Honors Biology

Name _____

Period: _____

Paperase Lab

Introduction: In this lab, your hands are the enzyme, paperase. This enzyme splits the sugar, paperose, into subunit A and subunit B. You will split this molecule by ripping the paper model down the middle along the line.

Procedure:

PART I:

1. Your group needs to obtain a sheet with 100 molecules of paper**ose**. You will cut out the paperose molecules (containing an "A" and a "B") from the first two columns of 25 (for a total of 50) for Part I. Then cut out the two columns for Part II. Be sure to keep these separate from each other.
2. Place the first 50 molecules of paperose in a container.
3. One member will act as the enzyme (paper**ase**), the other member will keep time and record the number of molecules ripped at each time marker.
    a. The person who acts as the enzyme must follow these rules:
        - When told to begin, grab one paperose molecule from the container **without looking** and rip it down the middle. You can look at the molecule while you rip it.
        - Place the pieces back into the container and **without looking**, grab another whole paperose molecule. Repeat.
        - If you grab a molecule that is already ripped, throw it back in and try again.
        - Count the number of molecules ripped aloud as you go and keep a running count.
        - Try to work at a consistent pace throughout (that is, don't start out like a manimal only to wear out after 45 seconds; work at a pace that you can sustain for 6 minutes).
        - Do not stop until the 360 seconds (6 minutes) are up.
    b. The timer will tell the enzyme when to begin and in Table 1 will record the ongoing count when they have reached each time interval (10 seconds, 30 seconds, 60 seconds, 120 seconds, 180 seconds, and 360 seconds). The time intervals are cumulative (that is, do not start counting over at each time interval). The enzyme should keep ripping and counting for the entire 360 seconds. If the enzyme runs out of paperose molecules, record the time at which you ran out (use this number as your last time point instead).

Results:

Table 1: Number of Paperose Ripped Over Time (WITH THUMBS)

Time (seconds)	Number of Paperose Ripped
10	
30	
60	
120	
180	
360	

Part II:

1. Repeat the investigation, but this time the enzyme is not allowed to use their thumbs at all. Record data in Table 2 below.

Results:

Table 2: Number of Paperose Ripped Over Time (NO THUMBS)	
Time (seconds)	**Number of Paperose Ripped**
10	
30	
60	
120	
180	
360	

Part III:

1. Graph the results presented in Tables 1 and 2 on the same graph. Connect each data point with a straight line. Don't forget to label the axes (including units), include a descriptive title and make a key to distinguish the "WITH THUMBS" line from the "NO THUMBS" line.
2. Determine the "WITH THUMBS" reaction rate for the following times in Table 1: 1-10 seconds, 10-30 seconds, 30-60 seconds, 60-120 seconds, 120-180 seconds, and 180-360 seconds. Record this information in Table 3. How to determine rate of reaction for each time interval? Calculate rate the same as we calculate slope (change in y ÷ change in x). In this case, "y" is the number of paperose molecules and "x" is the time in seconds. Do the same for the "NO THUMBS" data and record the information in Table 4.
3. Make a line graph of the results presented in Tables 3 and 4 on the same graph. Draw a line of best fit. Be sure to include a key to distinguish the "WITH THUMBS" line from "NO THUMBS" line.

Results:

Table 3: # of Paperose Ripped by Time Interval (WITH THUMBS)	
Time (seconds)	Reaction Rate (Paperose/second)
10	
30	
60	
120	
180	
360	

Table 4: # of Paperose Ripped by Time Interval (NO THUMBS)	
Time (seconds)	Reaction Rate (Paperose/second)
10	
30	
60	
120	
180	
360	

Part IV:

1. For the **"WITH THUMBS" data only**, determine the number of Paperose Molecules left after each time interval (use the data in Table 1) and record the information under the column headed "Number of Paperose Remaining" in Table 5 below.
2. Then, under the column headed "Reaction Rate (Paperose/second)" in Table 5 below, copy the reaction rates that you calculated in Table 3 for each corresponding time interval.
3. Prepare a line graph of the data in Table 5. Draw a line of best fit.

Table 5: Effect of Available Paperose Molecules on Reaction Rate

Number of Paperose Remaining	**Reaction Rate (Paperose/second)**

Conclusion:

1. What happened to the concentration of paperose molecules over time?

2. What happened to the rate of the reaction over time in part one of this activity? Explain why this occurred.

3. If I took the paperose molecules and dispersed them around the room, would the molecules be more or less concentrated than in the container? Explain your answer.

4. In one to two sentences, describe the relationship between concentration of substrate and rate of reaction.

5. What did the experiment where you were not allowed to use your thumbs represent?