Solutions

A homogeneous mixture of pure substances.

Solvent: Major component of a liquid mixture.

Solute: Minor component of a liquid mixture.

Solubulity:

The extent in which one substance dissolves in another.

A soluble substance dissolves in a solvent. An insoluble solute does not dissolve to a significant extent in a solvent.

“Like dissolves like.”

Intermolecular Forces:

1. Dipole-Dipole Forces: Attractive forces occuring in polar molecules. Don't exist in nonpolar molecules.

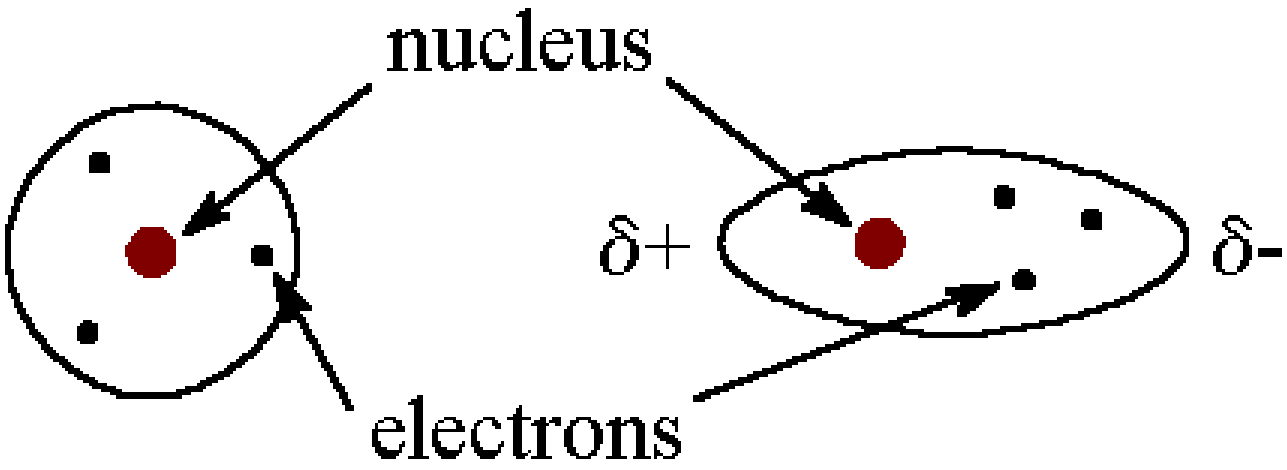
Ex: H-F

Substance	Dipole Moment(D)	Boiling Point(°C)
C_3H_8	0.1	-42
C_2H_6O	1.9	-25
CH_3CN	3.9	82

Intermolecular Forces cont…:

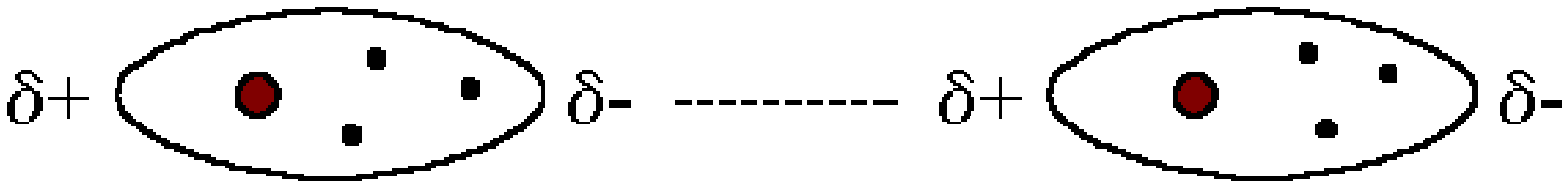
2. Dispersion Forces(London Forces): Attractive forces occuring in nonpolar and polar molecules. Movement of electrons results in a temporary and instantaneous dipole.

Ex: Ar, He, CH_4



symmetrical distribution

unsymmetrical distribution



London Forces increase as the number of electrons and thus the size of the molecule increases.

Substance	Melting Point(°C)
CH_4(smallest)	-182.5
CF_4	-150.0
CCl_4	-23.0
CBr_4	+90.0
CI_4(largest)	+171.0

Intermolecular Forces cont…:

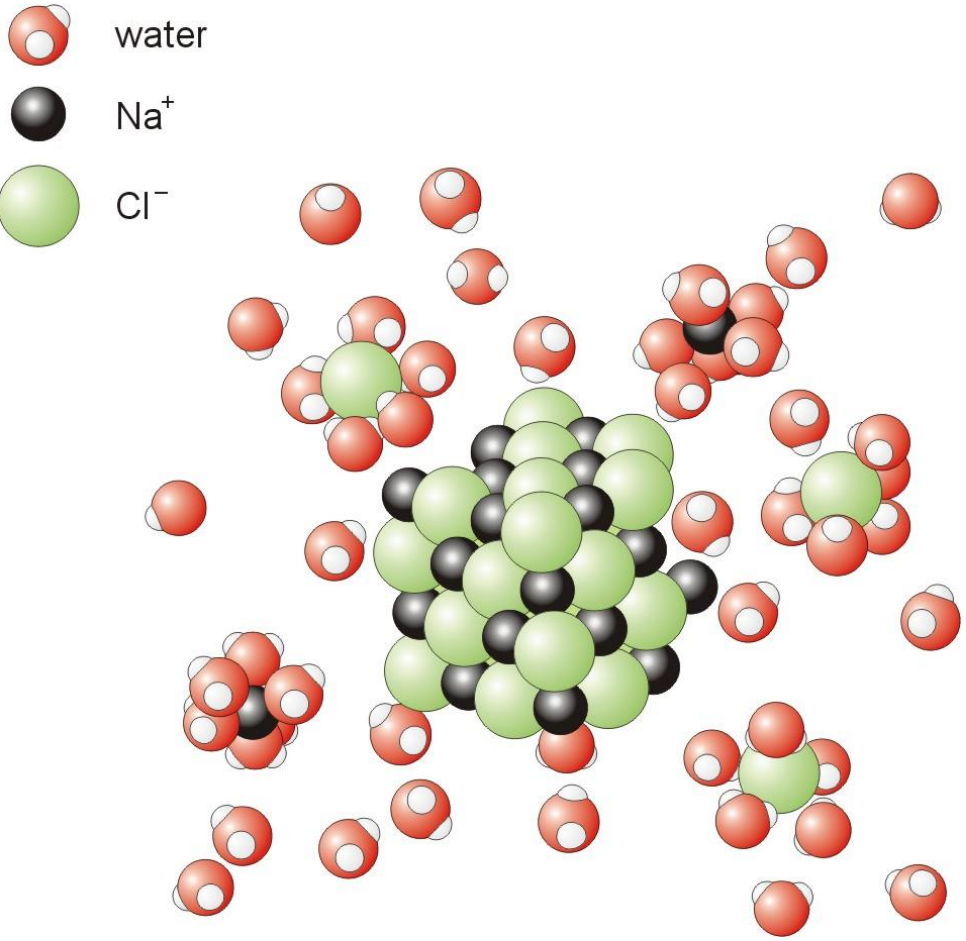
As molecule gets bigger(more electrons), London Forces get stronger and more energy needed to separate molecules.

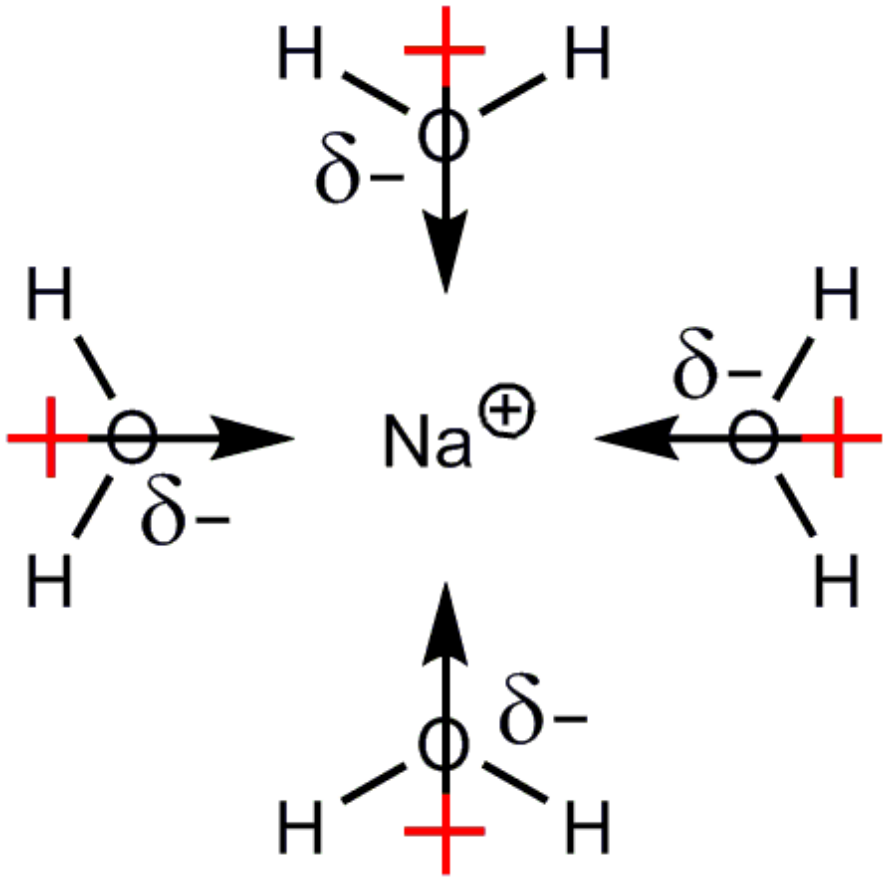
3. Hydrogen Bonding: Attractive force occuring in molecules containing hydrogen atoms directly bonded to a small electronegative atom(N,O, F).

Ex: HF, H_2O

Ion-Dipole Forces:

Interaction between an ion and the partial charge of a polar molecule.





Energetics of Solution Formation:

$$\Delta H_{soln} = \Delta H_{solute} + \Delta H_{solvent} + \Delta H_{mix}$$

ΔH_{soln}:Enthalpy of Solution.

$\Delta H_{soln} > 0$: Endothermic. More energy needed to separate the pure components than energy released on solution formation.

$\Delta H_{soln} < 0$: Exothermic. More energy released on solution formation than required to separate pure components.