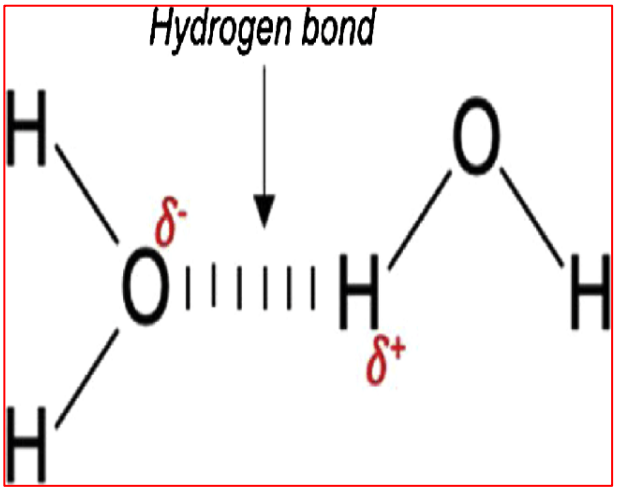
Hydrogen bond

• A chemical bond that hydrogen atom of one molecule is attracted to an electronegative atom, especially **nitrogen (N), oxygen (O) or fluorine (F)** atom, usually of another molecule.

• It is a **weak** attraction, where it's **weaker** than **covalent, ionic and metallic** bonds.

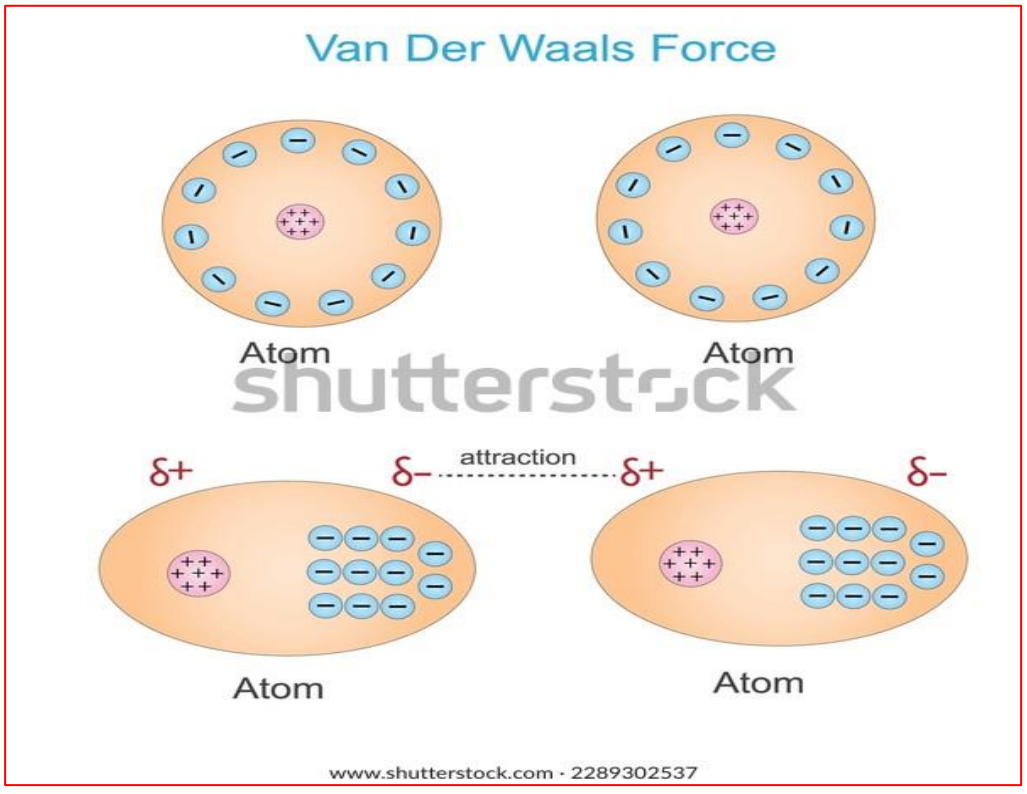
• Is very important, where **this type of bond occurs in both inorganic molecules (such as water) and organic molecules (such as DNA).**





Van der Waals Bonds

The dipoles involved in Van der Waals bonding come from fluctuations in the symmetry of the electron distribution surrounding the nucleus of an atom. Very weak interactions (2-4 $kJmol^{-1}$), very short-range, non-directional attractive forces between molecules or atoms. Example: Ni atom



Type of Van der Waals Bonds

1- dipole-dipole interactions

2-ion -dipole interactions.

3- London dispersion forces.

4-induced dipole-induced interaction.

Factors affecting Van der Waals interactions

1- the distance between the atoms.

2- the nature of the atoms involved.

3- the environment around the atoms.