PHASE EQUILIBRIUM

Phase: It is defined as any homogeneous & physical distinct part of a system which is separated from other parts of the system by definite boundary surfaces.

Homogeneous here means that system has identical physical properties & chemical composition throughout the system.

Gas system → only one phase is possible as gases are completely miscible with one another in all proportions.

Liquid system →
Number of phases = number of layers present in the system for completely miscible liquids.
Number of phase = 1.

Solid system →
Every solid constitutes a single phase.
Number of phases = number of solids.
In solids, every polymorphic form & allotropic modification constitutes a separate phase.

Components:

Smallest number of independent chemical constituents by means of which the composition of each & every phase can be expressed.

Here, independent chemical constituents means whose concentration can be varied independent of other constituents of the system.

Constituents: Total number of species present in the system.

→ In study of phase equilibrium system, we consider only intensive state of system (described by intensive variables) as mass (no. of moles) or size of each phase of system does not affect equilibrium position & so we are not concerned with relative mass or size of various phases.

Here, we deal not with number of moles (extensive variables) but with mole fraction (intensive variable).

Some examples:

One-component System:

Waters:

Equilibria between different phases.

Solid water (ice) ⇌ liquid water

Solid water (ice) ⇌ water vapour

Liquid water ⇌ water vapour

Solid water (ice) ⇌ liquid water ⇌ water vapour

Composition of any one phase (solid, liquid or vapour) can be expressed in terms of the single constituent i.e water. Therefore, number of components = 1.