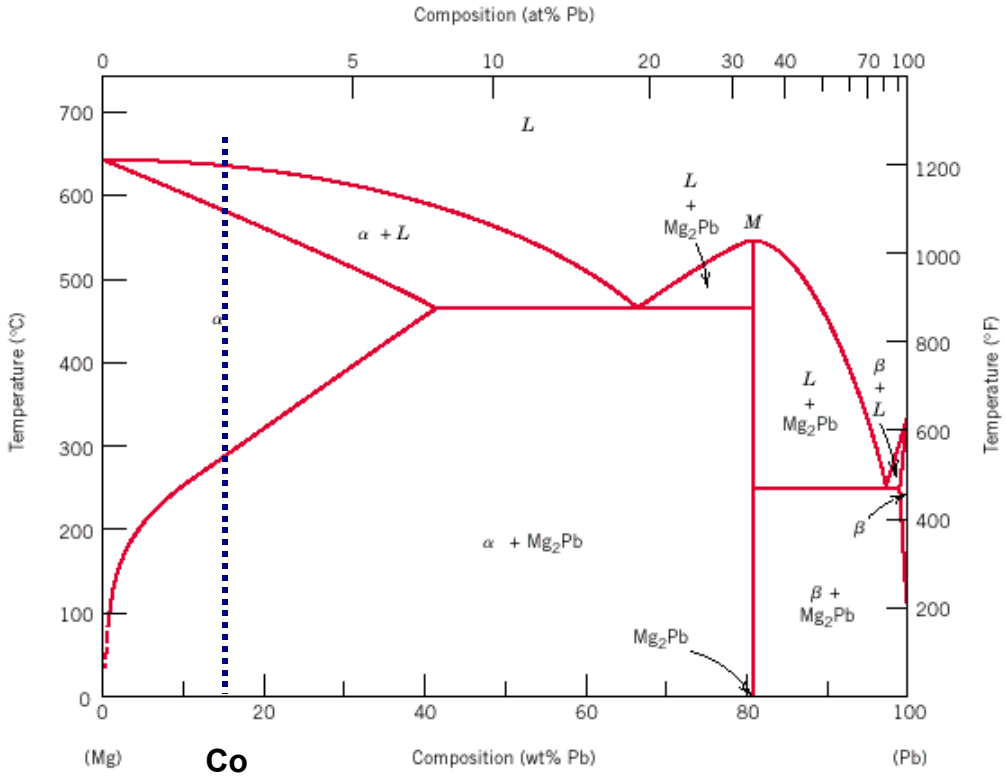
Mat E 272-C
Fall 2001 – Homework Set # 8

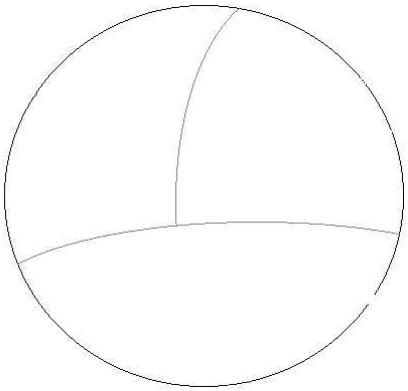
Due 3:00 pm Tuesday November 13, 2001

Note: Each problem is worth 5 points (20 points total for this assignment)

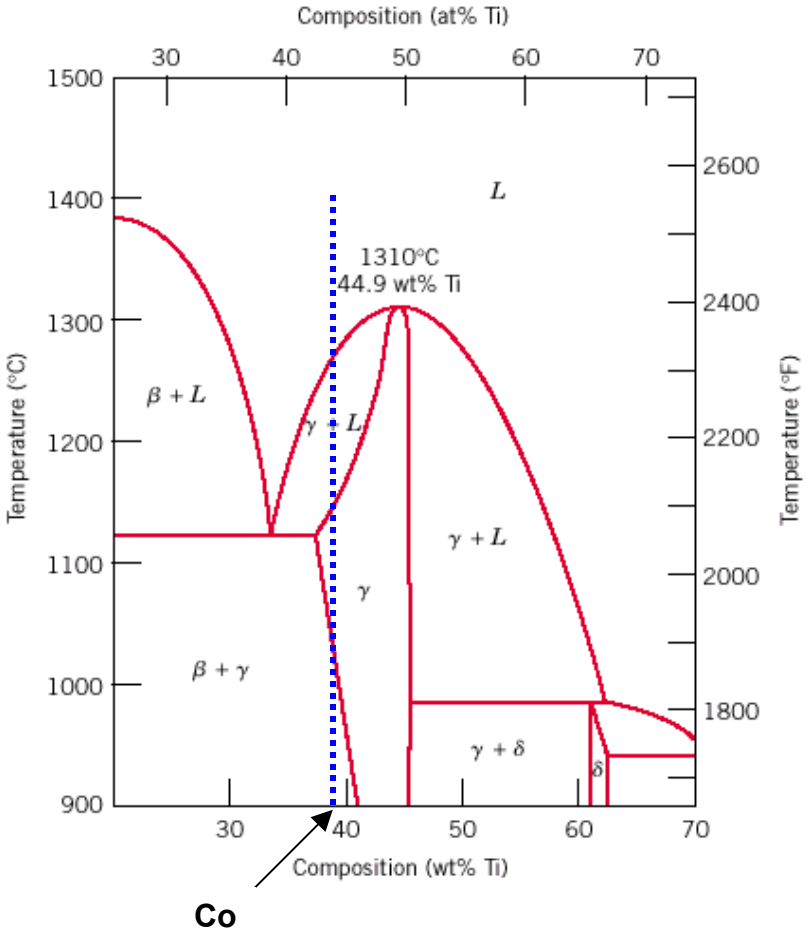
1. **Use the following phase diagram to predict the room temperature microstructure of an alloy of overall composition Co after <u>equilibrium</u> solidification from the melt:**



Use the circle on the next page to represent a region of the material under microscopic observation. Grain boundaries have been drawn in to distinguish neighboring grains. Your task is to sketch in the microstructure within each grain, <u>labelling all constituents</u>. (Follow the examples provided in Chapters 9 and 10 in Callister). Estimate the mass fraction of all constituents.

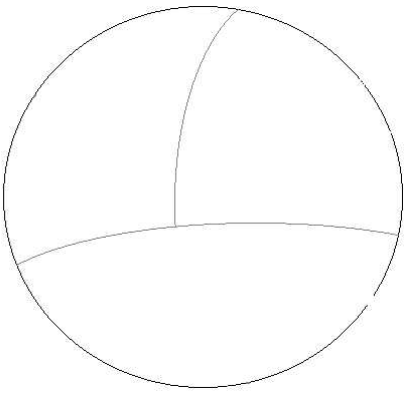


2. Use the following phase diagram to predict the room temperature microstructure of an alloy of overall composition Co after <u>equilibrium</u> solidification from the melt:

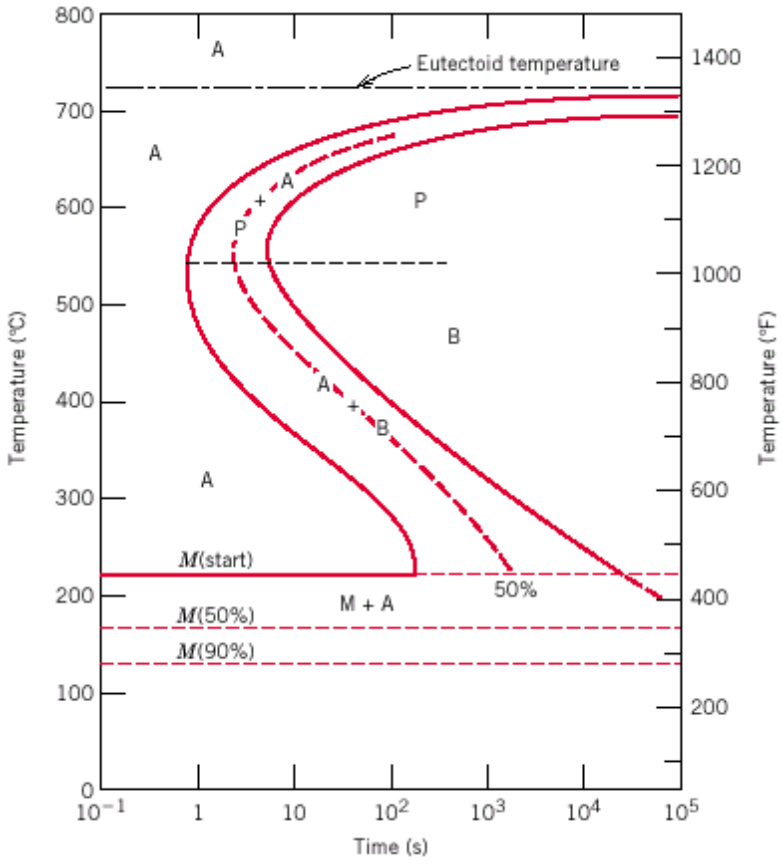


As you did for problem # 1, use the circle below to represent a region of the material under microscopic observation. Grain boundaries have been drawn in to distinguish neighboring grains. Your task is to sketch in the

microstructure within each grain, labelling all constituents. (Follow the examples provided in Chapters 9 and 10 in Callister) Estimate the mass fraction of all constituents.



3. Using the following isothermal transformation diagram for eutectoid steel, describe (in words) the resulting room temperature microstructures produced by the following conditions (draw in the specified cooling path on the diagram and label as appropriate a, b, c). Indicate what phases you expect in the final product. Assume the material has been fully austenitized before cooling.



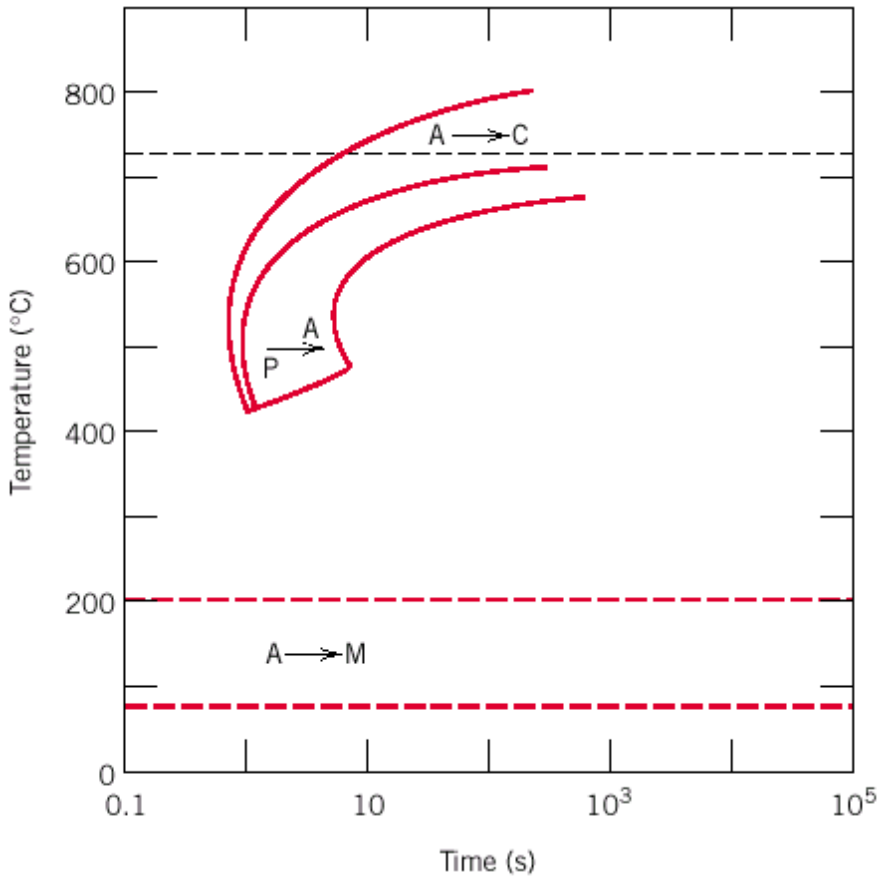
a) **Rapidly cool to 650°C, soak for 27.8 hours, then quench to room temperature:**

b) **Rapidly cool to 500°C, soak for 27.8 hours, then quench to room temperature:**

c) **Rapidly cool to 260°C, soak for 16.7 minutes, then quench to room temperature:**

d) **Rapidly cool to 500°C, soak for 6 seconds, then quench to room temperature:**

4. Using the following <u>continuous cooling transformation</u> diagram for a 1.13 wt % C iron-carbon alloy, sketch and label continuous cooling curves to yield the following microstructures:



a) fine pearlite + proeutectoid cementite

b) martensite

c) coarse pearlite + proeutectoid cementite