

Key and guide to exam #1

Chemistry 488, Spring 2013 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 $C_v = \Delta U/\Delta T$ (eq. 1.9a); $C_p = \Delta H/\Delta T$ (eq. 1.14a). Hence $C_p - C_v = (\Delta H - \Delta U)/\Delta T = \Delta(pV)/\Delta T = \Delta(nRT)/\Delta T = nR$. For molar heat capacities, you can set $n = 1$.

Problem 4 Convert 10^6 molecules to moles; multiply by $31 \text{ kJ mol}^{-1} \text{ sec}^{-1}$.

Problem 5 $dG = Vdp - SdT + \dots$; problem says to set $dT = 0$; compute the molar volume of tristearin (in $\text{m}^3 \text{ mol}^{-1}$); convert $200 - 1 = 199 \text{ atm}$ to Pa; multiply $\text{Pa} \times \text{m}^3$ to get J.

Problem 6 Use $G = H - TS$; compute $\Delta_{vap}G$ first at 298K, then again at 274K, then subtract. Note that the contribution of $\Delta_{vap}H$ cancels when you compute the change in $\Delta_{vap}G$.

Problem 7 At the boiling point, $\Delta_{vap}G = 0 = \Delta_{vap}H - T\Delta_{vap}S$; solve for T.

Problem 8 This is exactly like example 4.5, on pp. 161-162 of the text.