



PASCO Optics
Adjustable Focal Length Lens
OS-8494



Included Equipment	Quantity
1. Adjustable Focal Length Lens	2
2. Tubing, 5 mm O.D.	30 cm
3. 10 mL Syringe	1

Related Equipment

- Human Eye Model (OS-8477)
- Eye Model Bracket (OS-8469)
- Adjustable Lens Holder* (OS-8474)
- Basic Optics Light Source* (OS-8470)
- Basic Optics Bench*, 60 cm (OS-8541)
- Basic Optics Viewing Screen* (OS-8460)

*Part of Basic Optics System, OS-8515A

See www.pasco.com for other PASCO Optics System equipment.

Introduction

The Adjustable Focal Length Lens includes two lenses, a length of plastic tubing, and a 10 milliliter (mL) syringe. Each lens consists of a plastic housing with two flexible membranes held onto the housing with removable rings. Use the syringe to fill the lens with a fluid such as water and to increase or decrease the amount of fluid between the two flexible membranes. By adjusting the curvature of the membranes, you can adjust the focal length of the lens.

The Adjustable Focal Length Lens is designed to be used with the PASCO Human Eye Model (OS-8477) to demonstrate *accomodation*, the ability of the eye's crystalline lens to change its focal length. It can also be used with components of the PASCO Basic Optics System (OS-8515A) such as the Light Source, Optics Bench, Viewing Screen, and Adjustable Lens Holder.

Assembly and Maintenance

Cut a length of tubing about 15 cm (6 inch) long. Adjust the syringe so that the piston is beyond the midpoint of the cylinder. Attach the piece of plastic tubing to the 10 mL syringe and the connector on the edge of the lens housing (see Figure 1).

NOTE: Avoid touching the surface of the flexible membranes. If you need to clean the membrane's surface, use a soft, lint-free cloth moistened with water.

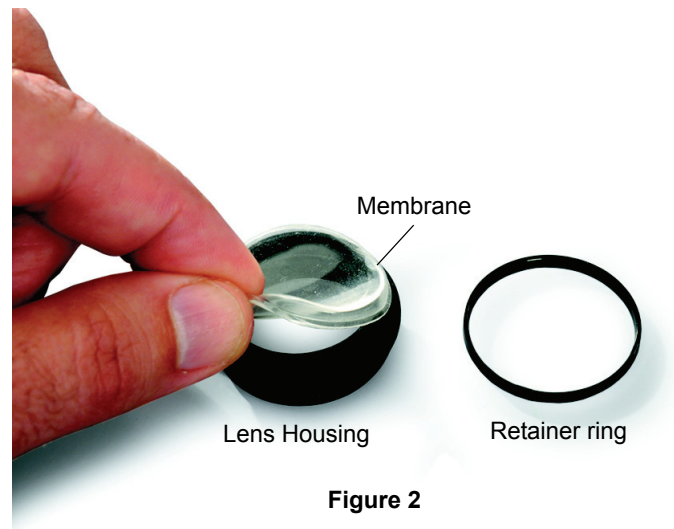
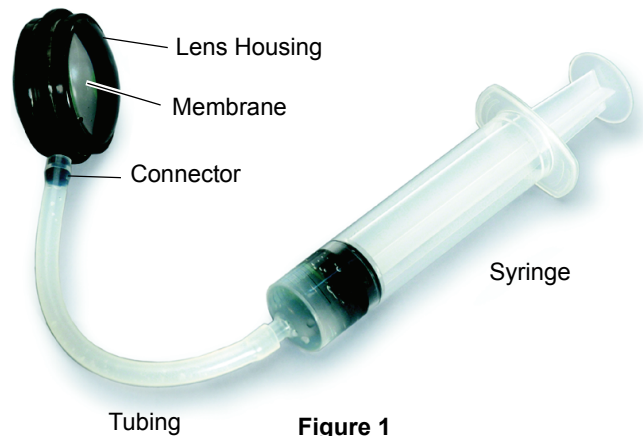
To remove a membrane for cleaning, carefully remove the retainer ring that holds the membrane in place and lift the membrane off the lens housing holding just the edges of the membrane (see Figure 2).

Put the clean membrane on the edge of the lens housing so that some of the membrane material extends over the edge. Be sure to center the membrane on the lens housing. Carefully press the retainer ring over the membrane and onto the lens housing (see Figure 2).

Filling the Lens

Fill the lens housing with a fluid such as water (or corn syrup) before using it with the Human Eye Model or the Basic Optics components. To fill the lens housing with a fluid, use differences in pressure to allow the fluid to fill the lens. Start with the lens housing and syringe connected to the plastic tubing as in Figure 1.

- Disconnect the syringe from the plastic tubing.
- To fill the syringe, push the piston all the way into the cylinder. Put the end of the syringe into the fluid and slowly pull the piston outward so that the fluid is forced up into the cylinder. Stop when the fluid level is at the midpoint of the cylinder.
- Re-attach the plastic tubing to the syringe. Hold the syringe vertically so the lens holder hangs down from the end of the tubing.
- DO NOT force the liquid from the syringe into the lens holder. Instead, slowly pull the piston out so that air from inside the lens holder bubbles up through the liquid in the cylinder. The fluid should begin moving drop-by-drop into the lens.
- When the piston is almost to the end of the cylinder, start pushing it back into the cylinder so that fluid moves from the cylinder into the lens housing.
- Repeat the process until the lens holder is filled with fluid and there are no air bubbles in the lens.
- After the lens holder is filled, make sure that the tubing is also filled with fluid. Refill the syringe until it is about one-quarter full and reconnect it to the syringe.



Use with the Human Eye Model

Set the Basic Optics Light Source about 5 to 10 cm in front of the Human Eye Model with the “crossed-arrow” target aligned with the opening in the front of the model. Place the retina viewing screen in the “NORMAL” groove.

Make sure that the lens is filled with a fluid such as water. Place the Adjustable Focal Length Lens inside the Human Eye Model in the lens holder groove labeled “SEPTUM” (see Figure 3).

Push the piston into the syringe to increase the amount of fluid inside the lens housing and change the curvature of the flexible membranes.

Observe the image of the crossed-arrow target on the retina viewing screen.

CAUTION: Do not push the piston too hard because the membrane may come loose.

Use with Basic Optics Components.

Mount the Basic Optics Viewing Screen near the middle of the Basic Optics Bench. Adjust the two lower fingers of the Adjustable Lens Holder to the “35” millimeter mark. Make sure that the lens is filled with a fluid such as water. Place the Adjustable Focal Length Lens onto the grooves at the ends of the two lower fingers and then adjust the third finger so it holds the lens in place (see Figure 4).

Mount the Basic Optics Light Source near the end of the bench. Mount the Adjustable Lens Holder near the light source

Push the piston into the syringe to increase the pressure inside the lens housing and change the curvature of the flexible membranes. Adjust the position of the lens holder and viewing screen so the image of the target is in focus on the viewing screen.

Observe the image of the crossed-arrow target on the Basic Optics Viewing Screen. Use the syringe to adjust the curvature of the lens membranes and observe the change in the image.

Suggestion

Use the Adjustable Focal Length Lens with the Human Eye Model, but fill the lens with air and fill the eye model with water. Make the level of the water in the eye model high enough to cover the Adjustable Focal Length Lens. Use the setup to explore the behavior of light through a “negative” lens.

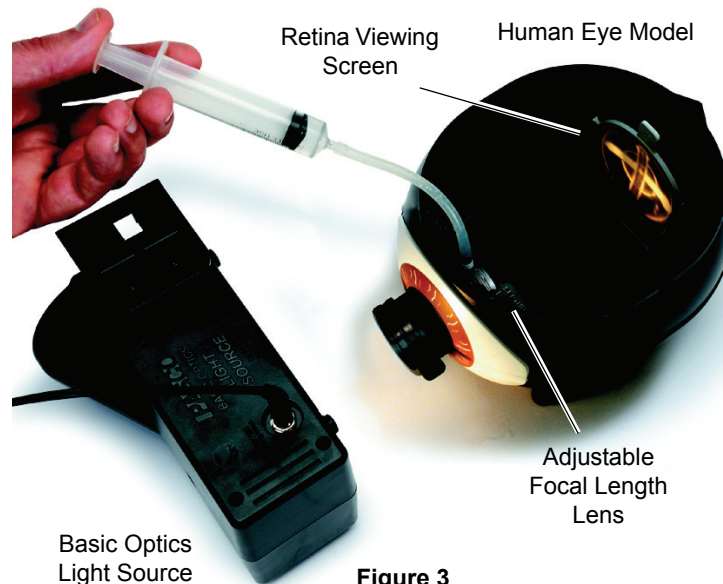


Figure 3

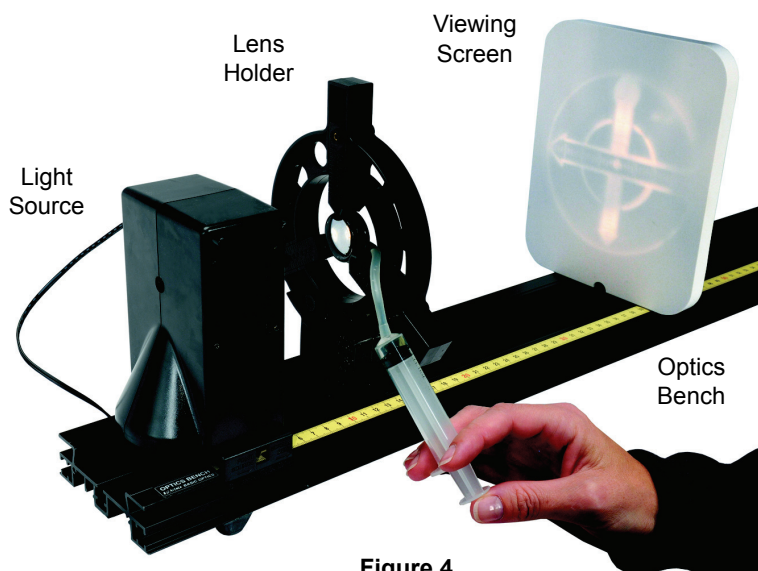


Figure 4

Technical Support

For assistance with any PASCO product, contact PASCO at:

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