Unit 9

Anatomy

**Ch. 43 Immune System**

1. Why are defense systems needed in multicellular organisms?
2. Explain the physiological structures in vertebrates that serve each of the following defense purposes:
    a. barriers
    b. traps
    c. elimination
    d. non-specific patrolling cells
2. How is immunity acquired during a vertebrate's life cycle?
3. Compare B-cells and T-cells.
4. How is it possible that functionally infinite variations of antibodies can be made from one set of genes?
5. Explain the role of Helper T-cells in the immune system.
6. The defenses of bacteria, plants, invertebrates and vertebrates.
7. The interplay between the vertebrate innate and adaptive immune systems.
8. The process of how a specific immune reaction is developed and how specific immune defenses function.
9. The causes, symptoms, and treatments of immune system disorders.
10. How and why vaccines work (and why they don't always).
11. What cell type does HIV infect? How does this lead to AIDS?

**Ch. 45 & 11 Endocrine System & Cellular Communication**

12. Explain the purpose of each of the following modes of cellular communication in multicellular organisms, and give an example of each from human physiology. For each, identify the ligand, and the response:
    a. Cell-Cell contact.
    b. Paracrine signaling
    c. Endocrine signaling
    d. Nervous system signaling.
13. Why would different lineages of animals have evolved to use the same hormones to affect different physiological responses?
14. Diagram the following hormonally-controlled regulatory processes in mammals. Include the major glands, hormones, effects of those hormones, and feedback loops involved in each of the following aspects of human physiology:
    a. Regulation of metabolism
    b. Regulation of Blood Calcium Level
    c. Regulation of the Female Reproductive System
    d. Regulation of the stress response.
15. Cellular communication processes

. a. mechanisms of cellular signal transduction

b. signaling modes of lipid-based and protein-based hormones
c. second-messenger signaling modes, and effects.

16. Why do cells need to communicate?
17. Explain what happens during the three phases of signal transduction.
18. What is the purpose of second messengers?
19. Consequences of defects in cellular signaling pathways
20. How cells use signaling pathways in their physiology.
21. The similarities and differences in G-Protein, Tyrosine Kinase, and ligand-gated ion channel signaling pathways.
22. How a signaling pathway can lead to an amplification of the response to the signal.
23. How a signaling pathway can have multiple physiological effects on a cell or organism.
24. The interactions of the nervous system, endocrine system, and other major body systems (you should be able to provide an example of interactions between the endocrine system and each of the other major body systems.

**Ch. 48 & 49 Nervous System**

25. Why are neurons necessary for animal systems, and why are they only found in animal systems?
26. Explain why each of the following aspects of neuron structure is important to neuron function:
    a. many inputs, one output
    b. unidirectional flow of nervous signals
    c. polarized membrane
    d. "all or nothing" binary nervous signaling system
    e. myelin sheath
27. Diagram each phase of an action potential, and explain what is happening at the neuronal membrane during each phase (specifically explain which channels in the membrane are open/closed during each phase, and the direction of ion movement across the membrane).
28. How is a nervous signal transmitted from one neuron to the next?
29. Why is the synapse a particularly good target for drugs and toxins?
30. Describe the function of acetylcholinesterase, and the effect to the body if that function is inhibited.
31. How the nervous system works with the other systems of the body (should be able to link to all other systems of the body).
32. How sensory neurons, interneurons, and motor neurons all work together.
33. How signaling pre-synaptic neurons can be either inhibitory or excitatory on post-synaptic neurons.