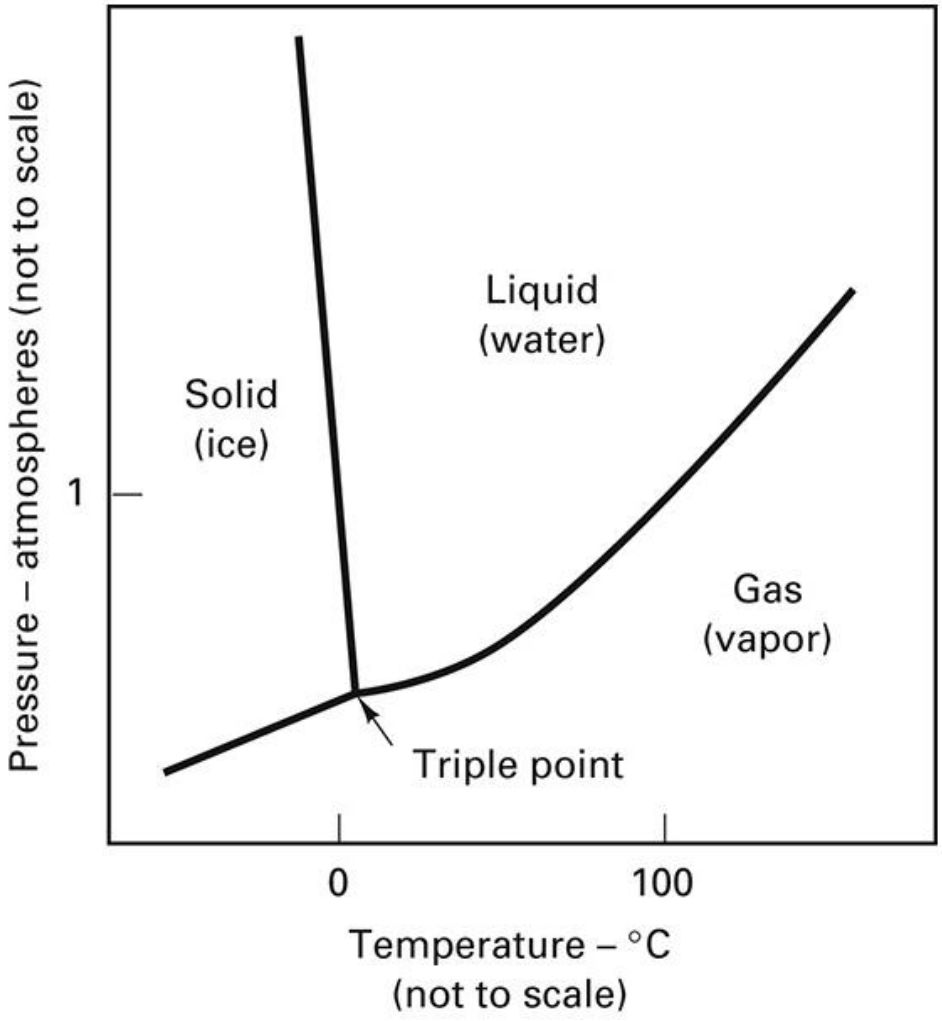
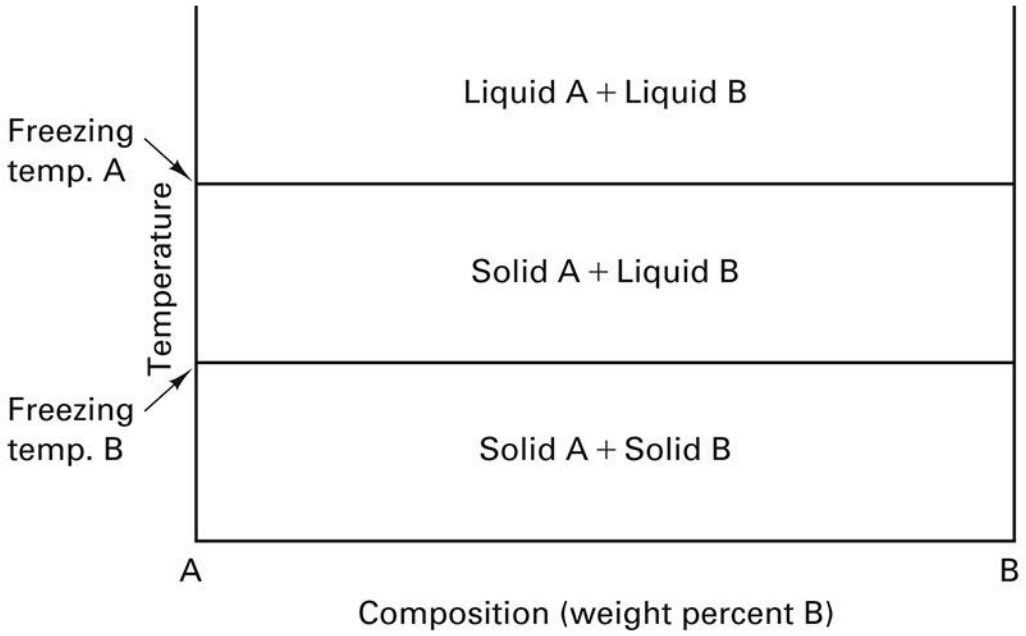

Pressure – atmospheres (not to scale)
1
Solid
(ice)
Liquid
(water)
Gas
(vapor)
Triple point
0
100
Temperature – °C
(not to scale)

Two materials that are completely insoluble in each other in both the liquid and solid states



Cooling curves of H_2O &NaCl mixtures

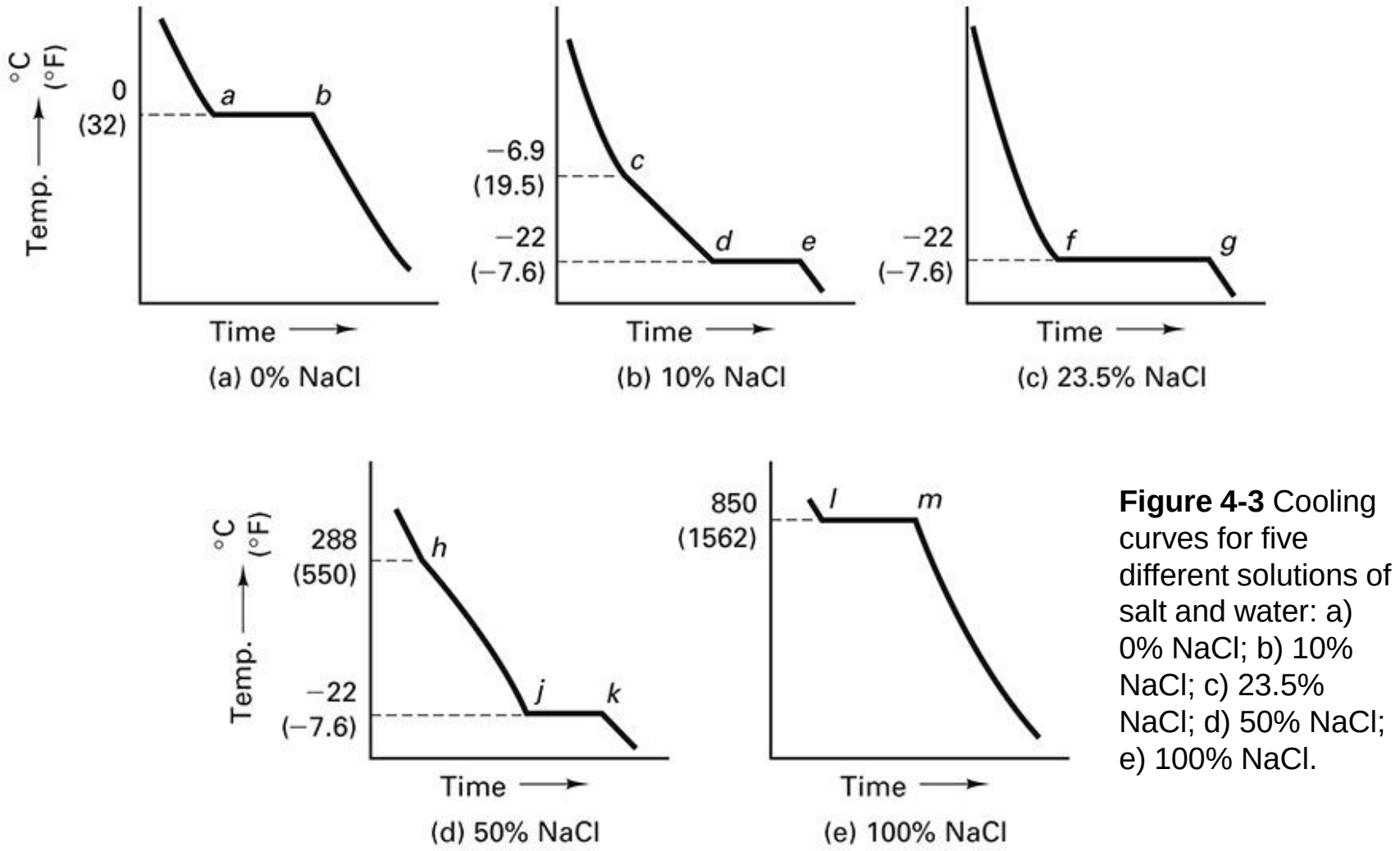


Figure 4-3 Cooling curves for five different solutions of salt and water: a) 0% NaCl; b) 10% NaCl; c) 23.5% NaCl; d) 50% NaCl; e) 100% NaCl.

Cooling Curves

- Figure 4-4 shows the transition points of a temperature time curve for a solution of NaCl in water
- Line a-c-f-h-l shows the lowest temperature at which the solution is totally liquid, known as a liquidis line

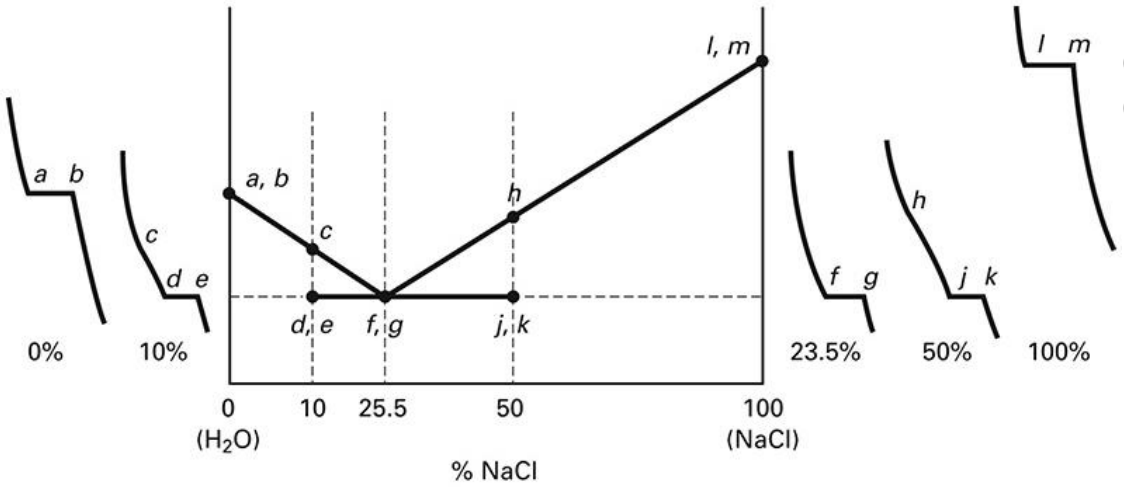


Figure 4-4 Partial equilibrium diagram for NaCl and H_2O derived from cooling-curve information.

Solubility Diagrams

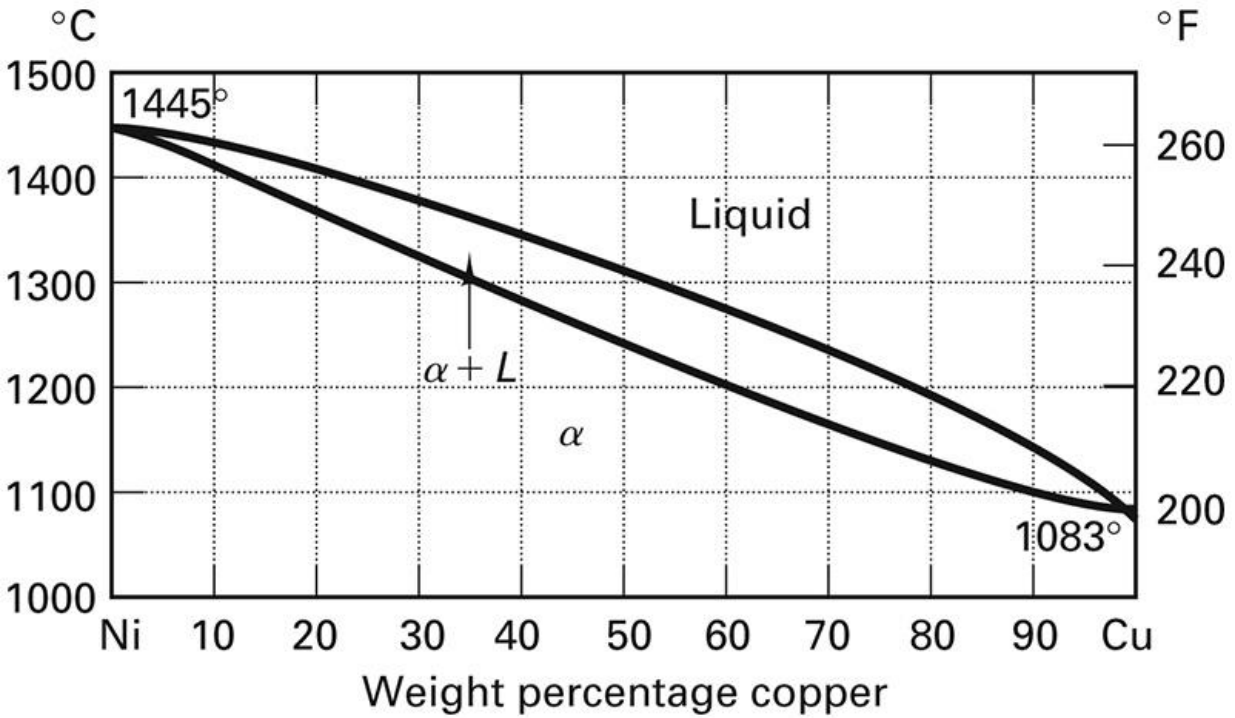
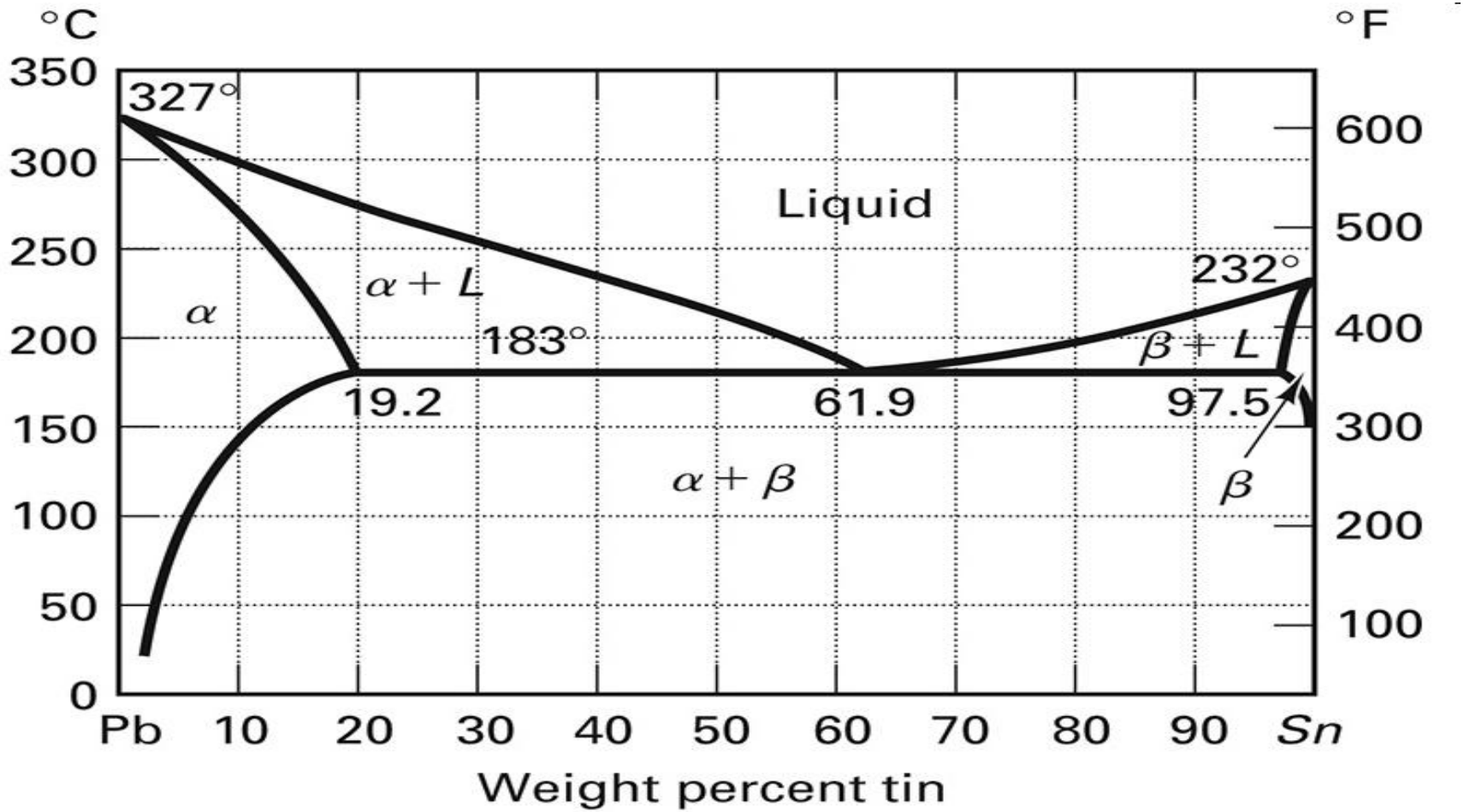


Figure 4-6 (Below) Copper-nickel equilibrium phase diagram, showing complete solubility in both liquid and solid states.

Pb-Sn diagram



Three-phase reactions

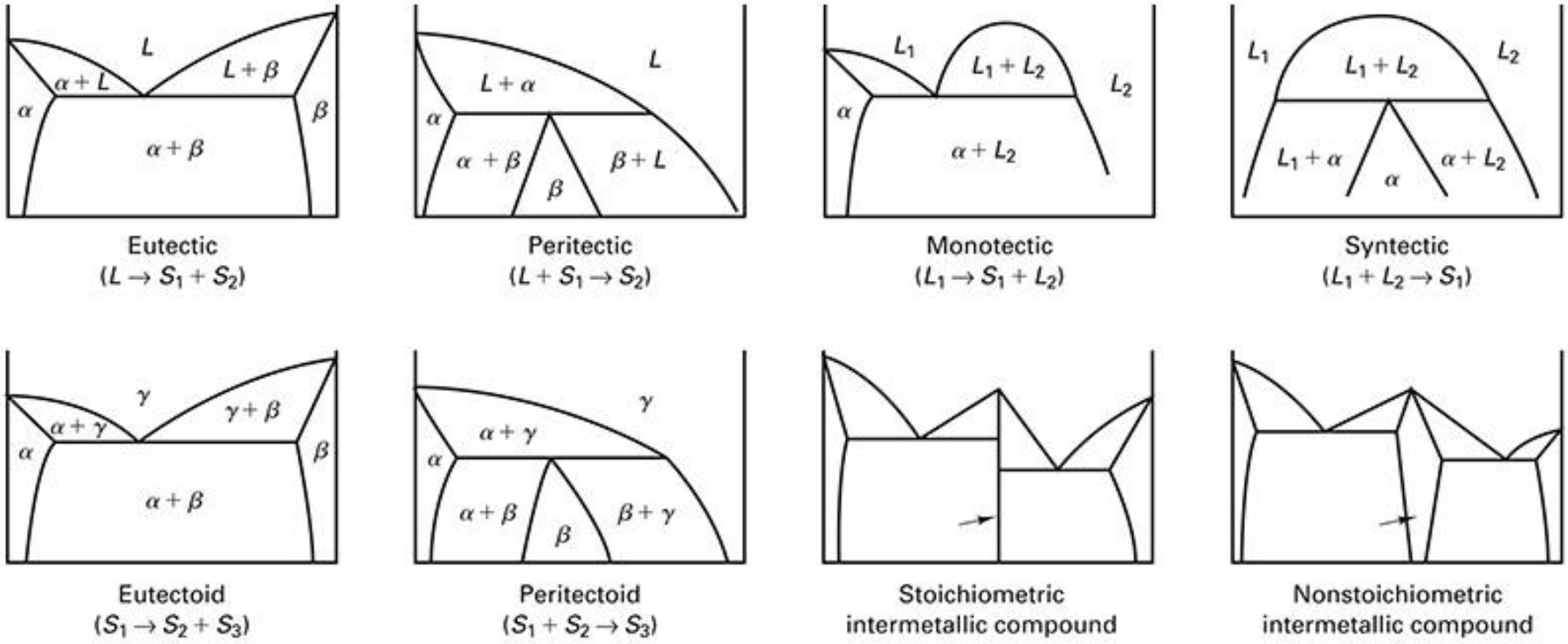


Figure 4-9 Schematic summary of three-phase reactions and intermetallic compounds.

Iron-Carbon Equilibrium Diagram

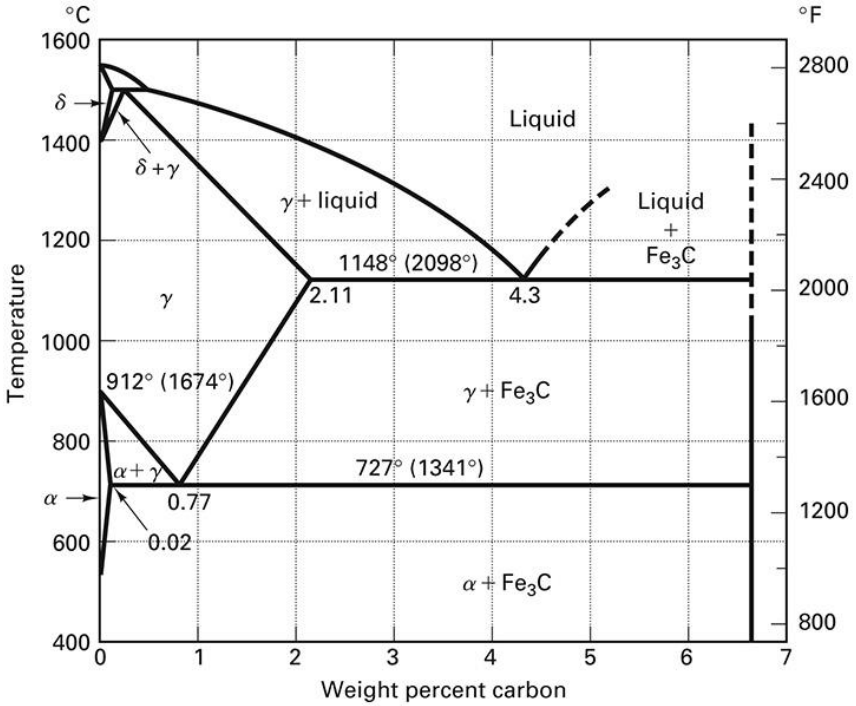


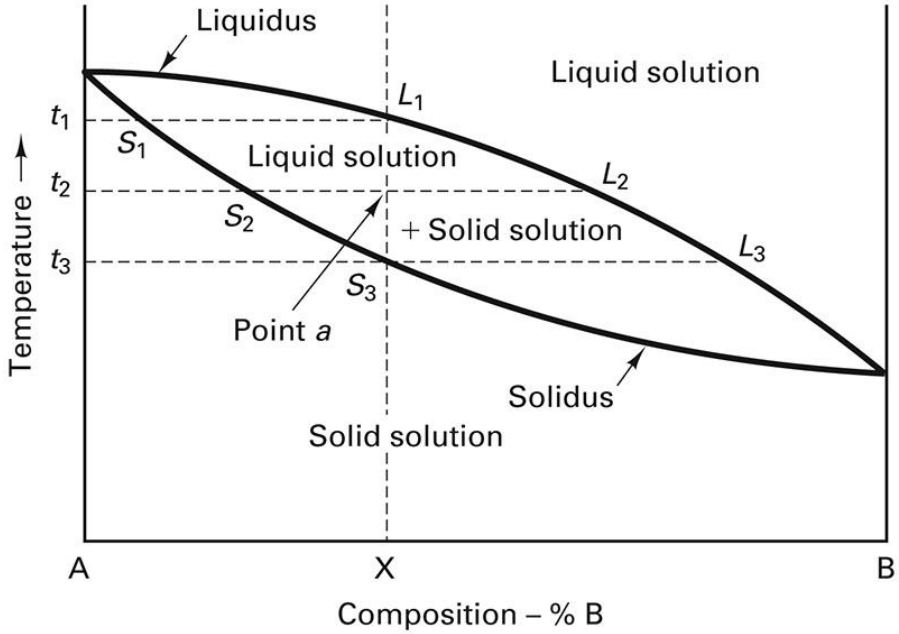
Figure 4-10 The iron-carbon equilibrium phase diagram. Single phases are α, ferrite; γ, austenite; δ, δ-ferrite; Fe_3C, cementite.

- Four single phase solids within the diagram
- Delta-ferrite, austenite, ferrite, cementite
- Steels are the iron alloys with less than 2.11% carbon

Utilization of Diagrams

- Phase diagrams contain the following information
  - The phases that are present at a given temperature and composition
  - Composition of each phase
  - Amount of each phase present
    - Using the lever law, the amount of each phase in a two-phase region can be calculated

Figure 4.8 Equilibrium diagram showing the changes that occur during the cooling of an alloy X.



Fraction of the material that is liquid

$$\frac{a - S_2}{L_2 - S_2} \times 100\% = L.F.$$

Fe-C Low T, Low 5C