

Quiz #1: Answer Key

MCB 102 Biochemistry

Section: Wed 10-11am  
January 30, 2007

Name: \_\_\_\_\_ Student ID: \_\_\_\_\_

1. A. Draw the titration curve for a weak acid, HA, whose  $pK_a$  is 3.2. Label the axes properly. (2 pts)
- B. Indicate with an arrow where on the curve the ratio of salt ( $A^-$ ) to acid (HA) is 3:1. (1 pt)
- C. What is the pH at this point? (2 pts)

**Ans:** The plot of pH vs. added base should have the general shape of those shown in Fig. 2-18, p. 65, with the midpoint of the titration (inflection point) at pH 3.2. The y-axis is pH, and the x-axis is *equivalents of base added*. The ratio of  $A^-$  to HA is 3 when 0.75 equivalents of base have been added. From the Henderson-Hasselbalch equation, the pH at this point can be calculated:

$$pH = pK_a + \log \frac{[\text{conjugate base}]}{[\text{acid}]} = 3.2 + \log 3 = 3.2 + 0.48 = 3.68$$

2. Cysteine is an important amino acid due to its ability to form disulfide bonds.
  - a. Draw out the reaction, including chemical structures: (2 pts)
  - See page 80 in text
  - b. What kind of reaction is this? (1 pt) oxidation
  - c. What is the name of the product? (1 pt) cystine
  - d. Which level(s) of protein structure do these bonds contribute to? (2 pts) 1°, 3°, 4

3.
 

A	B	C	D	E
<u>Y-K-M</u>	<u>G-P-R</u>	<u>D-W-Y</u>	<u>D-H-E</u>	<u>L-V-E</u>
Tyr-Lys-Met	Gly-Pro-Arg	Asp-Trp-Tyr	Asp-His-Glu	Leu-Val-Phe

1. Write the 1-letter abbreviation above each amino acid. (5 pts)

2. Which one of the above tripeptides: (5 pts)

D (a) is most negatively charged at pH 7?

A (b) will yield DNP-tyrosine when reacted with 1-fluoro-2,4-dinitrobenzene and hydrolyzed in acid?

E (c) contains the largest number of nonpolar R groups?

A (d) contains sulfur?

C (e) will have the greatest light absorbance at 280 nm?

4. A nonapeptide was determined to have the following amino acid composition: (Lys)<sub>2</sub>, (Gly)<sub>2</sub>, (Phe)<sub>2</sub>, His, Leu, Met. The native peptide was incubated with 1-fluoro-2,4-dinitrobenzene (FDNB) and then hydrolyzed; 2,4-dinitrophenylhistidine was identified by HPLC. When the native peptide was exposed to cyanogen bromide (CNBr), an octapeptide and free glycine were recovered. Incubation of the native peptide with trypsin gave a pentapeptide, a tripeptide, and free Lys. 2,4-Dinitrophenyl-histidine was recovered from the pentapeptide, and 2,4-dinitrophenylphenylalanine was recovered from the tripeptide. Digestion with the enzyme pepsin produced a dipeptide, a tripeptide, and a tetrapeptide. The tetrapeptide was composed of (Lys)<sub>2</sub>, Phe, and Gly. The native sequence was determined to be: (5 pts)

- A) Gly-Phe-Lys-Lys-Gly-Leu-Met-Phe-His.
- B) His-Leu-Gly-Lys-Lys-Phe-Phe-Gly-Met.
- C) **His-Leu-Phe-Gly-Lys-Lys-Phe-Met-Gly.**
- D) His-Phe-Leu-Gly-Lys-Lys-Phe-Met-Gly.
- E) Met-Leu-Phe-Lys-Phe-Gly-Gly-Lys-His.