

CHEM-342 Introduction to Biochemistry
Midterm Examination - Individual Part
Wednesday, 26 March 2008
H. B. White - Instructor

Name _____

Important - Please read this before you turn the page.

There are 9 pages to this examination including this page and the blank final page.

Write your name on every page.

This individual part of the midterm examination is worth 99 points with 7 bonus points possible.

There are 11 questions of which you need to answer 7.

You may refer to your notes, course reader, handouts, or graded homework assignments. Textbooks and reference books cannot be used.

This examination will assess your learning, problem-solving skills, and ability to communicate clearly. It is intended to be challenging even to the best students in the class.

Writing reflects how you think. Better quality answers will receive higher marks. Therefore organize your thoughts before you write and draw. Among the "right answers" I will read for the following questions, some will be better than others because they

- show greater depth of understanding,
- provide a more logical structure,
- use appropriate examples,
- include appropriate illustrations,
- avoid extraneous or inaccurate information, and
- choose words with precision.

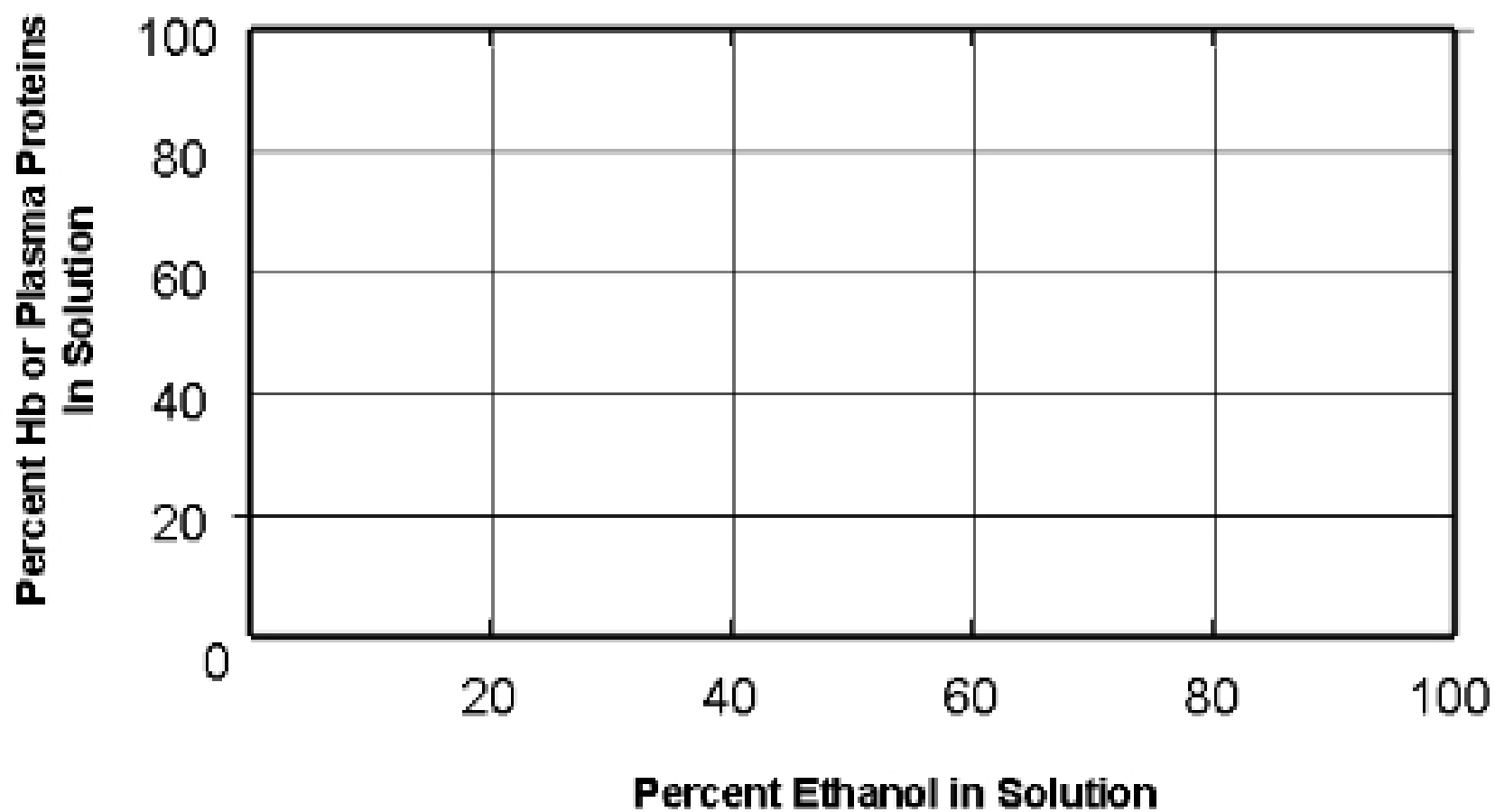
Strive to write not that you may be understood, but rather that you cannot possibly be misunderstood. Stream of consciousness answers are rarely well organized or clearly presented.

1. (15 Points) Stokes observed the changes on the color of blood extracts after various treatments to deduce changes that had occurred. Based on your understanding of hemoglobin and its reactions described by Stokes and in class, predict the color changes expected when each of the following is done to a freshly drawn sample of blood to which citrate or heparin was included.

	Red	Purple	Brown	Basis for prediction
(1) Freshly drawn blood sample	X			Oxyhemoglobin in blood is red
Seal and store solution 1 for several hours.				
Add equal volume of ether to solution 1.				
Add $K_3Fe(CN)_6$ to solution 1.				
Add HCl to solution 1.				
Add CO to solution 1.				
Add $Na_2S_2O_4$ (dithionite) to solution 1.				

- (6 pts) In the empty boxes above, put an "X" in the column that corresponds to the color you predict would result from the indicated treatment.
- (9 pts) In the empty boxes in the last column, write the basis for each prediction.
- (2 bonus points) What is the purpose of drawing blood in the presence of citrate or heparin?

2. (15 Points) The following two questions relate to the Zinoffsky (1886) article.
- a. (8 pts) Zinoffsky initially took extra time and effort to separate red blood cells from blood plasma, but later he simply avoided the 2% NaCl wash, added back distilled water, and proceeded to the first alcohol crystallization step. Based on Zinoffsky's comments, draw and label two graphs in the space below, one that represents the solubility of hemoglobin (Hb) and one that represents the solubility of serum proteins as a function of ethanol concentration in water.



- b. (7 pts) Knowing what we do about hemoglobin now, it would be quite unlikely for the sulfur-iron stoichiometry for hemoglobin to be 1:4. Explain why this is so in words and illustrate with a drawing.