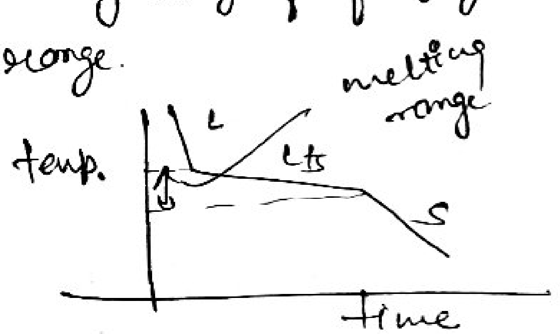
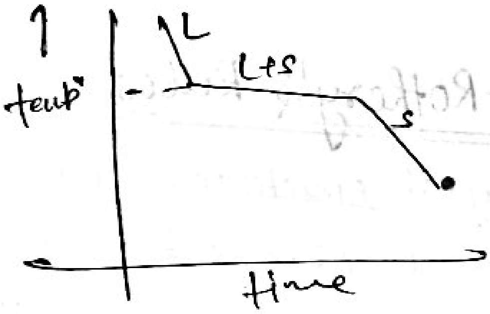
Solid solⁿ	Compounds
1. made of wt% basis	1. made on molor volume or voloney basis.
~~$2H_2 + O_2 \rightarrow 2$~~ No formulla	$2H_2O + O_2 \rightarrow 2H_2O + OH$ $Na^+ + Cl \rightarrow NaCl$ Can be written as formulla.
III. Solution Con cn. is variable	III. Molar vol. ratio remain fixed.
IV. They are indicated by greak letters in microstrure and phase diag.	IV.
V) Solid solⁿ melt are solidifies over a range of temp. known as melting range of freezing range. 	V) Compound melt or solidifies at const. temp. like pure metal. 
VI) They are formed due to mutual dislution of two elements.	VI) Compound are formed due to a chemical reaction b/w the two elements.
VII) Solid solⁿ are addresed by "MINOR ELEMENT IN MAJOR ELEMENT" Ex: α-ferrite is a solid solⁿ of carbon in iron. γ-Austenite " " " " Fe.	VII) Compounds are addressed by "Major element and minor element" Ex: Fe_3C → Is an interstatical compound of Fe and C. Mg_2Pb → Is an intermattalic " " Mg and Pb.

Solid solⁿ Strengthening

* Solid solns → are solns in solid state.
* It consist of ~~solvent and~~ → solvent, → Solute (Impurity)

* Two type of solid solⁿ exist they are interstaticial solid solⁿ and substitutional solid solⁿ
* Solid solⁿ are singlephase alloy.
* The reason for strength improvement by this tech. is. lattic distortion caused by solute impurity.
* for more significant improvement in strength the following two suggestion are made.
  - ↑es the concentration of solute.
  - ↑s the size diffⁿ b/w solvent and solute atoms.

Hume-Rothery's Rules:-

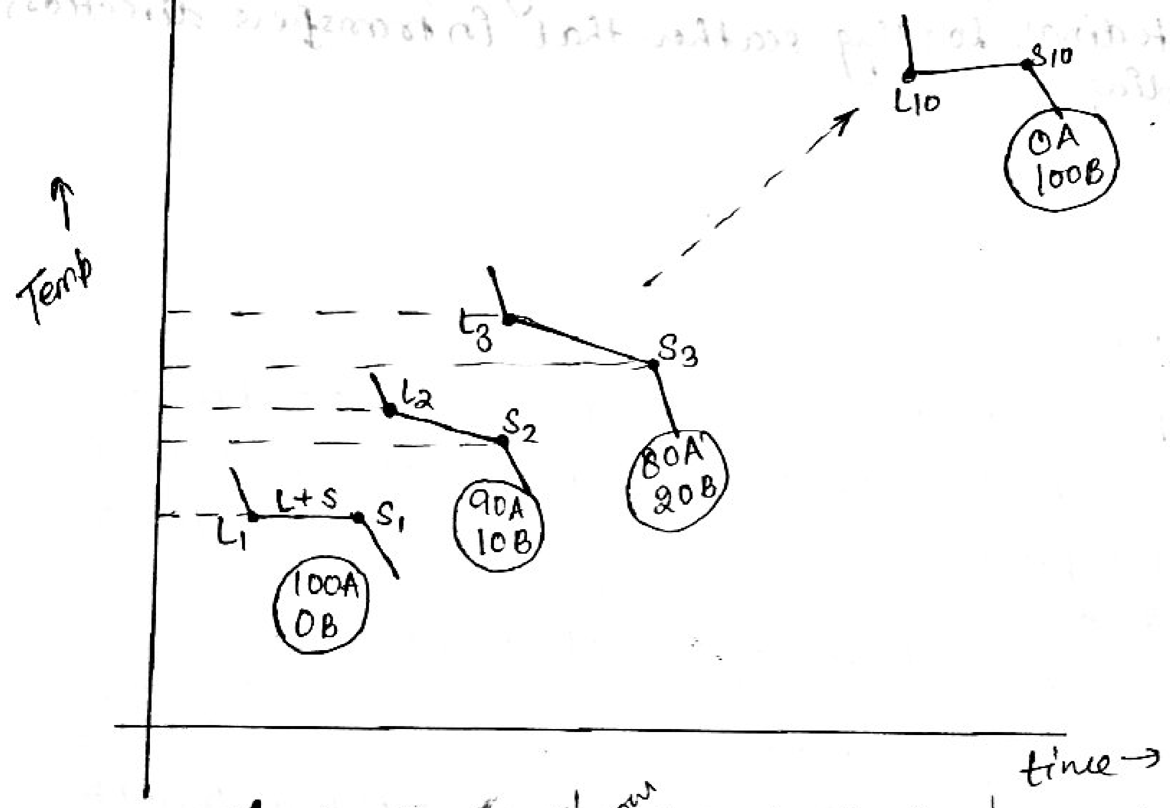
- Crystal structure factor:- The crystal structure of both the element should be same.
- Relative size factor:- The diff in atomic radi b/w the two elements should be less than 15%.
- Chemical affinity factor:- The greater the chemical affinity b/w the two element more the restriced will be the solubility.
- Relative valency factor:- An element of lower valency can disolve more amount of another element of higher valency, than the reverse.

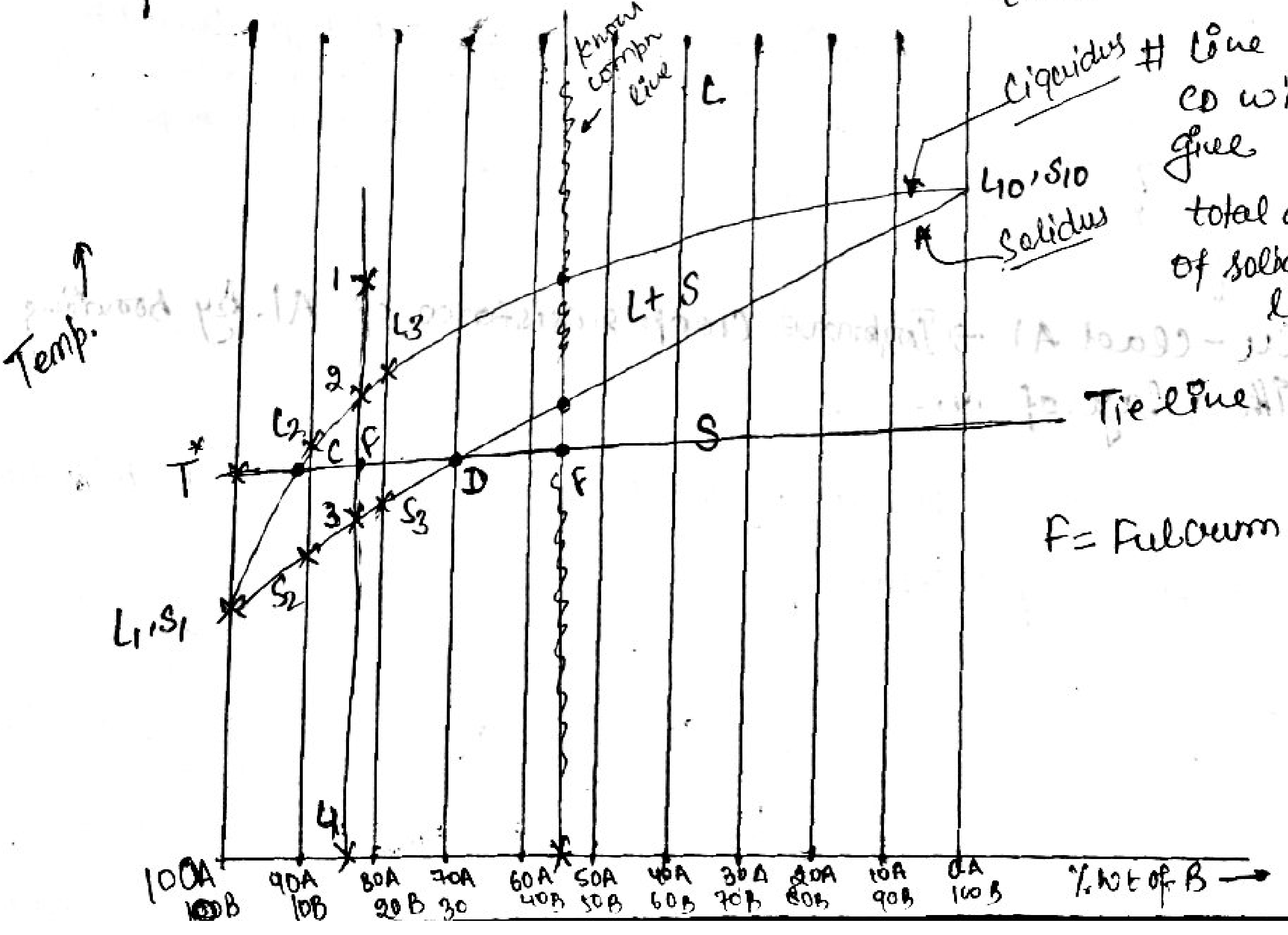
lower valency → solvent

higher " → solute.

Type-I :- <u>Isomorphous System</u>:- In this system of alloys the two elements added will exhibits complete solubility in both liquid and solid state.

Eg:- Cu-Ni System, Au-Ag system, Au-Cu, Mo-W System.





Line length CD will give total amount of solid and liquid.

F = Fulcrum

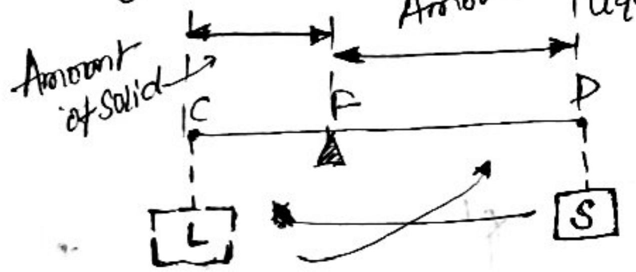
Uses:-

(I) Tie line rule:- Tie line is a horizontal line drawn at any known temp. (T^*)

Tie line rule is used for determination of composition of liquid and solid phases existing at any known temp.

(II) **Lever Rule:-** Lever rule is used for determination of relative amount of liquid and solid phases existing in an alloys, at any known temp.

Let x^* = any know compn

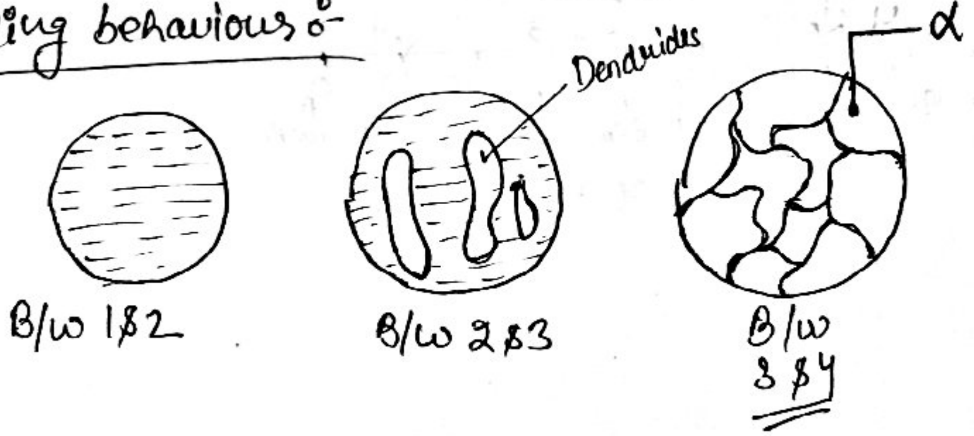


The relative amount of liquid and solid phase can be determined by moment balancing about fulcrum, when the lever is in equllibrium

Amount of solid (S)	$= \frac{CF}{CD} \times 100$
Amount of liquid (L)	$= \frac{FD}{CD} \times 100$

$L + S = 100\%$

(III) Cooling behaviours:-



Type-II :- <u>Eutectic</u> System: In this system of alloy the two elements added will exhibit complete solebity in liquid state and complete in solibility in solid state.

exp:-

Pb-As system, Bi-Cd, Au-Si system etc.

Let M = melting point of element 'A'.

N = " " " " 'B'.

Raoults law state that when an impurity is added to a Pure metal its melting point temp. decreases.

E = Eutectic [lowest melting point of Alloy]

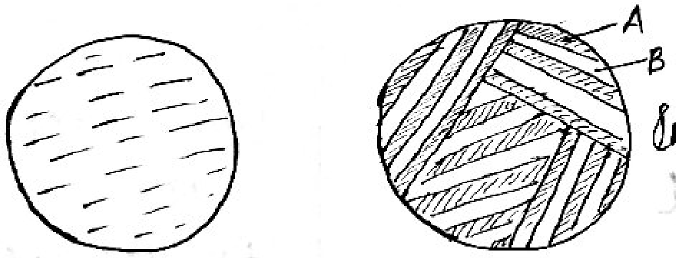
MEN = Liquidus.

* E = freezing temp and melting point.

MPEQN = Solidus.

Cooling behaviour of Eutectic Alloys:

Above 2
In liquid dissolve form.
A is dissolve in B or vise versa.

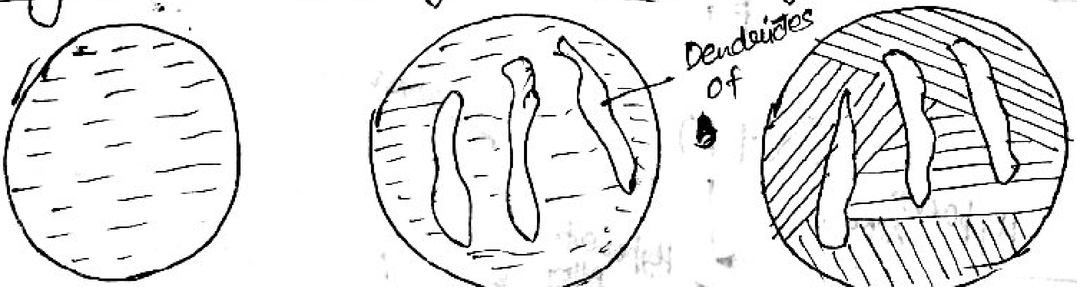


B/w 1&2   B/w 2&3.

Inter lamellar Structure of A & B.

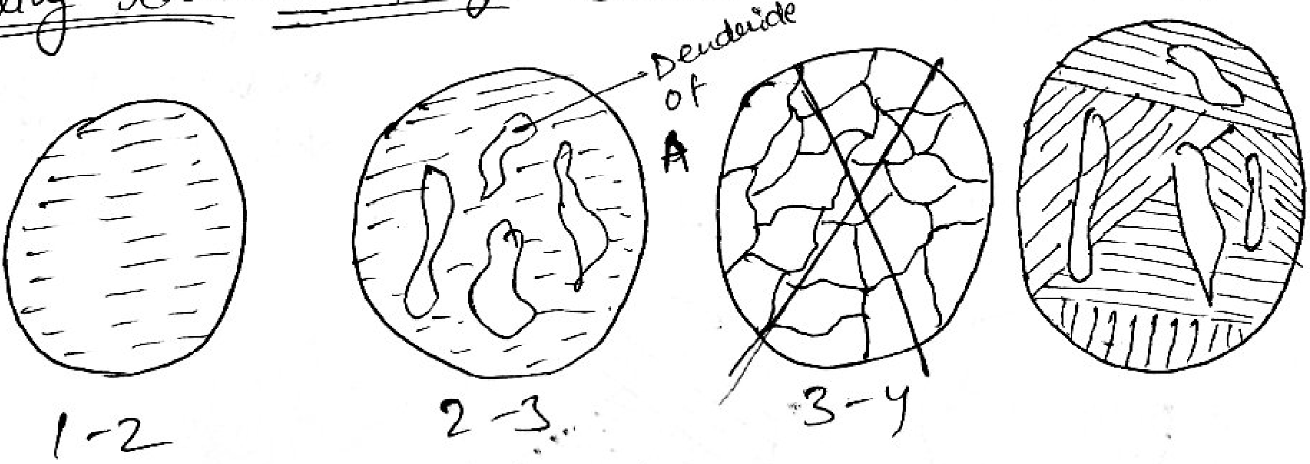
Here No dendride will form.

Cooling behaviour of ~~hypoeutectic~~ hypereutectic Alloys:



1-2   2-3   3-4

Cooling behaviour of hypoeutectic Alloys:



1-2   2-3   3-4