CHEM 440 Exam 1 6 Oct 2008 /100 Name _____

Do the easiest ones first; ask for clarification of any question.

1. (3 ea) Define the terms accurately and concisely:

a. Quaternary structure of proteins

b. K_m (from enzyme kinetics)

c. pI

2. (10) Compute the net charge to the nearest 0.1 unit on the tetrapeptide in a pH 5.0 buffer. Include a clear example of your method.

Glu – ala – his – lys

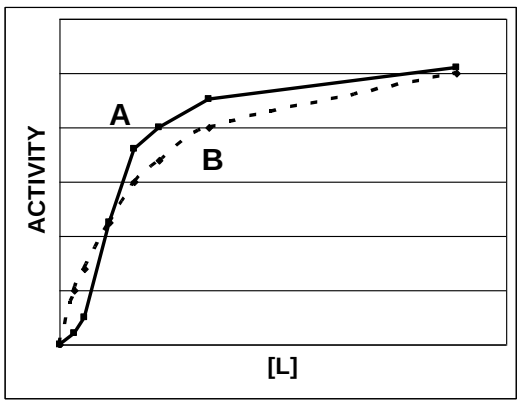
3. (12) Describe two techniques that could successfully separate a mixture of the two proteins in the table below. Explain why you think each would succeed.

Protein	Molecular mass	pI	shape
A	123 kD	6.2	elongated egg
B	120 kD	5.4	sphere

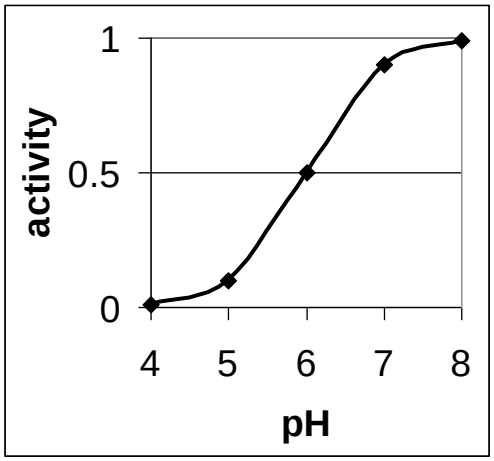
Technique #1:

Technique #2:

4. (5) L is a ligand that binds to both enzymes A and B with comparable affinity. What accounts for the behavior difference between the enzymes?



5. (6) Some aspects of the behavior of an enzyme are revealed in the plot at the right. What amino acid functional group is likely to be present in its active site and what must that group's chemical state be for the enzyme to be active?



6. (15) A particular concentration of an enzyme gave the tabulated experimental results. S is its normal substrate; A is another compound added at the shown concentration. Answer the following questions in the spaces provided. Show below the answers how you arrived at them.

a. K_m for S on E is _____ b. Compound A behaves as a _____

c. The binding constant for A on E is _____

	Rate (μmol/min)	
[S], μM	No A	[A]=2mM
3	10.4	4.1
5	14.5	6.4
10	22.5	11.3
30	33.8	22.6
90	40.5	33.8

7. (12) Compute the ΔG' for ATP hydrolysis at 25 °C and pH 7 if K_{eq}' for this reaction is 2.27×10^5 and the prevailing concentrations of pertinent species are as below. R = 8.3 J/mol•K

	ATP	+	HOH →	ADP	+	phosphate
Concs:	3 mM			1 mM		5 mM

8. Questions on regulation of enzyme activity

a. (5) A metabolic pathway is a sequence of reactions that transform a cell resource into a final product. At what point in this sequence (start, middle or end) is *regulation of rate* typically found, and why?

Location in sequence where regulation is likely: _____
Reason:

b. (9) Name 3 modes that cells can use to regulate rates of molecular traffic along metabolic pathways.

#1 _____ #2 _____ 3# _____

c. (5) Describe the mode of regulation that offers "instantaneous" response to changes in metabolic status.

9. (12) We discussed 5 major ways that enzymes use to accelerate the rate of the reaction they catalyze. Name **three** of these and describe in general how/why they work.

#1

#2

#3