STUDY GUIDE

Biological Bases of Behavior: 3A: Neural Processing and the Endocrine System

UNIT OVERVIEW

Unit 3A is concerned with neural processing and the endocrine system. Under the direction of the brain, the nervous and endocrine systems coordinate a variety of voluntary and involuntary behaviors and serve as the body's mechanisms for communication with the external environment.

UNIT REVIEW

First, skim each section, noting headings and boldface items. After you have read the section, review each objective by answering the fill-in and essay-type questions that follow it. As you proceed, evaluate your performance by consulting the answers. Do not continue with the next section until you understand each answer. If you need to, review or reread the section in the textbook before continuing.

Introduction (pp. 51-52)

Objective 1: Explain why psychologists are concerned with human biology, and describe the ill-fated phrenology theory.

1. In the most basic sense, every idea, mood, memory, and behavior that an individual has ever experienced is a _____ phenomenon.
2. The theory that linked our mental abilities to bumps on the skull was _____ . Researchers who study the links between biology and behavior are called _____ . We are made up of smaller and smaller _____ ; we are also part of larger _____ . Thus, we are _____ systems.

Neural Communication (pp. 52-58)

Objective 2: Describe the parts of a neuron, and explain how its impulses are generated.

1. Our body's neural system is built from billions of nerve cells, or _____. Information arriving in the brain and spinal cord from the body travels in _____ neurons. Instructions from the brain and spinal cord are sent to the body's tissues via _____ neurons. The neurons that enable internal communication within the brain and spinal cord are called _____ .
2. The extensions of a neuron that receive messages from other neurons are the _____ .
3. The extension of a neuron that transmits information to other neurons is the _____ some of these extensions are insulated by a fatty tissue called the _____ _____ , which helps speed the neuron's impulses.
4. Identify the major parts of the neuron diagrammed below.

a. _____

b. _____

c. _____

d. _____

5. The neural impulse, or _____ _____ , is a brief electrical charge that travels down a(n) _____.
6. The fluid interior of a resting axon carries mostly (positively /negatively) charged ions, while the fluid outside has mostly (positively/negatively) charged ions. This polarization, called the _____ , occurs because the cell membrane is _____ _____ .
7. An action potential occurs when the first part of the axon opens its gates and (positively /negatively) charged ions rush in, causing that part of the neuron to become _____ . During the resting pause following an action potential the neuron pumps (positively /negatively) charged ions back outside the cell.
8. To trigger a neural impulse, _____ signals minus _____ signals must exceed a certain intensity, called the _____ . Increasing a stimulus above this level (will/will not) increase the neural impulse's intensity. This phenomenon is called an _____ response.
9. The strength of a stimulus (does/does not) affect the intensity of a neural impulse. A strong stimulus (can/cannot) trigger more neurons to fire.

Objective 3: Describe how nerve cells communicate.

10. The junction between two neurons is called a _____ , and the gap is called the _____ _____ . This discovery was made by _____ .

11. The chemical messengers that convey information across the gaps between neurons are called _____ . These chemicals bind to receptor sites and unlock tiny channels, allowing electrically charged _____ to enter the neuron.
12. Neurotransmitters influence neurons either by _____ or _____ their readiness to fire. Excess neurotransmitters are reabsorbed by the sending neuron in a process called _____ .

Outline the sequence of reactions that occur when a neural impulse is generated and transmitted from one neuron to another.

Objective 4: Describe how neurotransmitters influence behavior, and explain how drugs and other chemicals affect neurotransmission.

13. A neurotransmitter that is important in muscle contraction is _____; it is also ,important in learning and _____ .
14. Naturally occurring opiate-like neurotransmitters that are present in the brain are called _____ . When the brain is flooded with drugs such as _____ or _____ , it may stop producing these neurotransmitters.
15. Drugs that produce their effects by mimicking neurotransmitters are called _____ . Drugs that block the effects of neurotransmitters by occupying their _____ _____ are called _____ . While certain _____ drugs create a temporary "high" by mimicking the endorphins, the poison _____ produces paralysis by blocking the activity of the neurotransmitter ACh.

The Nervous System (pp. 59-62)

Objective 5: Identify the two major divisions of the nervous system, and describe their basic functions.

1. Taken altogether, the neurons of the body form the _____ _____ .
2. The brain and spinal cord form the _____ nervous system. The neurons that link the brain and spinal cord to the body's sense receptors, muscles, and glands form the _____ nervous system.
3. Sensory and motor axons are bundled into electrical cables called _____ .
4. The division of the peripheral nervous system that enables voluntary control of the skeletal muscles is the _____ nervous system.
5. Involuntary, self-regulating responses-those of the glands and muscles of internal organs-are controlled by the _____ nervous system.
6. The body is made ready for action by the _____ division of the autonomic nervous system.
7. The _____ division of the autonomic nervous system produces relaxation.

Describe and explain the sequence of physical reactions that occur in the body as an emergency is confronted and then passes.

8. Neurons cluster into work groups called _____ _____.
9. Automatic responses to stimuli, called _ _____, illustrate the work of the _____ . Simple pathways such as these are involved in the _____ - _____ response and in the _____ reflex.

Beginning with the sensory receptors in the skin, trace the course of a spinal reflex as a person reflexively jerks his or her hand away from an unexpectedly hot burner on a stove.

The Endocrine System (pp. 62-63)

Objective 6: Describe the nature and functions of the endocrine system and its interaction with the nervous system.

1. The body's chemical communication network is called the _____ . This system transmits information through chemical messengers called _____ at a much (faster / slower) rate than the nervous system, and its effects last (a longer time/a shorter time).
2. In a moment of danger, the autonomic nervous system orders the glands to release _____ and _____ .
3. The most influential gland is the _____ , which, under the control of an adjacent brain area called the _____ , helps regulate _____ and the release of hormones by other endocrine glands.

Write a paragraph describing the feedback system that links the nervous and endocrine systems.

PROGRESS TEST 1

Multiple-Choice Questions

Circle your answers to the following questions and check them with the answers. If your answer is incorrect, read the explanation for why it is incorrect and then consult the appropriate pages of the text (in parentheses following the correct answer).

1. The axons of certain neurons are covered by a layer of fatty tissue that helps speed neural transmission. This tissue is
   a. dopamine.
   b. the myelin sheath.
   c. acetylcholine.
   d. an endorphin.
2. Heartbeat, digestion, and other self-regulating bodily functions are governed by the
   a. voluntary nervous system.
   b. autonomic nervous system.
   c. sympathetic division of the autonomic nervous system.
   d. somatic nervous system.
3. A strong stimulus can increase the
   a. speed of the impulse the neuron fires.
   b. intensity of the impulse the neuron fires.
   c. number of times the neuron fires.
   d. threshold that must be reached before the neuron fires.
4. The pain of heroin withdrawal may be attributable to the fact that
   a. under the influence of heroin the brain ceases production of endorphins.
   b. under the influence of heroin the brain ceases production of all neurotransmitters.
   c. during heroin withdrawal the brain's production of all neurotransmitters is greatly increased.
   d. heroin destroys endorphin receptors in the brain.
5. The effect of a drug that is an antagonist is to
   a. cause the brain to stop producing certain neurotransmitters.
   b. mimic a particular neurotransmitter.
   c. block a particular neurotransmitter.
   d. disrupt a neuron's all-or-none firing pattern.
6. Which is the correct sequence in the transmission of a simple reflex?
   a. sensory neuron, interneuron, sensory neuron
   b. interneuron, motor neuron, sensory neuron
   c. sensory neuron, interneuron; motor neuron
   d. interneuron, sensory neuron, motor neuron
7. In a resting state, the axon is
   a. depolarized, with mostly negatively charged ions outside and positively charged ions inside.
   b. depolarized, with mostly positively charged ions outside and negatively charged ions inside.
   c. polarized, with mostly negatively charged ions outside and positively charged ions inside.
   d. polarized, with mostly positively charged ions outside and negatively charged ions inside.
8. Dr. Hernandez is studying neurotransmitter abnormalities in depressed patients. She would most likely describe herself as a
   a. personality psychologist.
   b. phrenologist.
   c. psychoanalyst.
   d. biological psychologist.
9. Voluntary movements, such as writing with a pencil, are directed by the
   a. sympathetic nervous system.
   b. somatic nervous system.
   c. parasympathetic nervous system.
   d. autonomic nervous system.

10. A neuron will generate action potentials when it
    a. remains below its threshold.
    b. receives an excitatory input.
    c. receives more excitatory than inhibitory inputs
    d. is stimulated by a neurotransmitter.

11. Which is the correct sequence in the transmission of a neural impulse?
    a. axon, dendrite, cell body, synapse
    b. dendrite, axon, cell body, synapse
    c. synapse, axon, dendrite, cell body
    d. dendrite, cell body, axon, synapse

Matching Items

Match each structure or technique with its corresponding function or description.

Structures

_____ 1. sensory neuron

_____ 2. axon

_____ 3. threshold

_____ 4. motor neuron

_____ 5. dendrite

_____ 6. synapse

_____ 7. reuptake

_____ 8. action potential

_____ 9. myelin sheath

_____ 10. interneuron

_____ 11. neuron

Functions or Descriptions

a. absorption of excess neurotransmitters

b. carries incoming information to the brain and spinal cord

c. insulates the axons of certain neurons

d. neuron extension through which messages pass to other neurons

e. nerve cell

f. level of stimulation required to trigger an action potential

g. carries outgoing information from the brain and spinal cord

h. neuron extension that receives incoming information

i. junction between two neurons

j. neural impulse

k. neurons within the brain and spinal cord

PROGRESS TEST 2

Progress Test 2 should be completed during a final unit review. Answer the following questions after you thoroughly understand the correct answers for the section reviews and Progress Test 1.

Multiple-Choice Questions

1. When Sandy scalded her toe in a tub of hot water, the pain message was carried to her spinal cord by the _____ nervous system.
    a. somatic
    b. sympathetic
    c. parasympathetic
    d. central

2. Which of the following are governed by the simplest neural pathways?
    a. emotions
    b. physiological drives, such as hunger
    c. reflexes
    d. movements, such as walking

3. Melissa has just completed running a marathon. She is so elated that she feels little fatigue or discomfort. Her lack of pain is probably the result of the release of
    a. ACh.
    b. endorphins.
    c. dopamine.
    d. norepinephrine.

4. The myelin sheath that is on some neurons
    a. increases the speed of neural transmission.
    b. slows neural transmission.
    c. regulates the release of neurotransmitters.
    d. prevents positive ions from passing through the membrane.

5. I am a relatively fast-acting chemical messenger that affects mood,. hunger,. sleep,. and arousal. What am I?
    a. acetylcholine
    b. dopamine
    c. norepinephrine
    d. serotonin

6. The neurotransmitter acetylcholine (ACh) is most likely to be found
    a. at the junction between sensory neurons and muscle fibers.
    b. at the junction between motor neurons and muscle fibers.
    c. at junctions between interneurons.
    d. in all of these locations.

7. The gland that regulates body growth is the
   a. adrenal.
   b. thyroid.
   c. hypothalamus.
   d. pituitary.
8. Epinephrine and norepinephrine are ___ that are released by the __ gland.
   a. neurotransmitters; pituitary
   b. hormones; pituitary
   c. neurotransmitters; thyroid
   d. hormones; adrenal
9. The effect of a drug that is an agonist is to
   a. cause the brain to stop producing certain neurotransmitters.
   b. mimic a particular neurotransmitter.
   c. block a particular neurotransmitter.
   d. disrupt a neuron's all-or-none firing pattern.
10. Chemical messengers produced by endocrine glands are called
   a. agonists.
   b. neurotransmitters.
   c. hormones.
   d. enzymes.
11. In the brain, learning occurs as experience strengthens certain connections in cell work groups called
   a. action potentials.
   b. neural networks.
   c. endocrine systems.
   d. dendrites.

Matching Items
Match each structure or term with its corresponding function or description.

Structures or Terms	Functions or Descriptions
___1. biological psychology	a. natural, opiate-like neurotransmitters
___ 2. endorphins	b. body's system of glands
___ 3. central nervous system	c. concerned with the links between biology and behavior
___ 4. peripheral nervous system	d. the brain and spinal cord
___ 5. autonomic nervous system	e. connects the brain and spinal cord to the rest of the body
___ 6. sympathetic nervous system	f. bundled axons
___ 7. nerve	g. arouses the body
___ 8. somatic nervous system	h. calms the body
___ 9. endocrine system	i. controls the glands and muscles of internal organs
___ 10. parasympathetic nervous system	j. enables voluntary control of skeletal muscles
___ 11. neurotransmitters	k. chemical messengers released into synapses

PSYCHOLOGY APPLIED

Answer these questions the day before a test as a final check on your understanding of the unit's terms and concepts.

Multiple-Choice Questions

1. A biological psychologist would be more likely to study
   a. how you learn to express emotions.
   b. how to help people overcome emotional disorders.
   c. life-span changes in the expression of emotion.
   d. the chemical changes that accompany emotions.
2. You are able to pull your hand quickly away from hot water before pain is felt because
   a. movement of the hand is a reflex that involves intervention of the spinal cord only.
   b. movement of the hand does not require intervention by the central nervous system.
   c. the brain reacts quickly to prevent severe injury.
   d. the autonomic division of the peripheral nervous system intervenes to speed contraction of the muscles of the hand.
3. Several shy neurons send an inhibitory message to neighboring neuron Joni. At the same time, a larger group of party-going neurons sends Joni excitatory messages. What will Joni do?
   a. fire, assuming that her threshold has been reached
   b. not fire, even if her threshold has been reached
   c. enter a resting potential.
   d. become hyperpolarized

4. Following Jayshree's near-fatal car accident, her physician noticed that the pupillary reflex of her eyes was abnormal. This MAY indicate that Jayshree's was damaged in the accident.
   a. myelin sheath
   b. autonomic nervous system
   c. pituitary gland
   d. somatic nervous system
5. I am a relatively fast-acting chemical messenger that influences movement, learning, attention, and emotion. What am I?
   a. dopamine
   b. a hormone
   c. acetylcholine
   d. glutamate
6. Since Malcolm has been taking a drug prescribed by his doctor, he no longer enjoys the little pleasures of life, such as eating and drinking. His doctor explains that this is because the drug
   a. triggers release of dopamine.
   b. inhibits release of dopamine.
   c. triggers release of ACh.
   d. inhibits release of ACh.
7. Which of the following was a major problem with phrenology?
   a. It was 1/ ahead of its time" and no one believed it could be true.
   b. The brain is not neatly organized into structures that correspond to our categories of behavior.
   c. The brains of humans and animals are much less similar than the theory implied.
   d. All of these were problems with phrenology.
8. I am a relatively slow-acting (but long-lasting) chemical messenger carried throughout the body by the bloodstream. What am I?
   a. a hormone
   b. a neurotransmitter
   c. acetylcholine
   d. dopamine
9. Your brother has been taking prescription medicine and experiencing a number of unpleasant side effects, including unusually rapid heartbeat and excessive perspiration. It is likely that the medicine is exaggerating activity in the
   a. central nervous system.
   b. sympathetic nervous system.
   c. parasympathetic nervous system.
   d. somatic nervous system.
10. A bodybuilder friend suddenly seems to have grown several inches in height. You suspect that your friend's growth spurt has occurred because he has been using drugs that affect the
   a. pituitary gland.
   b. parathyroids.
   c. adrenal glands.
   d. pancreas.

Essay Question

Discuss how the endocrine and nervous systems become involved when a student feels stress-such as that associated with an upcoming final exam. (Use the space below to list the points you want to make, and organize them. Then write the essay on a separate sheet of paper.)

KEY TERMS

Using your own words, on a piece of paper write a brief definition or explanation of each of the following terms.

1. biological psychology
2. neuron
3. sensory neurons
4. motor neurons
5. interneurons
6. dendrite
7. axon
8. myelin sheath
9. action potential
10. threshold

11. synapse
12. neurotransmitters
13. reuptake
14. endorphins
15. nervous system
16. central nervous system (CNS)
17. peripheral nervous system (PNS)
18. nerves
19. somatic nervous system
20. autonomic nervous system
21. sympathetic nervous system
22. parasympathetic nervous system
23. reflex
24. endocrine system
25. hormones
26. adrenal glands
27. pituitary gland