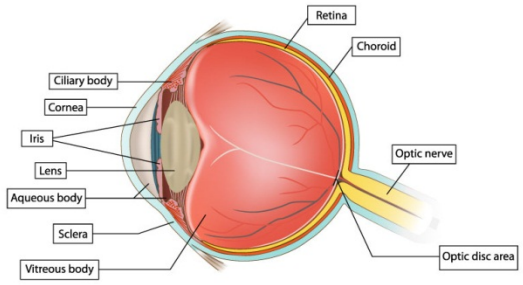
Student Worksheet for Eyeballs

Overview: We are going to make an eyeball model using a balloon. This experiment should give you a better idea of how your eyes work. The way your brain actually sees things is still a mystery, but using the balloon we can get a good working model of how light gets to your brain.



What to Learn: The balloon itself is the white part of your eye (sclera), which is a protein coating that holds the whole sphere together. The plastic lens we're going to insert into the throat of the balloon is the lens in your eye. The stretched rubber is the ciliary muscles, which are also a part of the iris, and this controls how much light enters your eye. The back interior of the balloon, where the image is going to appear, is your retina. The retina is where you'll find the cones and rods that send the light information to your brain.

When the balloon is focused on the candle, this is your normal vision. When you squish the balloon from the top, the image becomes distorted and the focal point of the lens places the image in front of the retina (making the image blurry). This is a condition called nearsightedness. Farsightedness is when you squish the balloon together to make it taller, and the image actually focuses beyond the back of the eye.

Materials:

- biconvex plastic lens
- round balloon, white, 9 inches
- assistant
- votive candle
- black marker
- book of matches
- metric ruler
- **Adult Supervision!**

Lab Time:

1. Blow up the balloon until it is about the size of a melon.
2. Hold the neck of the balloon closed to keep the air in while you insert the lens into the opening. The lens will need to be inserted perpendicular to the balloon's neck. It will prevent any air from escaping once it's in place. Like your eye, light will enter through the lens and travel toward the back of the balloon.
3. Hold the balloon so that the lens is pointing toward you. Take the lens between your thumb and index finger. Look into the lens into the balloon. You should have a clear view of the inside. Start to twist the balloon a little and notice that the neck gets smaller like your pupils do when exposed to light. Practice opening and closing the balloon's "pupil."
4. Have an adult help you put the candle on the table and light it. Turn out the lights.
5. Put the balloon about 20 to 30 centimeters away from the candle with the lens pointed toward it. The balloon should be between you and the candle. You should see a projection of the candle's flame on the back of the balloon's surface. Move the balloon back and forth in order to better focus the image on the back of the balloon and then proceed with data collection.

6. Describe the image you see on the back of the balloon. How is it different from the flame you see with your eyes? Draw a picture of how the flame looks here:

7. The focal length is the distance from the flame to the image on the balloon. Measure this distance and record it here:

   _____ (units?)

8. What happens if you lightly push down on the top of the balloon? How does this affect the image?

   _____

9. To approximate a farsighted eye, gently push in the front and back of the balloon to make it taller. How does this change what you see?

   _____

Questions:

1. How can you tell if a lens is double convex?

2. How can you change the balloon to make it like a near-sighted eye?

3. How can you change the balloon to make it like a far-sighted eye?