

## CARDIOVASCULAR DISEASE PROBLEM # 4

CHEMISTRY 161

Spring, 2009

Due Date: May 18<sup>th</sup>

### ***INCLUDE SOURCES IN ALL ANSWERS!***

1. The brain and heart are very sensitive to oxygen deprivation, with irreversible damage occurring in minutes. Lack of oxygen, due to arterial blockage, underlies most heart attacks and strokes. 11 pts.
  - a. Define the terms "ischemic" and "reperfusion". 2 pts.
  - b. What is tissue plasminogen activator (e.g. what kind of macromolecule) and how is it used in ischemic episodes? 2 pts.
  - c. What is the time period following a heart attack in which tPA has the most benefit? 1 pt.
  - d. Are there any side effects of tPA? If so, describe them. 2 pts.
  - e. What is the normal function of tPA in the body? 2 pts.
  - f. What is the possible danger of reperfusion in treating stroke? 2 pts.
2. Obesity is a major risk factor in heart disease. Much research is dedicated to finding drug-based treatments for obesity. A current focus of research is the protein leptin. 10 pts.
  - a. What is the role of leptin in metabolism? What is its effect on neuropeptide Y? 4 pts.
  - b. Liporex<sup>™</sup> is currently being marketed as a leptin-related weight-loss drug. What are three of the ingredients in Liporex? 2 pts.
  - c. Does Liporex actually contain leptin? 2 pts.
  - d. If you were a physician, would you recommend Liporex to your patients? Why or why not? 2 pts.
3. Diabetes significantly increases the risk for cardiovascular disease. One of the major problems in untreated diabetes, where blood sugar remains high, is glycation reactions of blood proteins, such as hemoglobin (Hb). Note: the terms glycation and glycosylation may be used interchangeably. 10 pts.
  - a. Give an example of a glycation reaction involving Hb. Show structures of reactants and products; for Hb, just show the side chain in the reaction. Hint: this is also known as the Amadori reaction. 4 pts.
  - b. Describe the hemoglobin glycation test. In your answer, include how this test is different from a blood glucose test, and also give the time frame over which this test reflects blood glucose levels. 6 pts.