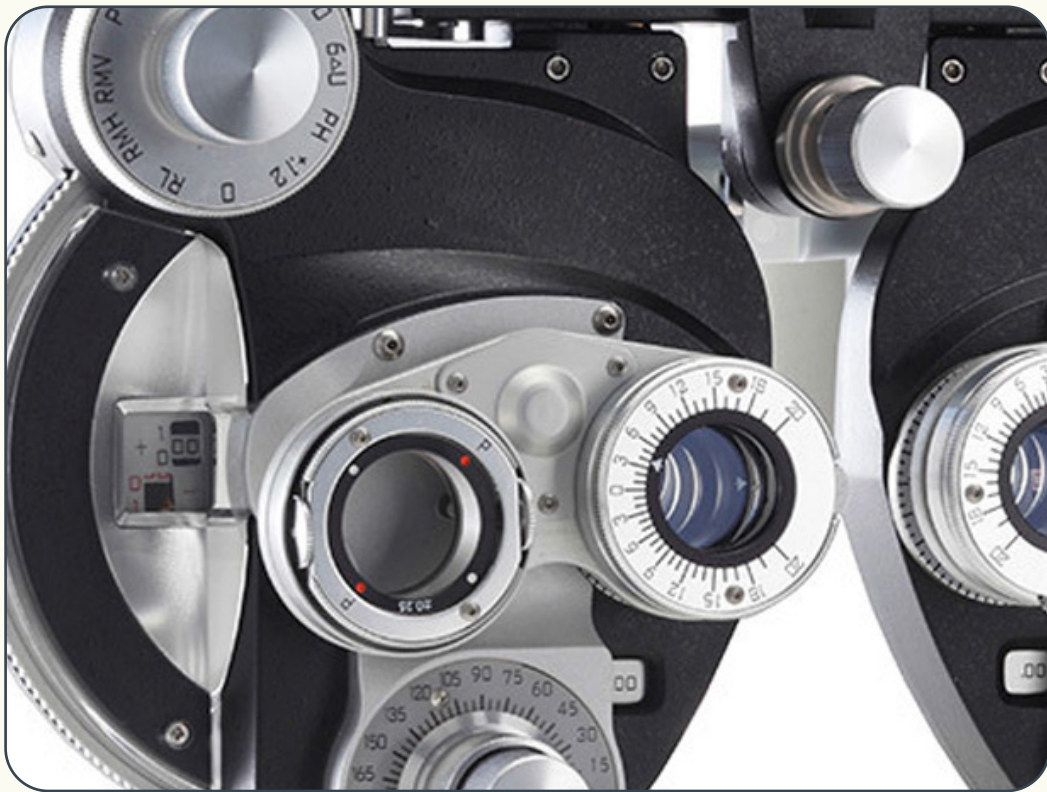


Lenses



Lenses

**Do you need an idea for a scientific study?
Try out one of our ideas or make one of your own.**

Lenses are optical devices found in eyeglass, telescopes, and microscopes. Take the following brief quiz to see how much you already know about lenses. See the bottom of page 4 to check your answers.

1. Who is credited with designing the first contact lens?
 - a. Plato
 - b. Archimedes
 - c. Aristotle
 - d. da Vinci
2. About how many people worldwide currently wear contact lenses?
 - a. 125,000
 - b. 1,250,000
 - c. 12,500,000
 - d. 125,000,000
3. More females wear contact lenses than males.
 - a. true
 - b. false
4. During the 15th century, eyeglass frames were commonly made of all these materials *except*:
 - a. wood.
 - b. animal horns.
 - c. metal.
 - d. tortoise shells.
5. About what percentage of the United States population wears corrective eyewear?
 - a. 10%
 - b. 25%
 - c. 50%
 - d. 75%



Magic Water!

Water has many unusual properties, such as a high specific heat, its liquid phase is denser than its solid phase, and it dissolves many substances. But is water magic? Can water change the color of an object that is not in the water? Get started now to see if water can make objects change direction and color.

Materials

1 piece 8" by 8" of white cardstock
2 different color markers

1 clear glass or jar
water

Procedure

1. Draw two thick vertical lines about 4 inches long, one of each color on one side of the cardstock.
2. Draw two horizontal arrows about 4 inches long, one in each direction on the other side of the cardstock.
3. Place the cardstock with the vertical lines against a wall on a flat surface such as the kitchen counter.
4. Place the jar or glass about 6 inches in front of the cardstock on the counter.
5. Position your head so you can see the vertical lines by looking through the clear jar.
6. In Table 1 below, describe your observations.
7. Slowly pour water into the jar as you continue observing the vertical lines until the jar is filled with water.
8. In Table 1 below, describe your observations.
9. Empty the jar of the water.
10. Flip the cardstock over so the horizontal arrows are visible through the jar.
11. In Table 1 below, describe your observations.
12. Slowly pour water into the jar as you continue observing the horizontal arrows until the jar is filled with water.
13. In Table 1 below, describe your observations.

Table 1. Observations

| Experiment | Observations |
|---------------------------------|--------------|
| Vertical lines with no water | |
| Vertical lines with water | |
| Horizontal arrows with no water | |
| Horizontal arrows with water | |

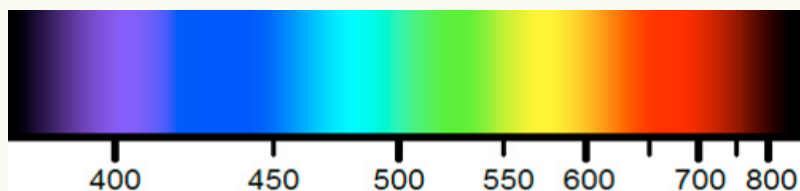
Questions

1. Propose a reason for what happened when the water was added to the jar when viewing the vertical lines.
2. Propose a reason for what happened when the water was added to the jar when viewing the horizontal arrows.

Lenses

Making Rainbows

Visible light is a form of electromagnetic waves that make up a part of the total electromagnetic spectrum. Visible light has wavelengths between 400 to 700 nanometers. Red light has the longest wavelength while violet light has the shortest in the visible spectrum.



A medium's refractive index is inversely proportional to the wavelength of the light. So red light that has a longer wavelength than blue light has a refractive index in a medium that is smaller than the blue light. This means that blue light travels slower through the medium than red light and is bent at a greater angle as it moves through the medium.

Water has a different refractive index than air. When the white light from the sun moving through air strikes a droplet of water the speed of the light slows down. This causes the light rays to change directions and bend according to their colors. The slower moving wavelengths bend to a greater degree than the faster moving colors. This separates the white light into the various colors of the rainbow. So, the next time you see a rainbow in the sky, think of refractive indexes, wavelengths of light, and colors. Or, just enjoy this beautiful work of nature.



Please visit our site for more helpful information:
STEMsims.com

Answers: Page 2 Answers: (1) d, (2) d, (3) a, (4) c, (5) c. Page 3 Answers: Magic Water: (1) The jar acted as a lens and reversed the images. (2) The jar acted as a lens and reversed the images. In both cases, the round outside of the glass changes the water into a rounded shape, which acts as a convex lens. This lens bends the incoming light towards the middle. Here, the light rays meet at the focal point. Past the focal point, the image is inverted because the light rays overlap.

© 2022 STEM Sims. All rights reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable, and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent or other industrial or intellectual property rights.