

Nervous System Lesson 1: *The Solve* Educator's Resource Guide

Objective

In *The Solve*, students will:

1. Solve a mystery that demonstrates how the nervous system receives information from the outside environment and generates a response to that stimulus.
2. Create a Mind Map to explore relationships among complex Nervous System vocabulary.
3. Communicate understanding that the nervous system consists of different types of nerve cells that are connected together to carry signals throughout the body.

Time Required: 40-75 minutes

Materials Required	Safety Considerations	Science & Engineering Practices
<ul style="list-style-type: none"> • Student Guide (<i>includes student agenda and Mind Map</i>) • Nervous System Comic Mystery • Scissors • Glue or tape 	None	<ul style="list-style-type: none"> • Developing and using models • Constructing explanations or arguments from evidence

Nervous System Comic Mystery Description

Otis the bat is having trouble with the usual echolocation strategies he uses to catch his prey. Usually the process is simple: send out a signal, wait for the sound wave to bounce off the object, and then interpret the signal to judge the distance. But for some reason, his usual tactic won't work on one tiger moth, so he calls Mosa Mack to help.

Mosa travels right to the source: his nervous system. Here, her and her team discover that transmitting messages throughout the body is more complicated than one might think. As she learns about all the connected pieces, she thinks she may have figured out Otis's nervous system mystery.



Inquiry Scale: Leveling Information

The Solve can be completed in various settings, including presentation-style, small groups, or individually. In the case of a flipped or blended classroom, it can be completed entirely at home.

Level 1: Most teacher-driven (*recommended for grades 4–5*)

View the animated mystery twice: once in full, and a second time along with the discussion questions, pausing the video as needed to answer the episode questions as a group. Project and complete the Mind Map as a class-wide activity. This can be done digitally or on paper. Have students informally quiz each other on the vocabulary until you feel they're familiar with the terms. Use the discussion questions at the bottom of the Mind Map to have a group discussion. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 2 (*recommended for grades 5–6*)

View the animated mystery in full. Afterwards, have students work through the episode questions to the best of their ability in small groups. Play the mystery a second time, pausing the video to discuss each question. Direct students to complete the Mind Map in small groups, either digitally or on paper. Come back as a class to review correct answers, as needed. Have students informally quiz each other on the vocabulary until you feel they're familiar with the terms. Use the discussion questions at the bottom of the Mind Map to have a group discussion. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 3 (*recommended for grades 6–7*)

Provide students with their student URL and have students view the animated mystery in small groups. Have students play the animated mystery once in full and then answer episode questions in their table groups to the best of their ability. Then, as a class, project the mystery, pausing, as needed, to discuss episode questions in a think-pair-share format. Have students complete the Mind Map in table groups, either digitally or on paper. Have students quiz each other on the vocabulary until you feel they're familiar with the terms. In table groups, have students go through the discussion questions on their own, and review answers as a class. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 4 (*recommended for grades 7–8*)

Provide students with their student URL and have students view the animated mystery and complete episode questions in pairs. Have students review their answers with a neighboring table group. Have students complete the Mind Map in pairs, either digitally or on paper. Have students quiz each other on the vocabulary until they feel they're familiar with the terms. Have these same pairs go through the discussion questions. Finally, have students complete the quiz digitally or on paper as an exit ticket.

MOSA MACK SCIENCE

Agenda

I. Solve the Nervous System Mosa Mack Mystery (20 minutes)

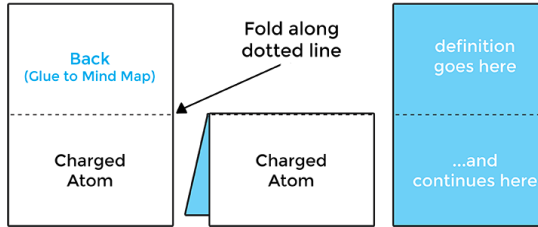
Differentiation Tip: The comic book and motion comic video can be read/watched as a class, in small groups, individually, or completed for homework. For additional support, students can read or watch the comic/episode twice: once before completing the questions, and once with teacher guidance, pausing to discuss each answer.

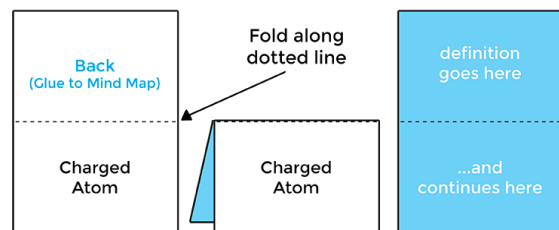
1. Read/watch the Mosa Mack Mystery on Nervous System.
2. Students answer the questions in their Student Guide as they read/watch. Encourage students to cite the specific page numbers/time codes in the Comic Mystery to promote writing with supporting evidence. Answers can be found in the key below.



II. Vocabulary Mind Map Activity (15–45 minutes)

Differentiation Tip: The Mind Map can be done as a class, in small groups, individually, or completed for homework.

- Students may complete the Mind Map **digitally**. Follow directions below. (15 minutes)
 - Go to <https://mosamack.com/home/nervous-system>
 - Select **Lesson 1: The Solve**.
 - Select **Vocabulary** and complete **Part 1**: matching terms with definitions.
 - Complete **Part 2**: matching terms and definitions with images on a diagram.
 - To complete the Mind Map **on paper**, follow the directions below (45 minutes).
 - Print and pass out the Student Guide: Nervous System Lesson 1: *The Solve*.
 - Introduce the warm up task: students will be making a Mind Map of the vocabulary for this Nervous System unit.
 - Model the directions carefully, emphasizing the following. Students should:
 - cut** out the vocabulary cards on the solid lines only
 - fold** the cards at the dotted lines
 - write the definition of the term on the inside of the card using definitions provided
 - Students use the clues from the Mind Map images, definitions, and terms to place the cards in the correct location in the Mind Map.
 - Check that the students have matched their cards correctly before moving on.
 - Students use glue or double-sided tape to connect the back of the vocabulary card to the correct place on the Mind Map.
 - Students discuss the questions with their group or as a class when they have completed the Mind Map.
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- The diagram illustrates the assembly of a vocabulary card. It shows a card with a front side labeled 'Back (Glue to Mind Map)' and 'Charged Atom', and a back side labeled 'Charged Atom'. A dotted line indicates where to fold. An arrow points to the dotted line with the text 'Fold along dotted line'. A separate box shows 'definition goes here' and '...and continues here'.



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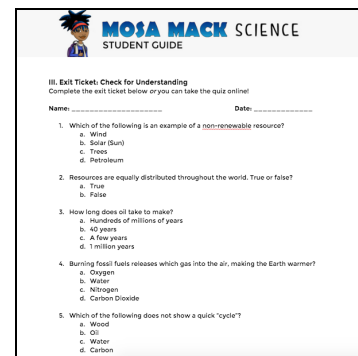
Teacher Tips:

- Since this is the first time many of the students will have seen these vocabulary terms, have students work together to use the images, definitions, and collaborative thinking to figure out where the terms go.
- Check in on student groups through this process. When you see a student or group who has placed a card in the correct place, ask a facilitating question such as, “Why do you think that term goes there?” or “What evidence leads you to believe that term goes there?” When students explain their thinking, this is a great opportunity to provide positive reinforcement. Then, encourage students to share their reasoning to the class or to other groups who may have trouble identifying the location of that specific term.
- If you do not have access to a color printer, provide students with black and white copies and project the colored version of the Mind Map at the front of the room so that students can reference both images.

III. Exit Ticket: Check for Understanding (10–15 minutes)

Differentiation Tip: This can be done in groups, pairs, individually, or more formally as a quiz online.

1. Students complete the exit ticket to check for understanding. This can be done online by selecting the **Quiz** button in Lesson 1 or on paper in the Student Guide. Answers are in the key below.



The image shows a student guide page for Mosa Mack Science. It features a cartoon character of a boy with glasses and a bow tie. The page is titled 'MOSA MACK SCIENCE STUDENT GUIDE'. Below the title, it says 'III. Exit Ticket: Check for Understanding' and 'Complete the exit ticket below or you can take the quiz online!'. There are fields for 'Name: _____' and 'Date: _____'. The exit ticket consists of five multiple-choice questions. The first question asks for an example of a non-renewable resource, with options: Wind, Solar (Sun), Trees, and Petroleum. The second question asks if resources are equally distributed throughout the world, with options: True and False. The third question asks how long it takes to make oil, with options: Hundreds of millions of years, 40 years, A few years, and 1 million years. The fourth question asks which gas is released by burning fossil fuels, with options: Oxygen, Water, Nitrogen, and Carbon Dioxide. The fifth question asks which of the following does not show a quick 'cycle', with options: Wood, Oil, Water, and Carbon.

MOSA MACK SCIENCE
STUDENT GUIDE

III. Exit Ticket: Check for Understanding
Complete the exit ticket below or you can take the quiz online!

Name: _____ Date: _____

1. Which of the following is an example of a non-renewable resource?
a. Wind
b. Solar (Sun)
c. Trees
d. Petroleum
2. Resources are equally distributed throughout the world. True or false?
a. True
b. False
3. How long does oil take to make?
a. Hundreds of millions of years
b. 40 years
c. A few years
d. 1 million years
4. Burning fossil fuels releases which gas into the air, making the Earth warmer?
a. Oxygen
b. Water
c. Nitrogen
d. Carbon Dioxide
5. Which of the following does not show a quick "cycle"?
a. Wood
b. Oil
c. Water
d. Carbon

Answer Key

Comic Mystery Questions

1. What problem is Otis the bat experiencing? (Page 3)

Something is wrong with Otis's ability to sense his surroundings. Even though he's sending out his normal echo signal (called "echolocation") to catch the moth, he somehow misses the moth!

2. How does Otis normally use echolocation to catch insects and avoid obstacles in the dark? (Page 4)

Otis sends out a signal and listens for the signal to bounce off objects and echo back to him. The sound of his echo can tell him how close objects are.

3. What type of neuron first receives the echo that bounces off the rock? (Page 6)

A sensory neuron.

4. What is a stimulus? Name a few examples, from the comic or your own experience. (Page 6)

A stimulus is an outside event that causes a response in the nervous system. For example, the noise Otis just heard, the sight of a tree, the taste of fleas, or the smell of prickly pear.

5. What is the job of the nerve cells? Where can we find them? (Pages 7-9)

Nerve cells send messages throughout the body. They are located all over the body. The brain and spinal cord are made of nerve cells.

6. The brain is where the signal gets figured out. How does a signal get to the brain? (Page 8)

Signals go from sensory neurons through more nerve cells, up the spinal cord, and then to the brain. (Exception: in some cases the signal goes straight to the brain. For example, if the stimulus is visual, the signal goes straight from the eyes to the brain.)

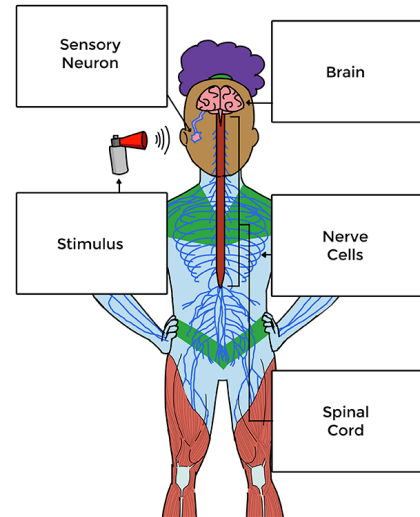
7. What is the job of nerve cells connected to the muscles? (Page 11)

These nerve cells take signals from the nerve cells in the brain and turn them into action.

8. What did Mosa figure out? Why can't Otis catch Bert? (Answer Comic)

Bert is jamming Otis's echolocation signal. Bert can detect when Otis is close and sends out sound waves that confuse Otis. This means that Otis cannot figure out Bert's location!

Mind Map Answer



Quiz:

1. When you see a car approaching, what type of neuron receives this information first?
 - a. **Sensory neuron**
 - b. Spinal cord
 - c. Brain
2. The sensory neuron is a type of:
 - a. Spinal cord
 - b. Brain
 - c. **Nerve cell**
3. The sound of a cheering crowd is an example of a:
 - a. Signal
 - b. **Stimulus**
 - c. Response
 - d. Echolocation
4. What is the name of the body part that passes messages from the sensory neurons to the brain?
 - a. Lungs
 - b. **Nerve cells**
 - c. Brain
 - d. Stimulus
5. This part of the nervous system is the decision-maker for the rest of the nervous system. What is it called?
 - a. **The brain**
 - b. Sensory neurons
 - c. Motor neurons
 - d. The spinal cord
6. What path will an incoming stimulus follow?
 - a. Spinal cord to sensory neuron to brain
 - b. Brain to sensory neuron to spinal cord
 - c. **Sensory neuron to spinal cord to brain**