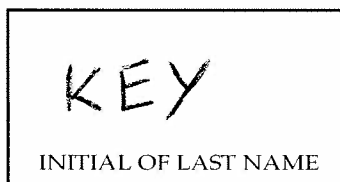


Chemistry 203 Lg (Fall '09) Exam #1  
September 22, 2009; 11:00-11:50 a.m.  
Prof. Richard Brutchey  
Prof. Matthew Pratt

Last Name: \_\_\_\_\_  
First Name: \_\_\_\_\_  
USC ID: \_\_\_\_\_  
T.A.: \_\_\_\_\_



Please do not open this exam until you are told to do so.  
Write legibly to avoid confusion.  
GOOD LUCK !!

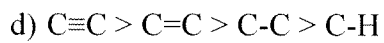
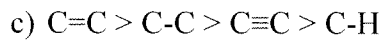
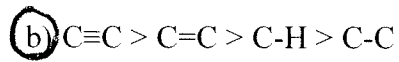
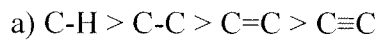
<b>Question #</b>	<b>Maximum Points</b>	<b>Score</b>	<b>Grader</b>
<b>1 - 5</b>	<b>20</b>		
<b>6 - 12</b>	<b>28</b>		
<b>13 - 17</b>	<b>20</b>		
<b>18 - 25</b>	<b>32</b>		
<b>Bonus</b>	<b>4</b>		
<b>TOTAL</b>	<b>104</b>		

I will observe the rules of Academic integrity while taking this exam.

\_\_\_\_\_  
Student Signature

**Circle the most nearly correct answer. (4 points each)**

(1) List the bond strengths from strongest to weakest:



(2) How long does the entire process of drug discovery and FDA approval typically take:

a) 3-5 years

b) 5-8 years

c) 10-15 years

d) 20-30 years

(3) Most drugs trials are terminated during which phase of clinical trials:

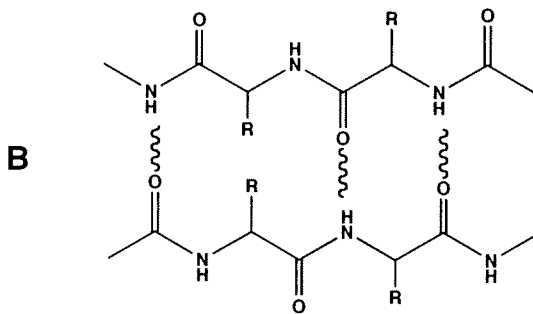
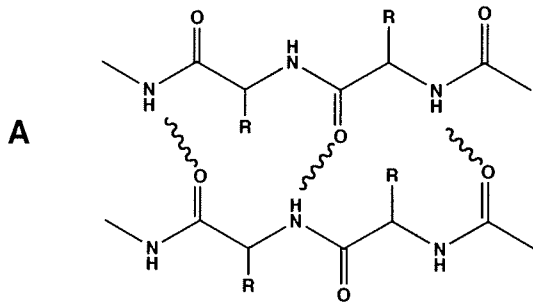
a) Phase I

b) Phase II

c) Phase III

d) Phase IV

(4) Which  $\beta$ -sheet structure shown below is aligned in an antiparallel fashion:



a) A

b) B

c) They are both aligned in an antiparallel fashion

d) Neither are aligned in an antiparallel fashion

(5) According to the induced fit theory:

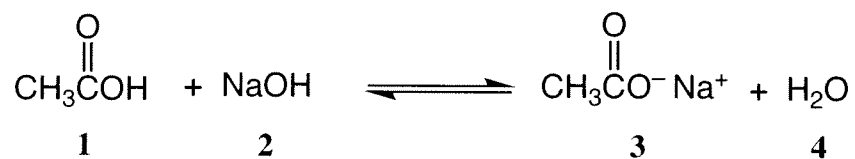
a) Only one type of substrate can bind to a particular active site in an enzyme

b) A substrate fits into a rigid enzyme active site like a lock into a key

c) An enzyme active site adjusts itself to allow binding of a substrate

d) None of the above are true

(6) Which of the following species is the conjugate base of acetic acid in the following acid/base reaction:



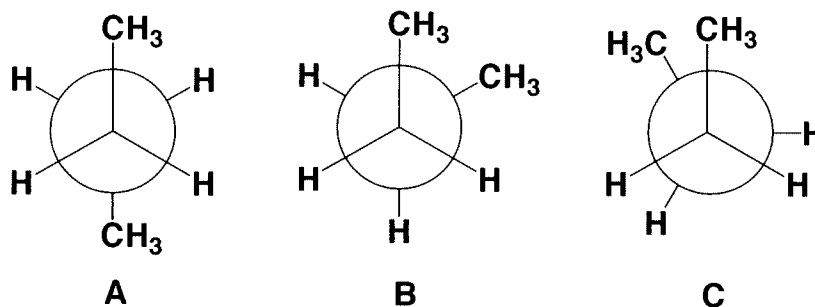
a) 1

b) 2

c) 3

d) 4

(7) Which alkane conformation is least stable:



a) A

b) B

c) C

d) both A and B are equally unstable

(8) What is the most correct bond angle for a carbon with four single bonds in a tetrahedral geometry:

a) 90

b) 109

c) 120

d) 180

(9) How many naturally occurring amino acids are there:

a) 18

b) 20

c) 43

d) 32

(10) In water at pH = 3, the predominant structure of an amino acid would be:

a)  $\text{NH}_2\text{-CHR-CO}_2\text{H}$

b)  $\text{NH}_3\text{-CHR-CO}_2^-$

c)  $\text{NH}_2\text{-CHR-CO}_2^-$

d)  $^+\text{NH}_3\text{-CHR-CO}_2\text{H}$

(11) Which of the following statements are true regarding allosteric inhibitors:

- i) They bind to a site other than the active site
- ii) They can sometimes irreversibly bind
- iii) A non-competitive allosteric inhibitor prevents substrate binding
- iv) rate does not change upon introduction of the inhibitor

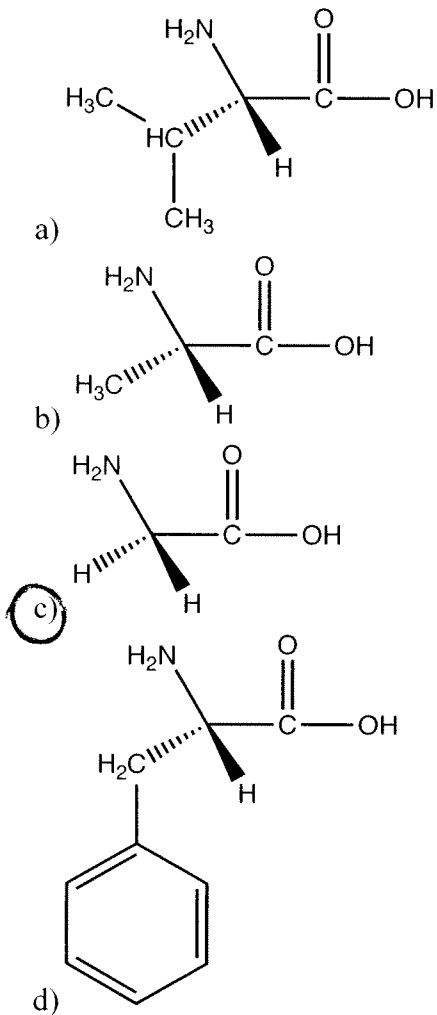
a) i, ii, iii and iv

b) i, ii and iv

c) i and ii only

d) ii and iii only

(12) Which one of the following amino acids is NOT chiral:



(13) Hydrogen bonding cannot occur between:

- a) two alcohols
- b) a primary amide and a carbonyl
- c) two water molecules
- d) a carbonyl and an ether

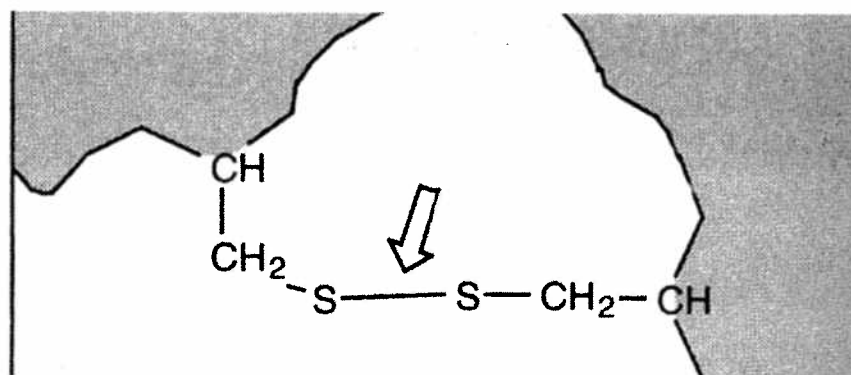
(14) Which statement regarding HIV-1 protease is not true:

- a) it is essential for replication of HIV
- b) the enzyme cuts active viral protein into inactive viral protein
- c) the enzyme active site contains 2 aspartic acid residues
- d) there are about 10 FDA approved HIV-1 protease inhibitors

(15) The bonding interactions that are most important for tertiary protein structure formation, from most important to least important, are:

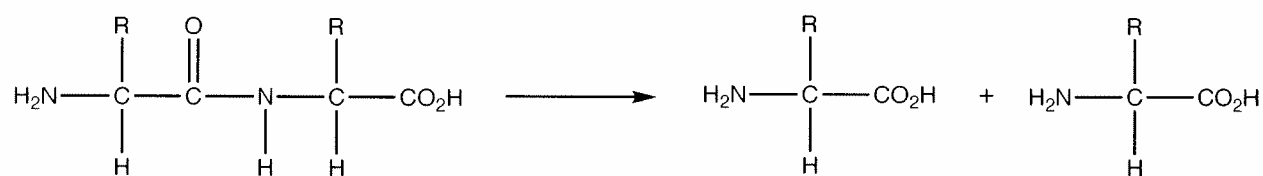
- a) van der Waals > hydrogen bonding > disulfide > ionic
- b) hydrogen bonding > van der Waals > disulfide > ionic
- c) ionic > disulfide > hydrogen bonding > van der Waals
- d) hydrogen bonding  $\approx$  van der Waals > disulfide > ionic

(16) The disulfide bond shown below is formed from the reaction of:



- a) two thiols
- b) two alcohols
- c) two thioethers
- d) two sulfones

(17) This reaction is catalyzed by which of the following types of enzymes:



- a) amylase
- b) lipase
- c) nuclease
- d) protease

(18) Which of the following are secondary structures of proteins:

- i) Alpha helix
- ii) Beta sheet
- iii) Gamma twist
- iv) Random coil

a) i and ii

b) i and iv

c) i, ii, and iii

d) i, ii, and iv

(19) Enzymes do what to a chemical reaction:

a) increase the rate constant

b) decrease the rate constant

c) make the reaction slower

d) increase the activation energy of the reaction

(20) The electronegativity of atoms in the periodic table tends to:

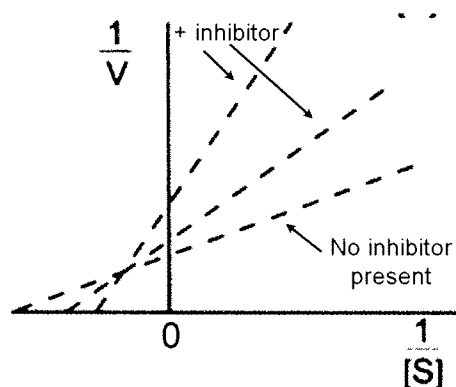
a) Increase from right to left

b) Increase from left to right

c) Increase from top to bottom

d) Increase from top right to bottom left

(21) The following Lineweaver-Burk relationships were plotted for a substrate with and without the presence of an inhibitor.



Which of the following statements are true:

- i) The inhibitor is non-competitive
- ii) The inhibitor is mixed
- iii)  $K_m$  increases in the presence of inhibitor
- iv)  $\text{rate}_{\text{max}}$  is the same with and without inhibitor

a) i, iii, and iv

b) ii, iii, and iv

c) ii and iii

d) i and iv

(22) What type of inhibitor most accurately describes Saquinavir:

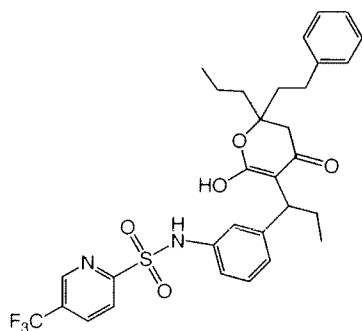
a) Reversible

b) Irreversible

c) Allosteric

d) Transition-State Analog

(23) Which of the following statements about the following molecule are true:



- i) Its name is Saquinavir
- ii) It is an HIV protease inhibitor
- iii) It contains a sulfonamide group
- iv) It contains a pyrrole group

a) i, ii, and iii

b) ii, iii, and iv

c) ii and iii

d) all are correct

(24) Which of the following statements regarding a protein's overall tertiary structure are true:

- i) The interior of the tertiary protein structure is comprised mainly of amino acids with hydrophobic side chains
- ii) The overall tertiary structure is a combination of the various secondary structures
- iii) The protein's primary sequence has no influence of the final 3-D tertiary structure
- iv) Protein folding is affected by the sum of covalent, ionic, van der Waals, and hydrogen-bonding interactions

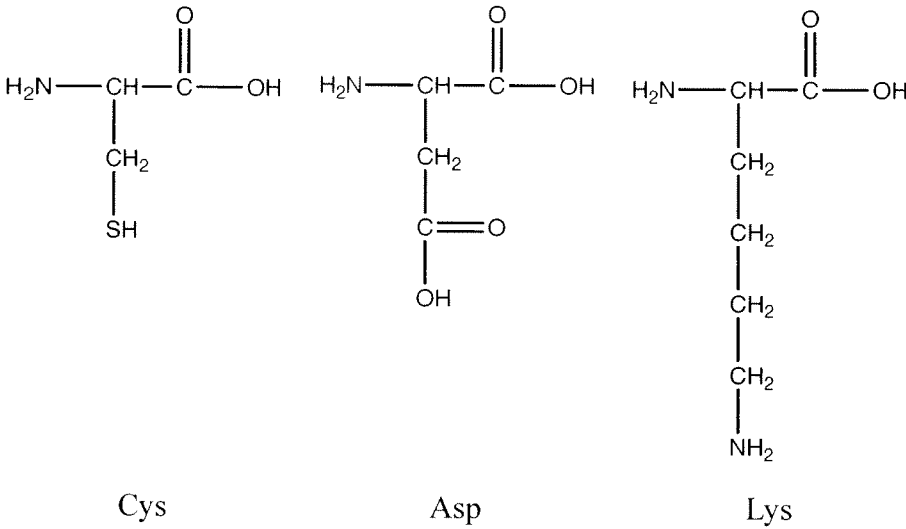
a) iv only

b) ii and iv

c) i, ii, and iv

d) i, ii, iii, and iv

(25) Which of these amino acids have side chains that would have an electrostatic (ionic) attraction with a second amino acid containing a primary amine side chain at pH = 7:



- a) Asp only
- b) Lys only
- c) Cys and Asp
- d) Asp and Lys

**BONUS (4 extra points)**

(26) What pharmaceutical company was recently levied a \$2.3 billion fine by the Justice Department for illegally marketing drugs:

- a) Novartis
- b) Pfizer
- c) GlaxoSmithKline
- d) Merk & Co.