SUBJECT - CHEMISTRY
CLASS - BSc (SUB/HON) PART-I
GROUP - B
TOPIC - Hydrogen bonding.

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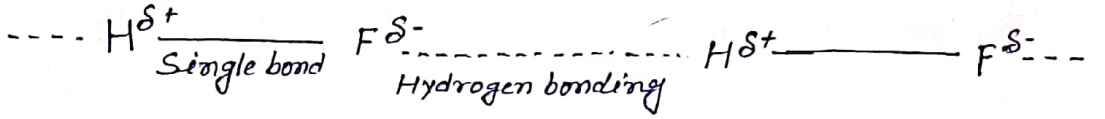
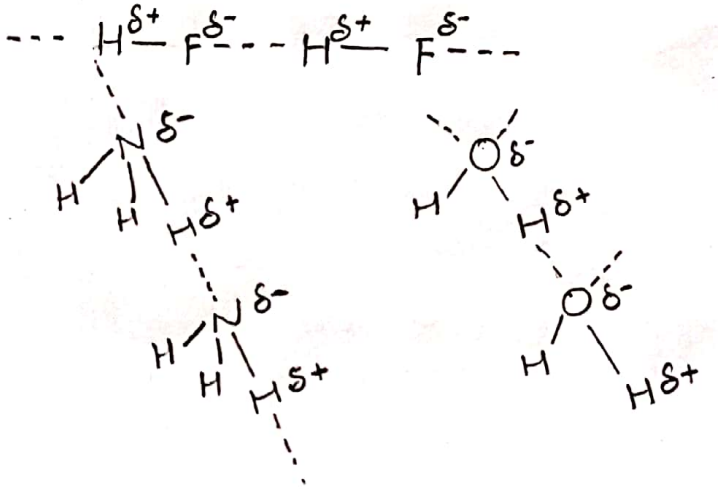
Hydrogen bonding: When a H-atom comes between two most electronegative elements (e.g F, O, N) then it holds one by a single covalent bond and another by a purely weak electro-static bond. This weak electrostatic bond is called hydrogen bonding.



It is shown by a dotted line..... It has strength of 20-25 KJ mol^{-1} while single bond has the strength of about 200-400 KJ mol^{-1}. It is stronger than Vander Waal's forces. The greater difference of electronegativity between the bonded atoms creates greater charge separation, hence the tendency to form hydrogen bonding by an element increases if its electronegativity increases.

(1) Intermolecular hydrogen bonding:

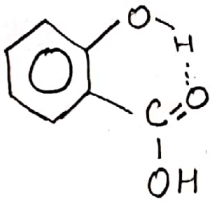
Such bonding is formed between two molecules i.e $(HF)_n$ $(H_2O)_n$ $(NH_3)_n$ etc.



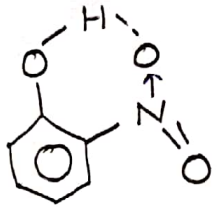
Due to such type of bonding molecular association increases, Thus molecular weight increases, and properties depending upon it such as m.p, b.p density, viscosity etc. will increase. The maximum number of H-bonds a water molecule can form is four.

(ii) Intramolecular hydrogen bonding:

When hydrogen bonding occurs within a molecule, it is called intramolecular hydrogen bonding e.g



Salicylic acid



O-nitrophenol

Due to this type of bonding, the molecule exists as a monomer. Such compounds are therefore more volatile and less soluble. Intramolecular hydrogen bonding usually gives rise to the formation of 5 or 6 membered chelate rings.

Q What type of elements exhibit hydrogen bond?

Ans Most electronegative elements like F, O & N exhibit hydrogen bond. The greater difference of electronegativity between the bonded atoms creates greater separation of charges and hence the tendency to form hydrogen bond increases with increase of electronegativity of element.

Elements	Electronegativity		Tendency to form hydrogen bond
F	4.0	↓ Decreases	↓ Decreases
O	3.5		
N	3.0		