Key and guide to exam #1

Chemistry 342, (01:160:342), Spring 2016
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 1 The standard Michaelis-Menten formula, $v_0 = V_{max}/(1 + K_M/[S])$ gives you the intial rate if you know $[S]$. Rearrange this to compute $[S]$ if you know v_0. Then insert $v_0 = 0.9V_{max}$ and $v_0 = 0.1V_{max}$ to get $[S]_{90}$ and $[S]_{10}$.

Problem 2 Use $\nu\lambda = c$ and $\widetilde{\nu} = 1/\lambda$.

Problem 4 The boundary condition on ϕ is that the wavefunction has to be the same for ϕ and $\phi + 2\pi$, since those represent the same point in space. Functions like $\sin(n\phi)$ and $\cos(n\phi)$ will work as long as n is an integer. [Note that $\cos(0\phi) \equiv 1$ is a valid solution, although it would have to be normalized.]

Problem 6 Please review the derivation of this on pp. 384-385 of the text.

Problem 7 This is a rigid rotator problem, for which the energies are $E_J = J(J+1)\hbar^2/(2\mu r_0^2)$. Note that frequencies are always related to differences in energy, so you must compute $\Delta E = E_1 - E_0 = h\nu$; then convert ν to λ as in Problem 2.