Study Guide: Endocrine System

1. Compare the Endocrine and Nervous System as regulatory systems is terms of speed, method of transmission, types of activities regulated. How and where are the two systems interconnected? Which functions are better served by one system than the other? Give examples of each.

2. Describe the difference between an endocrine and an exocrine gland in terms of structure and function. Give examples of each.

3. What is meant by a target organ (tissue, cell)? What is it about the target cell that makes it respond to a particular hormone? What is a hormone? What is a common type of effect that a hormone produces in a target cell? What are the main chemical classes of hormones? Define; endocrine, paracrine, and autocrine. Where are these hormones often found?

4. Define: Metabolism; Catabolism; Anabolism; Glycogenolysis; Glycogenesis; Gluconeogenesis; Lipogenesis; Lipolysis; Glycolysis.

5. Explain what is meant by a negative feedback mechanism. Give an example. How is a positive feedback mechanism different? Give an example of this.

6. Where is the Pituitary gland located? What is the infundibulum? Name the two lobes of the Pituitary. What are other names for those lobes? Describe the difference in the two lobes regarding the type of control exerted by the hypothalamus and their production (or not) of hormones.

7. Name the two hormones released from neurohypophysis. What are the target organs of oxytocin? How is it involved in a positive feedback cycle during childbirth? Why is oxytocin sometimes called “milk letdown factor”? What does ADH stand for? Under what circumstances is it released? Why is it sometimes called vasopressin? What is the main target organ of ADH, and what is the impact of ADH on the volume of urine being formed? How does this help maintain fluid balance? Blood pressure? Which of these hormones are considered “tropic” hormones?

8. Name the seven main hormones secreted by the adenohypophysis. Describe the main action of growth hormone on its target cells. How does this contribute to growth? What does FSH stand for? What is its impact on the ovary? on the testes? What female hormone does it stimulate from the ovary? Why is it called a gonadotropic hormone? What does LH stand for? How does it affect the ovary? What process does it induced? What hormone does it cause the corpus luteurn to release? What is LH called in men, and what hormone does it cause the testes to release? What is the main function of prolactin, and how does its function differ from that of oxytocin? Describe the functions of TSH, ACTH, and MSH. What does each stand for?

9. Discuss the location of the thyroid gland. What is the difference between the hormones 14 and T_3? What is another name for T_4? What are the targets of thyroid hormones? Describe their effects on the targets. What is the impact of hypothyroid in a fetus or infant? In an adult? What are symptoms of hyperthyroidism?

10. What other hormone is produced by the thyroid gland? What effects does it have on blood calcium levels? What hormone serves as the antagonist to calcitonin, and what is its effect on blood calcium? What are the target cells of calcitonin and PTH?

11. Where are the adrenal glands located? What is another name for the adrenals? Describe the location of the adrenal cortex and the adrenal medulla? Name three groups of hormones produced by the adrenal cortex. Structurally, how are all these hormones related? Name the most important of the mineral-corticoids. What two conditions cause the release of aldosterone? Where are its target cells, and how does it help maintain blood pressure? What ion does it cause the kidneys to reabsorb (into the bloodstream) and which ion does it help to eliminate from the body (via the urine)? Why does aldosterone also affect water volume of the blood?

12. What causes the secretion of glucocorticoids? (remember the pituitary) Describe some of the main effects of the glucocorticoids. Why are they considered to be stress hormones? What is gluconeogenesis, and how does it relate to blood sugar levels? What is the effect of glucocorticoids on blood pressure, blood sugar, inflammation? What is the long range effect on the immune system?

13. What are gonadocorticoids?

14. What are the hormones of the adrenal medulla, and what is their impact? How do they relate to the sympathetic nervous system? How do they affect blood glucose, and blood pressure?

15. Which two hormones are produced by the pancreas? Which part of the pancreas produces them? What are the target cells of glucagon, and what are its effects on blood glucose? How is this achieved? What are the target cells of insulin, and what is its effects on blood glucose? How is this achieved? What causes the release of glucagon and insulin normally? Describe the two types of diabetes mellitus.

16. What are the major hormones of the ovaries? What effects do they produce? What are the female secondary sex characteristics? What is the major hormone produced by the testes, and what are its effects? What are the male secondary sex characteristics?

17. Where is the pineal gland? What hormone does it produce, and what may be its function?

18. How is the thymus important as an endocrine gland?

19. In addition to all of the above, where else are hormones produced in the body? What are the functions of these hormones?

Study Guide: The Blood

1. Distinguish between plasma, lymph, interstitial fluid, extracellular fluid, the internal environment, cytoplasm, intracellular fluid. Where is each found? What do they have in common? How are they different?

2. List the functions of blood. Describe the physical characteristics of blood (i.e. temperature, color, viscosity, pH).

3. What is the average blood volume found in an adult?

4. Why is blood a tissue? What is the matrix? What kind of tissue is it?

5. What is the percentage of plasma and formed elements in whole blood?

6. What are the three types of formed elements? Compare the three types on the basis of size, nucleation, shape, numbers, mobility, life span. What is hemopoiesis? Where does it occur for each formed element? What is erythropoietin?

7. Describe hemoglobin -- structure and function. Where is it located? How does it combine with 02? What else does it carry? What is anemia? List four different causes/types of anemia.

8. Describe four characteristics that all leukocytes share to a greater or lesser degree.

9. Name the two main groups of leukocytes. Name the types within these groups. What are the normal percentages of each in a differential count of white blood cells? Which are most abundant? The most phagocytic? Which are involved in allergic reactions? Which are central to our specific immunity?

10. What is another name for a platelet? How are platelets involved in the process of hemostasis? Describe the five phases of hemostasis (i.e. vascular spasm, agglutination, coagulation, clot retraction, clot destruction).

11. Describe the events which lead to the formation of a clot (name the chemical events that take place.) What ion is necessary in each step of coagulation? What is serum? What is hemophelia?

12. What are the components of plasma? (by percent) Discuss the function of albumins and globulins. What other proteins are present in plasma?

13. What is the process by which plasma becomes tissue fluid? Which components are too large to filter out of the capillaries?

14. What is an antigen? antibody? agglutinogen? agglutinin?

15. What defines the different blood types? Name the four major types. Which agglutinogen/agglutinin is present in each? Where are these agglutinogens and agglutinins found?

16. What is agglutination? How is it not the same as coagulation? When does it occur and why is it dangerous? What blood types are compatible? Which are not?

17. What is the Rh factor? In what situations might it cause problems?

18. Which vitamin is necessary for synthesis of prothrombin? for erythropoiesis?

Study Guide: The Heart

1. Describe the heart by size, shape, location.

2. What is the function of the heart? Why is the heart a double pump?

3. Describe the layers of the pericardium and the heart. Between which two layers is serous fluid found?

4. Name and locate the four chambers of the heart. In what sequence do they contract? Which has the thickest myocardium and why? blood into/Out of each chamber? Which vessels bring venous blood back to the right atrium? Trace the blood flow from where it enters the right atrium to where it leaves the left ventricle. Which veins carry oxygenated blood? Which arteries carry deoxygenated blood?

5. What is the function of valves in the heart? Which are the AV valves? The semilunars? Name and locate the four valves. What are chordae tendineae and papillary muscles? What is their function? When do they contract? Do the valves open & close passively or actively?

6. What kind of tissue makes up the cardiac conduction system? How is this tissue different from cardiac muscle cells, how is it the same? What is its purpose? Why is the SA node called the pacemaker? Trace the pathway of an impulse as it moves from the SA node to the cells of the myocardium. Where are the nodes located? What instrument is used to measure electrical changes in the heart?

7. What is the cardiac cycle? On average, how long does it last? What is systole? Diastole? Describe the phases of the cardiac cycle including pressure changes, opening and closing of valves, and heart sounds. In one cycle, how long do systole and diastole last for the atria? For the ventricles?

8. Define cardiac output, stroke volume, stroke rate. How are they related? At rest, what is the average cardiac output?

9. What factors determine stroke volume? What does Starling's law of the heart state? What is preload, inotropic agents, and after load? What hormones and chemicals influence contractility?

10. What factors affect stroke rate? What hormones and chemicals influence heart rate? What and where are the cardioacceleratory and cardioinhibitory centers? To where do they send impulses? How are they related to the sympathetic and parasympathetic nervous systems? From where do they receive impulses? What and where are pressoreceptors (aka baroreceptors)?

11. What is a reflex? What do the carotid sinus reflex, aortic arch reflex, and right heart reflex control? Draw the pathways of each reflex.

12. What is the autonomic nervous system? Sympathetic and parasympathetic divisions? What are the effects of each division on the heart?

Study Guide: Blood Vessels

1. Define an artery and a vein in terms of direction of blood flow. Which carries oxygenated blood and which deoxygenated blood in systemic circulation? In pulmonary circulation?

2. Describe the basic three layers of an artery or a vein. What is the lumen of a vessel and how does its size compare between arteries and veins in the same location? Which vessels contain valves and what is their function? What is the vasovasorum?

3. Describe the differences in structure between large arteries and medium sized arteries. Which are closer to the heart and which further away? What is each called? How are their functions different?

4. How are large blood vessels themselves nourished?

5. Discuss the structure and function of an arteriole -- in particular, what is controlled by vasoconstriction and vasodilation of arterioles.

6. How are vasoconstriction and vasodilation controlled? Which portion of the nervous system is involved--autonomic or somatic? Where is the center that controls these activities and what is it 'called? Think of an example where arterial blood pressure would need to be elevated.

7. Describe the structure and size of a capillary. How is substance exchange enhanced by this? What and where is a precapillary sphincter? What does it control and how is it regulated? What are metarterioles & thoroughfare channels? What are sinusoids? How are they different from regular capillaries and where are they found?

8. Describe in broad terms the change in blood pressure from heart to arteries to capillaries to veins to heart. Where is blood pressure lowest? Highest? Where is blood velocity slowest? Fastest?

9. What factors aid in venous return? Why are veins considered blood reservoirs? Where are these blood reservoirs located?

10. What is the anastomosis? Give three possible functions of these. Where are they found?

11. Where does the aorta arise? Trace its path to where it ends. Which vessels arise from the ascending aorta? the aortic arch? the thoracic aorta?

12. Name the branches coming off the abdominal aorta. Where do they bring blood? Which two arteries does the aorta split into at its distal end? Which vessel takes blood to the pelvic organs? Which to the lower extremities?

13. Trace the arterial blood flow and venous return of the following areas, name all the major arteries and veins involved:

    a - the myocardium
    b - the brain
    c - the face and scalp
    d - the lower extremity
    e - the upper extremity
    f - the stomach, small intestine, large intestine, spleen, liver, pancreas, gonads, kidneys, abdominal muscles
    g - the bronchi, trachea, intercostal muscles

14. Describe the pathway of the hepatic portal system. What is its function? Which vessels supply blood to the liver? Where does the deoxygenated supply come from? the oxygenated blood? the nutrient rich blood?

15. Describe the names and locations of the azygos system veins. What is their function? Into what does the azygos blood drain?

16. Define blood pressure. Name all the major determinants of BP and how each one works. What controls or determines each factor? Trace a reflex arch for regulating BP (starting with pressoreceptors.)

Study Guide: Lymphatic System and Immunity

1. Give at least four main functions of the lymphatic system. How does it help maintain blood volume? How does it qualify as a cleansing system? In what way is it part of the immune system? What is its connection to the digestive system?

2. What is lymph? How is it formed? Where is it found? How does it differ from blood?

3. How are lymph capillaries different from blood capillaries -- size, permeability, connection to other vessels?

4. How are large lymph vessels similar to/different from veins with respect to tunics, rate of flow, pathways?

5. Where are lymph vessels NOT found?

6. What lymph organs are found along the pathway of the lymph vessels? What do we call vessels that lead to a lymph node? and out of the node? What is happening in the lymph nodes? Where in the body do we have concentrations of nodes? What does a swollen lymph node indicate?

7. Name the two lymphatic ducts. What function do they have? What area does each one drain? What and where is the cisterna chyli? Where does each duct begin arid end? What finally happens to lymph?

8. Name all the lymph organs. What is a function they all have in common? Name and locate the three sets of tonsils. Locate and describe the thymus. In what ways is it a controlling organ of the immune system? What happens to it up to puberty and after puberty? i.e. size/function. Where is the spleen? What are some functions of the spleen?

9. What is the difference between specific and non-specific resistance to disease? List some of the non-specific mechanisms of resistance and describe how each works.

10. What are the two major types of cells of the immune system? Where are they primarily produced? Which is involved in cellular immunity? Which is involved in humoral immunity?

11. What is an antigen? What is an antibody? Which cells produce free-floating antibodies? In what way may a B-cell be stimulated to produce antibodies? Into what subtypes does a B-cell differentiate when it is stimulated and what are their functions? When are memory cells activated and what do they do? What is this type of immunity called?

12. How does an antibody interact with an antigen? Describe three effects produced by the antigen-antibody complex. What is meant by antibody specificity?

13. What is interferon and where is it produced? What is complement and where is it found?

14. Name four different types of T-lymphocytes. Explain how a rnacrophage presents the antigen to the Helper T-cell. What two antigens/markers must be present on the macrophage to activate the Helper T-cells? How do Helper T-cells activate other cells? Which cells do they activate? Give the name and function of each.

15. List the steps in an immune system process? What is different between the primary response and the secondary response to the same antigen?

16 What is the difference between a bacterium and a virus? Describe how each damages cells.

17. What is a vaccination? What is it for? What is meant by an allergen?

Study Guide: Digestive System

1. Name the structures of the alimentary canal and their functions. Name the accessory organs of digestion and their functions.

2. Name the layers of the walls of the alimentary canal, and describe each. What is peristalsis? What is the function of a sphincter muscle? Locate and describe is the peritoneum? What and where is the mesentery?

3. Name and locate the three pairs of salivary glands. Describe the contents of saliva. What enzyme does it contain, and what is broken down by this enzyme? Give three functions of saliva. What is the innervation of the salivary glands.

4. Describe the structure of the esophagus. Does it contain skeletal or smooth muscle?

5. Identify the following portions of the stomach: rugae, body, cardiac sphincter, pyloric sphincter, fundus, gastric glands.

6. Name the components of the gastric juice. What is the function of hydrochloric acid (HCl)? What are the functions of the other components of the gastric juice? What is the relationship of pepsin to gastric juice? What type of anemia is caused by lack of intrinsic factor?

7. Locate and describe the functions of each of these structures of the small intestine: duodenum, jejunum, ileum, ileocecal valve, lacteals, villi, microvilli.

8. Describe the contents of the intestinal juice, and the function of each substance.

9. Locate and describe the functions of the structures of the large intestine: cecum, colon (ascending, transverse, descending, sigmoid), rectum, vertniform appendix, anal canal, internal & external sphincters.

10. Where is the pancreas m the abdominal cavity? What is its exocrine function? Endocrine function? What are the components of the pancreatic juice, and the function of each? How does pancreatic juice flow to the small intestine? Where does it enter the intestine?

11. What is the function of bile? Is it an enzyme? Where is it produced, and where is it stored? How does it flow to the small intestines?

12. How does blood reach liver cells (two sources)? How do liver cells get oxygenated blood? Nutrient-rich blood? Toxin-laden blood? What vessels drain the liver of blood, and where does the blood return to? What are sinusoids? Name eight functions of the liver. Why is it such a crucial organ?

13. Describe what is meant by mechanical digestion. What is deglutition? mastication? peristalsis? What is a bolus? chyme? feces? Describe the swallowing reflex, and what must be prevented in this process.

14. Describe the stages of chemical digestion of carbohydrates, lipids and proteins. What are the enzymes involved? What organ produces each enzyme? In which organ do the enzymes act? What is the goal of chemical digestion? What are the end products of chemical digestion? What are polysaccharides? disaccharides? monosaccharides? List the different types of each). What are triglycerides?

15. How and where are the end products of digestion absorbed? Which enter the bloodstream directly? To what organ are these nutrients delivered by the bloodstream first? Which nutrients enter the lymph capillaries? What are nutrients ultimately used for? Why is absorption of nutrients largely an active process? Where is water absorbed?

Study Guide: Respiratory System

1. Why do we need oxygen? Why must we rid the body of carbon dioxide?

2. List in order, the structures of the respiratory system.

3. What forms the nose? the nasal cavity (floor, roof, walls, septum)? Which receptors are located in the roof of the nasal cavity?

4. What lines the entire upper respiratory tract? What are the advantages of this? Discuss the changes that the air goes through during its passage through the nasal cavity.

5. Name the three divisions of the pharynx. What structures are found in each division? What are the different functions of the pharynx? Which other system does it belong to?

6. Name the major cartilage of the larynx. Describe the location of the larynx. What are the true vocal cords composed of? What is their function? How is sound produced here? How is speech produced? What determines the pitch of a sound? The volume?

7. Where is the trachea? What is it composed of? Where does it divide? What are its functions? What is the advantage of having cartilage in its walls?

8. What is the bronchial tree? What is a bronchiole? An alveolar duct? An alveolus?

9. Describe and locate the pleura (parietal and visceral). What type of membrane are they composed of? What is the pleural cavity?

10. Describe the structure and location of the lungs. Review the blood flow into and out of the lungs.

11. What is meant by ventilation? What causes it? What is external respiration? Internal respiration? Are these processes active or passive?

12 Define vital capacity and tidal volume.

13. Describe the neural and chemical control of respiration. How does CO_2 drive respiration? What is the relationship between CO_2 and acidity? What percentage of O_2 is carried by red blood cells? What percentage is dissolved in the plasma? What percentage of CO_2 is carried by the red blood cells? What percentage of CO_2 is dissolved in the plasma? What is most CO_2 in the plasma found as?

Study Guide: Urinary System

1. Name the organs of the urinary system, briefly describing the function and location of each organ.

2. List the functions of the urinary system as a whole.

3. Describe the gross anatomy of the kidney.

4. Describe the following structures: glomerular capsule, glomerulus, proximal convoluted tubule, Loop of Henle, distal convoluted tubule, collecting tubule (duct). What is a nephron?

5. Describe the circulation of blood associated with each kidney.

6. Describe the formation of urine in terms of: glomerular filtration, tubular reabsorption, tubular secretion.

7. What is the composition of filtrate?

8. What is the composition of urine?

9. Describe the mechanisms by which the following are reabsorbed from the nephron back into the bloodstream. (sodium ion – $Na+$, chloride ions – $Cl-$, water - $H2O$, glucose $C_6H_{12}O_6$).

10. Describe the structure of the ureter wall.

11. Describe the structure of the urinary bladder wall.

12. What is the purpose of the mucous membrane on the inner walls of the ureter and bladder?

13. Describe the controlling mechanism of micturition.

14. Describe the effects of ADH and aldosterone on the contents of the urine formed by the kidneys. How do these effects take place?