

QUESTIONS

1. Write the formula relating cardiac output, heart rate, and stroke volume; give normal human values for a resting adult and summarize the factors determining cardiac output. (10%)
2. Draw and describe the effects of increased P_{CO_2} , DPG (2,3-diphosphoglycerate), hydrogen ion concentration, and temperature on the oxygen-hemoglobin dissociation curve. (10%)
3. Describe the forces that determine the magnitude of the glomerular filtration rate (GFR). What is a normal human value of GFR? (10%)
4. Describe the formation of pain, and the mechanisms by which pain could be controlled medically or surgically. (10%)
5. What are the sources and effects of androgens in women? And why? (10%)
6. What effect would a diminished flow of secretion from the pancreatic duct have on digestion? Why does blockage of the pancreatic duct of mammals potentially lead to rapid death? (10%)
7. Explain how tolerance to self antigens may be produced. Also, give two examples of autoimmune diseases and explain their possible causes. (10%)
8. Describe how the chromosomal content determines the sex of a human embryo and how this relates to the development of testes or ovaries. (10%)
9. Explain how the secretion of insulin and glucagon are influenced by fasting; a meal that is high in carbohydrate and low in protein; and a meal that is high in protein and high in carbohydrate. Also, explain how the changes in insulin and glucagon secretion under these conditions function to maintain homeostasis. (10%)
10. A blood vessel removed from an experimental animal dilates when exposed to acetylcholine. After the endothelial is scraped from the lumen of the vessel, it no longer dilates in response to this mediator. Explain. (10%)