CHM 109 Final Exam Study Guide Fall 09

This exam will be divide into two parts. *You will be allowed to take a short break between the two parts. Supplemental Information at end of exam. No additional material (notes, etc.) permitted. Show logic and calculations where appropriate.*
Review the study guides and exam.

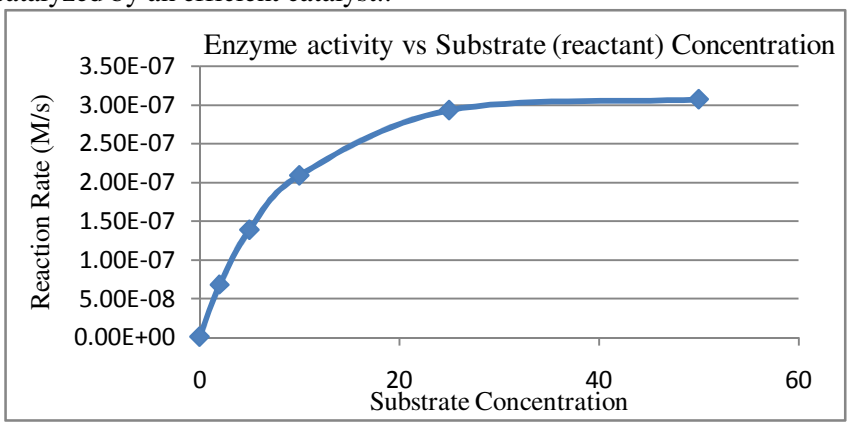
1. Draw a structure for a generalized amino acid (you may use "R" for the side chain).

2. Show how two amino acids join to form a peptide bond.

3. Why would it be very appropriate for the amino acid, aspartic acid, to lie on the outer surface of a cytoplasmic protein?

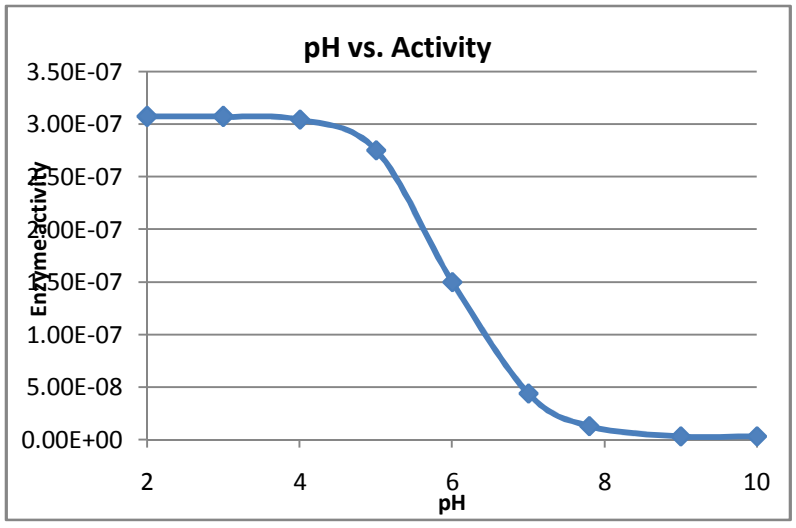
4. Draw a reaction coordinate diagram for the hydrolysis of a dipeptide (like Gly-Ala). Then draw another line on the same diagram to describe the reaction when catalyzed by an efficient catalyst..

5. Using the data shown at right, estimate the V_{MAX} and K_M values for enzyme. Explain your logic. Indicate what fraction of the enzyme would contain bound substrate when [S] = 30 mM.



6. Describe the molecular basis of sickle cell anemia, its treatment, and indicate why the trait is found at relatively high levels in some populations.

7. Provide a chemical explanation for the graph shown at right that shows the pH dependence of activity of an enzyme. Your answer must contain an equation for a chemical reaction.



8. Draw the structure of a Watson-Crick base pair. (Your choice.)

9. What is the "Central Dogma of Molecular Biology?"

10. What amino acid sequence would be coded from the mRNA template shown below? Make sure that you indicate the polarity of the peptide.
5' AUGGACCCGUGCGUCGUUUCUGUGACAUG ACAAC 3'

11a) Name two drugs that have been shown to be effective in reducing the frequency of breast cancer. To what class of drugs do both of these compounds belong?
b) Describe the basis of action of these drugs at the sub-cellular level. Make sure you have at least one drawing to aid in clarifying your answer.
c) Are these two drugs likely to be effective in preventing all types of breast cancer? Explain

your answer briefly.

12. Why is it important that DNA be able to replicate itself millions of times without error? What feature of DNA structure is particularly important with regard to avoiding errors?

13. Give one sentence descriptions of the roles of mRNA, tRNA, and rRNA in the cell.

14. What are the levels of structure of proteins? What kind of forces/bonds maintain this structure?

15. Describe where DNA is located and where proteins are synthesized. What molecules and processes exist that allow the transfer of this information from one location to the other?

16. Draw a DNA molecule being replicated. Include the direction the DNA is unwinding, the polarity of the parent and daughter strands and the direction the daughter strands are being synthesized.

Supplemental information

Periodic Table, electronegativity chart, the structures of the side chains of the 20 common amino acids, and a copy of the genetic code.

$K = °C + 273.15$ $Kw = 1.0 \times 10^{-14}$ $pH = pK_a + \log(\frac{A^-}{HA})$

$\Delta Go = -RT \ln Keq$ $R = 0.0820578$ (L·atm/(K·mol) $R = 8.3145$ J/(K·mol)

Acid Dissociation Constants as pKas From *Chemistry* by McMurray & Fay, *4th ed.*

Acid	**Formula**	**pk_{a1}**	**pK_{a2}**	**pK_{a3}**
acetic	$CH_3COO\mathbf{H}$	4.74		
acetylsalicyclic	$C_8H_7O_2COO\mathbf{H}$	3.52		
ascorbic	$C_6H_8O_6$	4.10		
benzoic	$C_6H_5COO\mathbf{H}$	4.19		
boric	$\mathbf{H}_3BO_3$	9.24		
carbonic	$\mathbf{H}_2CO_3$	6.37	10.25	
chloroacetic	$CH_2ClCOO\mathbf{H}$	2.85		
citric	$C_6H_8O_7$	3.15		
formic	$HCOO\mathbf{H}$	3.74		
hydrocyanic	$\mathbf{H}CN$	9.31		
hydrogen peroxide	$\mathbf{H}_2O_2$	11.62		
hydrosulfuric	$\mathbf{H}_2S$	7.00	~19	
hypobromous	$\mathbf{H}OBr$	8.70		
hypochlorous	$\mathbf{H}OCl$	7.46		
hypoiodous	$\mathbf{H}OI$	10.64		
iodic	$\mathbf{H}IO_3$	0.77		
oxalix	$C_2O_4\mathbf{H}_2$	1.23	4.19	
phenol	$C_6H_5O\mathbf{H}$	9.89		
phosphoric	$\mathbf{H}_3PO_4$	2.12	6.21	12.32
phosphorous	$\mathbf{H}_3PO_3$	2.00	6.58	
saccharin	$C_7H_5NO_3S$	11.68		