

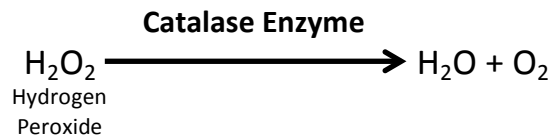
Name: _____ Period: _____

Lab 5: Environmental Effects on Enzyme Activity

Intro:

Enzymes are biological catalysts that speed up the rates of biochemical reactions necessary to support life. Enzymes accomplish this by lowering the activation energy of a reaction. In this lab, you will investigate the effects of temperature, pH, and reactant amount on the yeast enzyme catalase. You will measure the reaction rate or activity of the catalase enzyme in the reaction (written below) and observe how your assigned environmental factor impacts the reaction rate.

Catalase Reaction:



Lab Group Assignments:

Groups 1, 4, 7 Temperature

Groups 2, 5, 8 pH

Groups 3, 6, 9 Reactant Amount

Read the Materials and Methods on the Class Handouts!

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Part A:

Pre-Lab Questions:

1. For the chemical reaction for the catalase reaction, give the following:

Reactant(s): _____

Product(s): _____

2. Give the three environmental factors that can have an effect on the reaction rate or activity of an enzyme:

A. _____

B. _____

C. _____

3. Given your assigned environmental factor or effect, write an IF THEN BECAUSE hypothesis. Think: in which environment do you think the catalase enzyme will function best or have the highest reaction rate?

4. Identify the following variables for your experiment:

A. Independent variable: _____

B. Dependent variable: _____

C. At least five controlled variables: _____

Data Collection:

(Note: you will be discussing with other lab groups to get the data for the rest of your table & graphs. We will do this together in class!)

		Time for Paper Dot to Rise (in seconds) (Reaction Rate)			
		Trial 1	Trial 2	Trial 3	Average
Temperature	High Temp (Actual _____ °C)				
	Room Temp (Actual _____ °C)				
	Low Temp (Actual _____ °C)				
pH	Acidic pH (Actual pH _____)				
	Neutral pH (Actual pH _____)				
	Basic pH (Actual pH _____)				
Amount of Reactant	3% Hydrogen Peroxide				
	5% Hydrogen Peroxide				
	10% Hydrogen Peroxide				

Part B:

For Part B you will create THREE **LINE** graphs each representing the results for each environmental factor or effect. For each graph you need to complete the following:

- Label the x and the y axes
- NEATLY identify the three data points (average numbers only!)
- NEATLY connect the three data points to create a line (not necessarily straight)

Graphs:

Environmental Effects on Catalase Enzyme Activity/Reaction Rate

Temperature

pH

Amount of Reactant

Conclusion:

1. In at least 3 **full** sentences, describe what happened in your experiment (hint: look at ALL your graphs!) Be thorough and thoughtful in your analysis! (You should have discussed this with your group!)

****Flip over!****

2. Choose one of the three graphs. Describe one **EXTRAPOLATION** you could make and one **INTERPOLATION** you could make given the data.

3. Given our discussion about enzymes, what do you think would happen if we did **NOT** have the catalase enzyme to breakdown hydrogen peroxide. Would it still eventually break down to water and oxygen gas? Would it take a long time? Explain your answers. Catalase enzyme is behaving as a catalyst in the reaction. Why is this important? (Hint: think about activation energy)

Part A				
Score:	1	2	3	4
Description:	Some or no questions are answered or attempted. Collected data may be difficult to follow or interpret. Questionable lab technique.	All questions are answered, may not be thorough, and at least 50% accurate. Collected data may be difficult to follow or interpret. Questionable lab technique.	All questions are answered thoroughly and at least 90% accurate. Collected data is neat and demonstrates proper lab technique.	All questions are answered thoroughly and 100% accurate. Collected data is neat and demonstrates proper lab technique.

Part B				
Score:	1	2	3	4
Description:	Most data has been completed in the tables. Graph titles do not accurately reflect variables. Data has been drawn on the graph, but may not be completely accurate compared to data table. Graph is not neat. Some or no questions attempted; not thorough.	Graph titles attempt to accurately reflect variables. Data has been drawn on the graph, but may not be completely accurate compared to data table. Graph needs some improvement in neatness. All questions attempted, may need improvement on thoroughness.	Graph titles are accurate and reflect variables, may use some slight improvements. Data has accurately been drawn on the graph. Graph is neat, but may need some slight improvements. All questions answered accurately, may need improvement on thoroughness.	All data has been completed in the tables. Graph titles are accurate and reflect variables. Data has accurately been drawn on the graph. Graph is neat and needs no improvements. All questions answered accurately and thoroughly.