Nervous and Endocrine Systems Worksheets

CK12 Editor

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AUTHORS
CK12 Editor

CHAPTER 1

Nervous and Endocrine Systems Worksheets

CHAPTER OUTLINE

Chapter 20: Nervous and Endocrine Systems

- Lesson 20.1: Nervous System
- Lesson 20.2: Endocrine System

1.1 Nervous System

Lesson 20.1: True or False

Name_____ Class_____ Date_____

Write true if the statement is true or false if the statement is false.

_____ 1. The axon is a long, membrane-bound extension of the cell body.

_____ 2. The sodium-potassium pump removes Na+ ions from the cell by active transport.

_____ 3. Chemical synapses use ions as messengers.

_____ 4. The cerebellum is involved in coordination and control of body movement.

_____ 5. If the cerebellum is damaged there will be paralysis.

_____ 6. A reflex is an automatic action caused by a defined stimulus and carried out through a reflex arc.

_____ 7. The parasympathetic division gets the body ready for "fight or flight."

_____ 8. The fovea contains the largest concentration of rod cells in the eye.

_____ 9. Hair cells send electrical signals to the cerebellum.

_____ 10. A psychoactive drug alters cognitive function in the central nervous system.

Lesson 20.1: Critical Reading

Name_____ Class_____ Date_____

Read this passage from the lesson and answer the questions that follow.

Somatic and Autonomic Nervous Systems

The motor division of the peripheral nervous system is divided into the somatic nervous system and the autonomic nervous system: The somatic nervous system is the part of the PNS that is associated with the conscious (voluntary) control of the body through the movement of skeletal muscles and the perception of external stimuli through senses such as touch, hearing, and sight. The system includes all the neurons connected with muscles, skin and sense organs. The somatic nervous system is made up of sensory nerves that receive sensory information from the external environment, and motor nerves responsible for muscle contraction. Together with interneurons, the sensory and motor neurons are found in a reflex arc. A reflex is an automatic (involuntary) action caused by a defined stimulus and carried out through a reflex arc. For example, a person stepping on a sharp object would start the reflex action through the creation of a stimulus, (pain) within specialized pain receptors located in the skin tissue of the foot. The resulting stimulus would be passed along sensory neurons to the spinal cord. This stimulus is usually processed by an interneuron to create an immediate response to pain by initiating a motor response in the muscles of the leg which pull the foot away from the object. This reflexive action would occur as the pain sensation is arriving in the brain. A reflex arc is shown in **Figure 19**.

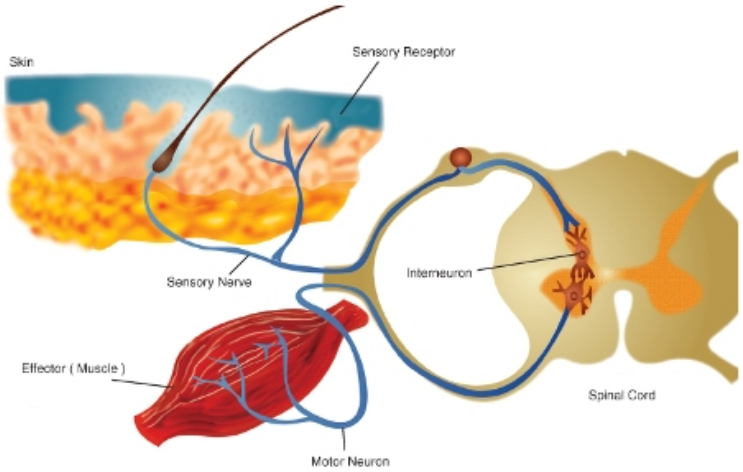


FIGURE 1.1

The components of a reflex. A sensory receptor that detects a stimulus and sends nerve signals to the spinal cord. These signals activate motor neurons that lead back to the effector (muscle).

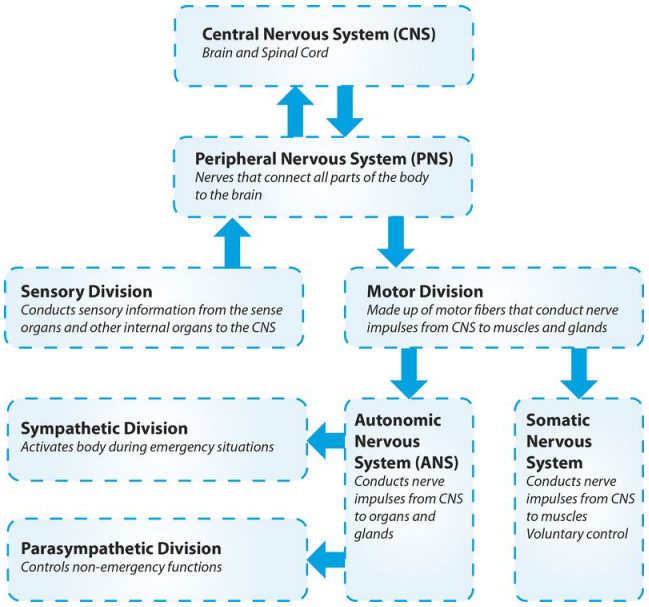
The autonomic nervous system (ANS) is the part of the peripheral nervous system that maintains homeostasis in the body. Your body carries out most of these maintenance activities without your conscious control, which is why the autonomic nervous system is also called the involuntary nervous system. The ANS has far reaching effects, such as the control of heart rate, digestion, respiration rate, salivation, and perspiration. Some autonomic nervous system functions work in line with the conscious mind, such as breathing.

The ANS is also made up of the sensory and motor neurons that send messages to and from the internal organs. These neurons form reflex arcs that pass through the medulla oblongata. This explains why even a person's cerebrum may experience trauma, yet their cardiovascular, digestive and respiratory functions will continue even if higher level functions such as awareness and consciousness, are lost. Such a low level of brain functioning is referred to as a vegetative state.

The ANS has two subdivisions: the sympathetic division and parasympathetic division. The sympathetic division generally stimulates body systems during emergency situations. It gets the body ready for "fight or flight", which would probably be required by the situation shown in **Figure 20**, while the parasympathetic division controls non-emergency functions such as digestion. The relationship between the divisions of the nervous system is illustrated in **Figure 21**.

FIGURE 1.2

A situation in which your sympathetic nervous system (and hopefully your somatic nervous system), would be firing at full speed.[1]



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Questions

1. The motor division of the peripheral nervous system is divided into what two nervous systems?

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2. List two ways in which the somatic nervous system is associated with the voluntary control of the body.

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3. If a person steps on a sharp object, what reflexive action occurs as the pain sensation is arriving in the brain?

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4. Give an example of a bodily function that is controlled by both the somatic and autonomic nervous systems.

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5. Look at Figure 20. Explain how both the sympathetic and somatic nervous systems would be working here.

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Lesson 20.1: Multiple Choice

Name_____ Class_____ Date_____

Circle the letter of the correct choice.

a. In myelinated neurons, ion flows occur only at the
   a. myelin sheaths
   b. Nodes of Ranvier
   c. synapses
   d. Schwann cells

b. One of the three functional groups of nerves is the
   a. sensory neurons
   b. interneurons
   c. motor neurons
   d. all of the above

c. The most common excitatory transmitter in the body is
   a. glutamate
   b. GABA
   c. glycine
   d. acetylcholine

d. The receptors for epinephrine are called
   a. histamine receptors
   b. adrenoceptors
   c. glutamate receptors
   d. 5-HT receptors

e. One of the autonomic functions is
   a. heartbeat
   b. breathing
   c. temperature regulation
   d. all of the above

f. The central region of the spinal cord is known as
   a. white matter
   b. grey matter
   c. the brainstem
   d. none of the above

g. Photoreceptors are found in the
   a. iris
   b. cornea
   c. retina
   d. lens

Lesson 20.1: Vocabulary

Name_____ Class_____ Date_____

Match the vocabulary term with the correct definition.

Term

____ 1. dendrites

____ 2. axon

____ 3. action potential

____ 4. neuromuscular junction

____ 5. glial cell

____ 6. midbrain

____ 7. nociceptor

____ 8. synapse

____ 9. cerebellum

____ 10. psychoactive drug

Definition

a. a substance that affects the central nervous system by altering cognitive function

b. cell that provides a support system for the neurons

c. a long, membrane-bound extension of the cell body that passes the nerve impulse onto the next cell

d. extend from the cell body and receive a nerve impulse from another cell

e. the part of the brain involved in coordination and control of body movement

f. part of the brain involved with unconscious functions such as breathing, heartbeat, and temperature regulation

g. an electrical charge that travels along the membrane of a neuron

h. a type of pain receptor which responds to potentially damaging stimuli

i. a specialized junction at which neurons communicate with each other

j. a synapse between a neuron and a muscle cell

1.2 Endocrine System

Lesson 20.2: True or False

Name_____ Class_____ Date_____

Write true if the statement is true or false if the statement is false.

_____ 1. The nervous and endocrine systems work closely together to help us respond to our environment.

_____ 2. Hormones are chemical messenger molecules that are made by cells in one part of the body and cause changes in cells in another part of the body.

_____ 3. Exocrine glands secrete hormones.

_____ 4. Steroid hormones diffuse through cell membranes.

_____ 5. The pituitary gland secretes hormones that stimulate exocrine glands.

_____ 6. Insulin and glucagon are both involved in controlling blood glucose levels.

_____ 7. Cortisol decreases blood pressure and blood sugar levels.

_____ 8. The gonads only produce endocrine actions, not exocrine ones.

_____ 9. Epinephrine is a "fight or flight" hormone.

_____ 10. Positive feedback mechanisms are not as common as negative feedback mechanisms.

Lesson 2: Critical Reading

Name_____ Class_____ Date_____

Read this passage from the lesson and answer the questions that follow.

Negative Feedback

Negative feedback is a reaction in which the system responds in such a way as to reverse the direction of change. Since this tends to keep things constant, it allows for a process to return from a state of imbalance back to a homeostatic equilibrium.

A common, non-biological example of negative feedback happens in a home heating system. When you are home, you set your thermostat to 21°*C* (about 70°*F*), which is the **set point**. The thermometer in the thermostat monitors the room temperature and will sense when the temperature drops below the 21°*C* set point (the stimulus). The thermometer will then send a message to the thermostat (control center), which in turn sends a message to the furnace to switch on and heat up the room. When the room temperature returns to the set temperature, the thermostat shuts the furnace off. In this home-heating example, the increase in air temperature is the negative feedback that results in the furnace being shut off. In this way a set room temperature of 21°*C* (within a degree or two) is maintained.

An example of negative feedback in the body is the control of blood-glucose concentrations by insulin. A higher amount of glucose in the blood (the stimulus), signals the beta cells of the pancreas to release insulin into the blood. Hormone concentration alone cannot trigger a negative feedback mechanism, negative feedback is instead triggered

by an overproduction of the effect of the hormone, such as the lowering of blood glucose concentration (the effect), which causes a decrease in the secretion of insulin by the pancreas.

Negative Feedback: Regulation of Thyroid Hormones

The thyroid hormones thyroxine (T4) and triiodothyronine (T3) regulate the rate of metabolism. The production of T4> and T3 is regulated by thyroid-stimulating hormone (TSH), which is released by the anterior pituitary. The thyroid and the TSH-producing cells of the anterior pituitary form a negative feedback loop, as shown in **Figure 14**.

Thyroid-stimulating hormone production is decreased when the T4 levels are high, and when TSH levels are high, T4 production is decreased. The production and secretion of TSH is in turn controlled by thyrotropin-releasing hormone (TRH), which is produced by the hypothalamus. The rate of TRH secretion is increased in situations such as cold temperature because increasing the metabolic rate would generate more heat. Increased levels of T4 and T3 in the blood cause a reduction in TRH secretion. Among other things, TSH secretion is reduced by high levels of thyroid hormones, as well as the antagonistic hormone somatostatin. These feedback loops keep the concentration of thyroid hormones within a narrow range of concentrations.

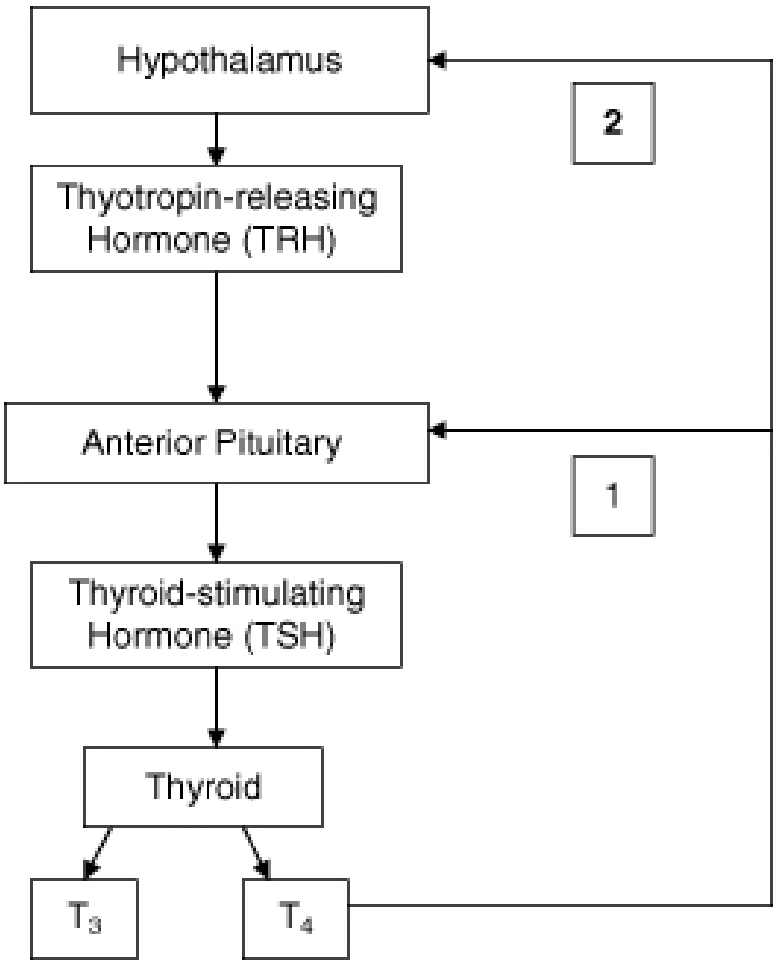

FIGURE 1.3

Two negative feedback loops exist in the control of thyroid hormone secretion. (1) shows the loop between the TSH-producing cells of the anterior pituitary and the thyroid. Increased levels of T4 and T3 in the blood cause a reduction in TSH secretion. (2) shows that increased levels of T4 and T3 in the blood cause a reduction in TRH secretion.

Questions

1. What is negative feedback?

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2. In the home-heating example, what is the negative feedback?

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3. What hormone effect triggers the negative feedback in the blood-glucose example?

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Look at the figure above to answer questions 4 and 5:

4. In negative feedback loop 1, what effect does the increased levels of T3 and T4 in the blood have?

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5. What is the effect of the two negative feedback loops on the concentration of thyroid hormones?

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Lesson 20.2: Multiple Choice

Name_____ Class_____ Date_____

Circle the letter of the correct choice.

a. The endocrine system releases hormones into the
    a. nervous system
    b. muscles
    c. blood
    d. none of the above

b. Amino acid-based hormones usually bind to receptors that are found on the
    a. cell nucleus
    b. cell membrane
    c. mitochondria
    d. none of the above

c. Glucagon is released by the
    a. thymus
    b. pituitary gland
    c. ovary
    d. pancreas

d. The posterior pituitary releases which of the following?
    a. oxytocin

b. LH
c. FSH
d. growth hormone

e. Melatonin is involved in

a. digestion
b. water loss
c. sleep cycles
d. none of the above

f. An example of a positive feedback mechanism is

a. control of blood glucose concentrations
b. control of milk production
c. control of thyroid hormone secretion
d. none of the above

g. Which of the following regulates metabolism?

a. pancreas
b. pituitary gland
c. adrenal glands
d. kidneys

Lesson 20.2: Vocabulary

Name_____ Class_____ Date_____

Match the vocabulary term with the correct definition.

Term

____ 1. cortisol

____ 2. glucagon

____ 3. target cell

____ 4. islets of Langerhans

____ 5. hypersecretion

____ 6. hyposecretion

____ 7. prostaglandins

____ 8. gonads

____ 9. exocrine glands

____ 10. endocrine glands

Definition

a. an important hormone involved in carbohydrate metabolism

b. the production of too much of a hormone

c. a steroid hormone produced by the adrenal glands

d. the gamete producing organs

e. areas of the pancreas with groupings of endocrine cells

f. hormone-like substance made from essential fatty acids, produced by most cells in the body

g. the cell on which a hormone has an effect

h. the production of no hormone or too little of a hormone

i. a system of organs that releases chemical message molecules into the blood

j. organs that secrete their products into ducts