Fajan's Rule :

This rule is used to decide relative ionic & covalent character in a molecule. A molecule is predominantly covalent if

(I) Smaller the size of cation.

(II) larger the size of anion.

(III) greater the charge on cation and anion.

(IV) ion does not have inert gas configuration but it possesses pseudo inert gas configuration (18 electrons in the ultimate shell).

(I) $\xrightarrow[\text{decreasing covalent character due to increase in the size of cation}]{\text{LiCl > NaCl > KCl > RbCl > CsCl}}$

(II) $\xrightarrow[\text{decreasing ionic character because of increase in anionic size}]{\text{NaF > NaCl > NaBr > NaI}}$

(III) $\xrightarrow[\text{increasing covalent nature due to increase of charge on anion and increase in size of anion}]{\text{NaF > } Na_2O \text{ > } Na_3N}$

(IV) CuCl and NaCl

$[Cu^+] = [Ar]3d^{10}$; $[Ne^+] = [Ne]$

Cations with 18-electron shells (pseudo inert gas configuration) has grater polarising power than 8-electron shell (inert gas configuration) ion with the same charge and size. Thus, CuCl is more covalent than NaCl.

Hydrogen Bonding :

(I) The concept of H-bonding was introduced by Latimer and Rodebush.

(II) H-bonding is said to be formed when slightly acidic hydrogen attached to a strongly electronegative atom such as F, O and N is held with weak electrostatic forces by the non- bonded pair of electron of another atom. That is , it is a dipole-dipole interaction.

(III) Of all the electronegative diatomic atoms, only F, O, and N enter into stable H-bond formation.

(IV) The weak electrostatic interaction leading to the H-bond formation is shown by dashed(.....) lines.

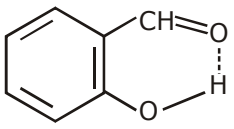
(V) Greater the electronegativity difference stronger is the H-bond. For example,

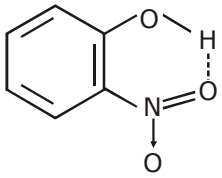
$$\overset{\delta^-}{F} \text{ ..... } \overset{\delta^+}{H} > \overset{\delta^-}{O} \text{ ..... } \overset{\delta^+}{H} > \overset{\delta^-}{N} \text{ ..... } \overset{\delta^+}{H}$$

Intramolecular H-bonding ;

This type of H-bonding occurs when polar H and electronegative atom are present in the same molecule.

(a) o-hydroxy benzaldehyde (b) o-nitrophenol





Intermolecular H-bonding

This type of H-bonding takes place between hydrogen and electronegative element (like F,O,N) present between molecules of the same substance (H_2O and H_2O) or different substances (H_2O and NH_3).