🧠 Lesson Plan: The nervous system

Grade Level: 8
Subject: Life Science
Duration: 45–60 min
NGSS MS-LS1-8: Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

🎯 Learning Objectives

By the end of this lesson, students will be able to:

- **Identify** the parts of a neuron — cell body, dendrites, axon, and axon tips — and state the direction a message travels through each.
- **Describe** how a stimulus becomes a response as a nerve impulse passes from a sensory

- **Nerve impulse:** The message a neuron carries. Every impulse begins in a neuron's dendrites and moves along the cell to an axon tip: sensory neurons start it, interneurons in the brain or spinal cord pass it on, and motor neurons deliver it to a muscle so the muscle contracts.
- **Synapse:** The small gap between an axon tip and the next dendrite, muscle, or other cell. A message cannot cross the gap on its own, so the axon tip releases a chemical called a neurotransmitter that carries the impulse across to the next cell.
- **Central nervous system:** The brain and the spinal cord, which sit along the center of the body. The brain controls most body functions, and the spinal cord is the pathway that links the brain to nearly all of the body's other nerves.

- **Peripheral nervous system:** All of the nerves that branch out from the brain and spinal cord to the limbs and organs. Its nerves come in matching pairs on each side of the body and carry impulses in both directions, which speeds up the body's response.
- **Reflex:** A rapid action that happens automatically, without you deciding to do it. In a reflex the spinal cord makes the muscles contract instead of waiting for the brain, which speeds up reactions that could otherwise let the body be injured.
- **Autonomic nervous system:** The nerves of the peripheral nervous system that control involuntary movements you never have to think about, such as the heartbeat and digestion. The somatic nerves are its partner and control the movements you choose to make.

💼 Materials Needed: (all links are included in this PDF)

- Printed copies of the Nervous System Study Guide (https://newpathworksheets.com/api/guide/study-guide-science-grade-8-the-nervous-

- 30 cm ruler for the partner reaction-time catch test (one per pair)

📝 Lesson Procedure

Step 1: Introduction (5 minutes)

- Open by asking: "When you touch something hot, your hand pulls back before you have even decided to move it — so what part of your body made that decision?"

- Clap once without warning and have students name what detected the sound, what carried the message, and what moved in response; keep this stimulus-and-response chain to revisit at the end of the lesson.
- Preview the three jobs of the nervous system named in the Study Guide — gathering information, deciding what it means, and carrying out the response — as the roadmap for the lesson. (https://newpathworksheets.com/api/guide/study-guide-science-grade-8-the-nervous-system-1.pdf)

Step 2: Direct Instruction (15 minutes)

- Use the Study Guide's labeled neuron diagram to name the cell body, nucleus, dendrites, axon, and axon tips, then trace one impulse from a dendrite along the axon and across a synapse, naming the neurotransmitter that carries it over the gap. (https://newpathworksheets.com/api/guide/study-guide-science-grade-8-the-nervous-system-1.pdf)
- Tap a seated volunteer's knee tendon with the rubber reflex hammer so the class watches the lower leg kick before the student can decide to move it, then trace the reflex path:

receptor, the neurons, and the muscle involved in each catch.

- Have partners match brain, brainstem, axon, and autonomic nervous system to their definitions on the vocabulary worksheet, checking each answer against the Study Guide wording. (https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-8-the-nervous-system-1-1.pdf)

Step 4: Independent Practice (13 minutes)

- Students complete Practice Worksheet 1 on their own, identifying the organs of the central nervous system, the three parts of the brain, and what protects the brain from damage.

(https://newpathworksheets.com/api/worksheet/worksheet-science-grade-8-the-nervous-system-1-1.pdf)

- Each student sketches a neuron from memory, labels the cell body, dendrites, axon, and axon tips, and draws an arrow showing the direction the impulse travels.
- Each student writes a three-step stimulus-to-response chain for one everyday event — a phone buzzing in a pocket, stepping on a sharp stone — naming the receptor that detects it, the neurons that carry the impulse, and the body's response.

Step 5: Assessment (13 minutes)

- Administer Practice Worksheet 2 as the end-of-lesson quiz, covering reflexes and the sense organs of the ear and eye. (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-8-the-nervous-system-1-2.pdf)
- Have students classify each of these as voluntary, involuntary, or reflex: waving to a friend, digesting lunch, blinking when a bug flies at the eye, the heart speeding up during a sprint, and jerking a hand off a hot pan.
- Use the Study Guide's Lesson Checkpoint questions as exit questions: where every nerve

- Provide a pre-labeled neuron diagram with the cell body, dendrites, axon, and axon tips already named so students trace the impulse path with a finger instead of recalling the labels.
- Let students complete the vocabulary matching worksheet with the Study Guide open, since each definition appears almost word for word in the text.

Extension Activities

- Build a human nerve relay: students stand an arm's length apart as neurons, pass a hand squeeze down the line, and time the impulse with 5, 10, and 20 students to show how distance affects response time.
- Map touch receptors with a two-point test: students touch a partner's fingertip, forearm, and back of the neck with two blunted toothpicks, find the smallest gap each area can still feel as two points, and rank the areas by how many receptors they must have.
- Test the senses working together by having students identify flavored jelly beans while pinching the nose shut, then again with the nose open, and explain what the smell receptors added.

Complete List of Available Resources:

- NewPathWorksheets: The nervous system (https://newpathworksheets.com/science/grade-8/the-nervous-system-1)

- Vocabulary PDF 5 (https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-8-the-nervous-system-1-5.pdf)
- Vocabulary PDF 6 (https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-8-the-nervous-system-1-6.pdf)

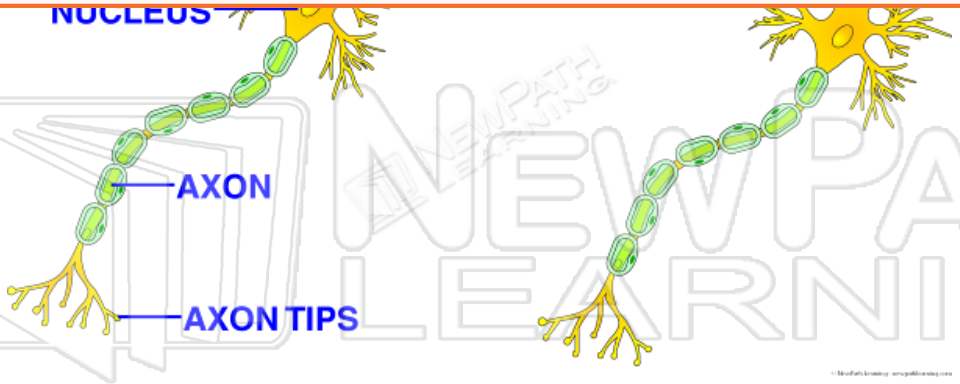
THE NERVOUS SYSTEM

Functions of the Nervous System

The **nervous system** is a network of communication used by body parts to maintain homeostasis and bodily functions.

The nervous system gathers information from inside and outside of the body, responds to the information that it gathers and helps to maintain homeostasis.

- A change in the environment causes an organism to react called a **stimulus**.
- The nervous system will then examine the information from the stimulus and produce a **response**.
- Homeostasis is maintained by the nervous system responding and making the necessary changes to adjust to the environment.



There is only one axon attached to each neuron. Both axons and dendrites are called nerve fibers. Nerve fibers are wrapped together like a rope that is made of many thin strings and covered in connective tissue and called a **nerve**.

Three types of neurons

There are three different types of neurons: sensory neurons, interneurons, and motor neurons. The three different types of neurons will work together to carry messages all throughout the nervous system.

- The **sensory neuron** picks up the stimulus from inside or outside of the body and turns it into a nerve impulse. Every nerve impulse begins in the **dendrites** of a neuron and move rapidly along the cell until it reaches an **axon** tip.
- There is a small space or gap in between the axon tip and the dendrite, neuron, muscle, or other cell the axon is connected to

system structure?

The Central Nervous System

All of the information inside and outside of the body is brought to the central nervous system. The **central nervous system** controls the functions of the body.

Organs of the Central Nervous System

The **brain and the spinal cord** are the organs of the central nervous system. Notice that the organs of the central nervous system are located in the center of the body.

- The **brain** is located within the skull and controls most of the functions of the body.
- The **spinal cord** is located in the center of the back. It links the brain to the majority of the nerves in the peripheral nervous system.

Impulses from the peripheral nervous system travel through the spinal

Cerebrum: The largest portion of the brain is the cerebrum and is located at the top of the brain. The cerebrum interprets information from the senses, controls the skeletal muscles, and carries out processes like judging, remembering, and learning.

The cerebrum is divided into the right and left cerebrum. Each half has its own functions. The right cerebrum receives impulses from the skeletal muscles on the left side of the body and the left cerebrum receives impulses from the right.

Cerebellum: The cerebellum helps to keep your balance by coordinating muscle movements.

Brainstem: The brainstem controls the involuntary muscles of the body, such as your heart.

The Spinal Cord

The spinal cord is housed within the vertebral column. The spinal cord connects the brain with the peripheral nervous system. The spinal cord is also protected by connective tissue and fluid.

Lesson Checkpoint:
Which part of your brain controls your decision-making process?

Nerves from the peripheral nervous system come in pairs. There are identical nerves on each side of the body. Nerve impulses are able to travel in both directions, which increases the speed of response from the brain. There are two different types of nerves that make up the peripheral nervous system.

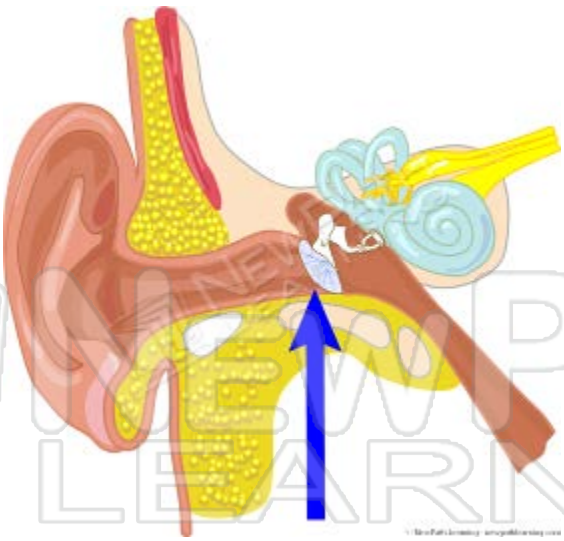
Two types of nerves

They are the somatic nervous system and the autonomic nervous system. The **somatic nervous system** controls voluntary movements. The **autonomic nervous system** controls involuntary movements.

Reflexes

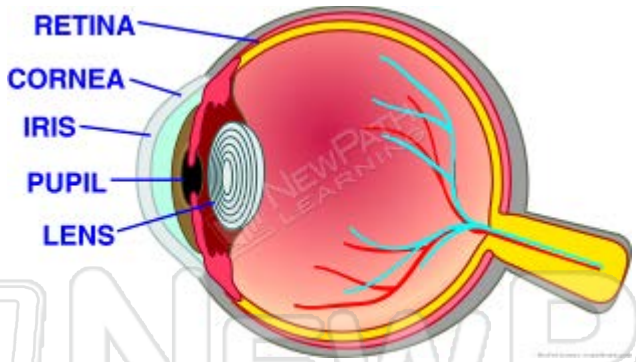
A **reflex** is a rapid action that occurs without control, automatically. As we have already learned, the brain controls the movement of skeletal muscles.

In certain instances, the spinal cord causes the skeletal muscles to contract. This speeds up reactions that may cause damage to the body.



- The **eardrum** is a membrane that vibrates when sound waves reach it. The eardrum is a structure that separates the outer and middle ear.

- The light continues until it reaches the opening that lets light into the eye called the **pupil**.
- The amount of light that enters the eye is controlled by the circular muscles of the **iris**. After the light passes through the pupil, it enters a flexible structure that focuses light called the **lens**.
- The light then moves through a gel like substance until it reaches the **retina**. The retina is a layer of receptor cells that line the back portion of the eye.



Smell: There are receptors in the nose that react with chemicals within the air. When you smell something, chemicals have reacted with those receptors and the information about the smell is sent to the brain where it is processed. The human nose is able to tell the difference between more than 50 different odors.

Taste: The sense of taste also depends on chemicals.

PREVIEW

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The nervous system

Sci H

Name_____ Class_____ Date_____

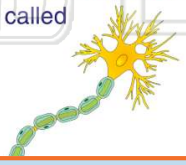
1 Which of the following is not a function of the **nervous system**?

A gathers information from inside the body
B gathers information from outside the body
C supports the body
D maintains homeostasis

2 A **change in the environment** causes an organism to react to that change. What is the **change** in the environment called?

A reaction
B stimulus
C reflex
D synapse

3 In the nervous system, the **cells** that carry messages are called _____.



A nerve impulses
B brain cells

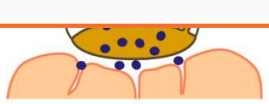
4 The _____ is the **message** that is sent through the nervous system.

A nerve impulse
B dendrite
C axon

5

motor neuron
D sensory neuron, interneuron, and motor neuron

D axon tips



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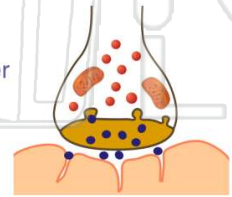
9 What is the **chemical** on which the nerve impulse travels **across the synapse**?



A neurotransmitter
B DNA
C hemoglobin
D neurochemical

10 What is the function of the **central nervous system**?

A to break down nutrients
B to control the functions of the body
C to deliver nutrients to the cells
D to bring information from the arms and legs

The nervous system

Sci H

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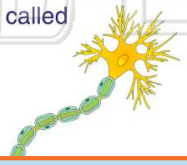


A nerve impulses
B brain cells
C muscles
D sensory neuron, interneuron, and motor neuron

D

4 The _____ is the **message** that is sent through the nervous system.

A nerve impulse
B dendrite
C axon
D neuron

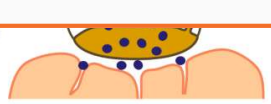
A

5

B

7

C



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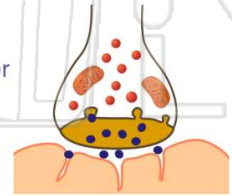

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The nervous system

Sci H

Name_____ Class_____ Date_____

1 The **brain** and the **spinal cord** are organs of the central nervous system.

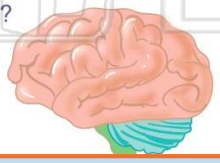
A true
B false

2 Which is not a function of the **spinal cord**?

A bringing information to the brain
B interpretting all of the nerve impulses
C bringing information to the rest of the body
D attaching the central and peripheral nervous system

3 Which is not one of the **three parts** of the human brain?

A brain stem
B cerebellum
C spinal cord
D [illegible]



4 The type of **neuron** that is in the brain is _____.

A sensory neuron
B interneuron
C physical neuron
D [illegible]

5

7

[illegible] from the arms and legs
C to help keep your balance
D to control involuntary muscles

C to help keep your balance
D to control involuntary muscles

9 The central nervous system branches out from the **peripheral nervous system**.

A true
B false

10 Which are the two parts of the **peripheral nervous system**?

A somatic and dramatic
B automatic and manual
C somatic and automatic
D manual and dramatic

The nervous system

Sci H

Name_____ Class_____ Date_____

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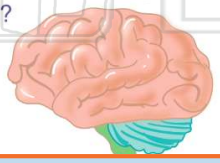

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PREVIEW

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The nervous system

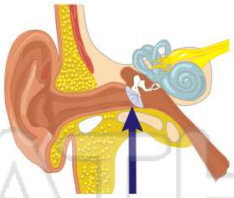
Sci H

Name_____ Class_____ Date_____

1 What **structure** of the nervous system **controls reflexes** that occur automatically?

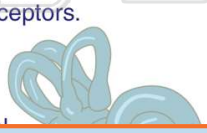
A peripheral nervous system
B brain
C spinal cord
D notochord

2 What structure picks up **sound vibrations** within the ear?



A ear lobe
B eardrum
C semicircular canals
D cornea

3 The _____ is a **snail-shaped tube** within the ear that is filled with fluid and hair-like receptors.



A cochlea
B eardrum

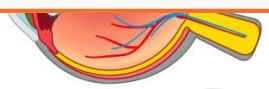
4 What structure gives an individual their **sense of balance**?

A cochlea
B eardrum
C semicircular canals

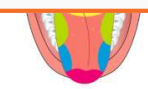
5

7

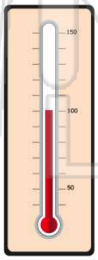
C cornea
D lens



C sour
D chewy



9 Which **sense** picks up the changes in **temperature** within the environment?



A taste
B sight
C touch
D balance

10 Without our **senses**, we would not be able to describe our environment.

A true
B false

The nervous system

Sci H

Name_____ Class_____ Date_____

1 What **structure** of the nervous system **controls reflexes** that occur automatically?

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C spinal cord
D notochord

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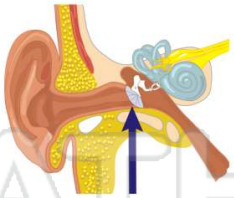

B

3 The _____ is a **snail-shaped tube** within the ear that is filled with fluid and hair-like receptors.

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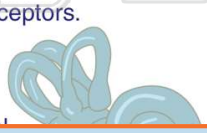
B eardrum



A

4 What structure gives an individual their **sense of balance**?

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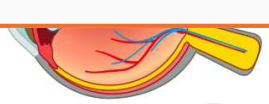

D

C sour
D chewy

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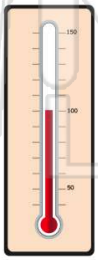


C

10 Without our **senses**, we would not be able to describe our environment.

A true
B false

A

The nervous system

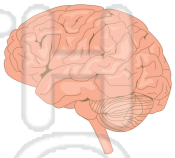
Sci H

Name_____ Class_____ Date_____

Match each of the following terms to its definition:

Axial skeleton	Cardiac muscle	Appendicular skeleton	Brain
Autonomic nervous system	Axon	Brainstem	Cartilage

1. - located within the skull; it is an organ that controls most of the different functions of the body



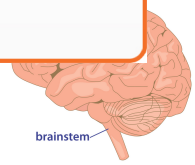
2. - a part of the skeleton composed of 126 bones found in the flexible regions of the body, including shoulders, hips and limbs

3. systen

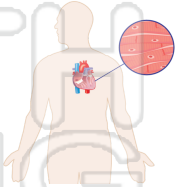
4. skelet

5. away f

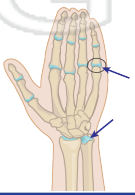
6. involu



7. - the heart muscle composed of highly specialized cells that repeatedly contract without fatigue; the muscles are striated like skeletal muscles and are involuntary like smooth muscles



8. - connective tissue that is flexible and strong, but softer than bone



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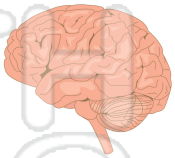

2. appendicular skeleton - a part of the skeleton composed of 126 bones found in the flexible regions of the body, including shoulders, hips and limbs

3. aut
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4. axi
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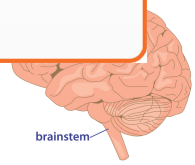
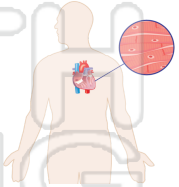
5. axo
the ne

6. bra
of the



7. cardiac muscle - the heart muscle composed of highly specialized cells that repeatedly contract without fatigue; the muscles are striated like skeletal muscles and are involuntary like smooth muscles



8. cartilage - connective tissue that is flexible and strong, but softer than bone