

# pH and Solutions



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

**“This shampoo is pH balanced and worth the extra \$3 compared to your regular shampoo.” Is this a true statement or more advertising fluff? Take the following brief quiz to see how much you already know about pH. See the bottom of page 4 to check your answers.**

1. What is the pH of most soaps and shampoos?
  - a. 1.0
  - b. 4.0
  - c. 7.0
  - d. 9.0
2. What is the pH of the fluid in most people’s eyes?
  - a. 1.0
  - b. 4.0
  - c. 7.0
  - d. 9.0
3. In 2018, about how many students and teachers in the United States were injured in science laboratories conducting experiments or demonstrations?
  - a. 10
  - b. 44
  - c. 164
  - d. 10,444
4. According to the U.S. Department of Labor, about how many eye injuries occur each day in the workplace?
  - a. 100
  - b. 1,000
  - c. 10,000
  - d. 100,000
5. What percent of the eye injuries that occur in the workplace could have been prevented if appropriate safety glass had been worn by the worker?
  - a. 25%
  - b. 50%
  - c. 75%
  - d. 90%



# The Eyes Have It!

How many times has your science teacher told you to keep your safety glasses on at all times in the science laboratory? The reason is for your own protection and not just so your teacher can hear her or his voice. In this experiment, you'll see the effects of an acid on a material like the fluid in your eyes.

1 – small clear drinking glass  
1 mL white vinegar

**Materials**  
1 – raw egg  
1- pair scissors  
safety glasses

1 – dropper  
1 – plain sheet of paper

## Procedure

1. Make sure that you get permission before conducting this experiment.
2. Make sure to wash your hands thoroughly with soap and warm water when handling raw eggs.
3. Place your safety glasses on your eyes!
4. Trace the eye in Figure 1 onto a plain sheet of paper.
5. Use the scissors to cut out the eye drawing.
6. Place the eye drawing underneath the clear glass.
7. Carefully break the raw egg and place the egg white only (not the yolk) in the clear drinking glass.
8. Note and record in Table 1 the appearance of the egg white in the glass.
9. Collect about 1 mL of white vinegar using the dropper.
10. Dispense all the white vinegar in the dropper into the glass with the egg white.
11. Let the solution in the glass sit for about one minute.
12. Note and record in Table 1 the appearance of the egg white in the glass.
13. Clean the glass with warm soapy water and thoroughly wash your hands and the area where you worked.

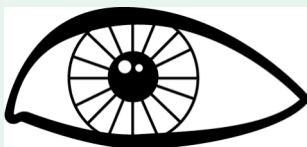


Figure1. Eye Drawing

**Table 1. Investigation Results**

Experiment	Observations
Egg white in glass	
Egg white in glass + white vinegar	

## Questions

1. Describe the changes that occurred when the vinegar was added to the glass and egg white. How does this relate to you wearing your safety glasses in the science lab?
2. Do you think the process that occurred with the egg white can be reversed? If so, how?

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## A Cornea Transplant

The cornea is the clear outer covering of the eye that serves as a proactive layer for the structures inside the eye. The cornea also helps focus light rays on the retina to provide clear images. Damage to the cornea can occur due to disease or traumas, such as accidents with acids and bases.

A cornea transplant is a surgical operation that removes parts or the entire cornea. The cornea is replaced by the healthy cornea of a human donor. This replacement surgery typically costs between \$13,000 to 27,000. The surgery is most often successful at improving the patient's sight, as well as relieving pain associated with the initial eye injury.

There are risks related to having the surgery. These risks include some serious complications such as eye infections, bleeding, glaucoma, rejection of the donor's cornea, and detached retina. Although these risks are typically small, as with all surgeries benefits must be compared to the possible side effects.

Donor corneas are secured from people who have died and signed up to have their corneas donated. Potential donors are screened for eye diseases and for previous eye surgeries that may have damaged their corneas. No tissue matching is required for corneal transplants, unlike donating organs such as kidneys or hearts. Because of this, many donor corneas are available, reducing the wait-list time for patients requiring a cornea transplant.



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In the case of the egg white/vinegar and can be with your eyes.

**Answers:** Page 2 Answers: (1) d, (2) c, (3) c, (4) b, (5) d. Page 3 Answers: The Eyes Have It! (1) The clear egg white became cloudy. A similar experience with an acid can damage your eye's cornea just like the egg white was damaged. (2) This process cannot be reversed. The damage is permanent.

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