CHEM-342 Introduction to Biochemistry
Mid-term Examination - Group Part
Friday, 25 March 2005
H. B. White - Instructor
25 Points

Group Members _____

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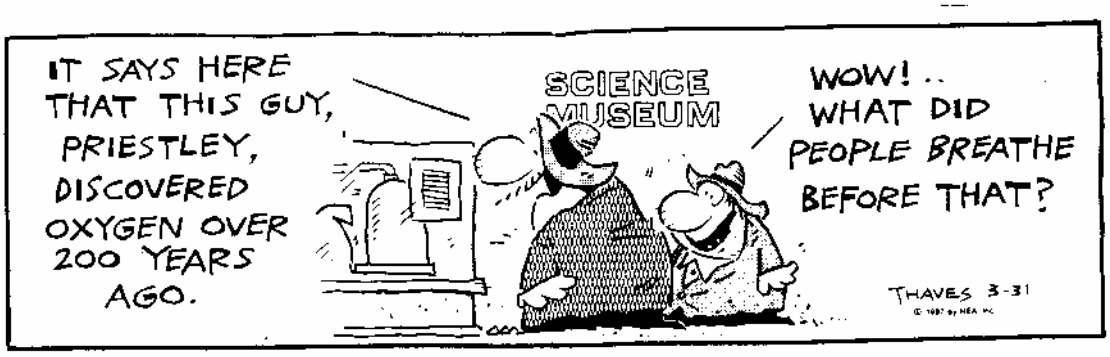
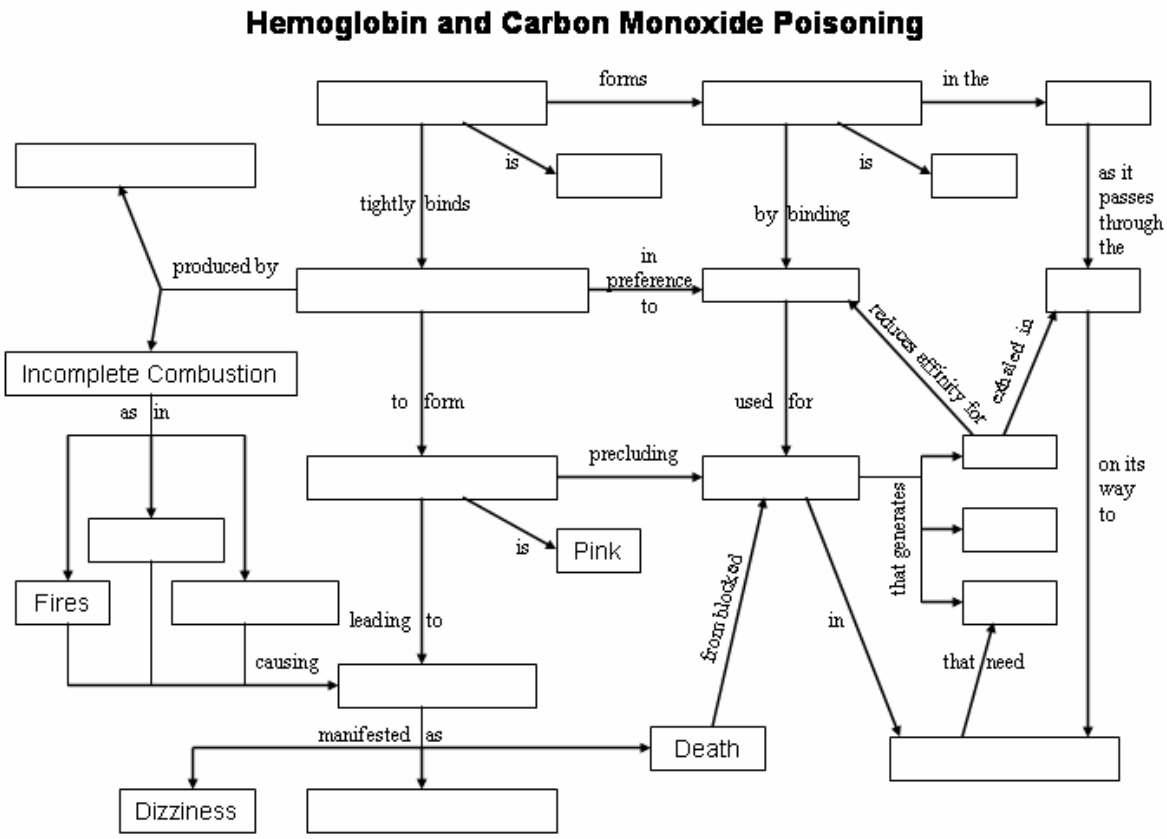
Important - Please read this before you turn the page.

1. Write your names or group number on each page of the exam you turn in.
2. You may refer to your notes, course reader, handouts, or graded homework assignments. (Wireless laptop computers and textbooks cannot be used.)
3. Please read each question carefully and make sure that you have thought it through with **everyone's** input before converging on a solution.
4. If you do not agree with your group, you may submit the examination under your own name for separate grading.



1. (10 Points) Carbon monoxide, an odorless, colorless, and tasteless gas, is deadly. An atmosphere containing 0.1% CO can lead to death within an hour. CO binds to human hemoglobin ~220 times more tightly than does O_2. Two years ago, Nascar driver Rick Mast retired due to acute and chronic carbon monoxide poisoning that resulted in severe headaches and other symptoms in his work environment (New York Times, 2 February 2003, Sports section). Analysis of the blood of Americans show that between 0.5 and 2% of the hemoglobin in the blood of rural nonsmokers has CO bound. This level can increase to as much as 5% in urban nonsmokers and 9% in heavy smokers. The value is never 0%, because CO is produced naturally in the body in the conversion of heme to bilirubin.

   Please complete the concept map below by filling in the empty boxes with the *most* appropriate words.



2. (15 Points) Hemoglobin carries oxygen from the lungs to the tissues where it is used in oxidative metabolism. Although respiration is often formally written with glucose as the substrate, the brain is one of the few organs that actually uses glucose almost exclusively as its carbon source for respiration. A typical adult human brain will convert about 150 grams of glucose to carbon dioxide and water per day.

   Estimate the proportion of the oxygen you inhale every day that is used to oxidize glucose in your brain. Show your work and describe your reasoning. You will be provided with a plastic bag, a straw, and a ruler to estimate the amount of air you breathe each day.