Chapter 8

1. *Chemical potential.* Define the chemical potential, μ. What properties does it depend upon? What is its functional form for an ideal gas or dilute solution? What is the standard chemical potential?

2. *Chemical forces and equilibrium.* Define ΔG and ΔG^0, and chemical equilibrium. What are the forward and backward reaction rates for a reaction at equilibrium? Formulate the static (at equilibrium) mass action rule in terms of ΔG^0. Is your body in chemical equilibrium?

3. *Dissociation.* The probability of a dissociating molecule to be in its protenated form is described by $P_\alpha = (1+10^{x_\alpha})^{-1}$, where $x_\alpha = pH - pK_\alpha$. Define pH and pK, and describe how this relation is derived. Discuss how dissociation can be used to determine the amino acid content of a protein. Explain the results presented in Fig. 8.1.

4. *Reaction rates.* What determines reaction rates? What is a transition state? Why is it important to know the basic reaction mechanisms when creating a dynamical model? Why is this less important when dealing with chemical equilibrium?

5. *Enzyme reactions.* Describe different approaches to model enzyme reactions and discuss differences in behavior.

6. *Self-assembly.* What drives formation of micelles and bilayer membranes? What is the critical micelle concentration and why is it a meaningful definition?

Recommended exercises

8.2, 8.3, 8.5, 8.6