Vertebrate Physiology 437 EXAM II  31 October 2002  NAME__________________

0. Where do you think blood tends to pool when a witch flies on her broomstick? (1 point)

True or False (write ‘true’ or ‘false’; 6 points total; 1 point each)

1._________ The atria and the ventricles are innervated by the parasympathetic autonomic nervous system.

2._________ Incompetence (incomplete closure) of the right AV valve would lead to lower pressure in the right atrium.

3._________ Paracrine hormonal activity means that a hormone acts directly on the cell that released it.

4._________ Follicle stimulating hormone (FSH) and thyroid stimulating hormone (TSH) are both released from the anterior pituitary.

5._________ In smooth muscle, calcium controls force production by binding to the troponin/tropomyosin complex.

6._________ End-diastolic volume of the ventricle is greater than end-systolic volume.
Really Short Answer (maybe a few words or a sentence; 28 points total; 2 points each)
1. With relevance to the circulatory system, describe differences in functional anatomy between arboreal snakes and terrestrial snakes.

2. In the heart, what is the mechanism behind pacemaker cell autorhythmicity (think ion movement)?

3. What effect does arginine vasotocin (AVT) have on male cricket frogs?

4. How could the same hormone have different, even opposite, effects on different cells (for example epinephrine in the peripheral circulatory system vs. at the heart)?

5. Other than viscosity, list two important factors that determine the flow rate in a vessel.

6. At the level of the sarcomere, why does the length-tension curve for skeletal muscle have the shape that it does?

7. How can increased force production be achieved in skeletal muscle? Is increased force production in cardiac muscle different?
8. What is unique about the latch state of smooth muscle as compared to typical skeletal muscle contractions?

9. Describe one of the two major anatomical changes that occurs at the heart in recently (within hours) born mammals.

10. How does the Frank-Starling mechanism explain the observation that increased blood flow into the heart from venous return is correlated with increased ventricular contractility and a greater volume of blood being ejected from the heart?

11. What is the major role of the lymph system in the body?

12. How does the giraffe circulatory system respond when the animal bends down to drink?

13. Define Central Pattern Generator.

14. What effect would increased levels of CO₂, temperature, and adenosine tend to have on nearby arteriole smooth muscle?
Short Answer (CHOOSE 6 (SIX) of the following 8 questions; ~ 2 or 3 sentence answers; 30 points total; 5 points each)

1. In the retina, how does lateral inhibition function to pinpoint the location of origin of incoming light? Name specific cell types that might be involved.

2. Describe how the sympathetic and parasympathetic autonomic nervous systems are different with respect to anatomy, mechanisms of action, and functional role.

3. Describe the mechanism of activity of a typical steroid hormone.

4. Provide hormonal examples of positive feedback and negative feedback in the female menstrual cycle.
5. Draw a positive work loop with appropriately labelled axes.

6. How does a reptilian three-chambered heart function as a more-than-three-chambered heart?

7. Describe how baroreceptors would react to increased arterial blood pressure. What are two effects you would expect to then observe?

8. Put the following terms in their proper order as a given drop of blood moves through them. Start with the right atrium.
   - Right Atrium
   - Pulmonary Artery
   - Left AV Valve
   - Systemic Venule
   - Iliofibularis Muscle Capillaries
   - Pulmonary Vein
   - Left Ventricle
   - Left Atrium
   - Inferior Vena Cava
   - Systemic Arteriole
   - Aortic Semilunar Valve
Longer Essay Answer (20 pts; ~a few well-organized paragraphs).
1. Describe excitation-contraction coupling in vertebrate skeletal muscle. Begin with the initiation of an endplate potential (EPP) at the muscle in response to the release of acetylcholine (ACh) from the innervating alpha motor neuron. End with a brief discussion of cross-bridge cycling.
**Long Essay Answer (15 pts; ~a few well-organized paragraphs).**

2. Describe the patellar tendon reflex. Include discussion of afferent signals, efferent signals, stretch receptors, antagonistic muscles, divergence and convergence, etc.

(Use the following, incomplete, drawing to jog your memory as to the important events and structures.)