

Three, Two, One... BLASTOFF!

Name: _____

The enzyme catalase speeds up the breakdown of hydrogen peroxide (H_2O_2) into water and oxygen gas (O_2). The reaction is described by the following chemical equation:



Problem:

How does the concentration of an enzyme affect the rate of a reaction? Perform a controlled experiment to **draw a conclusion about the function of enzymes.**

Materials:

- 1 seedless watermelon. Watermelon extract solution (100%) Seedless watermelon works best.
- Large knife
- Blender
- 1200 mL (32 mL/group) 3% hydrogen peroxide solution (H_2O_2)
- 5 50-mL beakers
- 4 60 X 15 mm Style Petri dish lids
- 1 90 X 15 mm (Quad separated Petri dish)
- distilled water
- filter paper disks (Fisher brand, Qualitative P8) 12 paper disks will be needed.
- forceps
- Single hole punch
- paper towels
- Stop watch, wrist watch, or clock (time piece)
- Catalase Lab Report Template (Excel File) graph

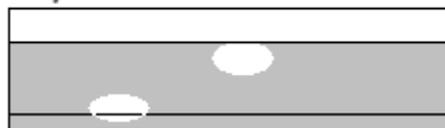
Solution	Watermelon Extract	Distilled Water
0% watermelon extract	0 mL	1000 mL
25% watermelon extract	250 mL	750 mL
50% watermelon extract	500 mL	500 mL
75% watermelon extract	750 mL	250 mL
100% watermelon extract	1000 mL	0 mL

Volumes in this table are for 60-two member lab groups.

Procedure:

1. Use the single hole punch to create 12 filter paper disks.
2. Catalase is found in watermelon extract. The negative control in our experiment will be the 0% concentration of watermelon. Since this concentration will not give any results, it will not be tested by your group. Locate the 50-mL beakers containing different concentrations of watermelon extract. (25%, 50%, 75%, & 100%) Use the plastic pipette to deposit a small amount of these four solutions of watermelon extract into the plastic Petri dish lids. Less than 2-mL of each solution will be needed.
3. Pour a small amount of extract from each of the 50-mL beakers into the Petri dish lids. Place the Petri dishes on the correct location of the Catalase Solutions Label Sheet. Pour 8 mL of the 3% H_2O_2 solution into each of the four troughs of the 90 X 15 mm (Quad separated Petri dish)
4. Using the forceps, place three filter paper disks into the Petri dishes labeled 25%, 50%, 75%, & 100% watermelon extract. Keep the disks in the solutions. There is no need to place any disks into the 0% catalase solution as this is the negative control. Remove each disk as needed.
5. Place a disk from the 25% solution on a paper towel for 4 seconds to remove any excess liquid. Be sure to remove any excess watermelon extract. This process may require turning the disk over and over or moving it back and forth with the forceps.
6. Using the forceps, transfer the filter paper disk to the bottom of one of the Petri dish lids labeled H_2O_2 . The enzyme in the watermelon catalyzes the formation of bubbles of oxygen gas, which causes the disk to rise to the surface.

Stop rising time when filter paper disk just touches the surface of the water.



Procedure: (continued)

7. Release the filter paper disk by pushing it quickly to the bottom of the lid using the forceps. Have one person in your group measure how long it takes for the bubbles to carry the disk to the top of the lid. **Important! Time begins when the disk is placed at the bottom of the Petri dish. The Time stops when any portion of the filter paper disk reaches the top of the hydrogen peroxide.**
8. Repeat step 5 two more times.
9. Repeat steps 3 to 7 for each of the three remaining watermelon extract solutions. **Remember the 0% watermelon solution will yield an extremely long rising time. This solution acts as the negative control.**
10. Calculate the average rising time for each of the watermelon extract solutions. Record this information in the data table.

Observations:

Construct two graphs: (Use the Excel file at the following web site:

http://www.mrjohns2.weebly.com/uploads/9/8/5/0/98501120/enzyme_reults_template_fall_2017.xlsx

One graph that plots the concentration of potato extract (on the X axis) versus the average rising time (on the Y axis) for your individual average results for each concentration of enzyme containing watermelon extract.

- The second graph needs to depict the average rising times obtained from collaboration with other groups in the class that performed the experiment.

Analysis and Conclusions:

1. Suppose you had dipped a filter paper disk in a 30% watermelon solution. Using the graph, predict how long it would take this disk to rise to the top of a beaker of H_2O_2 .
2. How does the concentration of the enzyme affect the rate of the breakdown of hydrogen peroxide? Use the results of this experiment to justify your answer.

Watermelon (Catalase) Solution	T1 Rising Time	T2 Rising Time	T3 Rising Time	Average Rising Time T1
0%				
25%				
50%				
75%				
100%				

	Graph 1 Average (Seconds)	Graph 2 Class Avg. (Seconds)
25%		
50%		
75%		
100%		

Lab Report : Enzyme Lab

Teacher Name: **Mr. Johns**

Student Name: _____

CATEGORY	5	4	3	2
Question/Purpose	The purpose of the lab or the question to be answered during the lab is clearly identified and thoughtfully stated.	The purpose of the lab or the question to be answered during the lab is identified; but stated in a somewhat unclear manner.	The purpose of the lab or the question to be answered during the lab is partially identified; but is stated in a somewhat unclear manner	The purpose of the lab or the question to be answered during the lab is erroneous, irrelevant, or missing.
Background Sources	Several reputable background sources were used and cited correctly. Material is translated into student's own words.	A few reputable background sources are used and cited correctly. Material is translated into student's own words.	A few background sources are used and cited correctly, but some are not reputable sources. Material is translated into student's own words.	Material is directly copied rather than put into students' own words and/or background sources are cited incorrectly.
Hypothesis	Hypothesized relationship between the variables and the predicted results is clear and reasonable based on what has been studied.	Hypothesized relationship between the variables and the predicted results is reasonable based on general knowledge and observations.	Hypothesized relationship between the variables and the predicted results has been stated; but appears to be based on flawed logic.	No hypothesis has been stated.
Materials	All materials and setup used in the experiment are clearly and accurately described.	Almost all materials and the setup used in the experiment are clearly and accurately described.	Most of the materials and the setup used in the experiment are accurately described.	Many materials are described inaccurately OR are not described at all.
Methods	Procedures are listed in clear steps. Each step is numbered and is a complete sentence.	Procedures are listed in a logical order, but steps are not numbered and/or are not in complete sentences.	Procedures are listed but are not in a logical order or are difficult to follow.	Procedures do not accurately list the steps of the experiment.
Results	Professional looking and accurate representation of the data in tables and/or graphs. Graphs and tables are labeled and titled.	Accurate representation of the data in tables and/or graphs. Graphs and tables are labeled and titled.	Accurate representation of the data in written form, but there are no graphs or tables presented.	Data are not shown OR are inaccurate.
Conclusions	Summary describes the skills learned, the information learned and some future applications to real life situations.	Summary describes the information learned and a possible application to a real-life situation.	Summary describes the information learned.	No summary is written.
Participation	Used time well in lab and focused attention on the experiment.	Used time fairly well; Stayed focused on the experiment most of the time.	Did the lab but did not appear very interested. Focus was lost on several occasions.	Participation was minimal OR student was hostile about participating