

Findley, 2017

Name:

Student ID:

CHEM 271

February 10th, 2017

CLASS TEST 1A

Use the back of the page if you need more space.

The questions are not in order of difficulty. Please read questions carefully.

Answers in point form are accepted.

Write in **pen** only. You may use a non-programmable calculator.

There are 7 pages and 14 questions. Make sure you have them all.

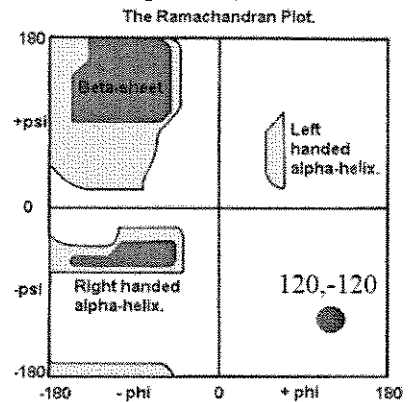
1. Draw the structure of the following peptide at pH 7. Include all stereochemistry. (8 points)

GRIP

Under each amino acid write the three letter abbreviation.

2. Why are glycine residues so common in β -turns? Refer to the structure of the peptide backbone in your answer. (2 points)

3. No common protein structures have ϕ/ψ angles of $120,-120$. Why? Refer to the structure of the peptide backbone in your answer. (2 points).



4. In the space below draw out the cartoon representation of a single polypeptide strand that folds into a parallel β -sheet containing two β -strands. (2 points)

5. How does a high concentration of urea alter the structure of a protein? Phrase your answer in terms of hydrogen bonding. (2 points)

6. A) Why are hydrophobic protein residues normally found on the interior of soluble proteins? (2 points)

B) Where in membrane proteins are hydrophobic residues normally found? Why? (2 points)

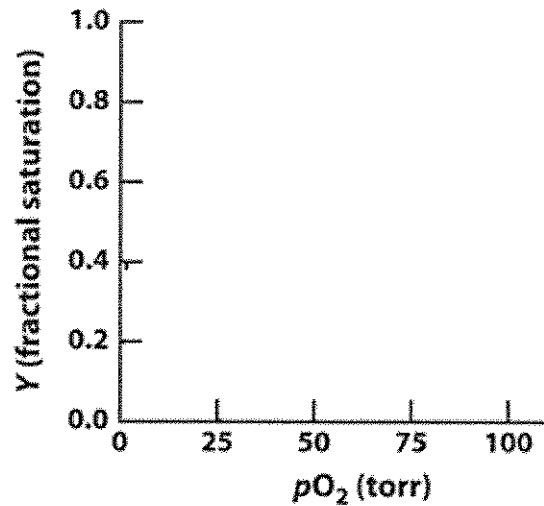
7. A) Compare the following two protein sequences. Assign 10 points per identity, -25 points per gap. (2 points)

Sequence 1: PETLENGSPGFDKFKHLK

Sequence 2: PDAK-----DLFSFLK

B) How would scrambling sequence 1 help determine if two protein sequences are closely related? (2 points)

8. A) On the chart below, draw and label the binding curves for myoglobin and hemoglobin (2 points)



B) Unlike hemoglobin, myoglobin is unaffected by 2,3-bisphosphoglycerate. Why? (2 points)

9. β -thalassimia is a disease involving which protein subunit? (1 point)

B) A patient with β -thalassimia lacks the gene for AHSP. Will their thalassemia be better, worse, or unaffected? Why? (2 points)

10. Gel filtration chromatography and SDS-PAGE both use polymers to separate proteins based on size. Why do large proteins move through gel filtration columns very quickly and through SDS-PAGE gels very slowly? (3 points)

11. Define: (2 points)

ELISA (give full name only)

Isoelectric point (pI)

12. Indicate if the following statements are True (T) or False (F): (3 points)

_____ The fluorophore in green fluorescent protein (GFP) sits on the outside of the protein.

_____ X-ray crystallography works best with small, disordered proteins.

_____ NMR structures are determined from interactions between protons that are nearby in space.

13. The pKa of Tris is 8.3. What is the ratio between Tris [A⁻] and Tris-HCl [HA] at the following pH values (4 points)

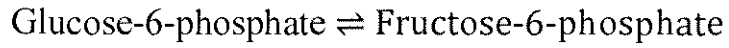
pH 8.3

pH 9.3

pH 5.3

B) Is Tris/Tris-HCl an effective buffer at pH 5.3? Why or why not? (2 points)

14. The second step of glycolysis is the following reaction:



At pH 7 and 25 °C, 1M of G6P and F6P will equilibrate to $[\text{F6P}]/[\text{G6P}] = 2.43$. R, the molar gas constant, is $8.3145 \text{ Jmol}^{-1}\text{K}^{-1}$.

A) What is the standard free energy of this reaction at pH 7 and 25 °C? (2 points)

B) In the cell the overall ΔG is -1400 Jmol^{-1} . Calculate the ratio of products to reactants. (2 points)