HW solution for Lecture 11

8.2
(a) Along the freezing line, liquid and solid phases are in equilibrium.
(b) Along the vaporization line, liquid and vapor phases exist in equilibrium.
(c) At the triple point, all three phases - vapor, liquid and solid - coexist.

8.3
Three triple points can be identified having the following phases in equilibrium:

1. vapor, liquid and δ Fe
2. vapor, δ Fe, and γ Fe
3. vapor, γ Fe, α Fe

8.4
The equation for the Gibbs phase rule is:

\[ P + F = C + 2 \]

where
- \( P \) = the number of phases that coexist within a specific system
- \( F \) = the degrees of freedom for the system
- \( C \) = the number of components in the system

8.5
(a) At the triple point, there are zero degrees of freedom.
(b) Along the freezing line of pure water, there is one degree of freedom.

8.6
(a) A cooling is a record of temperature versus time for a metal as it solidifies from melt and cools to room temperature. (b) The cooling curve can provide information regarding phase changes (liquid-solid and solid-solid) experienced by the material. It can also provide information related to casting of a molten metal such as time required for solidification.

8.7
The binary isomorphous alloy system is a two-component system in which the two elements are completely soluble in each other in the liquid and solid states and form a single type of crystal structure for all compositions.