****Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_

**Virtual Lab: Enzyme-Controlled Reactions**

***Directions:*** *Type in the following link:*

*http://www.mhhe.com/biosci/genbio/virtual\_labs/BL\_11/BL\_11.html. This will take you to the McGraw Hill virtual enzyme catalysis lab. Follow the directions given below to navigate the website.*

**Pre-Lab:**

1) On the left side of the screen, you will see the purpose and objectives of the experiment. Record the purpose and objectives IN YOUR OWN WORDS in the space below:

Purpose: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Objectives:

A. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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B. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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2) Click the Information button at the bottom of the page. Take a couple minutes to read through some basic information about enzyme action.

You will be testing the effects of pH on the speed of reaction. Change the pH values for test tubes 1-5 to those given below:

Test Tube 1 = pH 3

Test Tube 2 = pH 5

Test Tube 3 = pH 7

Test Tube 4 = pH 9

Test Tube 5 = pH 11

**In this experiment, we will keep the amount of substrate constant. Use an intermediate value (2.0 grams of substrate) for each test tube.**

**\*\*The enzyme is lactase, the substrate is lactose. The test tubes already contain the enzyme lactase.**

3) State a hypothesis for this trial in “If… then…because” format.

IV = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

DV = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4) Why are we keeping the substrate constant for this trial?

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5) Click on the computer screen to see the results of the experiment. Complete the data table below to record your results

**Title \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |  |  |
| --- | --- | --- |
|  | **pH** | **Number of Molecules of Product Formed per Minute** |
| **Test Tube 1** | 3 |  |
| **Test Tube 2** | 5 |  |
| **Test Tube 3** | 7 |  |
| **Test Tube 4** | 9 |  |
| **Test Tube 5** | 11 |  |

**6) Use the graph paper provided by your teacher to graph the results of shown in the table above. You should create a line graph with your independent variable on the x-axis and your dependent variable on the y-axis. You must include a title and labeled axes (with units and proper scale). Type your name under the title.**

7) Discuss the results from this trial in the space below. Do the results support or refute your hypothesis? Support with data.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Post-Lab Question**

8) What does your data indicate about the optimum pH level for this enzyme catalyzed reaction?

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9) What happens to enzyme structure when there is a drastic change in pH?

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10) Enzymes function most efficiently at the temperature of a typical cell, which is 37 degrees Celsius. Increases or decreases in temperature can significantly lower the reaction rate. What does this suggest about the importance of temperature regulating mechanisms in organisms? Explain.

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**Tips for Writing a Procedure for a Science Experiment**

1. Use numbered list of steps.

2. Organize steps in small, concise directions in the order you would do them in the lab.

3. Avoid using personal pronouns (I, he/she, you, we)

4. Use commands such as “Measure 50ml of water in a 50ml graduated cylinder”, including quantities in the description and what type of equipment was used.

5. Include all the steps, no matter how small they may seem, such as “Label beaker A – lactose”

6. A control group is included when necessary

7. If trials are conducted, your procedure should reflect the number of trials conducted.

8. If you are repeating the steps, except for changing the independent variable, you should write a step in the procedure such as “repeat steps 2 – 5, except use a pH of 5”

9. Make sure you include enough information so someone can replicate it exactly.

10. Have someone else proof read, like your parents, to see if they understand the steps.

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