Section A: Endocrine vs. Nervous Systems

The endocrine and nervous systems function to regulate body activities. Since both systems are involved in regulation, how does the endocrine system differ in regulation compared to the nervous system? The nervous system uses electrical impulses and neurotransmitters to control processes. These impulses are localized and are extremely fast. The endocrine system is comprised of glands that use chemical messengers to influence a wide range of activities such as growth, development and metabolic activities. These chemical messengers called hormones regulate processes at a slower rate. The hormonal effects last longer and are more widespread within the body.

1. How are the nervous system and the endocrine system different?

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<th>Nervous System</th>
<th>Endocrine System</th>
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Section B: Intro to endocrine

1. What are hormones? ________________________________

2. Most hormones circulate in blood and come into contact with essentially all cells. However, a specific hormone usually affects only a limited number of cells called ______________________ which contain receptors for that hormone. When hormones bind to receptors, it triggers a cascade of reactions within the cell that affects function.

3. Endocrine glands secrete hormones directly into the bloodstream while exocrine glands release secretions through ducts into cavities or body surfaces. Some endocrine glands have other functions beyond hormone production and secretion. These organs are called mixed glands. For example: In addition to hormone production, the pancreas secretes digestive enzymes into the small intestines. Consider the other endocrine glands and list glands that would be considered mixed based on the above criteria. ____________________________

4. Label the endocrine organs in the diagram. thyroid, thymus, pineal, hypothalamus, pituitary, ovaries, testes, parathyroid, adrenal, pancreas

   a. ____________________________
   b. ____________________________
   c. ____________________________
   d. ____________________________
   e. ____________________________
   f. ____________________________
   g. ____________________________
   h. ____________________________
   i. ____________________________
   j. ____________________________
Section C: Regulation & Feedback
1. Positive vs. Negative Feedback: Identify if the following are describing **positive feedback** or **negative feedback**.
   a. _______________________ regulated by opposing hormones. One hormone may raise the level of a particular chemical or action while the other hormone lowers the level of the chemical or action.
   b. _______________________ the rise in blood glucose levels triggers the pancreatic release of insulin. Insulin causes blood glucose levels to drop, which signals the pancreas to stop producing insulin.
   c. _______________________ the release of the hormone or the activity causes an increase in the production of the hormone.
   d. _______________________ used to maintain homeostasis
   e. _______________________ effects of the stimuli are designed to amplify the results
   f. _______________________ most common form of feedback in the endocrine system

2. Identify which type of stimuli is being described below. **neural, hormonal, or humoral**.
   a. _______________________ Materials in body fluids contain ions and nutrients that stimulate endocrine glands
   b. _______________________ Sensory stimuli cause activation of an endocrine gland.
   c. _______________________ The amount of calcium in the blood activates the Thyroid or Parathyroid to release Calcitonin or PTH.
   d. _______________________ Turned on or off by release of hormones from other organs
   e. _______________________ The anterior pituitary releases TSH which stimulates the thyroid gland to produce thyroxine. (see diagram)
   f. _______________________ The sympathetic nervous system stimulates the adrenal medulla to release epinephrine and norepinephrine in response to stress.

Section D: Pituitary Gland
The pituitary gland is divided into the anterior and posterior lobes. The hypothalamus sends a message which causes the anterior pituitary to produce and release hormones into the circulatory system. The posterior lobe contains the ends of nerve cells coming from the hypothalamus. The hypothalamus sends hormones directly to the posterior lobe through these nerves. The posterior pituitary gland stores and releases these hormones.

1. Describe the role of the hypothalamus in the regulation of the anterior pituitary gland. __________________________________________________________

2. Which two hormones are stored and released from the posterior pituitary gland? ________________________________________________

3. Which two hormones work together to ensure normal functioning of the ovaries and testes? __________________________________________________________

4. Which hormone is essential in early years to maintain a healthy body composition and for growth in children? In adults, it aids healthy bone and muscle mass and affects fat distribution. __________________

5. Why is the pituitary gland called ‘The Master Gland’? __________________________________________________________

6. Allie and her grandmother went out to eat at a restaurant that had a self-serve soda fountain. During the evening Allie drank 5 cokes. Later on she found herself visiting the restroom on a more than regular basis. Explain why she is experiencing excessive urination. __________________________________________________________
7. The parents of a 14 year old Megan are concerned about her height because she is only 4 feet tall and they are both close to 6 feet tall. After tests by their doctor, certain hormones are prescribed for the girl. What hormones are prescribed and explain why the girl might expect to reach normal height?

8. Identify the hormones produced from the pituitary gland based on the description below.
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   - 
   - 
   - 
   - 
   - 

9. Section E: Thyroid & Parathyroid Glands
   1. The thyroid gland absorbs iodine and uses it to make thyroid hormones: thyroxine (T4) and triiodothyronine (T3). T3 and T4 are released into the bloodstream and needed to regulate metabolism.
      - The thyroid gland is under the control of the pituitary gland. When the level of T3 & T4 drops too low, the pituitary gland produces ______________ which stimulates the thyroid gland to manufacture and secrete ______________. The pituitary senses this rise in blood levels and responds by decreasing its TSH production.
   2. Is the above hormonal mechanism representative of a negative or positive feedback system?
   3. Which type of stimuli causes the release of TSH?
   4. The thyroid and parathyroid glands release hormones to regulate the Ca+ levels in the blood.
      a. Explain what occurs when the blood Ca+ levels become too low. 
      b. Explain what occurs when the blood Ca+ levels become too high.
   5. Which type of stimuli causes the release of calcitonin and PTH?
   6. This hormone action is regulated by negative feedback. Explain how this was determined.
Section F: Adrenal Glands
1. Where are the adrenal glands located? ________________________
2. The outer region of the adrenal glands is called the ______________________ and the inner region of the adrenal glands is called the ______________________.
3. What hormone stimulates the adrenal cortex to produce glucocorticoids? ______________________
4. Which hormone is stimulated by rising blood levels of K+, low blood levels of Na+ and decreasing blood volume and blood pressure? ______________________
5. Which hormone helps the body resist stressors by increasing blood glucose, fatty acid and amino acid levels, and blood pressure? ______________________
6. Which hormone is produced in small amounts to bring about the onset of puberty? ______________________
7. What are the two types of catecholamines? ______________________
8. Which hormone is stimulated by the sympathetic nervous system to enhance and prolong the fight or flight response to short-term stress? ______________________
9. Wanda is in an abusive relationship in which she lives in constant fear of physical and verbal attack. What adrenal hormones are being excessively produced and released as she deals with this long-term stress? ______________________

Section G: Pancreas, Gonads, Thymus Gland & Pineal Gland
1. Use the diagram to help explain what occurs when you have low blood sugar.
2. Use the diagram to help explain what occurs when you have high blood sugar.
3. Mary Morgan has just been brought into the emergency rooms of City General Hospital. She is perspiring profusely and is breathing rapidly and irregularly. Her breath smells like acetone (sweet and fruity) and her blood glucose test out at 650mg/100ml of blood. She is in acidosis. Normal blood glucose levels should be less than 140mg/100ml of blood. What hormone should be administered and why? __________________________________________________________________________________________
4. What hormones stimulate the testes and ovaries to function? ______________________
5. In females, which hormone promotes the maturation of the reproductive organs and the development of secondary sex characteristics? ______________________
6. In males, which hormone promotes the maturation of the reproductive organs and the development of secondary sex characteristics? ______________________
7. In females, which hormone works with estrogen to regulate the menstrual cycle? ______________________
8. Which hormone is essential for the maturation of T cells (lymphocytes) and the immune response? ______________________ What gland produces this hormone? ______________________
9. The ______________________ gland produces the hormone, ______________________, which regulates our biological rhythms.
10. When do melatonin levels normally rise -- during the day or night? ______________________