

I. (35) Elective Experiments. Do only ONE of the following three problems; pick one that correspond to your lab work. (Other choices will not be counted.)

A. Equilibrium and spectrophotometry.

- $T = 0.1019$; $\epsilon = 656.5 \text{ L mol}^{-1} \text{ cm}^{-1}$
- $[I_2] = 3.473 \times 10^{-4} \text{ M}$; $[M] = 7.5255 \times 10^{-4} \text{ M}$; $[M \cdot I_2] = 2.1933 \times 10^{-4} \text{ M}$;
 $K_c = 839 \text{ M}^{-1}$
- $\Delta H^\circ = -21.3 \pm 1.6 \text{ kJ/mol}$; $\Delta S^\circ = -71.7 \text{ J mol}^{-1} \text{ K}^{-1}$; $\Delta G^\circ = -0.24(7) \text{ kJ/mol}$

B. Thermal Expansivity. [Hint: Precision is very important in all these calculations.]

- $V_b = 26.5286 \text{ mL}$; $\alpha = 9.307 \times 10^{-4} \text{ K}^{-1}$
- $s_{Dh} = 0.283 \text{ mm}$; $s_{DT} = 0.14 \text{ K}$; $s_a = 3.98 \times 10^{-5} \text{ K}^{-1}$
- $V_h = 0.0265 \text{ mL}$; $V_0 = 25.758 \text{ mL}$; $s(V_0) = 1.57 \times 10^{-4} \text{ mL}$
- $r = 1.33465 \text{ g/mL}$
- $V_0 = 25.789 \text{ mL}$; $r = 1.33425 \text{ g/mL}$

C. Liquid-Vapor Equilibrium.

- 69.7 torr (acetone) & 61.7 torr
 - $P_A = 42.97 \text{ torr}$; $P_B = 12.83 \text{ torr}$; $P_{A,id} = 48.79 \text{ torr}$; $P_{B,id} = 18.51 \text{ torr}$;
 $g_A = 0.881$; $g_B = 0.693$
 - $P = 67.3 \text{ torr}$; $x_{A,v} = 0.725$
 - yes, max-boiling
 -
- This function ensures that $x_{A,v}$ correctly goes to 0 and 1 when $x_{A,l}$ does.
$$b^*x + c^*x^2 + d^*x^3 + (1 - b - c - d)^*x^4$$
- $s_P = 0.268 \text{ torr}$; $s_x = 0.0074$

II. (15) Review.

- A.** (1) -12°C and 33 torr (2) 56.9°C (3) 31.9 kJ/mol (4) 44.7 kJ/mol
(5) 12.8 kJ/mol

B.

- $a(t) = (a_0 - a_\infty) \exp(-k_{\text{eff}} t) + a_\infty$
- $(a - b) \exp(-c^*x) + b$; $a = 10$; $b = -3$; $c = 0.02$