1. Consider an alloy containing 70% Ni and 30% Cu. Its phase diagram is shown below.
(a) At 1350°C make a phase analysis assuming equilibrium conditions. The phase analysis should include: (i) What phases are present? (ii) What is the chemical composition of each phase? (iii) What is the weight percentage of each phase?
(b) Make a similar phase analysis at 1500°C.
(c) Sketch the microstructures at these two temperatures.

2. Consider the binary peritectic iridium-osmium phase diagram below. Make phase analyses of a 70 wt % Ir–30 wt % Os alloy at (a) 2600°C, (b) 2665°C + ΔT, and (c) 2665°C - ΔT. In the phase analyses, include: (i) The phases present, (ii) The chemical compositions of the phases, and (iii) The amount of each phase. ΔT is a very small temperature difference.
3. Perform phase analyses for a high-carbon steel with the carbon content of 1 wt%, for (a) 2000 °F; (b) 1400 °F; (c) 1333 °F + ΔT; and (d) 1333 °F - ΔT; (e) Describe the phase transformation behavior of this steel when we slowly decrease temperature from 3000 °F to room temperature; i.e. at what temperature what would happen.

**Bonus Question.** (a) Based on the carbon content, what are the major different types of steel? (b) Why does carbon affect the strength of steel?