Advisement Teacher & Room #_____ *Biology Tutorial #26*

Student Name_____Tutor:_____

Biology Teacher's Name_____Period_____

CA State Standard 9b: Students know how the nervous system mediates communication between different parts of the body and the body's interactions with the environment.

Nervous and Endocrine System Communication

Living things must be able to respond to their environment to keep the conditions within their bodies stable, a process called homeostasis. The nervous system is a highly connected network of specialized cells that helps to maintain homeostasis.

Gathering and Responding to Stimuli

The nervous system has two parts that allow it to gather, interpret, and respond to stimuli. A stimulus *(pl. stimuli)* is anything that causes a response. The peripheral nervous system (PNS) is the body system that gathers stimuli and delivers signals to other organs of the body. Your five senses—vision, hearing, taste, smell, and touch—are part of the PNS. Each of these senses has sensory receptors that gather stimuli and transmit impulses to the central nervous system. The central nervous system (CNS) is the part of the nervous system that includes the brain and spinal cord.

HOW DOESTHE NERVOUS SYSTEM SENSE ENVIRONMENTAL CONDITIONS?

The body's five senses—vision, hearing, touch, taste, and smell—gather stimuli from the environment and transmit information to the nervous system. Light entering the eyes stimulates receptors located in the retina at the back of the eye. Sound waves cause the eardrum to vibrate, and these vibrations are transmitted to receptors in the inner ear. Receptors in the skin respond to pressure, pain, and touch. Chemical signals stimulate receptors in the tongue and nose. Signals received by the sense organs are transmitted as impulses along nerve pathways to the brain. The brain then interprets and generates responses to these signals.

WHAT IS A REFLEX ARC?

A reflex arc is an involuntary action, such as blinking, sneezing, coughing, or pulling your hand away from a sharp or hot object. This behavior is beneficial because it allows the body to respond rapidly to protect itself from harm. In a reflex arc, a nerve impulse travels from a sensory neuron to the spinal cord and then to a motor neuron, *without traveling to the brain*. Such a response does not require conscious thought and may involve any of the senses.

HOW DO THE NERVOUS AND ENDOCRINE SYSTEMS WORK TOGETHER?

The nervous system works with the endocrine system to regulate conditions within the body. Communication between the nervous and endocrine systems is controlled by the hypothalamus, located in the brain. The hypothalamus is thus considered part of both the nervous and the endocrine systems. The hypothalamus receives and sorts information from sense organs. It may take incoming impulses and transfer them to another part of the brain, or it may stimulate a gland of the endocrine system. It stimulates other glands by producing hormones. Many of these hormones are sent to the pituitary gland. The pituitary, which is located near the hypothalamus, produces several hormones that stimulate activity in other cells throughout the body.

WHAT ARE THE JOBS OF HORMONES?

Hormones are chemicals that help regulate various functions, such as growth, reproduction, and metabolism. Hormones produced by the pituitary control body functions either by directly affecting a target tissue or by stimulating other glands to release hormones. An example of a pituitary hormone is growth hormone, which regulates how tall a person grows. Other pituitary hormones include follicle-stimulating hormone (FSH) and luteinizing hormone (LH), which control the release of hormones by the testes and ovaries. Thyroid-stimulating hormone (TSH) controls the release of hormones by the thyroid, which in turn regulates metabolism.

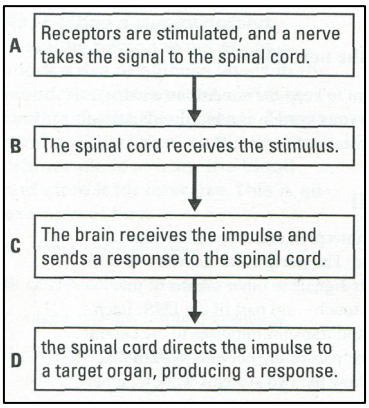
ANSWER THE QUESTIONS THAT FOLLOW:

1. What is a reflex arc, and how is it beneficial? Give two examples of reflex arc responses.

2. How do the nervous and endocrine systems work together?

3. What is the pituitary gland? Give an example of a pituitary hormone, and explain its function.

4. The diagram right shows the pathway of an impulse, from sensors to response. Which step in the diagram would *not occur* if this process described a reflex arc?
   A) A B) B C) C D) D



5. What system carries sensory information from the tip of the finger, but also carries impulses to muscles in the foot?
   A) endocrine system
   B) peripheral nervous system
   C) central nervous system
   D) reflex arc system

6. A girl walks on a sandy beach. She steps on a sharp piece of shell and quickly jerks her foot up. Her action is an example of a
   A) conscious decision to move her foot.
   B) reflex arc.
   C) response to hormonal stimulation.
   D) decision by the hypothalamus.

7. How are the roles of the nervous system and the endocrine system similar?
   A) Both use signals called hormones.
   B) Both send messages through the spinal cord.
   C) Both are controlled by reflex arcs.
   D) Both allow body systems to produce responses.

8. Which of the following is true about the ***main*** role of the nervous system in the body?
   A) It interprets stimuli so that the body can interact with its environment.
   B) It gathers stimuli and prevents the body from maintaining homeostasis.
   C) It relaxes the endocrine system so that hormones don't overreact.
   D) It organizes the nerves in the body so that they do not overlap.

9. In the table, identify the five senses and the kinds of stimuli to which they respond. Then explain how one of the senses helps you perceive environmental conditions.

Sense	Stimulus