

## THE UNIVERSITY OF MANITOBA

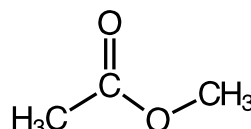
October 11, 2017

Mid-Term-1 EXAMINATION

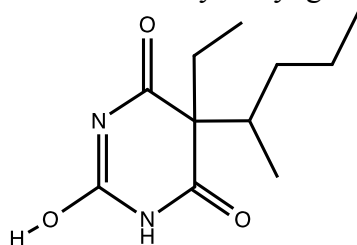
PAPER NO: 1LOCATION: 223 Wallace BuildingPAGE NO: 1 of 3DEPARTMENT & COURSE NO: CHEM / MBIO 2770TIME: 0.83 HOUREXAMINATION: Elements of Biochemistry IEXAMINER: J. O'Neil**Instructions**

- Please mark the Answer Sheet using PENCIL ONLY.
- Enter your NAME and STUDENT NUMBER on the Answer Sheet.
- The exam consists of multiple-choice questions. Enter your answers on the Answer Sheet.
- There is only 1 correct answer for each question.
- PLEASE READ ALL THE QUESTIONS CAREFULLY!
- The back of the last page may be used for calculations.

1. Where will the thiolate anion ( $\text{CH}_3\text{-S}^-$ ) attack the following ester?

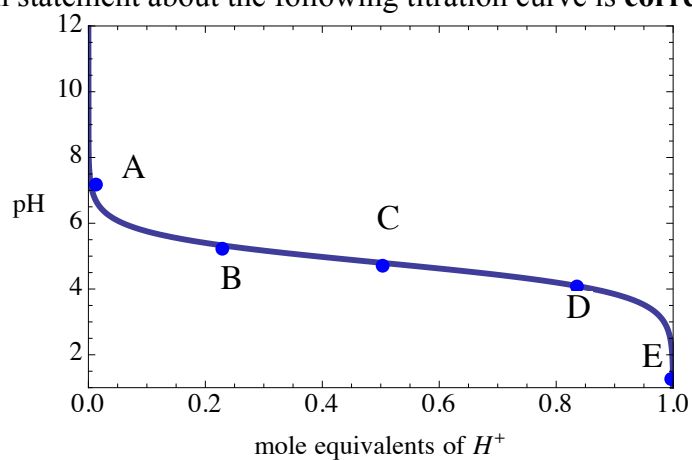


- A) At the carbonyl oxygen.  
 B) At one of the methyl carbons.  
 C) At the ester oxygen.  
 D) At the carbonyl carbon.  
 E) Nowhere, as none of the atoms are attractive to nucleophiles.
2. If the free energy change,  $\Delta G$ , for a reaction is  $-15 \text{ kJ/mol}$ , the reaction \_\_\_\_\_  
 A) is at equilibrium.  
 B) will proceed up the enthalpy hill.  
 C) will proceed down the free energy hill.  
 D) is endergonic.  
 E) is exothermic.
3. 25 mL of 0.1 M HCl solution is added to 1.5 L of pure water. What is the pH of the resulting solution?  
 A) 1.0  
 B) 2.60  
 C) 2.78  
 D) 4.00  
 E) 11.22
4. Pentobarbital (shown below) is used as a sedative in humans and as a veterinary anesthetic in animals. It contains a hydroxyl group with a  $\text{pK}_a$  of 8.1. What is the pH of a solution of pentobarbital in which the hydroxyl group is 60% dissociated?

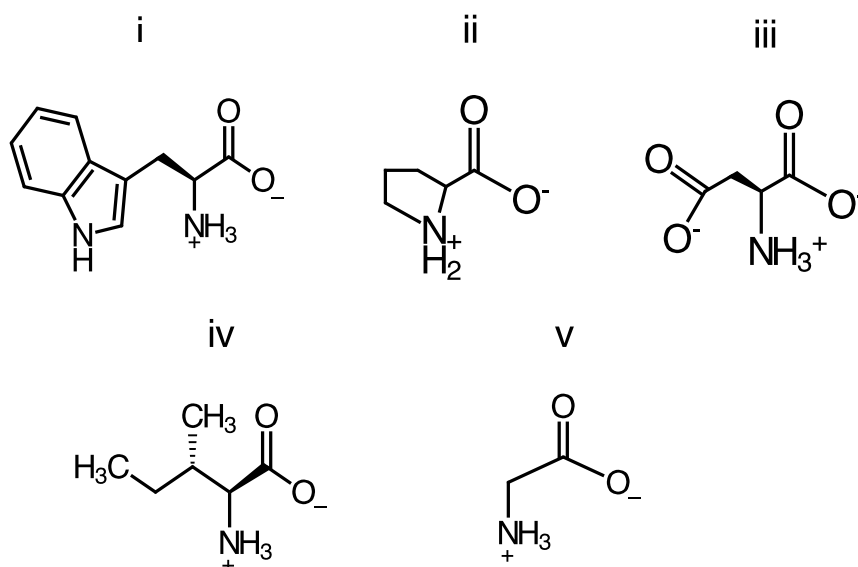


- A) 7.88  
 B) 7.92  
 C) 8.10  
 D) 8.28  
 E) 8.50

5. Which statement about the following titration curve is **correct**?

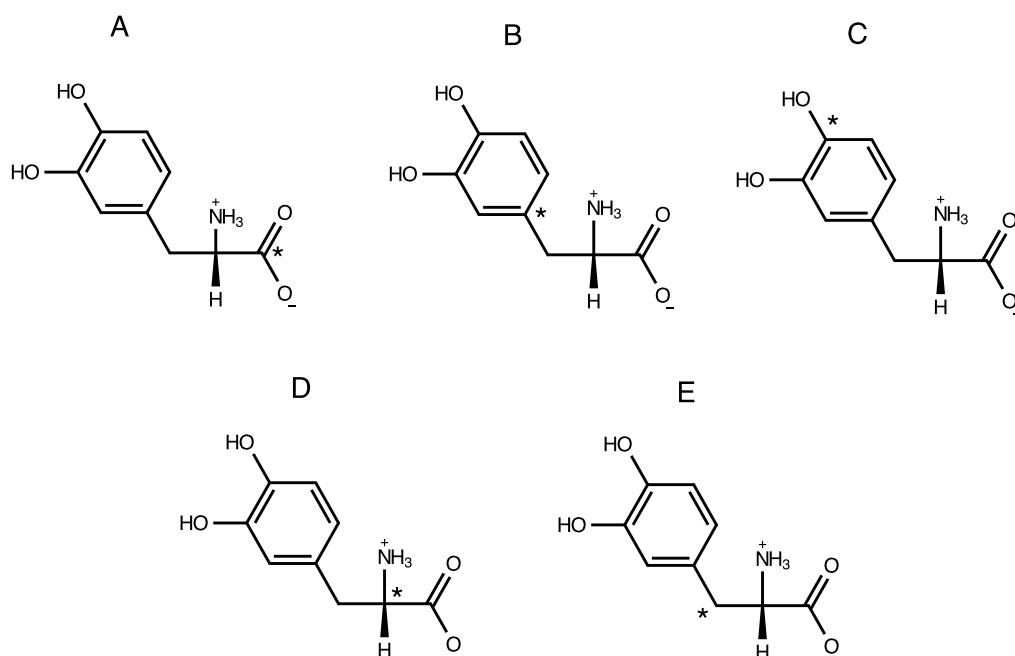


- A) The compound being titrated is a strong base.  
 B) At point "B" there is more of the weak acid form of the buffer than the conjugate base form.  
 C) At point "A" the fraction of conjugate base is low.  
 D) At point "E" the compound exists mainly in the conjugate base form.  
 E) The  $pK_a$  of the compound is about 5.
6. \_\_\_ is an aromatic amino acid and \_\_\_ is an acidic amino acid.



- A) iv, v  
 B) ii, iv  
 C) i, iii  
 D) iii, iv  
 E) iv, iv
7. Which of the following amino acids contains an amide group in its side-chain?
- A) Asparagine.  
 B) Lysine.  
 C) Leucine.  
 D) Histidine.  
 E) Glycine.

8. Humans synthesize the amino acid *L*-Dopa from tyrosine as a precursor to the synthesis of some neurotransmitters. Medically, *L*-Dopa is used in the treatment of Parkinson's disease. Select the diagram below that correctly identifies the asymmetric (chiral) carbon in *L*-Dopa with \*.



9. Identify the INCORRECT statement:
- Leucine and isoleucine are isomers because they can be interconverted by a conformational change.
  - In the  $\alpha$ -helix, side-chains protrude from the sides of the helix.
  - Peptides can adopt many conformations because of rotation about single covalent bonds.
  - Unfolding or denaturation of a protein usually leads to the loss of biological activity.
  - Larger proteins elute earlier than smaller proteins in size-exclusion chromatography.
10. A disulphide bond is \_\_\_\_\_
- a weak interaction.
  - formed by the reduction of Cys.
  - a covalent bond between the side-chains of Cys residues.
  - formed during a pH titration.
  - formed by an electrophilic attack on a nucleophile.

SCRATCH