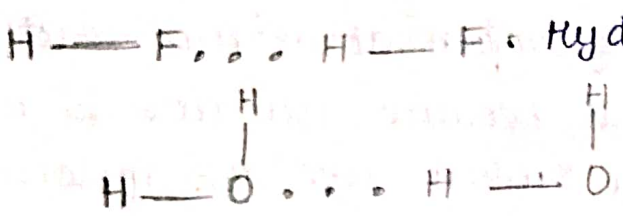
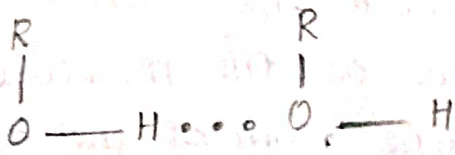
Hydrogen Bonding :

when a hydrogen atom has between two atoms having strong electronegativities, it shows an unique property of forming a bond between the two electronegative atoms. One is held by a covalent bond and the other by an electrostatic force. The electrostatic force is called the hydrogen bond. Hydrogen bond is usually indicated by dotted lines. Hydrogen bond is formed in the following compounds.

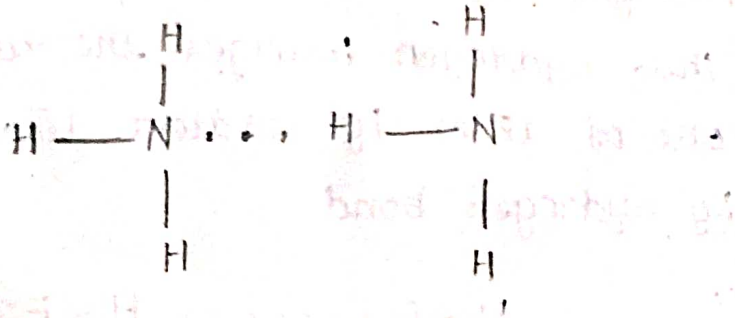


Hydrogen fluoride

water



Alcohol



Ammonia

..... = Hydrogen bond.

Hydrogen bond may be represented by general formula A – H ... B. One of the essential conditions of hydrogen bond is that, both atoms A and B which are bridged by hydrogen must be highly

electronegative elements and small in size. Another condition is that must have a lone pair of electrons. Thus hydrogen bond is seen only compounds of fluorine, oxygen and nitrogen.

Nature of hydrogen bonding:

Hydrogen bond is electrostatic in nature. All molecules which enter into hydrogen bonding are strongly polar. consider hydrogen fluoride.

$$H^{\delta+} - F^{\delta-}$$

Fluorine atom has a fractional negative charge and hydrogen atom has fractional positive charge. This is because fluorine is highly electronegative when two HF molecules approach closely, there would be strong electrostatic attraction between the positively charged hydrogen of one of the molecules and negatively charged fluorine atom of the other molecule. Thus hydrogen bridges the two fluorine atoms one of them by covalent link and the other by hydrogen bond.

$$H-F \cdots\cdots H-F$$

Hydrogen bond is much weaker than a normal covalent bond. The strength of hydrogen bond found to vary between 2-10 K cals per mole.

Types:

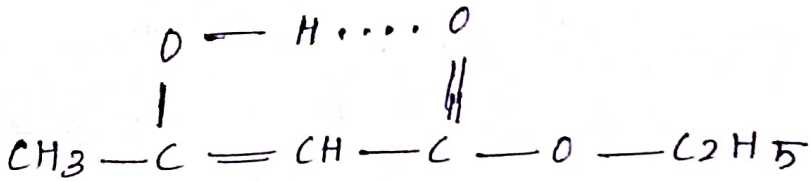
There are two types of hydrogen bonds.

* Inter molecular hydrogen bond
* Intra molecular hydrogen bond.

The inter molecular hydrogen bond is formed between two or more molecules.

eg: H–F .... H–F .... H–F.

This leads to molecular association. The intra molecular hydrogen bond is formed between atoms within the same molecule. For example, Intramolecular hydrogen bond is formed in aceto acetic ester.



This leads to the formation of a ring known as chelate ring.