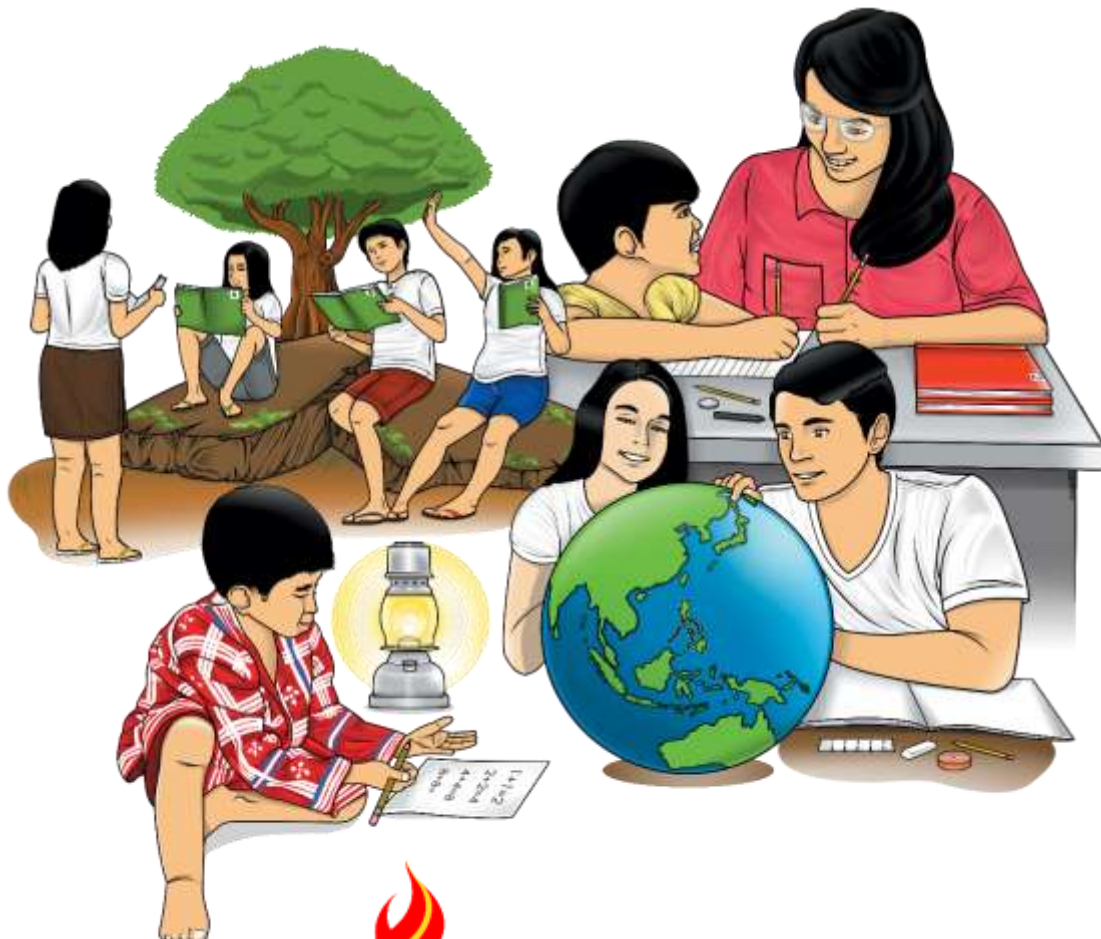


Quarter 3 – Module 3: Nervous System: The Control System of the Body



Science – Grade 10
Alternative Delivery Mode
Quarter 3 – Module 3: Nervous System: The Control System of the Body
First Edition, 2020

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Science

Quarter 3 – Module 3: Nervous System: The Control System of the Body

Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.



What I Need to Know

Imagine a mail messenger giving the mail message to the specific receiver. Prior to the delivery, there are processes being done so that the message will be received successfully by the receiver. In the human body, the nervous system is responsible in sending messages to the different parts of the body assuring that they work efficiently.

This module will provide you with information and simple activities that will help you understand how the nervous system works and coordinates with other body systems to maintain homeostasis.

At the end of this module, you will be able to:

1. Identify the major divisions and parts of the nervous system; and
2. Describe how the nervous system coordinates and regulates these feedback mechanisms to maintain homeostasis **(S10LT – IIIc-36);**

Going through this module can be a meaningful learning experience. All you need to do is make use of your time and resources efficiently. To do this, here are some tips for you:

1. Take the pretest before reading the rest of the module.
2. Take time in reading and understanding the lesson. Follow instructions carefully. Do all activities diligently. This module is designed for independent or self-paced study. It is better to be slow but sure than to hurry and miss the concepts you are supposed to learn.
3. Use a separate sheet of paper for your answers in each activity or assessment. Don't forget to write your name. Label it properly.
4. Try to recall and connect the ideas about body systems that you had in your lower years. Use the concept discussed in the lesson to explain the results of activities or performance task. You may answer in English or a combination of your vernacular and English.
5. Be honest. When doing the activities, record only what you have really observed. Take the self-assessments after each activity, but do not turn to the Answer Key page unless you are done with the entire module.
6. Don't hesitate to ask. If you need to clarify something, approach or contact your teacher or any knowledgeable person available to help you. You may also look into other references for further information. There is a list of references at the back part of this module.
7. Take the posttest prepared at the end of the module, so you can assess how much you have learned from this module.
8. You can check your answers in the activities, self-assessments, and posttest after you finished the entire module to know how much you have gained from the lesson and the activities.



What I Know

Directions: Read carefully each item. Write only the letter of the correct answer for each question. Use a separate sheet of paper for your answers.

1. What do you call the body's system which is composed of network of nerve cells and nerve fibers that transmit nerve impulses between parts of the body?
 - A. circulatory system
 - B. endocrine system
 - C. nervous system
 - D. reproductive system
2. What is the other term for "neurons"?
 - A. epithelial cells
 - B. muscle cells
 - C. nerve cells
 - D. red blood cells
3. Which of the following is NOT a part of the Nervous System?
 - A. brain
 - B. lungs
 - C. nerves
 - D. spinal cord
4. The neuron is made up of the following parts EXCEPT _____.
 - A. axon
 - B. brain
 - C. cell body
 - D. dendrites
5. What are the major divisions of the nervous system?
 - A. central and cranial nervous system
 - B. central and peripheral nervous system
 - C. peripheral and somatic nervous system
 - D. somatic and autonomic nervous system
6. Central nervous system is composed of brain and _____.
 - A. cerebrum
 - B. cranial nerves
 - C. spinal nerves
 - D. spinal cord
7. Brain functions as organizer and distributor of information in the body. What are its main parts?
 - A. brain stem, neurons, and cerebrum
 - B. brain stem, neurons, and spinal cord
 - C. cerebrum, cerebellum, and brain stem
 - D. cerebrum, cerebellum, and spinal cord
8. The _____ of a neuron carries the impulse towards the cell body.
 - A. axon
 - B. brain
 - C. dendrites
 - D. spinal Cord
9. The peripheral nervous system is comprised of cranial nerves and _____ nerves.
 - A. sensory
 - B. spinal
 - C. spinal cord
 - D. brain

10. Which of the following is TRUE about central nervous system?
 - A. The central nervous system is comprised solely of the brain.
 - B. The central nervous system consists of cranial and spinal nerves.
 - C. The central nervous system consists of the brain and spinal cord.
 - D. The central nervous system is part of peripheral nervous system.
11. It refers to an involuntary and nearly instantaneous movement in response to a stimulus.

A. brain	C. reflex
B. neuron	D. stimuli
12. When your hand touches a hot object, what is the automatic response to such stimulus?
 - A. Call for help.
 - B. Pour out water into the hot object.
 - C. Let your hand remain touching the hot object.
 - D. Withdraw your hand.
13. What part of your body is considered as the control center of the nervous system?

A. brain	C. spinal cord
B. heart	D. stomach
14. What will happen if one part of the nervous system fails to function properly?
 - A. The body can produce more neurons.
 - B. The body cannot perform well
 - C. The body will carry out its normal activities
 - D. The muscles can be used to move freely
15. The following are concepts on nervous system, which of them is correctly paired?

A. brain: cerebrum and nerves	C. nerves: axon and dendrites
B. CNS: brain and spinal cord	D. PNS: cerebrum and spinal nerves

How did you find the pretest? What was your score? If you got 15 items correctly, you may not go on with this module. But if your score is 14 and below, you must proceed with the module.

Have fun in learning about Nervous system! God bless you!

Lesson

3

Nervous System: The Control System of the Body



What's In

Directions: Below is a word search activity regarding the words found in nervous system. Here are fifteen (15) words listed below that you need to look for and write your own understanding/meaning about it. Use separate sheet of paper for your answer.

F	S	P	I	N	A	L	C	O	R	D	S	Y	M	M
U	T	L	T	W	H	P	N	J	M	U	Z	U	Z	E
S	X	S	E	J	D	I	V	E	L	Y	R	G	C	T
Q	E	Q	N	A	U	L	N	U	U	B	F	E	D	S
M	S	I	M	O	N	F	M	V	E	R	R	Z	J	N
V	Z	K	P	I	X	I	C	R	H	E	O	M	L	I
O	M	T	C	E	T	A	E	A	B	U	N	N	H	A
L	R	W	M	S	N	C	L	E	T	S	I	T	S	R
U	E	P	T	Q	D	W	L	U	J	Y	A	H	V	B
N	S	M	F	L	P	L	G	H	T	I	R	Z	I	D
T	P	L	I	S	U	O	M	L	O	F	B	C	H	Z
A	O	G	P	M	F	N	U	E	S	P	A	N	Y	S
R	N	S	I	S	A	T	S	O	E	M	O	H	I	R
Y	S	N	E	R	V	O	U	S	S	Y	S	T	E	M
A	E	S	E	T	I	R	D	N	E	D	J	P	U	W

Figure 1: Word Search

Words:

neurons	brain	stimulus	spinal cord
nervous system	response	voluntary	cell
homeostasis	dendrites	axons	brain stem
cerebrum	cerebellum	synapse	



What's New

THE NATURAL COMPUTER OF THE BODY

by: Divine Jean Dela Cruz Manandeg

Breathing, sleeping, reading, thinking, and feeling
All these activities and processes keep you going
Have you ever wondered what system does everything?
It's the nervous system, essential and crucial to our well-being

The nervous system is a collection of neurons that transmit signal
CNS involves the brain and spinal cord, it's central
PNS is about all nerves outside the CNS, it's peripheral
The system detects changes, both internal and external

Chemical means of communication can be too slow for the body
Speedy reactions or responses for survival are necessary
The key is electrical responses, all fast and quick
Sending signals along neurons even before you think and speak

Stimulus is a change in the environment, detected by a receptor
Response is a change in the organism, right after a stimulus detector
All changes needed to be analyzed for survival
Instantaneous transmission of impulses are electrical

Removing your hand after you got pricked, why is that?
Flinging your hand away after holding a pot, is it hot?
All these examples are normal stimuli reactions
Our brain is like a computer, it controls all body functions

Question:

What is the message of the poem?



What is It

Nervous System: The control system of the body

The nervous system is a complex network of nerves and cells that carry messages to and from the brain and spinal cord to various parts of the body. It is considered as the body's storage center of information and also the body's control system. It is mainly responsible for controlling and coordinating all the organ systems by sending messages from the brain through nerve signals. It makes sure that all the parts of the body are working together efficiently.

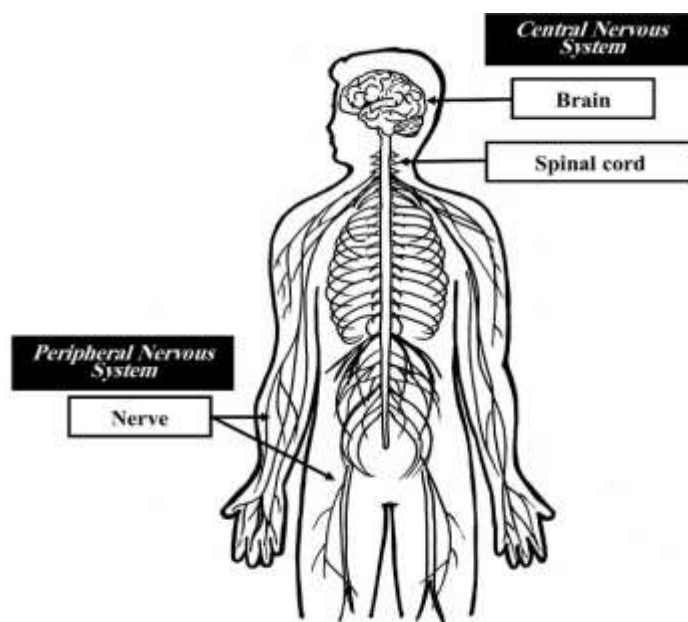


Figure 2. Nervous System

Illustrated by: Queenie Joy V. Alcantara & Louella C. Zacarias

Major Divisions and Parts of the Nervous System

I. Central Nervous System (CNS) serves as the main processing center of the nervous system. It consists of two main components, namely;

A. Brain is an organ located within the skull that functions as organizer and distributor of information for the body. It has three main parts:

1. Cerebrum is the large, upper part of the brain that controls activity and thought.
2. Cerebellum is the part under the cerebrum that controls posture, balance, and coordination.
3. Brain stem connects the brain to the spinal cord and controls automatic functions such as breathing, digestion, heart rate, and blood pressure.

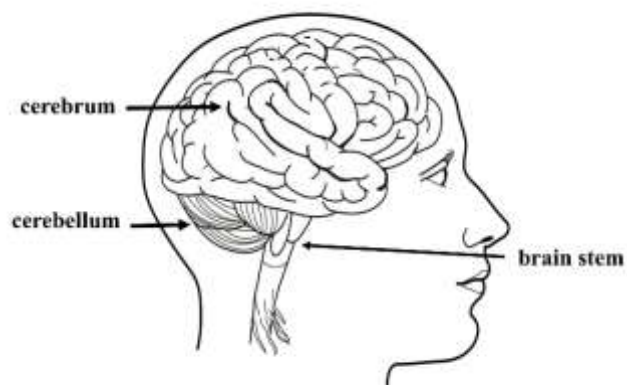


Figure 3. Parts of the brain

Illustrated by: Queenie Joy V. Alcantara & Louella C. Zacarias

- B. Spinal cord serves as a channel for signal between the brain and the majority of the body parts, and controls some simple musculoskeletal reflexes even without the processing of the brain.

II. Peripheral Nervous System (PNS) connects the central nervous system to the organs and limbs. It has two main divisions:

- A. Somatic Nervous System is associated with the voluntary control of body movements and has two main parts:

1. Spinal Nerves carry motor and sensory signals between the spinal cord and the body.
2. Cranial Nerves are nerve fibers that carry information into and out of the brain stem.

- B. Autonomic Nervous System is associated with the involuntary control of body movements and has two subdivisions:

1. Sympathetic Nervous System is activated when the body is in a dynamic role or stress. (e.g., increased heart rate and breathing, dilation of pupil, sweating)
2. Parasympathetic Nervous System maintains body functions and restores the body to normal or relaxed mode.

The Nerve Cell

The nerve cell is the basic unit of the nervous system and it is also called as **neuron**. There are billions of neurons in the body. Figure 4 shows the structure of a nerve cell. A neuron has a **cell body** containing the nucleus. In the cell body there are root-like structures called the **dendrites** and **axons**. Dendrites carry impulses toward the cell body while axons carry impulses away from the cell body. The gap between neurons is called **synapse**.

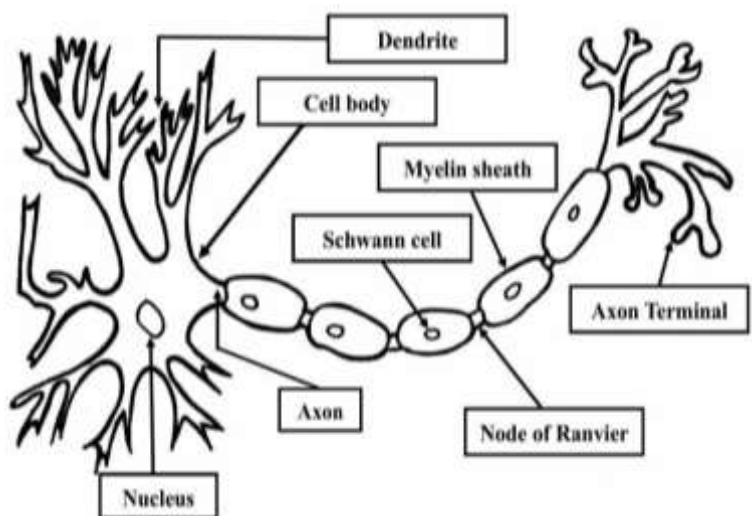


Figure 4: The parts of a neuron

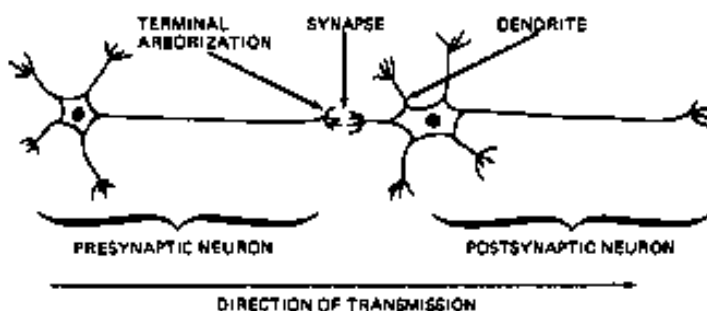


Figure 5: Synapse between 2 neurons

Illustrated by: Queenie Joy V. Alcantara & Louella C. Zacarias

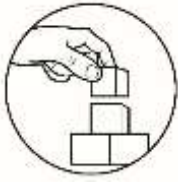
How Nervous System coordinates and regulates feedback mechanisms to maintain homeostasis?

The nervous system provides quick responses in maintaining homeostasis. Homeostasis is maintained in the body by regulating the body temperature, blood pressure, pH, and glucose concentration.

The nervous system and endocrine system are working together to maintain body's homeostasis. Homeostasis is the state reached when each part of the body functions in equilibrium with other parts. This is attained through the regulation of the bodily functions by the endocrine and nervous systems.

Feedback mechanisms are used by most of body systems to maintain homeostasis. When the brain receives messages from the body about an internal change in one of its systems, it works to restore the system to its normal state. The hypothalamus affects the pituitary gland, also known as the master gland, to secrete the right hormones. The hormones will flow with the blood and reach the specific organs to restore the normal state of the body or homeostasis. Molecules of hormones are received by receptors of cells making this event a neuroendocrine coordination. The nerves that are found all over the body allows the nervous system to monitor homeostasis of the body. While the endocrine system helps by secreting hormones into the bloodstream and send them to specific organs. The levels of hormones in the body are controlled by feedback. It is important that the amount of hormones in our body is kept at the right level. To achieve homeostasis, the nervous and endocrine systems work with each other to maintain a normal range of many processes and substances in the body such as:

- Temperature of the body
- Amount of water in the body
- Amount of metabolic wastes in the cell
- Blood calcium level



What's More

Activity: Break It Down!

Objective: Identify the parts of the nervous system.

Procedure:

Using the given graphic organizer, fill in the missing parts to complete the entire concept showing the structure of the nervous system. Use a separate sheet of paper for your answers.

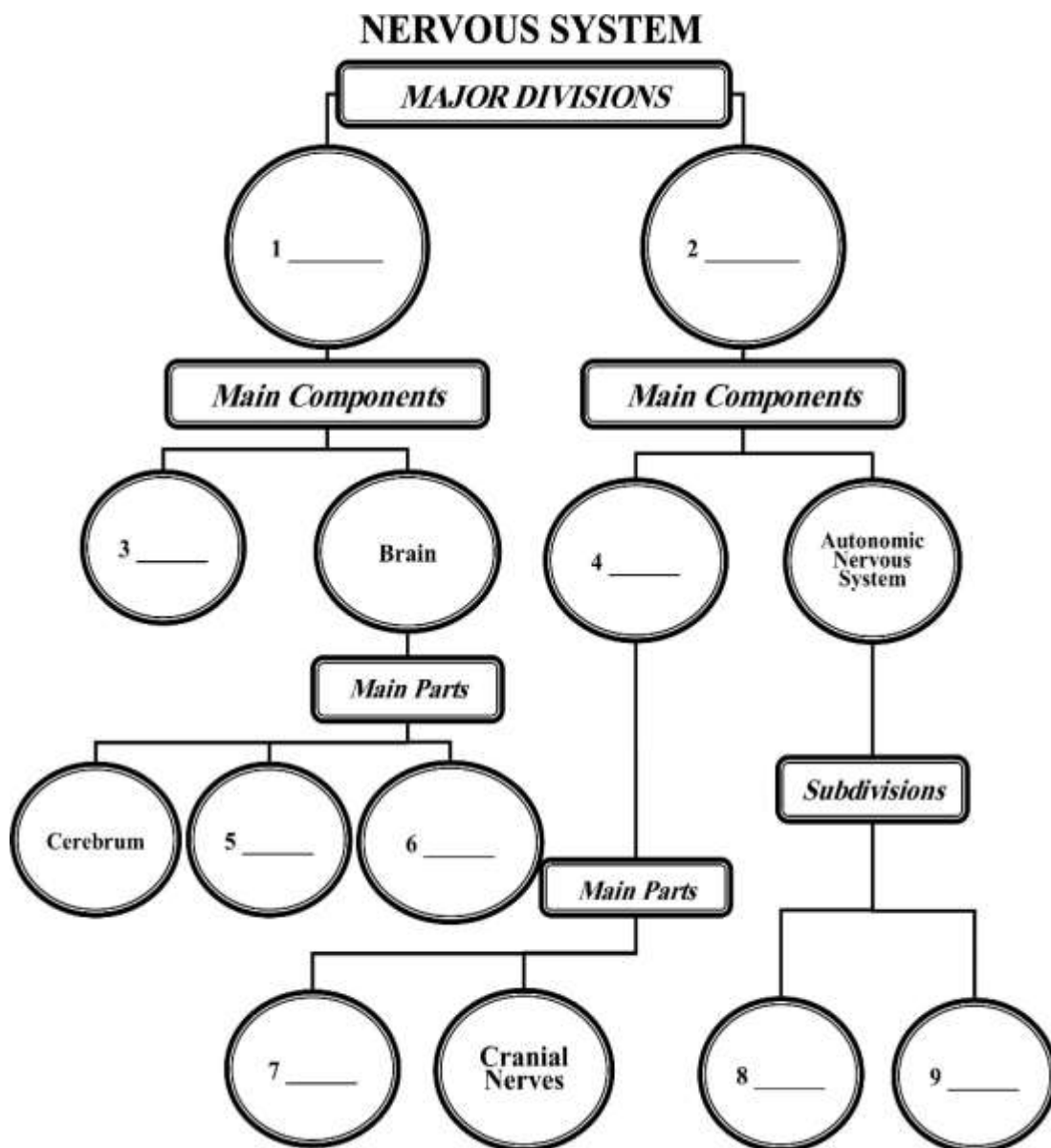


Figure 6. Major Divisions of Nervous System

(Adapted from DepEd Science 10 Learner's Module pages 230-231)

Directions: Answer the following questions in 20-30 words. Use a separate sheet of paper for this activity.

Guide Questions:

1. What is the difference between the central nervous system (CNS) and the peripheral nervous system (PNS) in terms of their functions?

2. What might happen to the human body if one part of the nervous system fails to carry out its function properly?



What I Have Learned

Great job! You are almost done with this module. Let's summarize what you have learned from the lesson and activities.

A. **Directions:** Supply the missing letters to spell the appropriate concept referred to in the following items. Use a separate sheet of paper and write only your answer.

1-2. These are the two major divisions of nervous system. (**C_N T R _ L and P E R _ P _ E _ A _**) Nervous System

3. It is associated with the voluntary control of body movements that has two main parts- spinal and cranial nerves. (**S _ M _ T _ C**) Nervous System

4. It is the basic unit of the nervous system. (**N _ U _ O _ S**)

5. It is any factor in the environment that may trigger a nerve impulse. (**S T _ M _ L _ S**)

6-7. The main components of central nervous system are (**B _ A _ N and S _ I N _ L C _ R _**)

8-10. Brain stem connects the brain to the spinal cord and controls automatic functions such as (**B _ E A _ H I _ G, D _ G _ S T _ O N, H E A R T R A T E , A N D B _ O _ D P _ E _ S U _ E**)

- B. **Directions:** Complete the paragraph below by writing the correct word. Choose your answer from the box provided. Use a separate sheet of paper for your answer.

____ (11) ____ have the special ability to carry signals or ____ (12) ____ . A nerve impulse is an electrochemical signal moving along an active neuron. A ____ (13) ____ is any factor in the environment that influences behavior. A ____ (14) ____ is a reaction to a condition or stimulus. To survive, an ____ (15) ____ must be able to respond to a stimulus.

Options:

Organism	Impulses	Environment
Neurons	Stimulus	Response

- C. **Directions:** Complete the paragraph below by writing the correct word. Choose your answer from the box provided. Use a separate sheet of paper for your answer.

The ____ (16) ____ system is the major control system to maintain ____ (17) ____ . It provides monitoring, response, and ____ (18) ____ of all systems in the human body and other organisms. It functions from the tiny level of individual cells to affecting the whole body.

Constantly monitoring conditions and watching for changes are done by the ____ (19) ____ inside and outside of the body. When a body system leaves a set point and falls outside its ____ (20) ____ range, signals are sent through the nervous system which trigger ____ (21) ____ to bring the system back into the normal range of functioning. This process maintains homeostasis. For example, thermoreceptors and mechanoreceptors in the skin sense changes in ____ (22) ____ and pressure, respectively. Then, signals sent from them to the ____ (23) ____ make it possible to detect situations that could cause injury or death. Furthermore, nerves make muscles contract which moves the ____ (24) ____ of the skeleton, making it possible to evade predators. This ability to perceive the environment and reacting to it is critical to maintain homeostasis in the ____ (25) ____ .

Options:

Nervous	Regulation	Receptors	Responses
Endocrine	Homeostasis	Normal	Brain
Body	Temperature	Bones	









What I Can Do

Part I:

Directions: Study each picture. Write the possible stimulus and response in statement form in each drawing. Use separate sheet of paper for your answer.

The example is given below.

Situation	Stimulus	Response
Example: 	Delicious aroma of the cooked food.	Salivation (active production of saliva)
1. 		
2. 		
3. 		

4. 		
5. 		
<i>Images in this table are illustrated by: Queenie Joy V. Alcantara & Louella C. Zacarias</i>		

Part II:

Directions: Read the passage below. Answer the questions that follow in complete sentence. Use a separate sheet of paper for your answer.

Your sister asked a favor from you to buy art materials needed in doing her project in Science subject. While going to market, you smelled a barbecue being grilled and started to salivate. You realized that you haven't eaten your lunch, so you bought barbecue before buying art materials.

1. What was the stimulus in this situation?

2. What was the response in this situation?

You were playing basketball in the school gym. After an hour, you got tired and thirsty. Consequently, you ran to a store and bought a bottle of water, then you looked for a shady and cool place to relax.

3. What was the stimulus in this situation?

4. What was the response in this situation?

All organisms have ways of dealing with a changing environment. Anything that provokes a response in an organism is called a stimulus. Any response to a stimulus moves the organism back to homeostasis in order to maintain a balanced, stable condition that favors survival.

Very well done! You are now ready to have your posttest. You may want to go over again the lessons and activities to review for the final assessment. God bless you!



Assessment

Directions: Read carefully each item. Use a separate sheet for your answers. Write only the letter of the correct answer for each question.

1. What is nervous system?
 - A. It is part of the human body.
 - B. It is the body's control center.
 - C. It regulates body hormones.
 - D. It transports blood throughout the body.
2. What is another term for nerve cell?
 - A. cancer
 - B. ganglion
 - C. mitochondrion
 - D. neuron
3. This serves as a channel for signals between the brain and the rest of body?
 - A. brain
 - B. body
 - C. neurons
 - D. spinal cord
4. What does the autonomic nervous system control?
 - A. body transmission of scents
 - B. involuntary actions like heartbeat
 - C. signals carried throughout the body
 - D. voluntary actions like walking
5. What are nerve signals?
 - A. flashing red lights
 - B. large flashing green lights
 - C. electrical impulses
 - D. type of hormones
6. What are the main parts of the nervous system?
 - A. arteries, veins, and capillaries
 - B. brain, spinal cord, and nerves
 - C. hands, feet, and tongue
 - D. nose, toes, and tongues

7. Which part of the brain helps keep your balance so you don't just fall or stumble while walking?
 - A. cerebellum
 - B. medulla oblongata
 - C. pituitary gland
 - D. spinal cord
8. Which of the following is TRUE about central nervous system?
 - A. It can be classified as somatic and autonomic nervous system.
 - B. It is composed of the brain and spinal cord.
 - C. It is composed of the brain, spinal cord, and hormones.
 - D. It is composed of cranial and spinal nerves.
9. You felt hungry because you haven't eaten your food for lunch trying to finish home works. Which of the following is the best response to the given stimulus?
 - A. Continue work.
 - B. Eat.
 - C. Ignore the situation.
 - D. Shout out loud.
10. Instructions from the brain to the target organs is carried by _____.
 - A. receptors
 - B. nerves
 - C. sense organs
 - D. hormones
11. It refers to the state reached when each part of the body functions in equilibrium with other parts.
 - A. feedback
 - B. homeostasis
 - C. impulse
 - D. unstable
12. Which nervous system controls the internal organs?
 - A. autonomic
 - B. central
 - C. peripheral
 - D. somatic
13. The hypothalamus connects the two systems, _____ and _____.
 - A. cardiovascular, urinary
 - B. circulatory, nervous
 - C. nervous, endocrine
 - D. nervous, respiratory
14. What part of a neuron carries the impulse toward the cell body?
 - A. axon
 - B. cell body
 - C. dendrite
 - D. nucleus
15. Which of the following is TRUE about synapse?
 - I. A connection between a neuron and another neuron
 - II. The site of transmission of electric nerve impulses between neurons
 - III. An automatic response to a stimulus
 - IV. It is considered as the control system of the body
 - A. I only
 - B. I and II only
 - C. I, II and III
 - D. I, II, III, and IV



Answer Key on page 18

How was the Assessment? What was your score? Congratulations if you got 12 to 15 items correctly. If your score is below 12, you must review the parts of the lesson that you did not understand well. You may also ask your teacher/facilitator for further explanation on these parts.



Additional Activity

NOTE: Choose only one activity to do.

In a short coupon bond, create a poster, a poem or a comic strip on how to take care of your nervous system. Below is the rubric on how to rate your work.

Category	4	3	2	1
Content	The poster, poem, or comic strip shows 7 ways to take care of nervous system.	The poster, poem, or comic strip shows 5 ways to take care of nervous system.	The poster, poem, or comic strip shows 3 ways to take care of nervous system.	The poster, poem, or comic strip shows 1 way to take care of nervous system.
Attractiveness	The poster, poem or comic strip is exceptionally attractive in terms of color, design, layout, and neatness.	The poster, poem, or comic strip is attractive in terms of color, design, layout, and neatness.	The poster, poem, or comic strip is acceptably attractive though it may be a bit messy.	The poster, poem, or comic strip is abstract and with very poor design. It is not attractive.
Clarity of Message	The message of the output is clear and compelling.	The output clearly shows some of the messages and is slightly compelling.	The output indirectly shows the message and is slightly compelling.	The output does not sufficiently show the message and is not compelling.
Timeliness	The output is submitted on or before the given due date.	The output is submitted one day after the given due date.	The output is submitted two days after the given due date.	The output is submitted three or more days after the given due date.

Congratulations for accomplishing this module. You may now look at the correct answers to all the activities and assessments. The Answer key is found on pages 17-18.



Answer Key

What I Know

What's In

1. C
2. C
3. B
4. B
5. B
6. D
7. C
8. C
9. B
10. C
11. C
12. D
13. A
14. B
15. B



What's New

Nervous system is the control system of the body. It has two main divisions the Central and Peripheral Nervous system. CNS is considered as the processing center of the nervous system it composed of brain and spinal cord. PNS contains all nerves outside CNS. Neurons are the basic unit of nervous system. It carries signals or impulses. In order to survive, an organism should respond to a certain stimulus.

What's More

Answer may vary.

1. The central nervous system includes the brain and spinal cord, while the peripheral nervous system includes all of the nerves that branch out from the brain and spinal cord and extend to other parts of the body including muscles and organs.
2. The body can't perform well too. Nervous system is composed of brain, spinal cord and nerves which are vital part in our body movements. As one of its parts will fail to function maybe the body will become paralyzed or even dead.

Guide Questions:

1. Central Nervous System
2. Peripheral nervous System
3. Spinal cord
4. Somatic nervous system
5. Cerebellum
6. Brainstem
7. Spinal nerves
8. Sympathetic
9. Parasympathetic

What I Have Learned

- A. 1. CENTRAL
2. PERIPHERAL
3. SOMATIC
4. NEURONS
5. STIMULUS
6. BRAIN
7. SPINAL CORD
8. BREATHING
9. DIGESTION
10. BLOOD
- PRESSURE
- B. 11. NEURONS
12. IMPULSES
13. STIMULUS
14. RESPONSE
15. ORGANISM
16. Nervous
17. homeostasis
18. regulation
19. receptors
20. normal
21. responses
22. temperature
23. brain
24. bones
25. body

Assessment

1. B
2. D
3. D
4. B
5. C
6. B
7. A
8. B
9. A
10. B
11. B
12. A
13. C
14. C
15. B

What I Can Do

- (Possible answers)
- Part I.
1. Stimulus: hearing the ringing of the phone
Response: He/she will pick up the phone.
 2. Stimulus: feeling the hot flat iron.
Response: He/she will remove his/her hand instantly.
 3. Stimulus: hearing the door slammed shut
Response: Someone will look at the door who slams it.
 4. Stimulus: feeling the warmth of the sunlight
Response: The dog will stick out its tongue. The dog will drink water.
 5. Stimulus: feeling cold
Response: She will look for a jacket.
- Part II.
1. Stimulus: You smell a barbecue being grilled
Response: You start to salivate and decide to eat
 3. Stimulus: feeling tired and thirsty
Response: You bought water and look for a shady and cool place.
 4. Response: You bought water and look for a shady and cool place.

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