

Biological Chemistry I

Exam 1

July 7th, 2016

Student name

/50

1. Draw the hydrogen bonding pattern that water molecules form with tyrosine at pH 7.0. (4 points)

2. a) Draw the structure of a tripeptide: Ala-Lys-Ile (5 points)

b) what is the charge of this tripeptide at pH 7.0? (2 points)

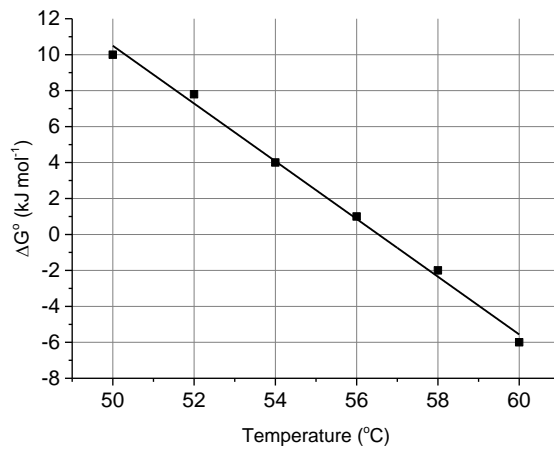
c) show the chiral atoms using star (*) symbol (2 points)

d) write the sequence of this tripeptide using one letter codes. (2 point)

3. Serum albumin is globular protein found in blood of vertebrates. Fig. 1 shows the dependence of ΔG° for denaturation of serum albumin on temperature. Considering the data in Fig. 1 and Fig. 2.

a) Is the denaturation of serum a spontaneous at 60 °C ? Explain. (3 points)

b) What temperature is the temperature at which the native and denaturated forms of chymotrypsin are in equilibrium? (3 points)



4. Dowex-50 is a **cation exchange** resin. Describe the expected elution pattern for mixture of aspartic acid, histidine and arginine amino acid residues that were solubilized in a buffer of pH 7.0. (3 points)

5. Match the level of protein structure in the left column with the appropriate description in the right column: (4 points)

- | | |
|---------------|--|
| a) Primary | 1) association of protein subunit |
| b) Secondary | 2) overall folding of a single chain, can include α -helical and β -sheet structure |
| c) Tertiary | 3) linear amino acid sequence |
| d) Quaternary | 4) arrangement of amino acids located near each other in the primary sequence |

6. a) The following five proteins were separated by gel electrophoresis. Give the order of their migration from the top (point of application) to the bottom of the gel. (4 points)

protein	Molecular weight (kDa)
trypsin	23.3
Cytochrome c	13.4
myoglobin	17.0
Serum albumin	69.0
Transferrin	90.0

7. A protein of MW of 30 kDa was characterized using MALDI-TOF. The spectrum revealed presence of two peaks with the m/z values of 30,000 and 15,000. Explain. (3 points)
8. You are given two solutions containing different purified DNAs. One is from bacterium *P. aeruginosa* and has a G+C composition of 68% whereas the other is from a mammal and has a G+C composition of 42%. You measure the absorbance of ultraviolet light (260 nm) of each solution as a function of increasing temperature. Which solution has a higher T_m value and why? (4 points)
9. What is the sequence of mRNA that will be synthesized from a template strand of DNA having following sequence? Indicate the 3' and 5' end of mRNA (5 points)

5' ACGTTACCTAGTTGC

10. Draw the chemical structure of pACG. (6 points)