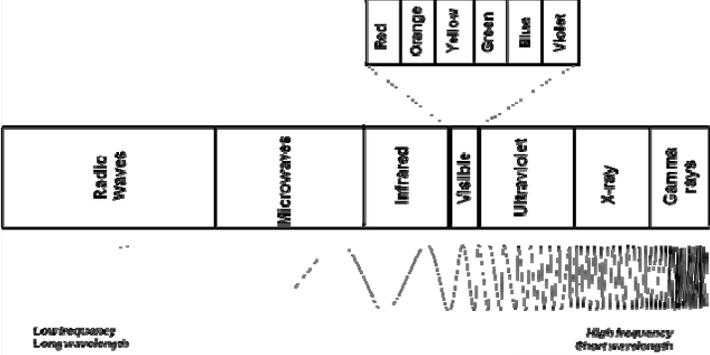
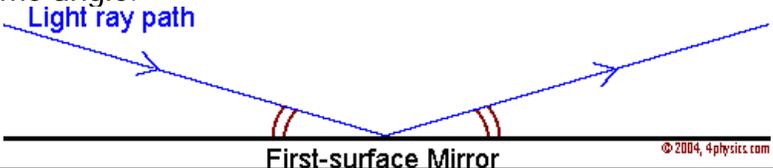
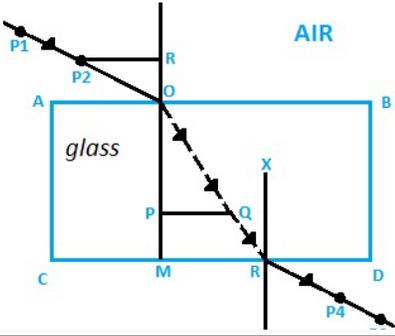
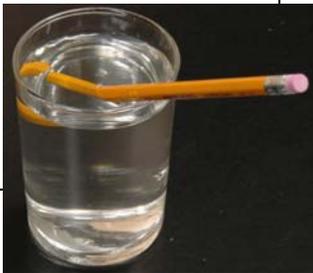


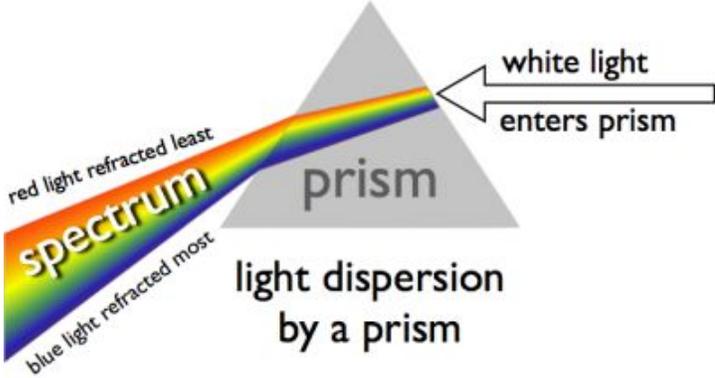
# Light (SOL 5.3) Study Guide



☆	What is light?	<b>Light</b> is energy. It has properties of both a wave and a small particle called a photon. (A photon moves in a straight line.)
☆	How does light travel?	Light is a wave that travels in straight lines (unlike sound). Light waves are called <b>transverse waves</b> . The straight paths are called <b>rays</b> .
☆	What is a ray?	A <b>ray</b> is a straight line that represents the path of light.
☆	What is a beam?	A <b>beam</b> is a group of parallel rays.
☆	Does light need matter to move through like sound does?	NO! Unlike sound, light <b>does NOT need matter</b> to travel through and can travel through a vacuum, like space.
☆	How fast does light travel?	Light waves travel <b>much faster</b> than sound. Light from the sun takes less than 8½ minutes to travel 93 million miles (150 million kilometers) to reach Earth.
☆	Light waves are what type of waves?	Light waves are considered to be <b>transverse waves</b> (unlike sound which travels in compression waves).
☆	What is a light wave?	Light waves are composed of a <b>wavelength, crest, and trough</b> .  <div style="text-align: center;"> <p><b>Transverse Wave</b></p> <p>The diagram shows a sinusoidal wave on a horizontal baseline. A double-headed arrow above the wave spans the distance between two consecutive peaks, labeled 'Wavelength'. The highest point of a peak is labeled 'Crest', and the lowest point of a valley is labeled 'Trough'.</p> </div>
☆	How are light waves characterized?	Light waves are characterized by their wavelengths and the frequency of their wavelengths.
☆	What is a wavelength?	A <b>wavelength</b> is the measurement of the size of the wave. It is usually measured from crest-to-crest or trough-to-trough.
☆	What is frequency?	<b>Frequency</b> is the number of waves passing a given point every second. The greater the frequency, the greater the amount of energy. High frequency light has high energy and low frequency light has low energy.
☾	What is electromagnetic radiation?	<b>Electromagnetic radiation</b> is another name for light because it has electric and magnetic fields.

	<p>What is the <b>electromagnetic spectrum</b>?</p>	<p>The entire range of light is called the <b>electromagnetic spectrum</b>. The difference between the various types of light is due to the amount of energy. Sunlight consists of the entire spectrum.</p> <p style="text-align: center;"><b>Electromagnetic Spectrum</b></p> 
	<p>Which light on the spectrum has the least energy? most energy?</p>	<p><b>Radio waves</b> have the lowest energy (lowest frequency) and <b>gamma rays</b> have the highest energy (highest frequency). In the visible spectrum, <b>red</b> has the lowest energy (lowest frequency) and <b>violet</b> has the highest energy (highest frequency).</p>
	<p>Can the human eye see all light?</p>	<p><b>NO!</b> We can only see a very small part of the total electromagnetic spectrum.</p>
	<p>What is the visible spectrum?</p>	<p>The <b>visible spectrum</b> is the part of the electromagnetic spectrum that we can see. We see visible light as the colors of the rainbow.</p>
	<p>How are colors different?</p>	<p>Each color has a different wavelength.</p>
	<p>How are the colors arranged in the <b>visible spectrum</b>?</p>	<p>The colors are arranged based on their wavelength. Red has the longest wavelength and violet has the shortest. Colors from the longest wavelength to the shortest wavelength are: red, orange, yellow, green, blue, and violet (<b>ROYGBV</b>)</p>
	<p>What about the colors <b>black</b> and <b>white</b>?</p>	<p><b>Black and white are NOT a part of the visible spectrum.</b></p> <p><b>Black</b> is when a material absorbs all the visible light and no light is reflected back. It is the total absence (none) of reflected light.</p> <p><b>White</b> is a reflection of all visible light together.</p>

	<p>How does light move?</p>	<p>Light travels in straight paths until it hits an object, where it bounces off (<b>reflected</b>), is bent (<b>refracted</b>), passes through the object (is <b>transmitted</b>), or is <b>absorbed</b> as heat.</p>
	<p>What is reflection?</p>	<p>Reflection occurs when light waves are neither transmitted nor absorbed, but are <b>bounced</b> off of objects they hit. If the surface of the object is smooth and polished (such as mirrors), each reflected wave will be reflected back at the same angle.</p> 
	<p>What is refraction?</p>	<p>Refraction occurs when light waves are <b>bent</b> resulting in a change in its speed as it moves from one medium to another (ex. light moving from air into water). The frequency of the wave does not change.</p>  
	<p>What determines the amount of refraction?</p>	<p>The amount of refraction depends on:</p> <ol style="list-style-type: none"> <li>1) The density of the material</li> <li>2) The wavelength of the light wave</li> <li>3) The angle of the light wave</li> </ol>
	<p>What are some examples of refraction?</p>	<p>Examples of refraction include:</p> <ol style="list-style-type: none"> <li>1) Refraction causes a setting sun to look flat.</li> <li>2) A spoon appears to bend when it is put in a cup of water.</li> <li>3) Shadows on the bottom of a pool are caused because air and water have different density.</li> <li>4) A glass prism disperses white light into its individual colors. As visible light exits the prism, it is refracted and separated into a display of colors.</li> </ol>

	<p>What is a rainbow?</p> 	<p>A <b>rainbow</b> is an example of both reflection and refraction. It occurs from water droplets that act as both mirrors and prisms. The rays of light have to slow down as they go from traveling through air to traveling through a liquid (the water droplet). This causes the light to bend, thus breaking the white light up into the colors of the rainbow.</p>
	<p>What happens when we use a prism?</p>	<p>A prism can be used to refract and disperse visible light. When different wavelengths of light in visible light pass through a prism, they are bent at different angles (refracted). Dispersion occurs when we see the light separated into a display of colors (ROYGBV).</p> 
	<p>What is dispersion?</p>	<p>Dispersion is the separation of light. It occurs with transparent surfaces that are not parallel to each other, such as prism or gemstone facets.</p> 
	<p>Can light go through objects?</p>	<p>Light can pass through some objects but is blocked by others.</p>
	<p>What are transparent materials?</p>	<p><b>Transparent</b> materials allow light to pass through easily. Examples include: Clear glass, clear plastic food wrap, clean water, and air.</p> 

♥	What are translucent materials?	<p><b>Translucent</b> materials allow some light to pass through, giving only a blurry view. Examples include: wax paper, frosted glass, thin fabrics, some plastics, and thin paper.</p> 
♥	What are opaque materials?	<p><b>Opaque</b> materials completely block light from passing through. Examples include: metal, wood, bricks, aluminum foil, and thick paper.</p> 