Relevant questions from 2002 course for the 2003 vertebrate physiology 3rd exam:

**True or False (write ‘true’ or ‘false’; 14 points total; 1 point each)**

1. ________ The impotence drug Viagra works by accelerating the removal and degradation of cGMP in arteriolar smooth muscle.

3. ________ In the capillaries of the lung, the ‘chloride shift’ describes the movement of chloride ions across the membrane into the red blood cell membrane in exchange for the movement of bicarbonate ions out of the cell.

5. ________ During mammalian inhalation the pressure in the lung is lower than the surrounding atmospheric pressure.

13. ________ In the heart, the Frank-Starling mechanism is under the control of the parasympathetic nervous system.

**Really Short Answer (maybe a few words or a sentence; 45 points total; 3 points each)**

1. Why can antarctic fish survive without respiratory pigments in their blood?

2. How is glucose reabsorbed in the proximal tubule of the nephron?

3. Define parabronchi.

7. What does increased phrenic nerve activity lead to?
9. List two different cell types we have discussed that have high concentrations of carbonic anhydrase.

10. Why is the response to decreased PO₂ of arteriolar smooth muscle in the lung different than in most other tissues of the body.

**Short Answer**

1. Choose A or B (circle the letter of the one you are answering).
   A. How does the painted turtle (*Chrysemys sp.*) use its shell and skeleton to buffer lactic-acid buildup (Jackson et al. 2000)? What differences were noted for the softshell turtle (*Apalone sp.*)?
   B. Describe several diving-related adaptations in the Weddell seal (Zapol 1987). Why do humans have such inferior diving capabilities?

2. Draw the oxygen dissociation curve and the myoglobin dissociation curve. Label the axes appropriately. Would the bohr-effect act to shift the oxygen dissociation curve to the right or to the left?

3. Why is there a lot of protein in the ureteral urine of many bird species? What is the fate of this protein?
4. Describe several long-term physiological changes seen in vertebrates subjected to decreased levels of atmospheric oxygen (at high altitude for example).

5. Describe how shark rectal glands excrete excess salt.

6. What contributes to the maintenance of the osmolarity gradient (higher osmolarity towards center of kidney/renal pelvis) observed in the interstitial fluid of the kidney?
8. What are some of the costs and benefits to an organism of excreting nitrogenous waste in its various forms? List the three forms and describe a potential cost and benefit for each.

13. Describe the roles of renin, angiotensin II, and aldosterone in the response of the vertebrate kidney to decreased renal blood pressure (as detected by decreased flow rate in the distal tubule).
Longer Essay Answer (25 pts; ~a few well-organized paragraphs).
2. Over the course of the semester we have often discussed the important roles of Na/K-ATPase pumps. Specifically, using at least four examples to show you understand some of the key functions of Na/K-ATPase, what would happen to a vertebrate if these pumps began to malfunction in the cells of the body.