

# Enzymes as Tools



Enzymes are proteins that act as catalysts in the production of chemicals needed by cells. Catalysts increase the rate at which chemical reactions go to equilibrium, but they are not consumed in the reactions themselves. While enzymes are important in the life of a cell, they can also be used to do work for us. Many difficult-to-remove fabric stains are composed primarily of proteins. Protein stains are not always easy to get out using surfactants, like sodium dodecyl sulphate (SDS). Instead, proteolytic enzymes in detergents break up proteins, making protein stains easier to remove from fabrics.

**QUESTION:** What is the work of enzymes?

**MATERIALS:**

beaker (100 mL) - 4	hard-boiled egg
detergent containing enzymes	kitchen knife
detergent that lacks enzymes	water

**PROCEDURE:**

1. Peel a hard-boiled egg and cut it into four pieces, all about the same size.
2. Discard the yolk.
3. Label the 4 beakers:  
Beaker 1 - water only  
Beaker 2 - water + detergent with enzyme  
Beaker 3 - water + detergent without enzyme  
Beaker 4 - water + **your choice, see Step 7**
4. Add 100 ml of water to each labeled beaker.
5. Add 2 mL of detergent with enzyme to beaker 2.
6. Add 2 mL of detergent without enzyme to beaker 3.
7. What you add to beaker 4 is up to you. You may want to try a different concentration of detergent, or a mixture of both detergents. Be as creative as you can be within the very narrow constraints of this exercise.
8. Place 1/4 of the egg white into each beaker.
9. Now let the beakers stand at room temperature for 2 days.
10. After 2 days, describe the appearance of the egg white in each beaker. Be sure your observations are thorough and accurate. Record your observations in the Data Section.

**DATA:** See next page

## PS – Activity #9

Data Table

VARIABLE	OBSERVATION
Beaker 1	
Beaker 2	
Beaker 3	
Beaker 4	

### QUESTIONS:

1. What is the hypothesis you are testing in this experiment?
2. Which beaker/s acted as controls in this experiment?
3. Did the enzymes present in the enzyme-containing detergent make a difference to the egg white?
4. Do the results of this experiment prove that enzyme-containing detergents are better at cleaning fabrics than regular detergents? Explain.
5. Would you want to use a proteolytic, enzyme-containing detergent on silk fabric? Why or why not?
6. What other uses might there be for proteolytic enzymes?
7. Why do cells make proteolytic enzymes?