# B.SC. (1ST SEMESTER)
# PHYSICAL CHEMISTRY
# INTERMOLECULAR FORCES

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# Intermolecular Forces

Johannes D van der waals ,
Dutch was the first to postulate
to intermolecular forces in
developing a theory to
account for properties of
real gases.

# Van der Waals forces include

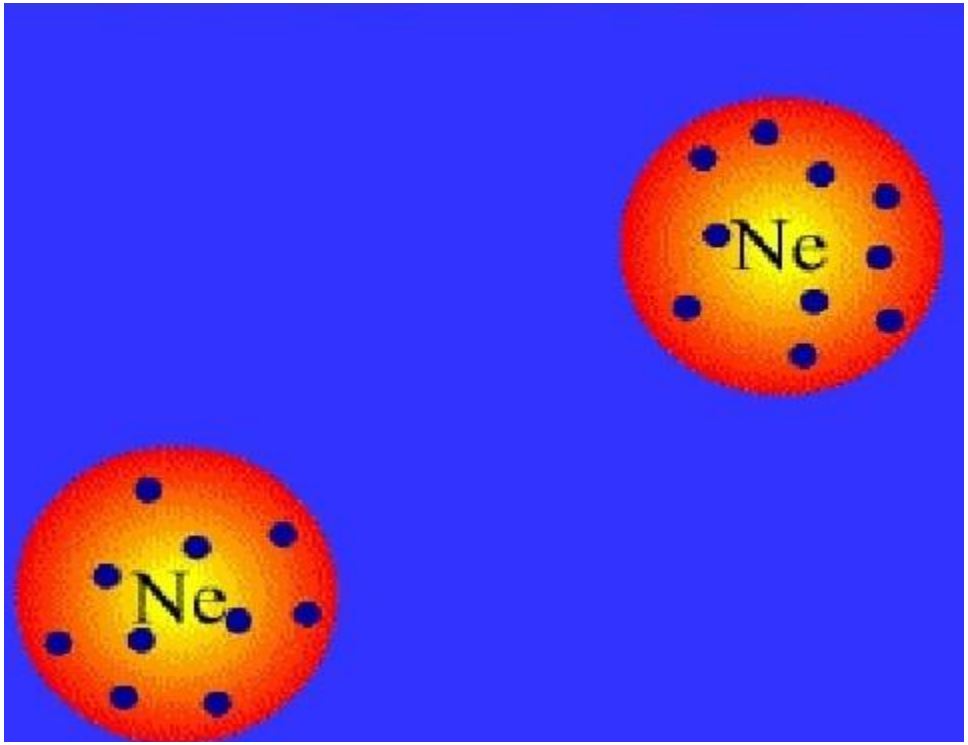
- London forces
- Dipole-dipole forces
- Dipole-induced dipole forces
- Other intermolecular forces are
- Ion-dipole interactions
- Ion-induced dipole interactions
- Hydrogen bonding

# LONDON FORCES

These arise from temporary variations in electron density in atoms and molecules. Electron distribution may be unsymmetrical and hence produce an instantaneous dipole.

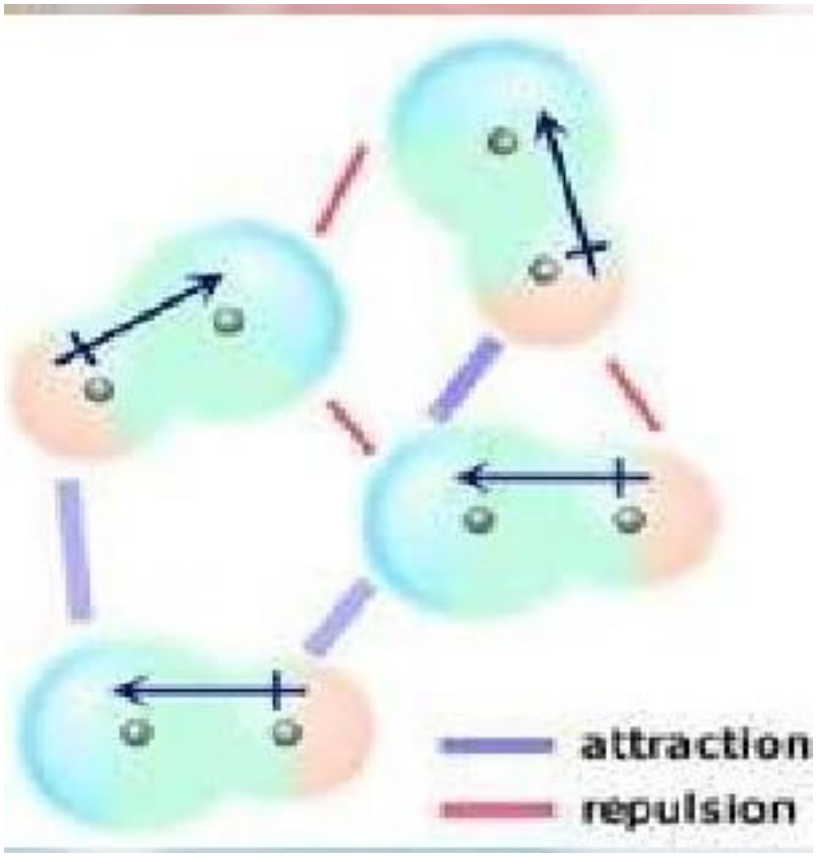
- Dispersion forces are present between all molecules, whether polar or non polar.
- Dispersion forces are stronger in molecules that are easily polarizable.

# LONDON FORCES

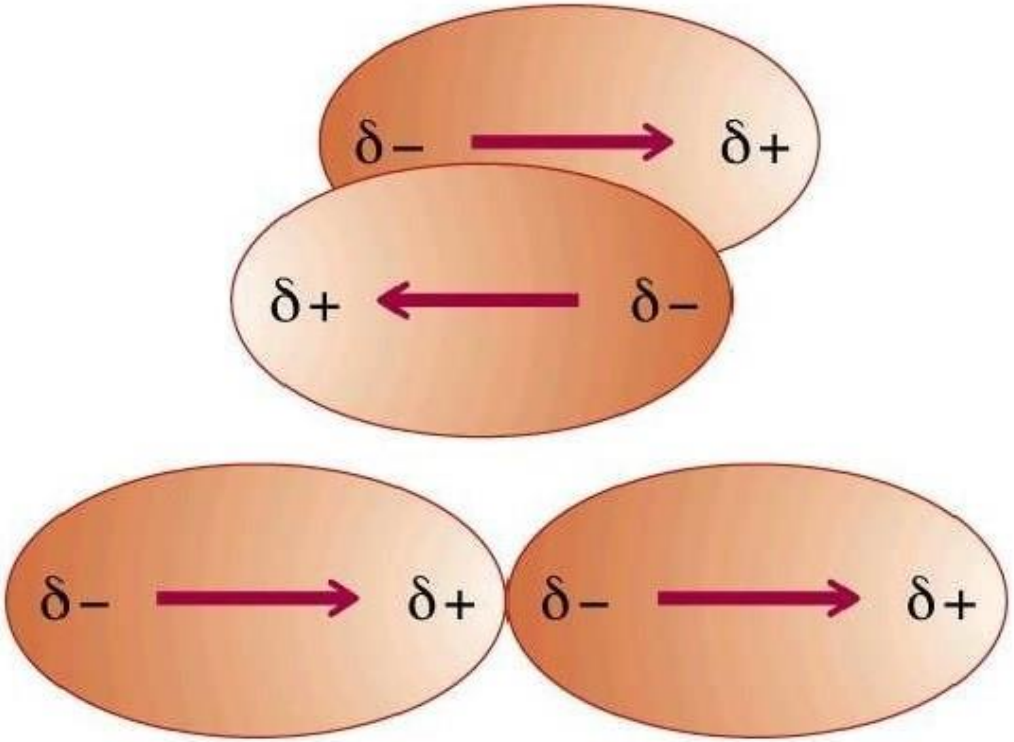


# Dipole-Dipole Forces

These forces arises due to interaction between oppositely charged ends of polar molecules.

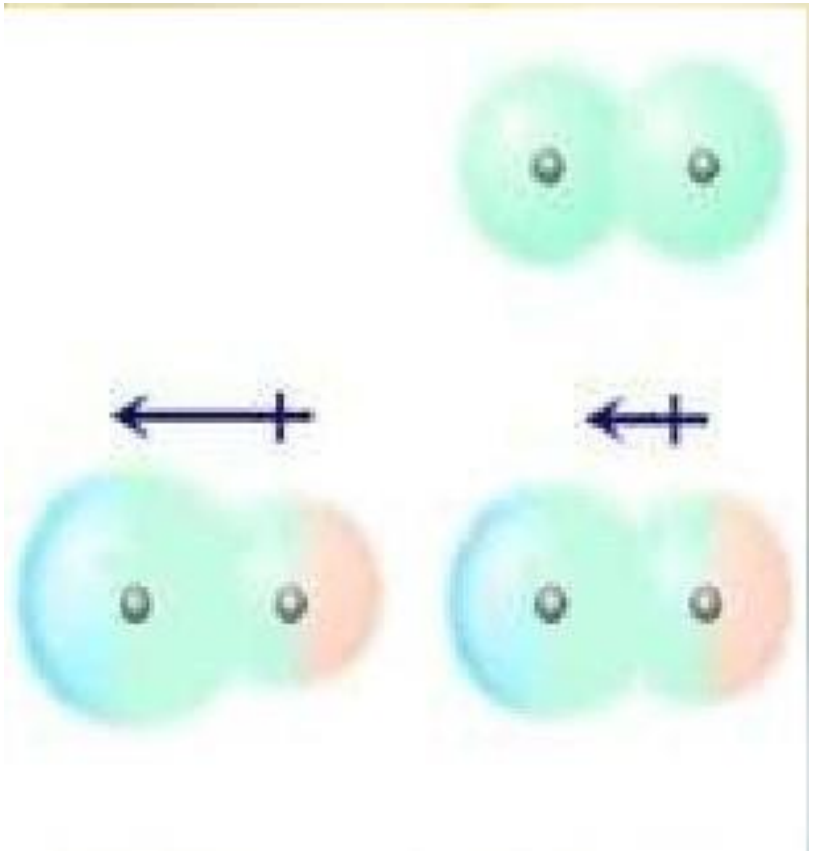


# Dipole-Dipole Forces



# Dipole-Induced Dipole Forces

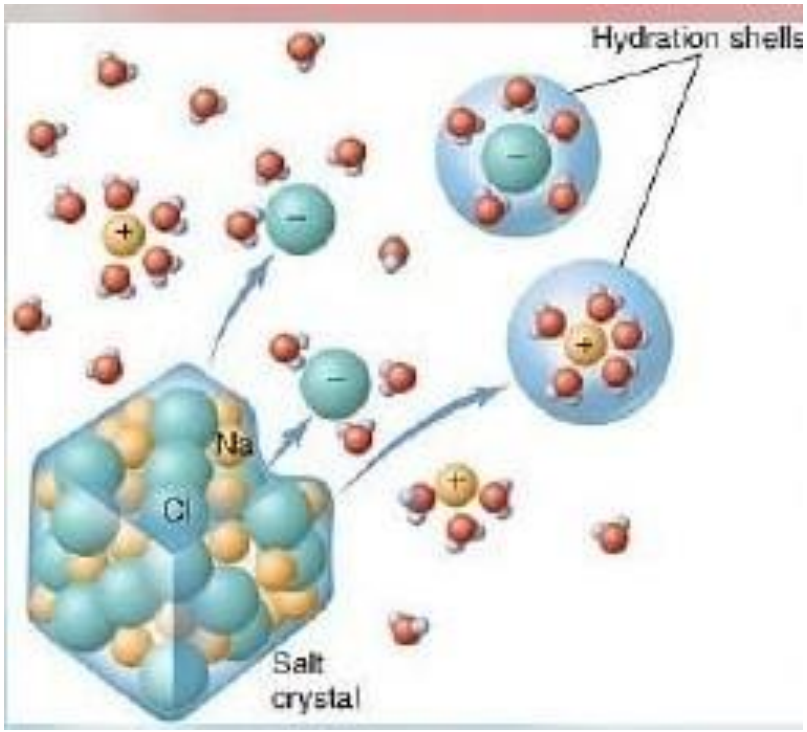
These operate between polar molecules having permanent dipole and the molecules having no permanent dipole. The polar molecule induces a dipole in the neighbouring non-polar molecule.



# Interactions

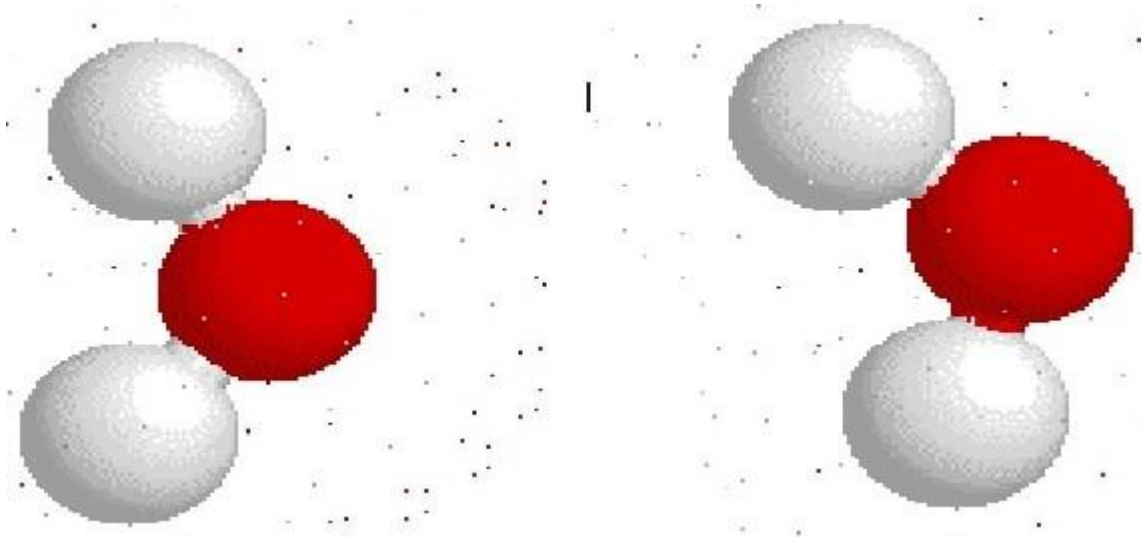
These interactions depends upon

- Charge and size of ion
- Magnitude of dipole moment of polar molecule



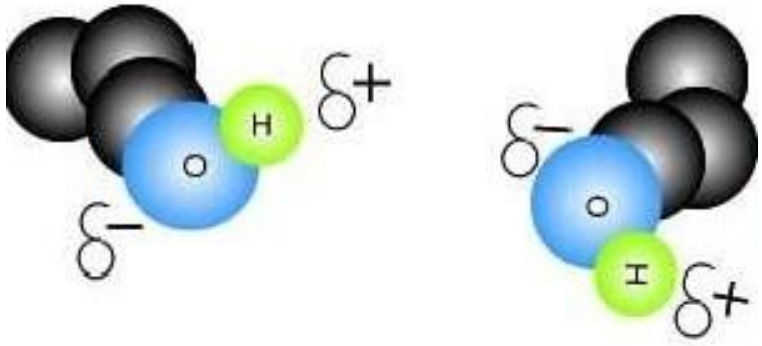
# Hydrogen Bonding

It is an electrostatic force of attraction that exist between covalently bonded hydrogen atom of one molecule and the electronegative atom of another molecule.



# Conditions for Hydrogen Bond Formation

A hydrogen atom attached to a relatively electronegative atom is a hydrogen bond donor. This electronegative atom is usually fluorine, chlorine or nitrogen.



# Intermolecular Hydrogen Bond

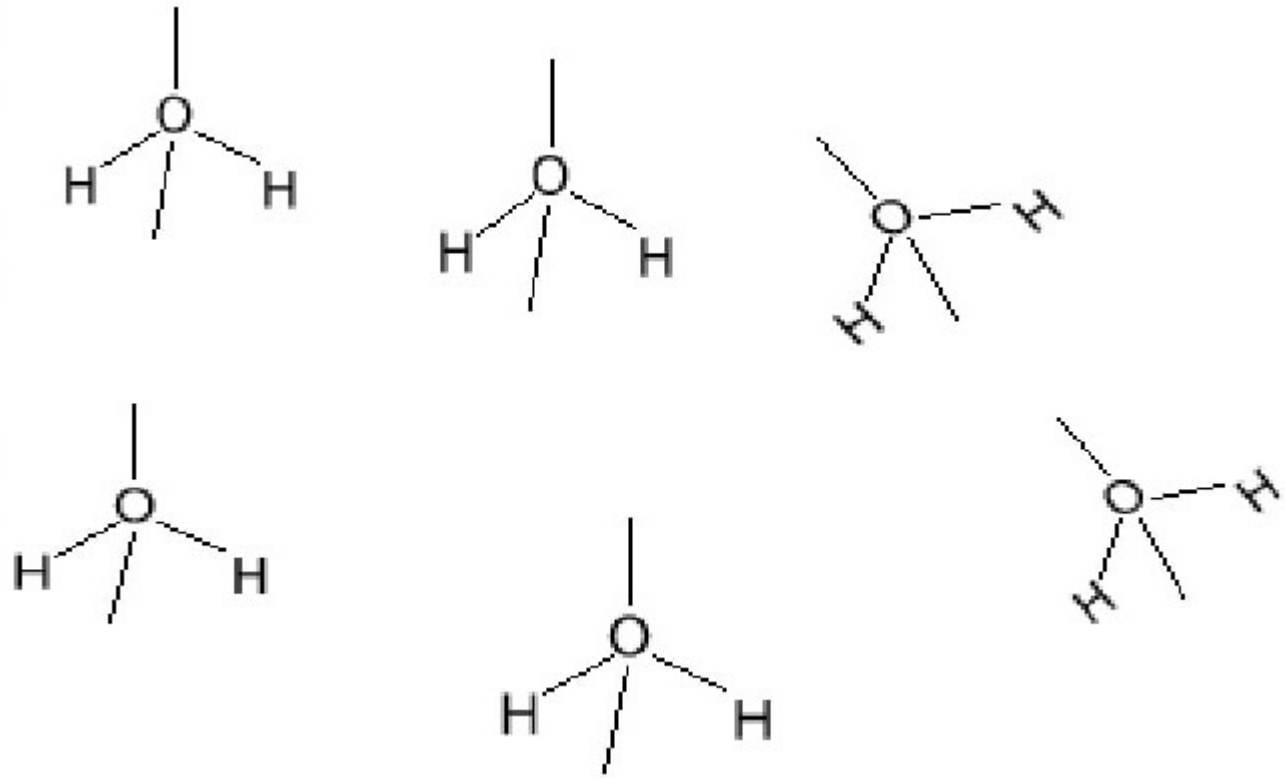
- It is formed between two different molecules of the same or different substances as
- Hydrogen bond between molecules of ammonia
- Hydrogen bond between molecules of water and alcohol

# Intramolecular Hydrogen Bond

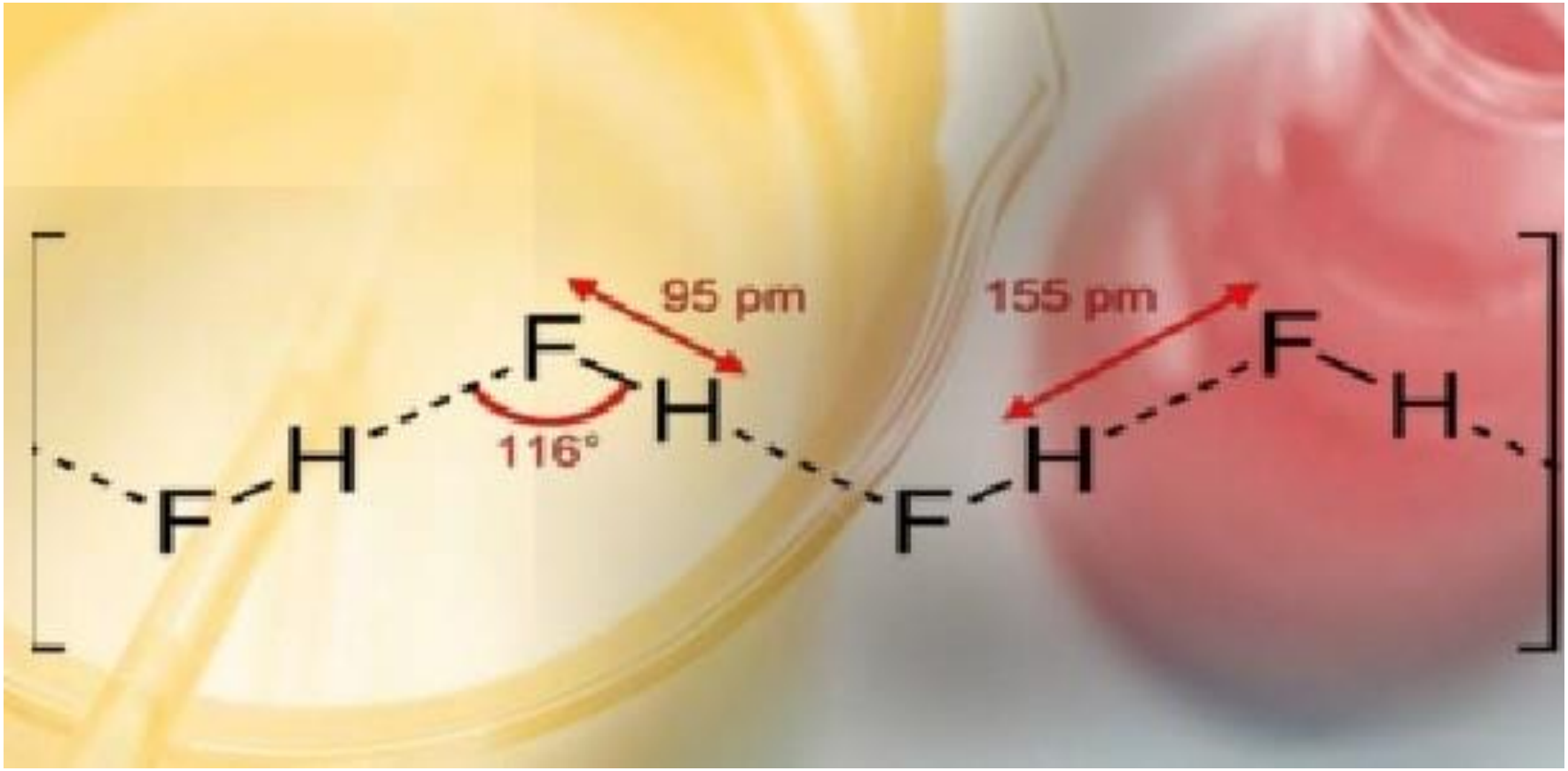
- It is formed between the hydrogen atom and a highly electronegative atom present in different bonds within the same molecule as

- o- salicylaldehyde
- 0- nitrobenzoic acid

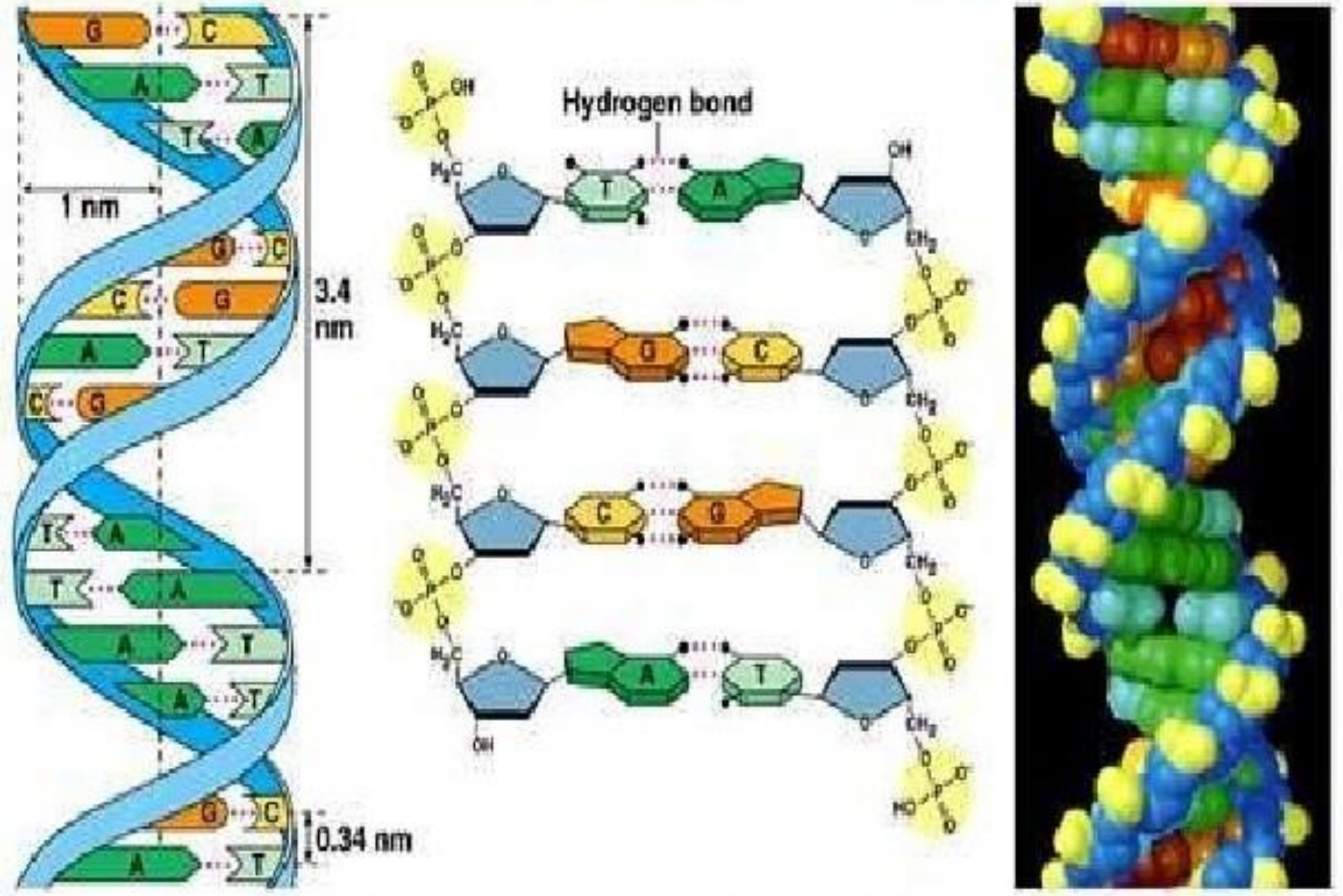
# Association of Water Molecules



# Association in Hydrogen Fluoride



# Hydrogen Bonding in DNA



# THANKS