

Endocrine System Worksheet

Name _____

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?

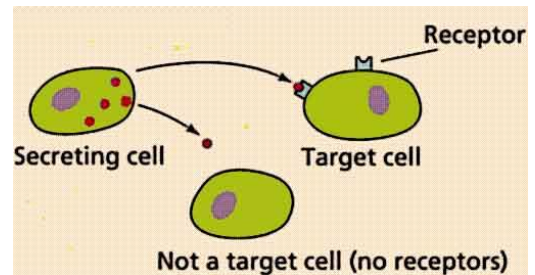
Nervous System	Endocrine System

Section B: Intro to endocrine

1. Our Endocrine system functions to control regulate and maintain ongoing processes. Identify a minimum of 3 processes within your body that the endocrine system helps to regulate or maintain.

2. What are hormones? _____

3. 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.



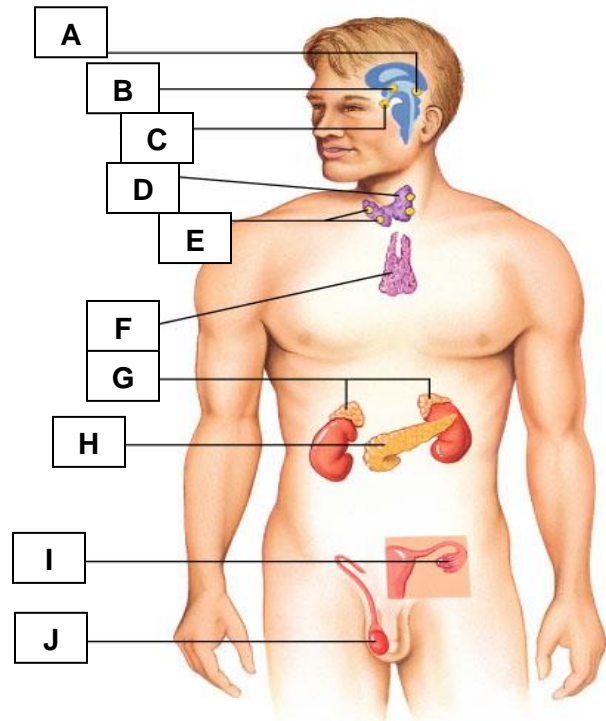
4. Endocrine glands secrete hormones directly into the bloodstream while exocrine glands release secretions through ducts into cavities or body surfaces. Some endocrine glands have other functions beyond hormone production and secretion. These organs are called mixed glands, because they have both endocrine and exocrine functions. *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. _____

5. Richard has symptoms of excessive hormone production of the parathyroid gland. The doctor is certain there is a tumor on the gland. Yet, when surgery was performed on his neck, the surgeon could not find the parathyroid gland at all. Where should the surgeon look to find the tumor on the parathyroid gland? _____

6. What does it mean when someone refers to the pancreas as a mixed endocrine/exocrine organ? _____

7. 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. _____

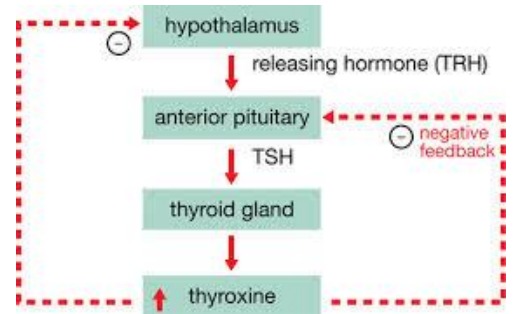


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Section C: Regulation & Feedback

1. 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.



2. 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
- g. _____ inhibitory and stabilizing

Section D: Pituitary Gland

The pituitary gland is divided into the anterior and posterior lobes. The anterior pituitary produces and stores several hormones. The hypothalamus sends a hormone 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. What hormones are involved?

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?

Match the hormone to the function.

Adrenocorticotrophic hormone (ACTH)

Growth hormone (GH)

Prolactin (PRL)

Thyroid-stimulating hormone (TSH)

Follicle-stimulating hormone (FSH)

Luteinizing hormone (LH)

Anti-diuretic hormone (ADH)

Oxytocin

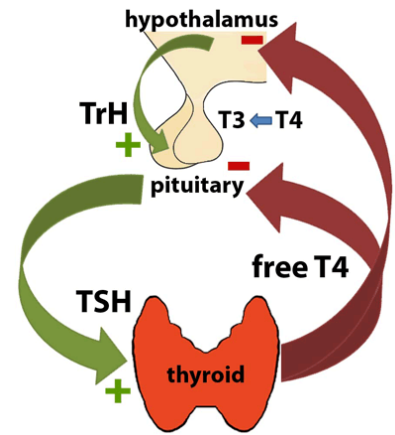
8. _____ Triggers the thyroid gland to release T3 and T4 hormones
9. _____ Stimulates mammary gland development and milk secretion
10. _____ Stimulates estrogen secretion, egg production (female) and sperm production (males)
11. _____ Triggers ovulation, progesterone production (female), prepares body for pregnancy and androgen production (males)
12. _____ Stimulated by rise in electrolytes, reduces water loss in the urine and increases thirst.
13. _____ Stimulates glucocorticoid release from adrenal gland which affects glucose metabolism
14. _____ Stimulates uterine contraction – labor, milk delivery
15. _____ Stimulates cell growth

“GOAT FLAP” – To help remember the hormones of the pituitary.

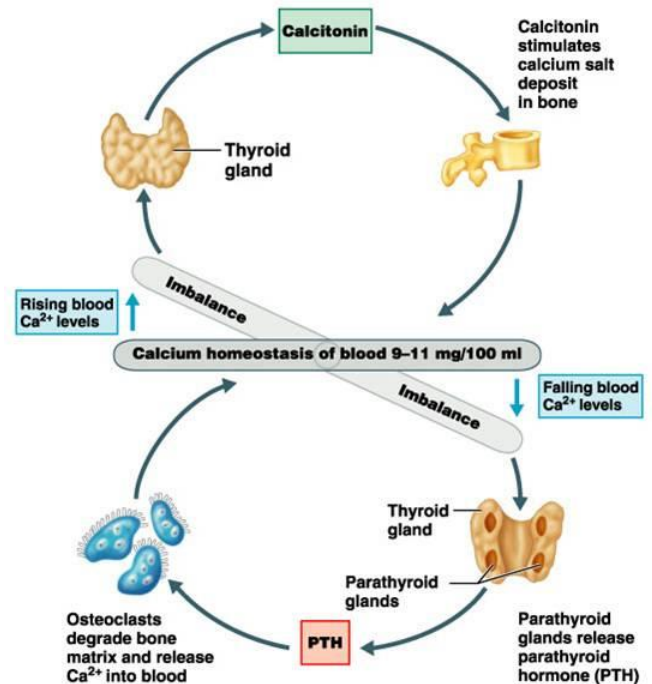
Section E: Thyroid & Parathyroid Glands

- The thyroid gland absorbs iodine and uses it to make thyroid hormones: thyroxine (T4) and triiodothyronine (T3). T3 and T4 are released into the blood stream 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.
- Is the above hormonal mechanism representative of a negative or positive feedback system? _____
- Which type of stimuli causes the release of TSH? _____
- The thyroid and parathyroid glands release hormones to regulate the Ca⁺ levels in the blood.
 - Explain what occurs when the blood Ca⁺ levels become too low. _____

 - Explain what occurs when the blood Ca⁺ levels become too high. _____



- Which type of stimuli causes the release of calcitonin and PTH? _____
- This hormone action is regulated by negative feedback. Explain how this was determined. _____



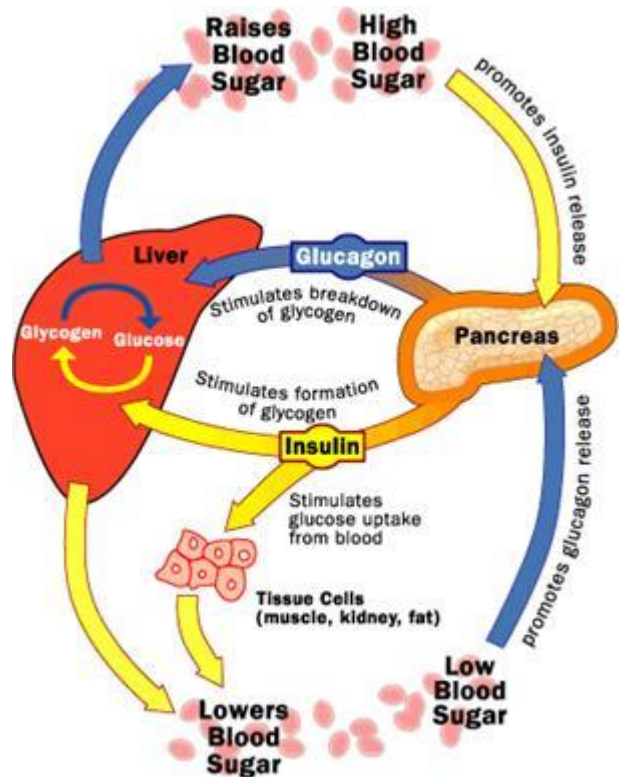
Section F: Adrenal Glands

- Where are the adrenal glands located? _____
- The outer region of the adrenal glands is called the _____ and the inner region of the adrenal glands is called the _____.
- What hormone stimulates the adrenal cortex to produce hormones? _____
- What is the main type of mineralocorticoid? _____
- Which hormone is stimulated by rising blood levels of K⁺, low blood levels of Na⁺ and decreasing blood volume and blood pressure? _____
- When sodium ions are reabsorbed, this leads to water reabsorption which increases blood volume. Does this increase or decrease blood pressure? _____
- Which hormone helps the body resist stressors by increasing blood glucose, fatty acid and amino acid levels, and blood pressure? _____
- What is the main type of glucocorticoid? _____
- Which hormone is produced in small amounts to bring about the onset of puberty? _____
- What are the two types of catecholamines? _____

- Which hormone is stimulated by the sympathetic nervous system to enhance and prolong the fight or flight response to short-term stress? _____
- Wanda is in an abusive relationship in which she lives in constant fear of physical and verbal attack. What two adrenal cortex hormones are being excessively produced and released as she deals with this long-term stress? _____

Section G: Pancreas, Gonads, Thymus Gland & Pineal Gland

- Use the diagram to help explain what occurs when you have low blood sugar.



- Use the diagram to help explain what occurs when you have high blood sugar.

- 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? _____

- What hormones stimulate the testes and ovaries to function? _____
- In females, which hormone promotes the maturation of the reproductive organs and the development of secondary sex characteristics? _____
- In males, which hormone promotes the maturation of the reproductive organs and the development of secondary sex characteristics? _____
- In females, which hormone works with estrogen to regulate the menstrual cycle? _____
- Which hormone is essential for the maturation of T cells (lymphocytes) and the immune response? _____ What gland produces this hormone? _____
- What happens to the thymus as one ages? _____
- The _____ gland produces the hormone, _____, which regulates our biological rhythms.
- When do melatonin levels normally rise -- during the day or night? _____

Section H: Review

Gland	Hormone	Functions
		Released when there are high levels of glucose in the blood
		Stimulates the production of breast milk
		Released to control body's metabolism
		Released when excess amounts of Ca in blood and causes Ca to be deposited in bone
		Released by low amounts of Ca in the blood and causes Ca to be released from bone
		Regulates the Na/K ions reabsorption by the kidneys
		Allows body to withstand long term stress by releasing glucose
		Causes kidneys to reabsorb water to prevent urine production
		Stimulate uterine contractions and milk ejection
		During pregnancy causes uterine walls to thicken and helps regulate menstrual cycle
		Promotes development of female reproduction organs and secondary sex characteristics
		Releases when there are low levels of glucose in the blood
		Causes the maturation of T cells
		Promotes development of male reproductive organs and secondary sex characteristics
		Stimulates adrenal cortex to release hormones
		Stimulates thyroid gland to release its hormones
		Activates the fight or flight response
		Affects biological rhythms
		Stimulates ovaries to produce hormones and egg maturation
		Stimulates testes to produce hormones and sperm production
		Stimulates total body growth
		Stimulates the production of small amounts of androgens to initiate puberty