

Waves Lesson 1: *The Solve*

Educator's Resource Guide: Animated Mystery

The Solve contains two mini lessons: The [live video lesson](#) and the [animation lesson](#). For the most comprehensive learning experience, conduct both. If you're short on time, choose one. Which lesson?

- For a more structured lesson, choose the animation (the lesson below).
- For a more inquiry-based lesson, choose the live video lesson and assign the animation for homework.

Objective

In *The Solve*, students will:

1. Solve a mystery that demonstrates how light waves and sound waves travel.
2. Create a Mind Map to explore relationships among complex Waves vocabulary.
3. Communicate understanding that different types of waves travel at different speeds.

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>)• Waves Mosa Mack Mystery Episode• Computer with speakers• Scissors• Glue or tape	None	<ul style="list-style-type: none">• Developing and using models• Constructing explanations or arguments from evidence

Mosa Mack Comic Mystery Episode Description

Thad the Thunder has a spectacular show that is leaving his audience stumped! Somehow he is able to predict the exact second that thunder occurs, to the dismay of many audience members who have bet otherwise.

After Billy loses all his money to this scam, Mosa suspects something fishy is going on, so she decides to talk to Thad's assistant, Sam, who shares some interesting information. While she's not quite certain what kind of deception is at play, she goes on a mission to learn everything she can about waves in order to find out.



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.

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Agenda

I. Solve the Waves Mosa Mack Mystery (20 minutes)

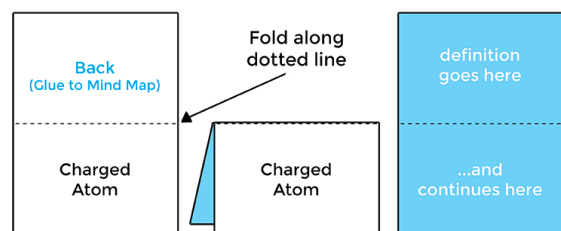
Differentiation Tip: The Video Mystery can be viewed as a class, in small groups, individually, or completed for homework. For additional support, students can view the episode twice: once before completing the questions and once with teacher guidance, pausing the video to discuss each answer.

1. Play the animated Mosa Mack Mystery on Waves.
2. Students answer questions either digitally on the Mosa Mack platform or on paper in the Student Guide as they watch. Encourage students to cite the specific time codes in the episode to promote writing with supporting evidence. Answers can be found in the key below.
3. View the answer video to confirm student understanding.

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.

1. Students may complete the Mind Map **digitally**. Follow directions below. (15 minutes)
 - a. Go to <https://mosamack.com/home/waves>
 - b. Select **Lesson 1: The Solve**.
 - c. Select **Vocabulary** and complete **Part 1**: matching terms with definitions.
 - d. Complete **Part 2**: matching terms and definitions with images on a diagram.
2. To complete the Mind Map **on paper**, follow the directions below (45 minutes).
 - a. Print and pass out the Student Guide: Waves Lesson 1: *The Solve*.
 - b. Introduce the warm up task: students will be making a Mind Map of the vocabulary for this Waves unit.
 - c. 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
 - d. Students use the clues from the Mind Map images, definitions, and terms to place the cards in the correct location in the Mind Map.
 - e. Check that the students have matched their cards correctly before moving on.



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- f. Students use glue or double-sided tape to connect the back of the vocabulary card to the correct place on the Mind Map.
- g. Students discuss the questions with their group or as a class when they have completed the Mind Map.

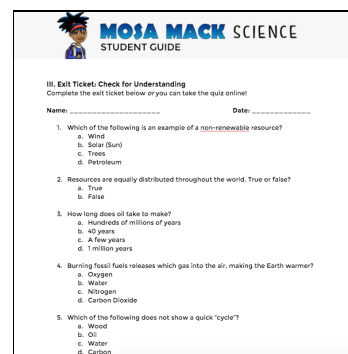
Teacher Tips:

- 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 two lines 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: a. Wind, b. Solar (Sun), c. Trees, d. Petroleum. The second question asks if resources are equally distributed throughout the world, with options: a. True, b. False. The third question asks how long it takes to make oil, with options: a. Hundreds of millions of years, b. 40 years, c. A few years, d. 1 million years. The fourth question asks which gas is released by burning fossil fuels, making the Earth warmer, with options: a. Oxygen, b. Water, c. Nitrogen, d. Carbon Dioxide. The fifth question asks which of the following does not show a quick 'cycle', with options: a. Wood, b. Oil, c. Water, d. Carbon.

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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

Episode Questions

1. What is Thad's special talent at the carnival? (0:05-0:10)

Answer: He is able to predict the sound of thunder before it happens!

2. What is Assistant Sam's job? How does she help Thad? (0:52,1:30)

Answer: Sam looks out for lightning during the storm and every time it strikes, she reports its brightness to Thad via a microphone.

3. How does the light from a lightning bolt travel through the air? Draw a labeled picture below of how light from lightning travels through air to our eyes. (1:17)

Answer: It travels in a wave through the air before reaching our eyes.

4. How does the amplitude of a wave relate to the brightness of the light? (1:17)

Answer: The higher the amplitude, the brighter the light.

5. Make a list of the different types of waves that Mosa's team explores. (2:10-2:35)

Answer: Microwaves, ultraviolet waves, X-rays, water waves, radio waves, sound waves.

6. Why did Sam say lightning and thunder are related? (3:12)

Answer: Lightning and thunder happen at the same time.

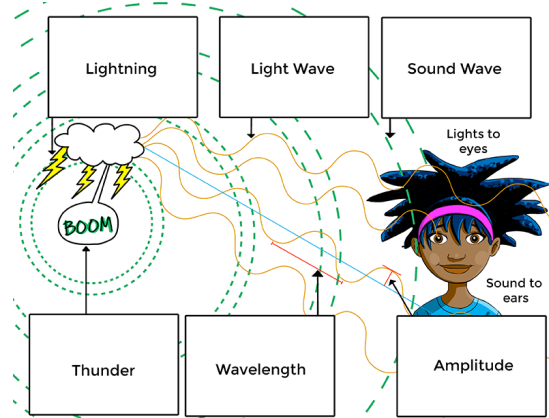
7. Why did it take Mosa so long to hear the airplane after she saw it? (3:47)

Answer: Light waves travel faster than sound waves.

8. What did Mosa figure out? How is Thad the Thunder cheating his audience? (Answer Video)

Answer: Thad the Thunder has his assistant Sam tell him when she sees lightning, so he can predict the thunder that will come immediately after. This is based on the idea that lightning and thunder happen at the same time, but light waves travel faster than sound waves. This means that when Sam sees the lightning (light wave), she must be telling Thad, who then knows that the clap of thunder (sound wave) will occur shortly after.

Mind Map



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Quiz:

- In the picture, which number points to the wave's amplitude?
 - 1
 - 2**
 - 3
 - 4
- In the picture, which number points to the wave's wavelength?
 - 1**
 - 2
 - 3
 - 4
- If a sound is louder or a light is brighter, what does this mean about the amplitude of the wave?
 - The amplitude is smaller
 - The amplitude is greater**
 - The amplitude is always the same
 - The amplitude is louder
- If a sound is softer or a light is dimmer, what does this mean about the amplitude of the wave?
 - The amplitude is smaller**
 - The amplitude is greater
 - The amplitude is always the same
 - The amplitude is louder
- Which of the following is a type of wave?
 - Microwave
 - Sound wave
 - Light wave
 - All of the above are types of waves**
- True or false: Sound waves travel faster than light waves.
 - True
 - False**
- Lightning and thunder happen at the same time. Which would you sense first?
 - Lightning**
 - Thunder

