

# Eye Balloon

**Overview:** In this lab, 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:** We see objects when light traveling from an object enters our eye.

## Materials

- biconvex plastic lens
- round balloon, white, 9 inches
- assistant
- votive candle
- black marker
- book of matches
- ruler

## Experiment

1. Blow up the balloon until it is about the size of a grapefruit. If it's difficult to inflate, stretch the material a few times or ask an adult to help you.
2. You will need an extra set of hands for this portion. Ask your partner to 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.
7. The focal length is the distance from the flame to the image on the balloon. Measure this distance and record it.
8. What happens if you lightly push down on the top of the balloon? Does this affect the image? You are experimenting with the affect caused by near-sightedness.
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?

## Eye Balloon Data Table

Draw a picture of how the flame looks to you.	
Record the focal length from flame to the image.	
What happens to the image when you push down on the top of the balloon?	
What do you see when you push on the front and back of the balloon to make it taller?	

### Reading

First, we'll discuss the parts of the balloon that relate to parts of your eye. The white portion of the balloon represents your sclera, which you may have already guessed is also the white part of your eye. It is actually a coating made of protein that covers the various muscles in your eye and holds everything together.

Of course, the lens you inserted represents the actual lens in your eye. The muscles surrounding the lens are called ciliary muscles and they are represented by the rubber neck of your balloon. The ciliary muscles help to control the amount of light entering your eyes. The retina is in the back of your eye, which is represented by the inside back of your balloon. The retina supports your rods and cones. They collect information about light and color and send it to your brain.

There are no light receptors in the area of your eye where the optic nerve attaches to your eyeball. This is your blind spot and if an image is in this spot, the light reflected off of it doesn't get perceived by your eye.

This is a fun experiment to play with using different ages of people. As folks get older, the shape of the eye changes and the blind spot can actually change. Ask a few fellow adults to help you demonstrate the lab and measure the distance for the blind spot based on how old the adults are. You can also test to see if different people with

different vision have different blind spots. For example, is the blind spot the same for someone with 20/20 versus 20/40? Or with or without eyeglasses? Have fun with the different variations!

### **Exercises**

1. How does your eye work like a camera?
2. How can you tell if a lens is double convex?
3. What is the difference between convex and concave?
4. Can you give an example of an everyday object that has both a convex and a concave side?
5. How can you change the balloon to make it like a near-sighted eye?
6. How can you change the balloon to make it like a far-sighted eye?

### **Answers to Exercises: Eye Balloon**

1. How does your eye work like a camera? (Both have lenses, both produce images with lots of components working together.)
2. How can you tell if a lens is double convex? (When you run your fingers across it, you feel two bumps on each side.)
3. What is the difference between convex and concave? (A concave surface curves inward, while a convex surface bulges out.)
4. Can you give an example of an everyday object that has both a convex and a concave side? (spoon)
5. How can you change the balloon to make it near-sighted? (lightly push down on the top)
6. How can you change the balloon to make it far-sighted? (gently push in front and back of the balloon to make it taller)