Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Toothpickase Activity

Purpose:

To explore the function of enzymes and discover what affects reaction rates.

Procedure:

Get into groups of 3- one student breaks the toothpicks (“enzyme”), one student is the timer and one student counts/records the broken toothpicks (the products).

Part I: How Fast Toothpickase Works

* Place a batch of toothpicks into a plastic bag
* The “enzyme” will reach into the bag, pull out a toothpick and break it. **Drop the broken toothpick back into the bag**. Continue this as fast as you can!
* The timer will time for 10 second intervals. Recorder will help hold the bag as well as keep track of how many toothpicks get broken and will record in the chart below.
* After each 10 second intervals, a new count of broken toothpicks will begin.
* At the end of the 90 seconds, all broken toothpicks are to be thrown away and all unbroken to be kept and returned (DO NOT THROW UNBROKEN TOOTHPICKS!)

|  |  |
| --- | --- |
| Time (seconds) | Number of toothpicks broken |
| 0 |  |
| 10 |  |
| 20 |  |
| 30 |  |
| 40 |  |
| 50 |  |
| 60 |  |
| 70 |  |
| 80 |  |
| 90 |  |

What does the hand represent?

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

What do the toothpicks represent?

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What do the broken toothpicks represent and why don’t we remove them from the bag?

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What might your fingers represent?

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Part II: Change the Structure of the Enzyme

* Empty the bag and start with 50 new toothpicks
* Now, the “enzyme” is to hold his/her thumb and pinky to the palm of their hand while they attempt to break as many toothpicks as possible.
* Time for 10 second intervals

|  |  |
| --- | --- |
| Time (seconds) | Number of toothpicks broken |
| 0 |  |
| 10 |  |
| 20 |  |
| 30 |  |
| 40 |  |
| 50 |  |
| 60 |  |
| 70 |  |
| 80 |  |
| 90 |  |

What happened to the number of toothpicks broken as more time passed? Why?

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Part III: Add Another Enzyme

* Start with at fresh batch of 50 new toothpicks
* In addition to keeping the enzyme you have, you will add another person’s hand to break toothpicks (adding another enzyme). Continue to leave the broken toothpicks in the bag.
* The third person is now responsible for timing and recording.

|  |  |
| --- | --- |
| Time (seconds) | Number of toothpicks broken |
| 0 |  |
| 10 |  |
| 20 |  |
| 30 |  |
| 40 |  |
| 50 |  |
| 60 |  |
| 70 |  |
| 80 |  |
| 90 |  |

Graphing the Results

Using graphing paper, graph the number of toothpicks broken at each time interval for each part of the lab (make dots and connect them to form a line-you should have 3 lines total).

\*Remember to label your axis as well as use a title!

\*Attach the graph paper to this sheet to get full credit for the lab!!

How did changing the enzyme (taking away fingers on your hand) affect the reaction rate? Use the graph to support your answer.

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How did adding a second enzyme affect the reaction? Use the graph to support your answer.

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