Polarization

Read from **Lesson 1** of the **Light Waves and Color** chapter at **The Physics Classroom:**

http://www.physicsclassroom.com/Class/light/u12l1e.html

MOP Connection: Light and Color: sublevel 2

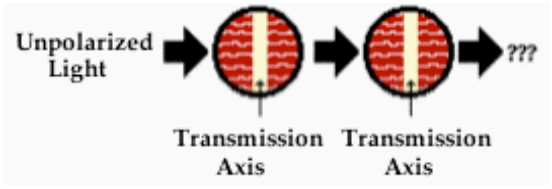
1. When a light wave vibrates in a variety of directions, the light is said to be ____.
   a. transverse b. polarized c. unpolarized

2. When a light wave's are isolated to a single plane, the light is said to be ____.
   a. transverse b. polarized c. unpolarized

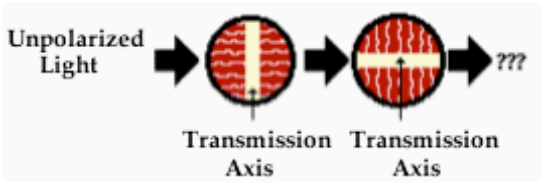
3. A Polaroid filter polarizes light by _____.
   a. re-orienting all the wave vibrations such that they vibrate in a single plane
   b. blocking part of the vibrations while letting through those that are in a specific plane

4. Filters allow light to pass through. Polaroid filters are very selective about the orientation of the light vibrations that are allowed through. The light that passes through a Polaroid filter is vibrating in a direction that is _____.
   a. parallel to the orientation of the molecules that make up the alignment
   b. parallel to the polarization axis or transmission axis of the filter
   c. parallel to the ceiling or the sky (if the source of light is on the ceiling or in the sky)
   d. always horizontal, regardless of what the light source is

5. Describe the result of shining light through two polarizing filters whose transmission axes are parallel to each other. Describe the intensity and the orientation of the emerging light.



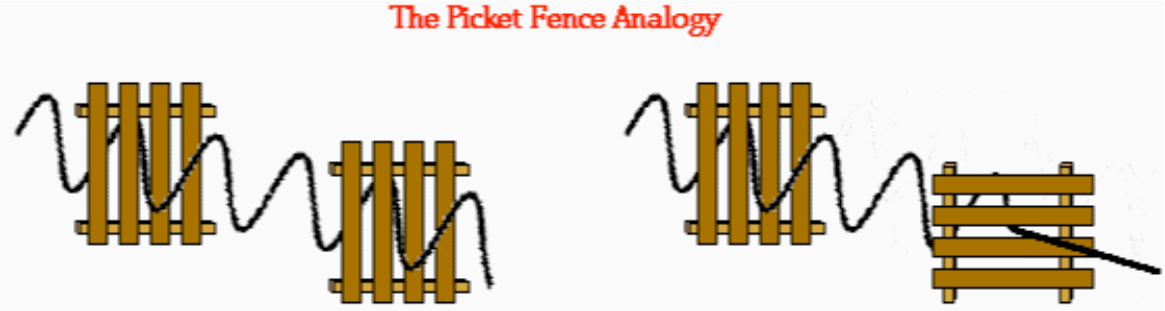
6. Describe the result of shining light through two polarizing filters whose transmission axes are perpendicular to each other. Describe the intensity and the orientation of the emerging light.



7. Passing light through a Polaroid filter is not the only way that unpolarized light can be polarized. Light is also polarized when it reflects off non-metallic surfaces. When light reflects off nonmetallic surfaces such as glass, water, or a road surface, the light is partly polarized. The reflected light consists of waves that are vibrating mostly _____ to the reflecting surface.
   a. parallel b. perpendicular

8. Carson Busses is driving down the road on a sunny day. Reflection of light off the road surface results in a large amount of polarization and a subsequent glare. Annoyed by the glare, Carson pulls out his Polaroid sunglasses. How must the axes of polarization be oriented in order to block the glare? (Note: the lines on the filters below represent the axis of polarization.)

9. The *picket fence analogy* is often used to explain observations such as that in questions #5 and #6. Use the picket fence analogy to explain your answers to questions #5 and #6. Make reference to the diagrams below in your explanations.



10. Another application of polarizing filters is in the production and viewing of three-dimensional movies. The goal of the production and viewing process is to present a scene from the movie in such a manner that it is perceived in three dimensions despite the fact that it is projected onto a flat, two-dimensional screen. Normal 3-D perception of the world is the result of viewing it with two eyes located is slightly different positions. This *stereoscopic vision* can be reproduced in film if the scene of a movie is filmed with two different cameras slightly offset from each other. Once filmed, the two movies are projected onto a flat metallic screen in the theater. Those viewing the film then watch the two movies through Polaroid glasses. To create the perception of the three dimensions, one eye must view one of the movies and the other eye must view the other movie. This is done using Polaroid filters. Each movie is projected through a Polaroid filter onto the screen. The transmission axes of the filters are perpendicular to each other. The viewers wear Polaroid filters over each eye but the transmission axes of the glasses are perpendicular to each other. Thus, one eye sees one of the projected movies and the other eye sees the other projected movie. As a result, the scene of the movie is perceived as three-dimensional.