

<b>Science</b>	<b>SCI.IV.4.4</b>	<b>Grade: 6</b>
<b><u>Strand IV:</u> Using Scientific Knowledge in Physical Science</b>		
<b><u>Standard 4:</u> Waves and Vibrations – All students will explain shadows, color, and light phenomena.</b>		
<b><u>Benchmark 4:</u> Describe ways in which light interacts with matter.</b>		
<p><b>Constructing and Reflecting:</b></p> <p><b>SCI.I.1.1</b> - Generate scientific questions about the world based on observation.</p> <ul style="list-style-type: none"> <li>• Construct questions for each of the investigations suggested below to guide the design of the investigation.</li> </ul> <p><b>SCI.I.1.2</b> - Design and conduct scientific investigations.</p> <ul style="list-style-type: none"> <li>• Experiment with mirrors to predict where a reflected beam will fall.</li> <li>• Experiment with lenses to show how refraction is used to focus light.</li> </ul> <p><b>SCI.II.1.3</b> - Show how common themes of science, mathematics, and technology apply in real-world contexts.</p>		
<p><b>Vocabulary / Key Concepts</b></p> <ul style="list-style-type: none"> <li>• reflection</li> <li>• refraction</li> <li>• absorption</li> <li>• transmission</li> <li>• scattering (or diffusion)</li> <li>• medium</li> <li>• lens</li> </ul> <p>Transmission of light:</p> <ul style="list-style-type: none"> <li>• transparent</li> <li>• translucent</li> <li>• opaque</li> </ul>	<p><b>Context</b></p> <p>Objects that reflect or absorb light, including mirrors</p> <p>Media that transmit light:</p> <ul style="list-style-type: none"> <li>• clear and frosted glass</li> <li>• clear and cloudy water</li> <li>• clear and smoky air</li> </ul> <p>Objects that refract light:</p> <ul style="list-style-type: none"> <li>• lenses</li> <li>• prisms</li> <li>• fiber optics</li> </ul> <p>Uses of lenses:</p> <ul style="list-style-type: none"> <li>• eye</li> <li>• cameras</li> <li>• telescope</li> <li>• microscope</li> <li>• magnifying lens for magnification and light gathering</li> </ul>	

## Knowledge and Skills

Students will describe the many ways light interacts with matter.

Light interacts with matter in many ways. Light can be reflected (bouncing off). This can be seen when a flashlight is shone on a mirror. It is through the reflection and absorption of light that we see objects and colors.

Light can also be refracted (bending of light as it passes through a medium e.g. lenses, prisms, water, air). One can see this principle when trying to grab something in the water and it's actually in a different position than perceived.

Finally, light can be transmitted (light passes through an object). If light passes straight through a medium and the object can be seen clearly it is said to be transparent. If light is scattered as it passes through a medium and the object is distorted or hazy the medium is said to be translucent. If the light does not pass through the medium and is absorbed and/or reflected, the object isn't seen, the medium is said to be opaque.

Medium: matter through which light passes

## Resources

### Coloma Resources

Lenses, prisms, fiber optics  
Light box (3)  
Mirrors

### Other Resources

- [The Why Files](#) – [Why is the Sky Blue?](#)
- Exploratorium – [Glue Stick Sunset](#) (why is the sky blue?)
- Exploratorium – [Snacks about Light](#)
- [The CSE Light Tour](#) – excellent interactive learning!
- ThinkQuest – [The World of Light](#) (cancel through the Chinese language pack opportunities – the original is in English)
- Michigan Teacher Network [Resources](#)
- Science Explosion: Waves and Vibrations
- Bill Nye: Eyeball, Light/Color, Light/Optics, Sound, Waves

### **Videoconferences Available**

For more information, see [www.remc11.k12.mi.us/dl](http://www.remc11.k12.mi.us/dl) or call Janine Lim 471-7725x101 or email [jl@remc11.k12.mi.us](mailto:jl@remc11.k12.mi.us)

### **IV.4.MS.4**

*20/20 Science* from COSI Toledo

### **6<sup>th</sup> Grade Science Curriculum**

#### **Technology Resources**

IV.4.MS.4 Describe ways in which light interacts with matter.

Vernier Probes available: Light Sensor, Temperature Probe

## Instruction

### Focus Question: What happens to light when it reflects?

Give students a flashlight. Using a mirror, students must light different objects in the room by simply adjusting the angle of the mirror and not position of the flashlight.

Discuss situations in the real world in which light is reflected, refracted and absorbed.

The teacher will explain the terms: transparent, translucent and opaque. Students will brainstorm examples of materials that have these characteristics. Students will shine flashlights in a darkened room on a variety of transparent, translucent, and opaque objects (mirrors, plastic, clear water, water with a drop of milk, wood block, prism, etc.).

With a partner, each student will classify objects into three categories based upon the way light does or does not pass through them.

As a class, students will discuss situations in the real world in which light is reflected (mirror/ calm water), refracted (light passing through water in a pool causing the perceived position of an object to be different from its actual position), and transmitted (stained glass window).

Students will use their knowledge of light and write a paragraph that explains a desert mirage. (desert mirage: light passing through water in a pool causing the perceived position of an object to be different from its actual position.)

## Assessment

### Optional Assessment

This assessment is to be done after the students have completed activities on reflection, refraction and absorption.

Students will be given a diagram of a pencil placed in a 400 ml beaker of water at an angle other than 90 degrees. This diagram will also include the incoming rays of light. They will draw reflected, refracted, and transmitted rays of light from the beaker and pencil and describe the behavior of the light rays.

(Give students rubric before activity.)

### Scoring Rubric

#### Criteria: Correctness of diagram:

**Apprentice** - Draws one ray of light correctly.

**Basic** - Draws two of the three rays correctly.

**Meets** - Draws three rays of light correctly.

**Exceeds** - Draws three rays of light correctly.

#### Criteria: Accuracy of description:

**Apprentice** - Describes one light behavior correctly.

**Basic** - Describes one or two light behaviors correctly.

**Meets** - Describes all behaviors correctly and clearly.

**Exceeds** - Describes all behaviors correctly and clearly; explains why the pencil image is bent.

**Teacher Notes:**

- Light travels in a straight line until it strikes an object. “To see an object, light from that object – emitted by it or scattered from it – must enter the eye. Light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection).” (NSES) Transmission occurs when light moves through an object, which can be either transparent or translucent. Refraction occurs when light traveling through an object is bent into a new direction. Objects are magnified by microscopes, telescopes, etc. when light from the object is refracted and focused in lenses. (JCISD)

**Focus Questions**

- How is light needed to see?
- What can happen to light when it strikes different objects, such as mirrors, glass, lenses, translucent materials, etc.?

**Notes**

The state benchmarks are very deliberately constructed to take students through these topics sequentially and developmentally. For example, students do not talk about sound and light as waves until the high school benchmarks – they only look at vibrating objects and mechanical waves such as those in slinkies or on water in middle school.