Chemistry 311

Physical Chemistry

Homework Assignment # 9
NOT TO BE GRADED

1. The following cooling curve data are given for the Antimony-Cadmium system:

Cd (% wt)	0	20	37.5	47.5	50	58	70	93	100
First break (°C)	–	550	461	–	419	–	400	–	–
Eutectic halt (°C)	630	410	410	410	410	439	295	295	321

Construct the phase diagram, assuming that no breaks other than these occur in any cooling curve. Find the formula of any compound(s) formed. Label the diagram completely, i.e., in each two-phase region specify the phases present and in the case of solid phases, identify the solids.

2. (a) The following data are for a three-component system made up of three partially miscible liquids, A, B, and C. The equilibrium compositions of the two layers formed when B is added to a solution of moderate amounts of C in A and to a solution of moderate amounts of A in C are given below.

Layer rich in A		Layer rich in C	
x_A	x_B	x_B	x_C
0.90	0.06	0.10	0.80
0.80	0.16	0.21	0.68
0.70	0.24	0.31	0.60
0.60	0.33	0.42	0.48
0.50	0.42	0.50	0.40
0.40	0.50	0.56	0.34
0.31	0.58	0.60	0.28

(a) Construct the phase diagrams showing the tie-lines connecting the equilibrium compositions.

(b) Identify the critical point composition

(c) A solution is prepared such that the mole-fractions of A, B, and C are, respectively, 0.30, 0.40, and 0.30. How many phases will be present at equilibrium?

(d) If we wish to generate a system containing a single phase by adding various amounts of A, B, or C to the solution in part (c), identify the compositions at which the single phase would result by addition of (i) A, (ii) B, and (iii) C.