CHEM352: Physical Chemistry I
Homework Set IV - due XXX of Nov, 5.00 pm

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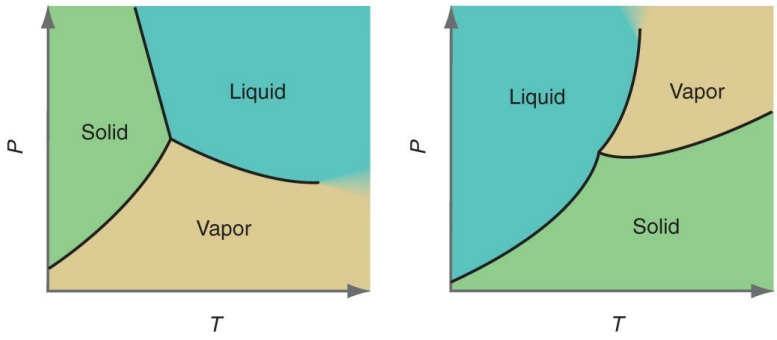
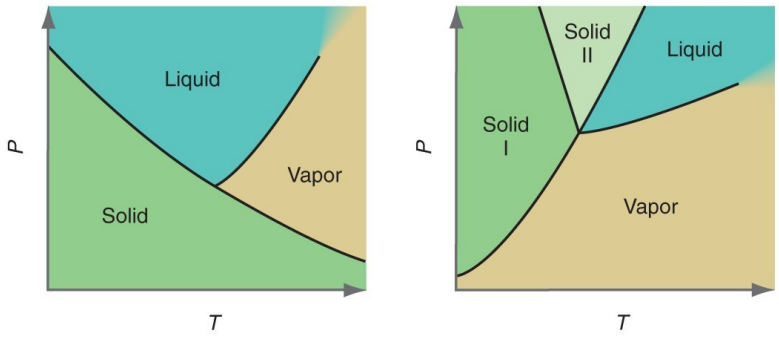
Lecture: Tue, 2.10-3.25 pm & Fri 2.10-3.25 pm, **C111**
Office hours: Thu, 4-6 pm, **HB - 1321B**

## Problem 1 — CH9/5pts

1. Eplain all features of the following diagrams that are not observed for real substances:

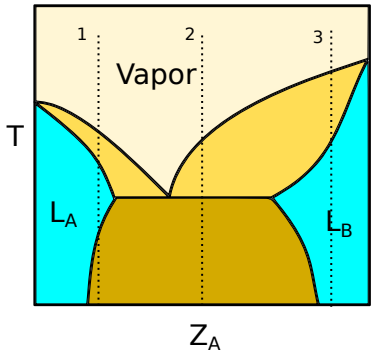



2. Eplain all features of the following diagrams that are not observed for real substances:




## Problem 2 — CH9/5pts

Using the 'bunny-ear' diagram below, list all phases present (including an estimate for the composition) and phase transitions that occur when increasing temperature along lines 1, 2 and 3.



## Problem 3 — CH10/5Pts

Calculate the pH of a buffer solution that is 0.200 molal in $CH_3COOH$ and 0.15 molal in $CH_3COONa$ using the Davies equation to calculate $\gamma_\pm$. What would be the pH if $\gamma_\pm = 1$ was assumed?

## Problem 4 — CH10/5pts

At 298.15 K, the pKa for acetic acid is equal 4.8. Using Debye-Hückel limiting law, calculate the degree of dissociation in 0.15 m and 1.50 m solutions. Compare these values with (1) situation when the ionic interactions have been ignored and (2) $\gamma_{pm}$ for the acid is equal 1.

## Problem 5 — CH11/5pts

1. Determine $E^\circ$ for the reaction:
$$Cr^{2+}(aq) + 2e^- \rightarrow Cr(s) \tag{1}$$
using one electron reduction and three electron reduction reactions of $Cr^{3+}$.

2. Determine the activity of $Sn^{4+}(aq)$ in the following reaction at 298.15K at equilibrium:
$$Sn(s) + Sn^{4+}(aq) \rightleftarrows 2Sn^{2+} \tag{2}$$
The $a_{Sn^{2+}} = 0.25$.

3. Determine $K_{sp}$ for $AgBr$ at 298.15K using the electrochemical cell descibed by:
$$Ag(s)|Ag^+(aq, a_{Ag^+})||Br^-(aq, a_{Br^-})|AgBr(s)|Ag(s) \tag{3}$$

You can find respective chemical potentials in Table 11.2 in the appendix or use your favorite web-search protocol.