Extra Credit Critical Thinking Questions
by Topic
Bio 2402: Anatomy and Physiology II

Ziser, 2004

The Human Body: An Orientation

1. Explain why models are useful in understanding the basic principals of anatomy and physiology.

3. A hormone from the pituitary gland causes the ovary to secrete estrogen. Estrogen, in turn, causes an increase in the rate of pituitary hormone secretion. That process, once it begins, continues until ovulation occurs. After ovulation the ovary secretes progesterone, which causes the rate of pituitary hormone secretion to decline toward its previous "normal" level. Is the system described a negative-feedback system, a positive-feedback system, or a system involving both negative and positive feedback? Explain

Chemistry & Biochemistry

1. Mrs. Roberts, in a diabetic coma, has just been admitted to Noble Hospital. Her blood pH indicates that she is in severe acidosis, and measures are quickly instituted to bring her blood pH back within normal limits. Why, specifically, is severe acidosis dangerous?

4. Describe how changing one amino acid in an enzyme could affect the function of an enzyme; use a specific example to demonstrate this concept

Cells; The Living Units

3. In Kidney dialysis, a person's blood is passed through a bath that contains several ions and molecules. The blood is separated from the dialysis fluid by a membrane that allows water, small ions and small molecules pass through but does not allow larger molecules such as proteins or cells to pass. What should the composition of the dialysis fluid be for it to remove urea (a small molecule) without changing the blood volume?

4. A man's body was found floating in the salt water of San Francisco Bay. The bay water is considerably more concentrated than body fluids. The coroner finds, during the autopsy, that the cells in his lungs are clearly swollen. Devise a scenario to explain these findings.

Bones and Bony Tissue

1. Compare and contrast controls of bone remodeling exerted by hormones and mechanical/gravitational forces relative to the actual purpose of each control system and changes in bone architecture that might occur.

3. Sherry is a pregnant teenager. her diet before she was pregnant consisted mostly of junk food and that hasn't changed since she became pregnant. Approximately 8-10 seeks into her pregnancy, she falls and breaks her arm. She doesn't understand why the bone broke, because it wasn't a hard fall. Test results determine that a significant amount of bone demineralization is occurring. Explain what is happening to Sherry.

Muscles and Muscle Tissue

3. Many potent insecticides contain toxins, called organophosphates, that interfere with the action of the enzyme acetylcholinesterase. Ivan is using such an insecticide carelessly, without gloves or dust mask. He absorbs some of the chemical through his skin and inhales it as well. What symptoms would you expect to observe in Ivan as a result of his "self-posioning".

4. A patient is suspected of suffering from either muscular dystrophy or myasthenia gravis. How could you distinguish between the two conditions?

Fundamentals of the Nervous System and Nervous Tissue

1. Mr. Miller is hospitalized for cardiac problems. Somehow, medical orders are mixed up and Mr. Miller is infused with a potassium enhanced intravenous solution meant for another patient who is taking potassium-wasting diuretics (ie., drugs that cause excessive loss of potassium from the body in urine). Mr. Miller's potassium levels are normal before the IV is administered. What do you think will happen to Mr. Miller's neuronal resting potentials? To his neurons' ability to generate action potentials? Explain.

7. Consider the following:
   a. a maximal stimulus is applied to a nerve cell and is maintained for a period of 10 seconds
   b. the action potential frequency decreases from a maximum of 400/sec immediately after the

stimulus to a frequency of 100/sec after 2 seconds and a frequency of 0/sec after 10 seconds. Explain the relationship between the stimulus duration and the observaed change in action potential frequency

The Central Nervous System

2. What does lateralization of cortical functioning mean? Why is the term cerebral dominance a misnomer?
3. Smelling salts can sometimes help restore consciousness after a person has fainted. The active ingredient of smelling salts is ammonia, and it acts by irritating the lining of the nasal cavity. Propose a mechanism by which smelling salts would raise a person from the unconscious state to the conscious state.

The Peripheral Nervous System and Reflex Activity

1. What is the homeostatic value of flexor reflexes?
2. Explain how a crossed extensor reflex exemplifies both serial and parallel processing.

The Autonomic Nervous System

4. Little Billy is stung on his cheek by a wasp. Because Billy is allergic to wasp venom, his throat begins to swell and his respiratory passages constrict. Would acetylcholine or epinephrine be more helpful in relieving his symptoms? Explain.
5. A patient has been exposed to the organophosphate malathion, which inactivates acetylcholinesterase. Which of the following symptoms would you predict: blurring of vision, excess tear formation, frequent or involuntary urination, pallor, muscle twitching, or cramps? Would atropine be an effective drug to treat the symptoms? Explain

Neural Integration

2. Cynthia, a 16-year-old girl, is rushed to the hospital after taking a bad spill off the parallel bars. After a complete neurological worktop, her family was told that she would be permanently paralyzed from the waist down. The neurologist then outlined for Cynthia's parents the importance of preventing complications in such cases. The common complications include urinary infection, bed sores, and muscular spasms. using your knowledge of neuroanatomy, explain the underlying reasons for each of these complications.
3. Doris develops a clot that blocks the right branch of the middle cerebral artery, a blood vessel that serves the anterior portion of the right cerebral hemisphere. What symptoms would you expect to observe as a result of this blockage?

The Special Senses

1. Sally, a 9-year-old girl, told the clinic physician that her "ear lump hurt" and she kept "getting dizzy and falling down." As she told her story, she pointed to her mastoid process. An otoscopic examination of the external auditory canal revealed a red, swollen eardrum, and her throat was inflamed. Her condition was described as mastoiditis with secondary labyrinthitis (inflammation of the labyrinth). Describe the most likely route of infection and the infected structures in Sally's case. Also, explain the cause of her dizziness and falling.
2. Mr. Gaspe appeared at the eye clinic complaining of a chip of wood in his eye. no foreign body was found, but the conjunctiva was obviously inflamed. What name is given to this inflammatory condition, and where would you look for a foreign body that has been floating around on the eye surface for a while?

The Endocrine System

1. Describe as many problems as you can think of that elderly people might have as a result of decreasing hormone production.
2. Explain why diabetes is a much more widespread and serious problem than extreme hypoglycemia; (think synergists and antagonists).

Blood

2. Explain, specifically, how liver dysfunction can cause bleeding disorders.
3. Why do people with advanced kidney disease commonly become anemic?

The Cardiovascular System - The Heart

1. Discuss how the Frank Starling law of the heart helps to explain the influence of venous return on stroke volume.
2. The refractory period of cardiac muscle is much longer than that of skeletal muscle. Why is this a desirable functional property?

The Cardiovascular System - Blood Vessels

3. Who would have a higher pulse pressure: a resting athlete or a resting couch potato. Why?
4. People with allergies commonly take antihistamines with decongestants to relieve their symptoms. The container warns that the medication should not be taken by individuals who are being treated for high blood pressure. Why not, be specific?

Nonspecific Body Defenses and Immunity

1. Some people with a deficit of IgA exhibit recurrent respiratory tract infections. Explain these symptoms
2. Jenny, a six year old child who has been raised in a germ-free environment form birth, is a victim of one of the most severe examples of an abnormal immune system. Jenny also suffers from cancer caused by the Epstein-Barr virus. Relative to this case:
    a. What is the usual fate of children with Jenny's condition.
    b. Why is Jenny's brother chosen as the bone marrow donor?
    c. Why is her physician planning to use umbilical blood as a source of stem cells for a bone marrow transplant if transplant of her brother's marrow fails.
    d. Attempt to explain Jenny's cancer.
    e. What similarities and dissimilarities exist between Jenny's illness and AIDS?

The Respiratory System

2. A surgeon removed three adjacent bronchopulmonary segments from the left lung of a patient with Tuberculosis. Almost half of the lung was removed yet there was no severe bleeding, and relatively few blood vessels had to be cauterized (closed off). Why was the surgery so easy to perform? Be specific.
3. A decrease in blood pressure triggers a baroreceptor reflex that leads to increased ventilation. What is the possible advantage of this reflex?

The Digestive System

2. Describe or make a flow chart of the neural and hormonal controls of stomach secretions.
3. Sometimes a gallstone can move to the pancreatic duct and block or impair the flow of pancreatic juices, thus causing pancreatitis. What symptoms would you expect to see if this occurred?

Nutrition, Metabolism, and Body Temperature Regulation

4. Explain how the following factors affect metabolic rate: thyroxine levels, eating, body surface area, muscular exercise, emotional stress, starvation
5. Individuals with anorexia nervosa typically exhibit bradycardia, hypotension, and decreased heart size. These problems can eventually lead to death from heart failure. How does anorexia cause these symptoms?

The Urinary System

1. Describe the important differences between blood plasma and renal filtrate, and relate the differences to the structure of the filtration membrane.
2. Describe the mechanisms that contribute to renal autoregulation.

Fluid, Electrolyte, and Acid-Base Balance

3. While visiting a foreign country, Milly inadvertently drinks the water, even though she had been advised not to. She contracts an intestinal disease that causes severe diarrhea. How would you expect her condition to affect her blood pH, urine pH, and her pattern of ventilation?
4. Raymond Chu is a party animal. Each weekend he consumes liberal amounts of alcoholic beverages. Alcohol stimulates hydrochloric acid secretion in the stomach. What changes occur in his respiratory rate and the pH of his urine following one of his typical binges?

Reproductive System

1. Women bodybuilders and women with eating disorders such as anorexia nervosa commonly

experience amenorrhea. What does this fact suggest about the relation between body fat and menstruation? What might be the benefit of amenorrhea under such circumstances?

2. Describe the effects not related to reproduction that the sex hormones (testosterone, estrogen, progesterone) have on the body

Heredity

1. A color blind man marries a woman with normal vision The woman's father was also color-blind.
   a What is the chance that their first child will be a color-blind son? A color-blind daughter?
   b. If they have four children, what is the chance that two will be color-blind sons?

2. Mr. and Mrs. Lehman have sought genetic counseling. Mrs. Lehman is concerned because she is unexpectedly pregnant and her husband's brother died of Tay-Sachs disease. She can recall no incidence of Tay-Sacs disease in her own family. Do you think biochemical testing should be recommended to detect the deleterious gene in Mrs. Lehman? Explain your answer.