

To reach a stable state.
Metals → positive ions
Non-metals → negative ions

Compound: A substance made of two or more elements that are chemically bonded together.

Element: A substance made of only one type of atom.

	+1	+2	+3	-3	-2	-1
Elements of group	1	2	13	15	16	17

Why do atoms gain or lose electrons?

Ionic charge of elements

	+1	+2	+3
Elements	H, Ag, Au	Zn, Cu, Fe, Sn, Pb	Fe

Constructing balanced chemical equations

The number of atoms for each element is the same on both the reactant and product side.

Symbol	State
s	solid
l	liquid
g	gas
aq	aqueous

Bonding-1

Formula for ionic compounds

Steps:

- Find out the ionic charges of ions formed by elements or molecules
- Balance the charges so that the ions combine to form a neutral compound.

Molecular ions

Name of molecular ion	Symbol
Nitrate	NO_3^-
Carbonate	CO_3^{2-}
Sulphate	SO_4^{2-}
Hydroxide	OH^-
Ammonium	NH_4^+

Electro-negativity is the property of a particular atom bonded covalently to attract the bond pair of electrons towards itself. Elements of similar electronegativity values form purely covalent bonds and when the difference of electronegativity between two elements is more than 1.7, the elements form ionic bonds.

Ionic bonding is formed due to the electrostatic attraction between positive and negative ion. The ions in the ionic compounds are arranged in a regular pattern called a **lattice structure**.

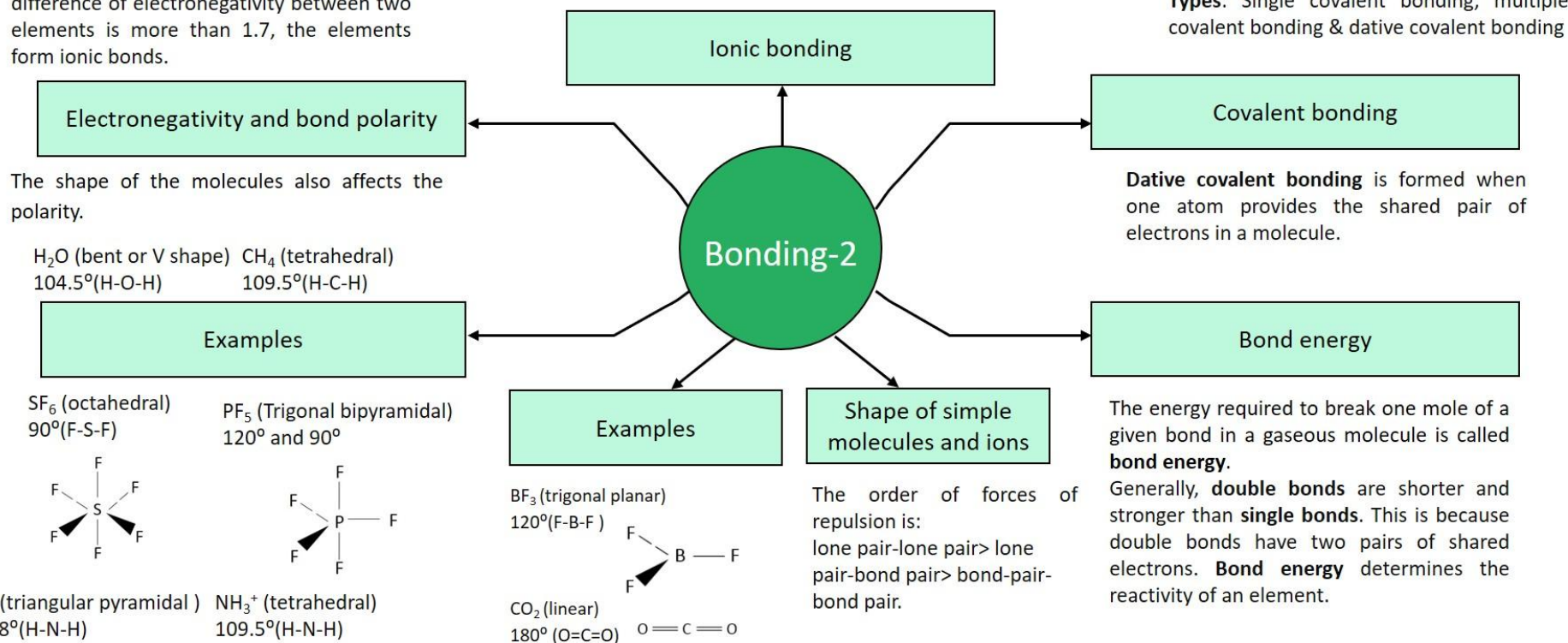
Strength of Ionic bonding:

Size of ions: Smaller ions have stronger ionic bonding.

Charge of ions: The higher the charge of the ions, the stronger the ionic bonding.

In **covalent bonds**, two or more atoms are held together by the force of attraction between the nuclei of atoms (positively charged) and one or more pair of shared electrons (negatively charged).

Types: Single covalent bonding, multiple covalent bonding & dative covalent bonding



Boiling point: $\text{HCl} > \text{HBr} > \text{HI} > \text{HF}$
 HCl to HI : increase in number of electrons and hence, increase of van der Waals' forces. The boiling point of HF is very high due to the presence of strong hydrogen bonding between HF molecules.

Variation in boiling points of hydrogen halides

The forces between the molecules in covalent bonds are called **intermolecular forces**.

van der Waals' forces: holds non-polar molecules together.

permanent dipole-dipole forces: forces of attraction between two molecules having permanent dipoles

hydrogen bonding: it is formed between molecules having a hydrogen atom bonded to one of the most electronegative elements (F , O or N).

Intermolecular forces

Bond strength:

van der Waals's forces < permanent dipole-dipole forces < hydrogen bonding < covalent bonding < ionic bonding

High boiling point of alcohols compared to alkanes

Alcohols are polar molecules due to the presence of hydrogen bonding. Due to the presence of hydrogen bonds, alcohols have higher boiling points when compared to alkanes of relative molecular masses.

Anomalous properties of H_2O

A water molecule has two hydrogen atoms and two lone pairs of electrons per molecule. It has an average of two **hydrogen bonds per molecule**.

- Ice is less dense than water
- Relatively high melting and boiling points (compared to hydrides of group 16)

Variation of boiling points of alkanes

The boiling point of alkane homologous series increases due to increase in the number of electrons in bigger molecules. This increase in number of electrons increases the size of induced dipole-dipole interactions (London forces) between the molecules. Because of large contact area, long chain alkanes have larger London force when compared to that of spherical shaped branched alkanes.

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