

Critical Thinking Questions (3-4 of these will be found on each unit exam)

These questions are for you, the student, to answer. I (Steve) will not help you answer the questions; I will help clarify any questions however. All of these questions can be answered using your notes and your text book. If necessary, informal groups of students could be organized to help you answer these questions. HOWEVER, you should NOT ask other professors, tutors, or other professionals to answer these questions for you. I will consider this cheating and you will receive a zero for the exam.

Exam 1

Chapter 19: Respiratory System

1. If a person has stopped breathing and is receiving pulmonary resuscitation, would it be better to administer pure oxygen or a mixture of oxygen and carbon dioxide? Discuss why.
2. The air pressure within the passenger compartment of a commercial aircraft may be equivalent to an altitude of 8,000 feet. What problem might this create for a person with a serious respiratory disorder (asthma, emphysema, etc)? Discuss why.
3. If the upper respiratory passages are bypassed with a tracheostomy, how might the air entering the trachea be different from air normally passing through this canal? What problems might this cause for a patient?
4. The respiratory system is designed to efficiently move gas to and from the cells of the body. Discuss some anatomical features of the lungs that allow them to easily transfer O₂ to the blood. Discuss some features of blood that allow it to carry O₂ at very high concentrations.

Chapter 9. Muscle.

1. As lactic acid accumulates in an active muscle, it stimulates pain receptors, and the muscle feels sore. In what types of exercise would the lactic acid most quickly accumulate within the muscle? Discuss why? How might the application of heat or substances that dilate blood vessels help relieve such soreness?
2. A person begins to exercise for the first time in three years, and slowly the person becomes more “physically fit”. As in any other bodily system, the muscular system will adapt to the stress it is placed under (stress = exercise).
Using your knowledge of the muscular system, discuss some potential cellular changes that will occur within or around skeletal muscle tissue as a person becomes more physically fit.
3. Curare is a toxin used by native Amazonians to help them catch prey. Curare will block acetylcholine receptors within skeletal muscle. What is the function of acetylcholine within skeletal muscle? Why could curare be used to treat chronic and problematic skeletal muscle twitching in humans? What would be the best way to administer curare to the patient with problematic muscle twitching: intramuscularly, IV, or orally? Why?
4. When discussing muscle contractions, explain why exercise intensity must decrease with time.

Chapter 15. Cardiovascular System.

1. If the mitral valve malfunctioned, what would happen to blood flow through the heart? Explain how this would affect a person's endurance.
2. When a person strains to lift a heavy object, intrathoracic pressure increases. What do you think will happen to the rate of venous blood returning to the heart during such lifting? Why?
3. Why is a ventricular fibrillation more likely to be life threatening than an atrial fibrillation?
4. Cigarette smoke contains thousands of chemicals, including nicotine and carbon monoxide. Nicotine constricts blood vessels and carbon monoxide prevents oxygen from binding to hemoglobin. How do these two components of smoke affect the cardiovascular system?
5. If you were responsible for constructing an artificial heart, what properties should the heart have? Why?
6. Mrs. Johnson is brought to the emergency room after being involved in an auto accident. She is hemorrhaging, but has a rapid pulse and her blood pressure is within normal limits. Describe the compensatory mechanisms of the cardiovascular system that are acting to maintain her blood pressure in the face of blood loss.

Exam 2.

Chapter 14. Blood

1. Cancer patients being treated with chemotherapy and radiation designed to destroy rapidly dividing cells are monitored closely for changes in their red and white blood cell counts and platelet counts. Discuss why and what are the consequences of having low counts.
2. A college professor from the Sauk Valley area traveled to the Swiss Alps for a year-long sabbatical leave. When he arrived, he noticed that he is short of breath when he walks up steps and tires easily with any physical activity. His symptoms gradually disappear and after a few months he feels fine. Upon returning to the U.S., he has a complete physical exam and is told that his erythrocyte count is higher than normal (but the rest of his blood work is normal). Explain these findings in detail. Will his RBC count remain higher than normal forever? Why or why not?
3. Mrs. Ryan goes to a clinic complaining of multiple small hemorrhaged spots in her skin and severe nosebleeds. While taking her history, the nurse notes that she is taking Apronal (a sleeping medication). This drug is known to be toxic to red marrow. Using your knowledge of physiology, explain the connection between the bleeding problems and taking of Apronal.
4. What change would you expect to occur in the hematocrit of a person who is dehydrated? Why?
5. You have a girl "friend" that is a vegetarian and does not use any vitamin supplements. Further, she has a very heavy menstrual flow each month. She constantly complains of being

tired. Using your knowledge of Biology, explain to her in detail why she is constantly fatigued.

6. Compare the hematocrits of a female weight lifter with 10% body fat with a heavily obese male.

Chapter 16. Lymphatic System.

1. A woman decides to have “cosmetic surgery”. During this procedure the right lymphatic duct is damaged beyond repair. Also, many surrounding lymph nodes had to be removed. She sues and hires you as her medical specialist. It is your job as a medical specialist to describe all of the consequences of having a damaged right lymphatic duct.

2. A friend tells you that she has tender, swollen “glands” along the left side of her neck. You notice that she has a bandage on her left cheek that is not fully hiding a large infected cut there. Exactly what are her swollen “glands” and how and why did they become swollen?

3. A woman has been diagnosed with breast cancer. Why are the surrounding lymph nodes removed along with the cancerous tissue? Why would a pathologist microscopically examine the cells found within the lymph node?

4. Why is an injection into the skin like an injection into the lymphatic system?

Chapter 17. Immune System

1. Some parents keep their preschoolers away from other children to prevent them from catching illnesses. How might these well-meaning parents actually be harming their children?

2. The HIV virus attacks and destroys helper T-cells (CD 4) in the human body. Explain exactly how this would compromise the immune system. Will the HIV virus kill someone and if not what do they die from?

3. Explain why xenografts are usually rejected by the patients.

4. Explain the underlying mechanisms responsible for the cardinal signs of acute inflammation: heat, pain, redness, and swelling.

5. Explain why young babies and the elderly often have compromised immune systems?

Exam 3

Chapter 13. Endocrine System.

1. What problems might result from the prolonged administration of cortisol to a person with a severe inflammatory disease?

2. Both growth hormone and growth hormone releasing hormone have been successfully used to promote growth in children with short statures. What is the difference in the ways these hormones produce their effects?

3. A patient who has lost large amounts of blood will secrete excess aldosterone from the adrenal cortex. Why was aldosterone released? What effect will this increased secretion have on the patient's blood concentrations of sodium and potassium?

4. How would you explain why new mothers sometimes experience cramps in their lower abdomen when they begin to nurse their babies?

5. You have a new job and it is in your job description to evaluate the usefulness of new drugs. A local drug representative is buying you lunch. He is trying to convince you that a new type of hormonal therapy is much more effective than previous hormonal drug therapies. The old drug was a steroid while the new drug is a non-steroidal hormone. His selling point is "the non-steroidal drug is just as powerful but at 1/4 the dosage compared to the older steroidal hormone". Explain, at a cellular and molecular level why he is probably correct.

Chapter 24. Reproduction.

1. If a woman undergoes "tubal ligation", will she experience menopause at an earlier age?

2. A major drug company has indicated they have found a "male oral contraceptive". Upon further investigation, you find out that this drug blocks the production of ICSH from the anterior pituitary gland. Explain why this **WOULD** be effective in preventing the production of sperm in adult males (give the exact mechanism). Besides potential sterility, list some potential harmful effects on adult males.

3. Sperm are removed directly from the epididymis of a male. These sperm are placed in a petri dish with ovulated eggs from his mate. Will the sperm fertilize the eggs? Why or why not? (HINT: we are assuming that the "environment" in the petri dish will not hinder fertilization).

4. A young male (age 9) is found to have a dangerous tumor in his testicles. His testicles are removed, but the Doctor indicates that the child will need to take Testosterone injections beginning at age 12 for the rest of his life. However, the family decides that they cannot afford the expensive Testosterone injections and never give them to him. Will this affect the gender of the child? Explain all the long-term consequences to this child.

Chapter 23. Development.

1. Many pregnancy tests check for the presence of hCG. What does hCG stand for? At which period of time will hCG production initially begin? A drug company has developed a drug that would block the receptors of the target cells for hCG. Discuss in detail, what would occur to a pregnant mother if the drug was taken during the 2nd week of pregnancy and the 15th week of pregnancy?

2. Discuss the similarities and differences between the anatomy and physiology of sperm and egg.

3. Can monozygotic twins exchange body parts by tissue or organ transplant without experiencing rejection reactions? Why or why not? Can dizygotic twins? Why or why not?

Digestion, Urinary System, and Water/pH, and electrolyte balance are found on the final as only multiple choice questions.