

# NASA Spotlite Interactive Lesson

## Interactions of Light Grades 5-8



Image Credit: NASA/Goddard Space Flight Center Conceptual Image Lab

## Student Packet



# NASA Spotlite Interactive Lesson Guide



## What are NASA Spotlites?

NASA Spotlites are 90-120 second student-produced video segments that address common science misconceptions.

NASA Spotlites are designed to increase scientific literacy in a standards-based classroom. By producing Spotlite videos, students gain production experience, as well as deepen their understanding of science content. Approved NASA Spotlites can be found at the NASA eClips website. <https://nasaclips.arc.nasa.gov>



A misconception is a view or opinion that is incorrect because it is based on faulty thinking or understanding.

This is an Interactive PDF. Features in this packet may include:

- fillable boxes
- quick checks
- multiple choice questions
- interactive GIFs (graphics interchange format)
- links to videos and online interactives

The hyperlinks included in this document open PDFs or webpages and may perform differently based on the device being used. Links may have to be cut and pasted into a web browser to open. PDFs and other documents may need to be downloaded to view.

*Try using Adobe Acrobat Reader and Flash Player for optimal performance of all interactive features included in this guide.*



Remember to save your responses.  
Under "file" choose "save as."  
Type your name in front of the document name.  
Choose "save."

# Pretest

## NASA Spotlight Interactions of Light Interactive Lesson Pretest / Posttest

Read each question and select the best choice.

1. When the sun's light rays slow down and bend as they leave air and enter water, they are:

2. Which of the following is an example of refraction?

3. Which of the following does not describe an interaction of light when it strikes an object?

4. Objects that block light are:

5. Which of the following items is translucent?

6. The stem of the flower under the water appears larger than the portion that is above the water. This occurs when light is bent or:



7. Light bends when it goes from one transparent material to another because:

8. When light travels from one medium to another, such as from air into water, it:

# Engage

## Today's Lesson

In this lesson you will learn about the characteristics of light. The activities you will participate in will let you explore and develop an understanding of what light does in different substances and why. Using interactive Frayer Models, you will learn key vocabulary that will help you explain how light interacts with different types of materials.

What do you already know about how light behaves?

### True or False

Light is unaffected as it passes through transparent materials.

## NASA Spotlight Video

Next, you will watch a clip of a video about light. As you watch the video, identify a misconception about light.

NASA Spotlight: Interactions of Light - Engage Segment



NASA eClips Website Link:

NASA eClips YouTube link: <https://youtu.be/1QDXApMIwKM>

Discuss

1. What did you observe about how light interacts with objects from watching the video?
2. Recreate Jimmy and Timmy's demonstration. What were your results? Were they the same as those of Jimmy and Timmy?

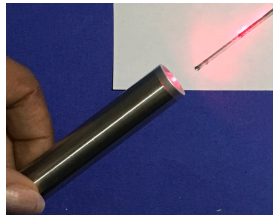
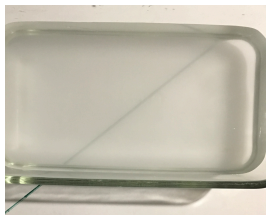
# Explore

## Explore Activities

Next, you will complete activities to learn what light does in different substances and why. Record all observations in your science notebook.

### Activity 1 - Light Beam in Water

1. Shine a laser pointer or narrow beam from a flashlight through a clear pan of water that has coffee creamer dissolved in it. Try shining the light through the pan at different locations.
2. Record your observations.
3. Draw a diagonal line on a sheet of paper and place it under the pan of water.
4. Line up the laser pointer with the diagonal line.
5. Record your observations.



### Activity 2 - Pencil in Water

1. Observe the pencil and notice that it is straight.
2. Place the pencil in the empty clear plastic cup and record observations.
3. Pour water into the cup until it is  $\frac{3}{4}$  full.
4. Looking from the side of the glass, focus on the pencil where the water and air meet. Record observations.
5. Remove the pencil from the cup and record observations.



### Activity 3 - Penny in Water

1. Place a penny in the middle bottom of a non-see-through cup. Hold it in place with a small piece of tape.
2. Stand in a place where you can see inside the cup but can't quite see the penny in the bottom of the cup. The top of the cup will block the penny.
3. While standing in the same place, have someone start to fill the cup up slowly with water. Make observations about what you can see as water is being added.

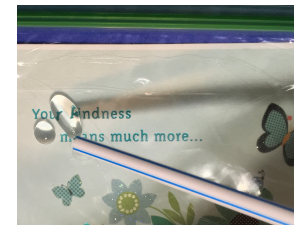


### Activity 4 - Wax Paper and Water

1. Place a piece of wax paper (or a baggie) over the printed text from a worksheet, newspaper or magazine.
2. Put a single drop of water on top of the wax paper. Move the paper around on top of the printed text and record your observations.
3. Experiment with different sized drops of water. How does this affect the size of the letters?



Image credit: Niyal, Shutterstock.com



### Think-Pair-Share

1. How did the activities demonstrate that something happens when light travels through transparent materials?
2. Which of these activities are most like Jimmy and Timmy's demonstration?

# Resources

## Frayer Model for Vocabulary Development

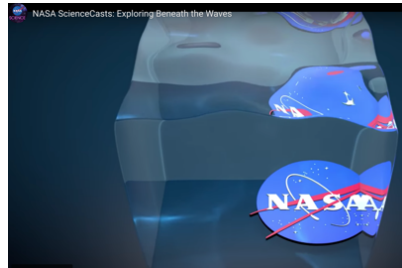
Use the graphic organizer to write definitions, characteristics, examples and non-examples for a vocabulary word. You can include drawings, graphics, and diagrams.

The graphic organizer is a diamond-shaped frame divided into four quadrants. The top-left quadrant is labeled 'Definitions' and has a green border. The top-right quadrant is labeled 'Characteristics' and has a yellow border. The bottom-left quadrant is labeled 'Examples' and has a blue border. The bottom-right quadrant is labeled 'Non-examples' and has a red border. The center of the diamond is a white diamond shape with a black border.

# Elaborate

## NASA CONNECTION

Exploring Beneath the Waves Excerpt  
from NASA ScienceCasts  
<https://go.nasa.gov/3qvtxDj>



Oceans cover over 70% percent of Earth's surface and profoundly influence our planet's atmosphere, weather, and climate. However, uncovering the many secrets hidden beneath the ocean's waves presents unique challenges for researchers, and requires specific technology to observe what humans can't see.

NASA technologists are developing sensors that can improve measurements of Earth's oceans, creating new instruments to study aspects of our home planet we haven't before been able to research.

Imaging what's below the ocean surface requires the development a new instrument capable of improving the information available to scientists. Ved Chirayath, a scientist at NASA's Ames Research Center says, "Images of objects under the surface are distorted in several ways, making it difficult to gather reliable data about them."

Why are the images of objects under the surface distorted?

## Elaborate Activity Prisms

You have explored and explained how transparent materials can bend light. Investigate bending light using prisms. Play with prisms of different shapes and make rainbows. Record all observations in your science notebook.

Shine a light source through a prism.

Explain:

What do you observe?

What colors do you see? In what order are the colors?

Where does the light enter and exit the prism?

Follow the directions for PhET website simulation.  
<https://phet.colorado.edu/en/simulation/bending-light>

1. Go to the following Phet website (<https://phet.colorado.edu>) and search for Bending Light simulation. Start with Intro.

2. When the simulator window opens, you should notice a laser pointing at a 45° angle downwards to the right.

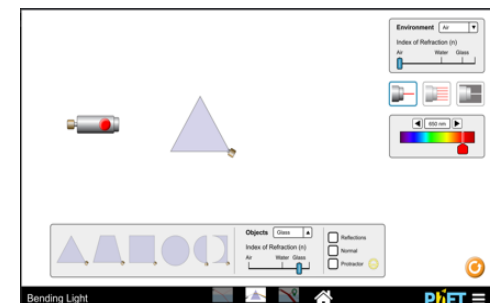
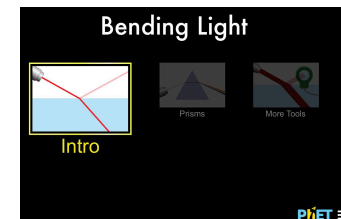
3. Look to the right of the window for the two information boxes explaining the media shown on the screen. Set both to air.

4. Click on the RED button on the laser. Record what happens.

5. Change the bottom medium first to glass and then to water. Click on the RED button on the laser. Record what happens.

6. Switch to the prism simulation and investigate the interactions of light with prisms.

7. Discuss your observations.



# Evaluate

## Identify Misconception

What is a common misconception people have about how light behaves and how can you correct this misconception?

## Vocabulary Review

Using your new vocabulary words and illustrations, explain what happens to light when it travels from one substance or material to another.

### Word Bank

light, refract, reflect, absorb, transmit, transparent, speed, materials, bend, direction, dense

### Sentence Starters

When light travels from...

## NASA Spotlight Video

Carefully re-watch the NASA Spotlight video about light. Write an explanation, suitable for a classmate or for a younger student, of what's going on in the video.

NASA Spotlight: Timmy and Jimmy's Interactions with Light



NASA eClips Website Link:

NASA Spotlight YouTube Link: <https://youtu.be/m4UiH0ZnvOc>



# Posttest

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8. When light travels from one medium to another, such as from air into water, it:

# Product Information

This product has been developed by the National Institute of Aerospace's Center for Integrative STEM Education.

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