Neurons and Nerve Impulses

Read the passage below, which covers topics from your textbook. Answer the questions that follow.

When a dendrite or the cell body of a neuron is stimulated, a sudden change occurs in the permeability of its cell membrane. At the point where it is stimulated, the cell membrane becomes permeable to Na⁺ ions. The rush of Na⁺ ions into the cell opens voltage-gated channels in the membrane that allow even more Na⁺ ions to diffuse rapidly from the outside of the membrane to the inside of the neuron. As a result of the inward diffusion of Na⁺ ions, the interior of the neuron’s cell body becomes more positively charged than the outer surface. The interior, once negatively charged, is now positively charged. The exterior, once positively charged, is now negatively charged with respect to the interior. This reversal of polarity across the membrane begins an action potential. The action potential starts at the point where the cell body of the neuron joins the axon.

Voltage-gated channels exist along the entire length of the axon. As the first small segment of the axon becomes positively charged, the change in voltage opens channels in the next segment of axon membrane. As before, Na⁺ ions enter, driving the voltage in a positive direction and opening channels in the next segment of the axon.

Shortly after they open, the voltage-gated channels for the Na⁺ ions close. Then voltage-gated channels for K⁺ ions open. The result is an abrupt outward flow of K⁺ ions. The outer surface again becomes positively charged, and the inner surface regains its negative charge. This signals the end of the action potential.

Read the question and write your answer in the space provided.

SKILL: Vocabulary Development

1. The term permeable comes from a Latin word that means “to penetrate.” How is the term permeable related to its word of origin?
Write your answers in the spaces provided.

SKILL: Sequencing Information

2. Order the statements to show the changes that occur during an action potential. Write “1” on the line in front of the statement that describes what happens first. Write “2” on the line in front of the statement that describes what happens next, and so on.

_____ a. Na+ ions diffuse into the neuron.
_____ b. The action potential ends.
_____ c. The cell membrane becomes permeable to Na+ ions.
_____ d. The gated channels for Na+ ions close.
_____ e. The interior of the neuron’s cell body becomes more positively charged than the outer surface.
_____ f. Voltage-gated channels for K+ ions open.
_____ g. Voltage-gated channels open.
_____ h. The inner surface of the neuron’s cell body regains its negative charge.
_____ i. A positive charge passes down the membrane of the axon.
_____ j. A dendrite or cell body of a neuron is stimulated.
_____ k. Additional Na+ channels in the axon membrane open until the whole neuron is positively charged.
_____ l. A stream of K+ ions flows outward.

Circle the letter of the phrase that best completes the statement.

3. An action potential begins at a point where the cell body of a neuron
   a. joins the axon.
   b. is selectively permeable.
   c. has more Na+ ions than K+ ions.
   d. Both (a) and (b)
Drugs and the Nervous System

Read the passage below, which covers topics from your textbook. Answer the questions that follow.

Alcohol is a *depressant*, a drug that decreases the activity of the central nervous system. Alcohol increases circulation to the skin, decreases blood flow to internal organs, and lowers body temperature. Alcohol causes the kidneys to excrete more water, which can cause dehydration. As drinking continues, judgment and coordination become impaired, speech slurs, and reaction time lengthens. Respiration rate slows after an initial increase. High doses of alcohol can cause death by respiratory failure. The severity of these effects depends largely on **blood alcohol concentration** (BAC), a measurement of the amount of alcohol in the blood.

Read each question and write your answer in the space provided.

**SKILL: Recognizing Text Structure**

1. The passage includes a main idea and supporting details. What is the main idea of the passage?

   ________________________________________________________________
   ________________________________________________________________

2. What supporting details are provided in the passage?

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

**Circle the letter of the word or phrase that best completes the statement.**

3. With increasing BAC levels, the effect of alcohol on the central nervous system
   a. decreases.
   b. increases.
   c. remains about the same.
   d. fluctuates between increasing and decreasing.
Hormones
Read the passage below, which covers topics from your textbook. Answer the questions that follow.

Hormones are made and secreted by endocrine glands. **Endocrine glands** are ductless organs that secrete hormones either into the bloodstream or the fluid around cells. Specialized cells in the brain, stomach, small intestine, liver, heart, and other organs also make and release hormones.

**Exocrine glands** secrete substances through ducts (tubelike structures). These substances can include water, enzymes, and mucus. The ducts transport the substances to specific locations inside and outside the body. Sweat glands, mucous glands, and salivary glands are exocrine glands.

Read the question and write your answer in the space provided.

**SKILL:** Recognizing Text Structure

1. The author of this passage used a similarities and differences text structure. What items are compared in the passage?

Read the question and write your answer in the space provided.

**SKILL:** Vocabulary Development

2. What is the meaning of *ductless* in the passage?

Read the question and write your answer in the space provided.

**SKILL:** Vocabulary Development

3. All of the following are classified as exocrine glands EXCEPT
   a. salivary glands.
   b. mucous glands.
   c. pituitary glands.
   d. sweat glands.