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|  | <h2 style="margin: 0;">Enzyme Lab Part 1&2: Effects of Temperature & pH</h2>  | TOTTEN SCIENCE |
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Credit for this lab to Mr. Buckley, Edwards-Knox Central School

Part I: 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.

If _____, then _____.

Background information

Potato and other living tissues contain the enzyme catalase. This enzyme breaks down hydrogen peroxide, which is a harmful by-product of the process of cellular respiration if it builds up in concentration in the cells. 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.

Materials: (per student group)

100 ml or other graduated cylinder, one beaker, 2 test tubes, 15 ml of 1% H₂O₂, hot plate, water, test tube rack, potato, and labeling pencil

Procedure:

1. Place one or two approximately 1 cm³ chunks of potato in the bottom of two different test tubes.
2. Just 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 badly!!!
4. Add 5 ml of hydrogen peroxide to the potato in each tube and record the relative amount of bubbling you see in each

Results:

Enzyme Activity at Different Temperatures

| Test Tube Temperature | Description of Bubbling / Other Observations |
|-----------------------|--|
| | |
| | |

Conclusion: Complete sentences on separate loose leaf paper

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. In class we learned that most enzymes in living systems function optimally at a temperature of 37 C. Did the results of our 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, independent variable, and dependent variable in this investigation and explain why you identified each as this.

Part II Problem: What are the effects of pH on enzyme activity?

Hypothesis: Make a hypothesis as to placing an enzyme in acidic environment will change the rate of an enzyme controlled reaction

If _____, then _____.

Background information

Potato and other living tissues contain the enzyme **catalase**. This enzyme **breaks down hydrogen peroxide**, which is **a harmful by-product of the process of cellular respiration** if it builds up in concentration in the cells. 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.

Materials: (per student group)

100 ml or other graduated cylinder, 2 test tubes, 15 ml of 1% H₂O₂ (Hydrogen peroxide), vinegar as an acidic solution, water, test tube rack, potato, and labeling pencil, pH (Hydriion) paper

Procedure:

1. Place one or two 1 cm³ chunks of potato in the bottom of two different test tubes.
2. Place 5 ml of an acid solution on the potato in the first test tube which you will label acid and 5 ml of water on the potato in the second test tube you will label water.
3. Add 5-7 ml of hydrogen peroxide to the solution in each tube and record the relative amount of bubbling you see in each.

Results

Enzyme Activity at Different Temperatures

| Test Tube pH level | Description of Relative Bubbling / Other Observations |
|--------------------|---|
| | |
| | |

Conclusion: Complete Sentences on Separate loose leaf paper

1. Did your results support your hypothesis? Explain your answer using observations
2. Explain why you believe you observed the results you observed. Terms such as optimum conditions and denature should be included in your explanation.
3. In class we learned that most enzymes in living systems function optimally at a pH of 7.0. Did the results of our lab support these observations? Explain why or why not this idea is supported.
4. List and explain at least two possible sources of error in this lab activity.
5. Identify the control, independent variable, and dependent variable in this investigation and explain why you identified each as this.