Chapter 9:- solid solutions & Phase Equilibrium

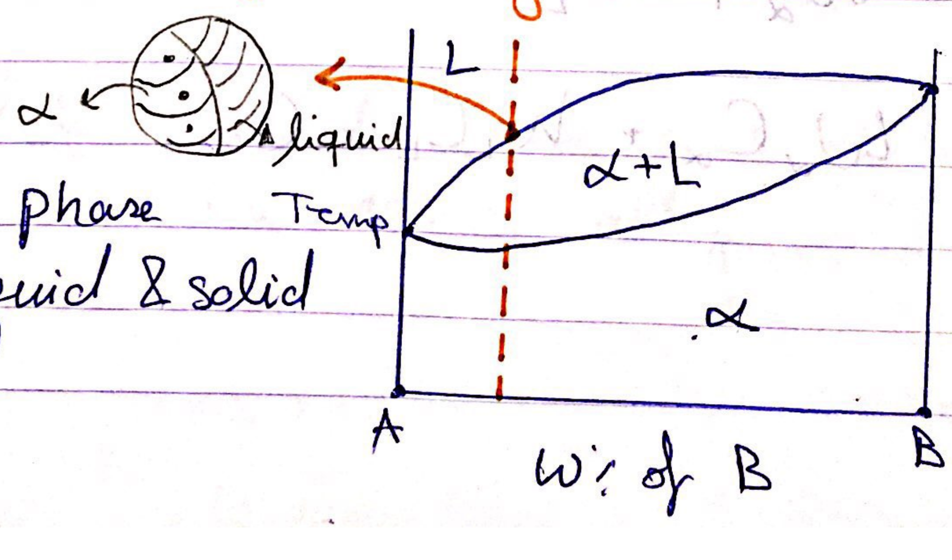
Gibbs phase rule :

$$\boxed{N + C = F + P}$$

- N → Number of noncompositional Variables
- C → Number of components (elements, or compounds)
- F → degree of Freedom
- P → Number of phases

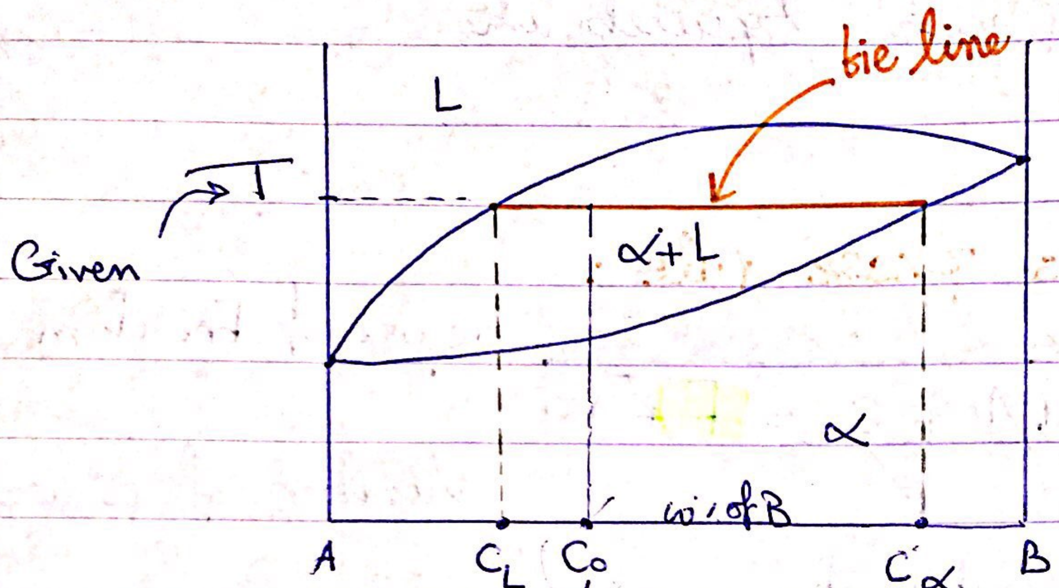
• Equilibrium occurs when system doesn't changes with Time

Binary isomorphous system:



L: liquid phase
α+L: liquid & solid
α: solid

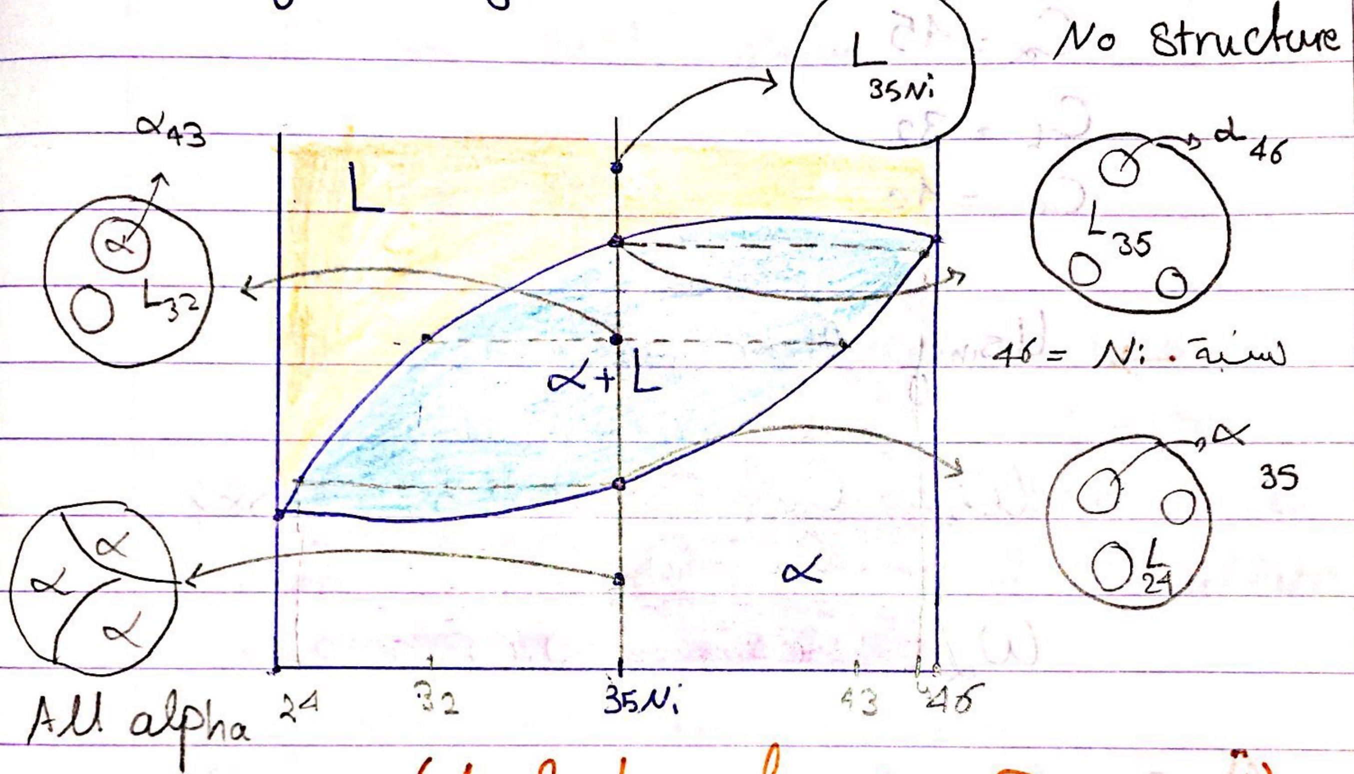
lever Rule:-



usually Given by the Question

- W_L (weight of liquid) $= \dfrac{S}{R+S} = \dfrac{C_\alpha - C_o}{C_\alpha - C_L}$
- $W_\alpha = 1 - W_L = \dfrac{R}{R+S} = \dfrac{C_o - C_L}{C_\alpha - C_L}$
- $W_\alpha + W_L = 1$
- $W_\alpha C_\alpha + W_L C_L = C_o$

Very slow cooling of an isomorphous alloy (very slow)



α_{35Ni}
$L = 0$

(A Section of a phase Diagram)

Graph 2

→ Solving Exercises using lever rule

Ex 9.9 page 37 + 38 in slides

Calculate amount of α and L at 1250° in Cu- 40% Ni alloy.

→

→ Using the Graph

$C_\alpha = 45$

$C_L = 32$

$C_o = 10$

→ Using lever rule:

$$W_L = \frac{C_\alpha - C_o}{C_\alpha - C_L} = 0.38 = 38\%$$

$$W_\alpha = 1 - 0.38 = 0.62 = 62\%$$

⚠ Remember: C_α = تركيز Ni في α

C_L = تركيز Ni في L

When the Question asks for the amount of phase $\equiv$ amount of α L in each phase

Back to graph 2

In pink Region, $\alpha = 100$; L = 0
In orange Region: $\alpha = 0$ L = 100.
In Blue Region, you use lever rule Given (a specefic T and Concentration)

→ Seen, in page 40 in the slides