Key and guide to exam #1

Chemistry 342, (01:160:342), Spring 2012
Physical Chemistry of Biochemical Systems

Use the hints below to get you started on problems you had trouble with on the first exam. You should arrange to meet with me if you still don't understand how to do the problems.

Problem 2 For the first part, see pp. 95-96 of the text; then set $H = U + pV$, which implies $dH = dU + pdV + Vdp$; substitute in the expression for dU to get $dH = TdS + Vdp$. Identify the required partial derivatives with the coefficients in these equations.

Problem 3 There are lots of equations that involve H and T, but the one that determines how enthalpy depends upon temperature is that $C_p = (dH/dT)_p$. Move dT to the other side of the equation and integrate both sides.

Problem 4 Start with $pV = nRT$ or $V = nRT/p$, and differentiate.

Problem 7 Start with $x_A = n_A/(n_A + n_B) \approx n_A/n_B$ when $x_A \ll 1$. Now $b_A = n_A/m_B$ (since "B" must be the "solvent" here). Combine the two equations to get an expression for x_A in terms of b_A.

Problem 8 Use μ(liquid)$= \mu^{\ominus}$(liquid), since the liquid is in its standard state; μ(gas)$= \mu^{\ominus} + RT\ln(p/p^{\ominus})$. At equilibrium, the two chemical potentials must be equal.

Problem 9 This is exactly like example 4.5, on pp. 161-162 of the text.

Problem 10 Move all the terms that involve p to one side of the equation, and all the terms involving T to the other side. Then integrate both sides.