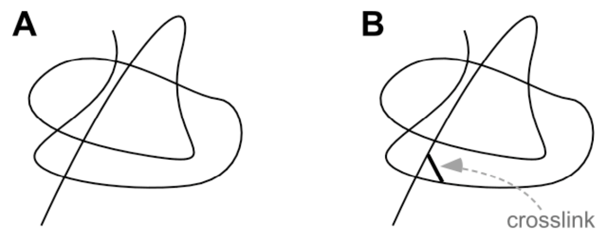
Quiz 8 – Core Course 2002 Name: ______________________________

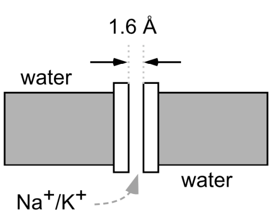
Please show your work, and your thinking, in the space provided. Be brief, but complete. Long, wandering answers typically demonstrate a lack of understanding…



1. (25 points) For this question (*and this question only*), ignore entropic contributions from water. Consider the folding of a protein, (A) at right. The protein is stably folded (folding is energetically favored over the random chain). You find that introduction of a covalent (disulfide) cross link where indicated (B), does not alter the structure of the protein but does substantially ***increase*** its stability. ***Explain this in thermodynamic terms*** (you do *not* need to know any details of protein structure to answer this question).

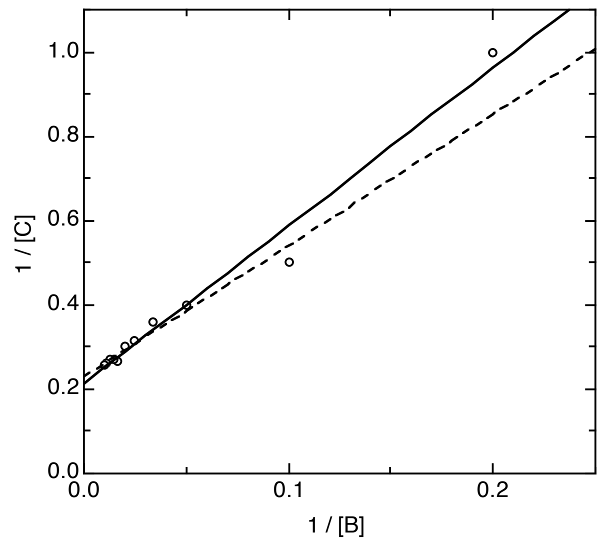
2. (25 points) In a presentation on campus this week, Scott Auerbach talked about a transmembrane protein channel that selectively allows K^+, but not Na^+ to pass through the channel. The protein channel is negatively charged and has an inner *diameter* of 2.8 Å. ***Explain*** why the channel allows K^+ to pass freely, but Na^+ passes through only very poorly, ie., the overall process of transport has a higher energy barrier. Think about what we talked about in class.

Ionic Radii (Å)	
Na^+	0.95
K^+	1.33
Atomic Radius (Å)	
O	0.73



3. Consider the following reaction:

$$A + B \rightleftharpoons C$$



a) (15 points) Your friend has been collecting data for this reaction and fitting it using "LineWeaver-Burke" analysis (don't worry that you've never heard of this). This analysis takes the equation for ligand binding and rearranges it to fit the data and obtain the equilibrium constant. In this case, the required assumption that B is in large excess ***is valid***. Assume that the uncertainty in each of the original measured values of [C] is constant at ±0.2. Without worrying about the precise derivation of the equation, ***decide*** which of the two fits is the better fit and ***explain*** why you chose the one you did. You may want to work through part (b) *first*.

b) (10 points) Assume that the uncertainty in each of the original measured values of [C] is constant at ± 0.2, in the above graph, ***plot the trend in (y) errors***. You need not draw every error in the plot above, but just a few to illustrate the trend.

4. (15 points) Consider the following kinetic mechanism:

$$A + B \underset{k_2}{\overset{k_1}{\rightleftharpoons}} C \underset{k_4}{\overset{k_3}{\rightleftharpoons}} A + D$$

Write the differential equations that describe the kinetics:

$$\frac{\partial A}{\partial t} =$$

$$\frac{\partial B}{\partial t} =$$

$$\frac{\partial C}{\partial t} =$$

$$\frac{\partial D}{\partial t} =$$

b) (5 points) Write the overall stoichiometry for the complete reaction

$$\rightleftharpoons$$

(reactants) (products)

c) (5 points) In this reaction, species A is called what?