

Trick or Treat? Enzyme Lab: Halloween Edition

Part 1: Catalase

Potato and other living tissues contain the enzyme catalase. This enzyme breaks down hydrogen peroxide (H_2O_2), which is a harmful by-product of the process of cellular respiration. If we use potato or other tissue containing this enzyme, we can use this to measure the relative influence of varying several different factors on the activity of enzymes in living tissue.

Problem: What are the effects of temperature on enzyme activity?

Hypothesis: Make a hypothesis as to how changing reaction temperatures will change the rate of an enzyme controlled reaction.

Materials: 100 mL graduated cylinder, one beaker, 2 test tubes, 15 mL of 1% H_2O_2 , hot plate, tapwater, test tube rack, potato, and labeling pencil.

Procedure:

1. Place one or two approximately 1 cm chunks of potato in the bottom of two different test tubes.
2. Cover the potato in the test tube with tap water.
3. Place each test tube individually in a different environment for 5 minutes. Keep the first test tube at room temperature, while placing the second in a boiling water bath. Caution: HOT WATER CAN BURN YOU BADLY!!!!
4. Add 5 ML of hydrogen peroxide to the potato in each tube and record the relative amount of bubbling you see.

Results:

| Test Tube Temperature | Relative Amount of Bubbling (Reaction) |
|-----------------------|--|
| | |
| | |

Conclusion:

1. Did your results support your hypothesis? Explain
2. Explain the influence of temperatures in excess of 50 C (like our boiling water) on the influence of most enzyme controlled reactions. Explain why this occurs.
3. What does the term denature mean?
4. Most enzymes in living systems function optimally at a temperature of 37 C. Did the results of your lab support these observations? Explain why or why not completely.
5. List and explain at least two possible sources of error in this lab activity.
6. Identify the control group, independent variable, and dependent variable in this investigation.

Notes:

1. The suffix “-ase” means enzyme. Which macromolecule (proteins, lipids, or carbohydrates) do you think the following enzymes break down? **Hint:** Look at the prefixes & then use process of elimination!

lipase= _____ amylase= _____ protease= _____

Use your 2.5 Reading Guide for the following questions:

2. **Enzymes** are _____ for chemical reactions in _____.
a. Which enzyme did you observed in the potato lab? _____
b. Enzymes are made primarily of which macromolecule? _____
c. What do catalysts do in a chemical reaction?
3. **Substrates** are the specific reactants that an _____ acts upon.
a. What was the substrate in the potato lab? _____
4. Write a chemical equation for the reaction that occurred in the potato lab.
a. What were the reactants? _____
b. What was/were the product(s)? _____
c. Now put it all together in a chemical equation in the space below:
Reactants → Products
→

Part 11: Jell-O Lab

Note: Meat tenderizer contains an enzyme called bromelain and the gelatin in Jell-O contains a protein called collagen.

Connection: Where can you find collagen in your body? _____

| Jell-O Treatment | Observations |
|------------------|--------------|
| | |
| | |
| | |
| | |

1. What similarities or differences did you observations between the treatment with the boiled pineapple juice and the treatment with the pineapple pieces? What phase was the Jell-O in for both treatments?
2. If they both had pineapple juice in the Jell-O, what could have caused any differences you observed?

Jell-O Lab Part II: Cover all surfaces of a piece Jell-O with meat tenderizer and record your observations over the class period. Compare that to a piece of Jell-O that remains untreated.

| Jell-O Untreated | Jell-O with Meat Tenderizer |
|------------------|-----------------------------|
| | |

3. The enzyme you observed in part II of the Jell-O lab was: _____
4. The substrate in the Jell-O lab was: _____
5. Besides for sanitary purposes, why would people working with processing and cutting large amounts of pineapples have to wear gloves?

6. Animation Notes:

(http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter2/animation__how_enzymes_work.htm)

- a. Enzymes _____ chemical reactions in the cell.
- b. An enzyme works by binding to one more specific molecules called the _____ or **substrates**.
- c. Binding occurs at the _____ site.
- d. The interactions between the _____ and the **enzyme** stresses or weakens some of the chemical _____ in the **substrate**.
- e. As a result of the chemical interactions within the active site, a new _____ is formed.
- f. The product is released from the active site, the enzyme assumes its _____ shape and is free to _____ again.

Finally – Some food for thought (PUN INTENDED): What enzymes do you think your body will use to break down this yummy Twix bar from Ms. Choi & Ms. Beggs? ☺

Happy Halloween! Be Safe T'night!