Chemistry Study Materials for Class 11
(NCERT Based Notes of Chapter- 04)
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States of Matter

Matter is anything that occupies space and has a definite mass. Matter mainly exists in three different states – solid, liquid and gaseous state.

Solids have a definite shape and definite volume. This is because in solids the particles are closely packed and so the intermolecular force of attraction is greater.

Liquids have no definite shape but have definite volume. In liquids, the intermolecular force of attraction is smaller than that in solids. So the particles do not have a fixed position.

Gases have no definite shape and volume. Here the particles are far apart and hence they have no force of attraction.

Comparison between the three states of matter

Properties	Solid state	Liquid state	Gaseous state
Shape and volume	Have definite shape and volume	No definite shape but have definite volume	Have no definite shape and volume
Inter molecular force of attraction	Strong	In between solids and gases	Very small
Arrangement of particles	Closely packed	Loosely packed	Far apart
K.E of particles	Very low	In between solids and gases	Very high
Diffusability	Very low	In between solids and gases	Very high
Compressibility	Very low	In between solids and gases	Very high

INTERMOLECULAR FORCES

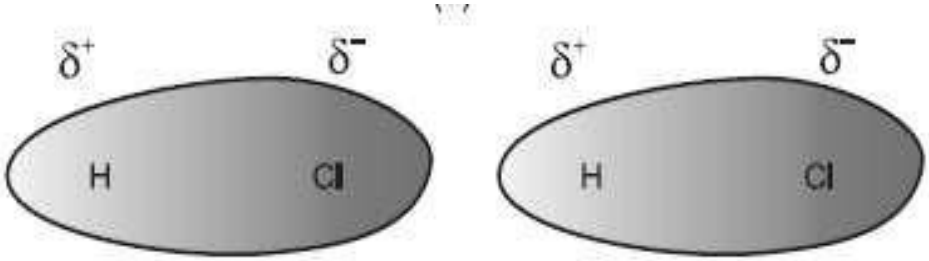
Intermolecular forces are the forces of attraction and repulsion between interacting particles (atoms and molecules). Attractive intermolecular forces are known as ***Vander Waals forces***. These forces include *dispersion forces or London forces, dipole-dipole forces, and dipole-induced dipole forces*. A particularly strong type of dipole-dipole interaction is *hydrogen bonding*.

1) Dispersion Forces or London Forces

Atoms and non-polar molecules are electrically symmetrical and have no dipole moment. But in an atom, at a particular moment, the nucleus is shifted towards one side and the electrons, to the other side. So a temporary dipole (momentarily dipole) is created. This results in the development of instantaneous dipole on the adjacent atom for a very short time. These temporary dipoles of atoms attract each other. This force of attraction between temporary dipoles is termed as London forces or dispersion forces. These forces are important only at short distances.

2) Dipole - Dipole Forces

Dipole-dipole forces act between the molecules possessing permanent dipole (polar molecules). These molecules interact with the neighbouring molecules. This interaction is stronger than the London forces but is weaker than ion-ion interaction because only partial charges are involved. The attractive force decreases with the increase of distance between the dipoles. E.g.: HCl Ends of the dipoles possess ―partial charges‖ and these charges are shown by Greek letter ***delta*** (δ

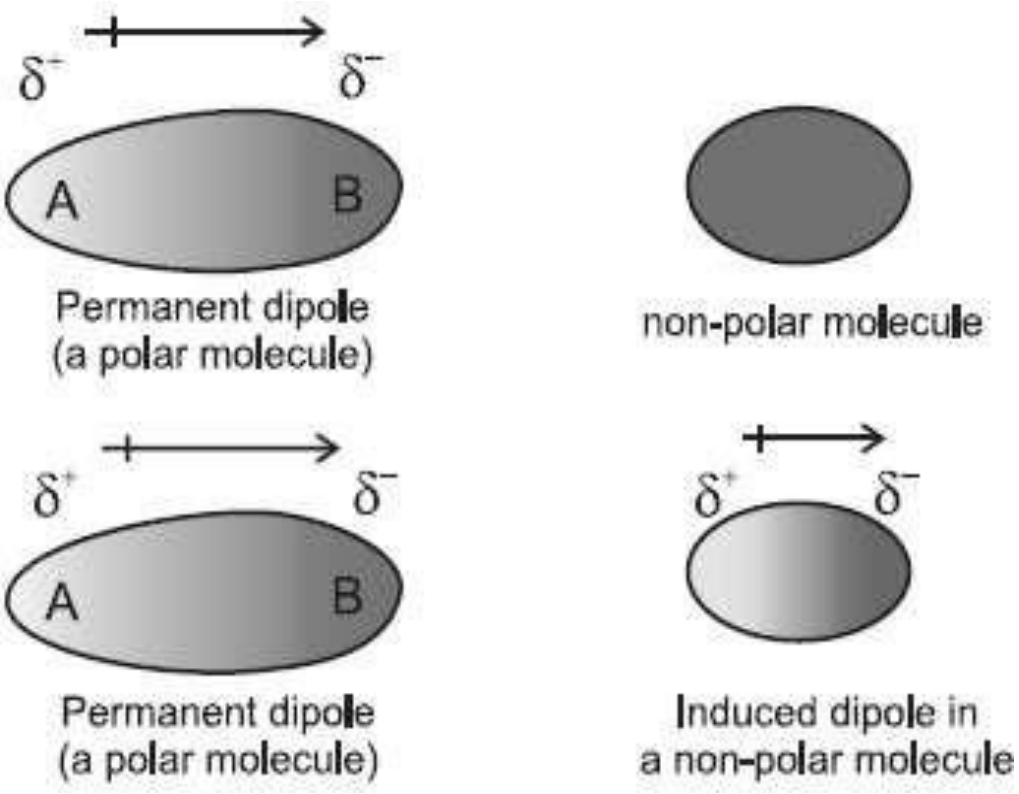


3) Dipole–Induced Dipole Forces

This type of attractive forces operates between the polar molecules and the non-polar molecules.

Permanent dipole of the polar molecule induces dipole on the electrically neutral molecule by deforming its electronic cloud. Thus an induced dipole is developed in the other molecule. The attraction between these molecules is termed as dipole – induced dipole force.

Thus an induced dipole is developed in the other molecule



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