

Enzyme-Substrate Model

Understanding enzymes is often difficult because we can not see what is actually happening. This activity uses common materials to show how enzymes work and the environmental factors that may play a role in these reactions.

Environmental factors that may affect enzymes:

- Denaturation:

- Coenzymes:

- Competitive Inhibitors:

In this activity:

The enzyme will be represented by: _____
The substrate will be represented by: _____
The active site will be represented by: _____
The coenzyme will be represented by: _____
The inhibitor will be represented by: _____

Directions:

1. **Trial One: Normal Enzyme Activity**

One member of each team of three students will attempt to pick up as many pennies as possible turning each one so that it is head-side up. Each pile of pennies should be originally laid out flat and all should be turned over so that tail-side is up. This process will be done 6 times for a period of ten seconds each time. Place this data in table one.

2. **Trial Two: Denaturation** (enzymes start to change shape because of high temperatures or change in pH)

A different team member will be picking up pennies and turning them head-side up. However, in this trial your active site will change. The team member who will be picking up pennies will have their index finger, middle finger and thumb taped together. This process will be done 6 times for a period of ten seconds each time. Place this data in table one.

3. **Trial Three: Role of a Coenzyme** (a helper enzyme)

A third team member will perform the penny-selecting task but she/he will have the assistance of a team member, representing the coenzyme. As you pick up the pennies, simply hand them to your partner and have them turn them head side up. This process will be done 6 times for a period of ten seconds each time. Place this data in table one.

4. **Trial Four: Competitive Inhibitors** (substance that gets in the way of the action of an enzyme)

This is the last trial. Any member will retrieve pennies similar to trial one but this time with a glove on their hand. The glove represents the inhibitor, which is competing for the active site on your finger. This process will be done six times for a period of ten seconds each time. Place this data in table one.

Data Table 1: Group Data

Remember each interval is 10 seconds.

Time Periods	Trial 1- # of pennies	Trial 2- #of pennies	Trial 3- # of pennies	Trial 4- # of pennies
1st interval				
2nd interval				
3rd interval				
4th interval				
5th interval				
6th interval				
Total # pennies				

Data Table 2: Class Data- put in the total number of the entire class.

Time Periods	Trial 1- total # of pennies	Trial 2-total # of pennies	Trial 3- total # of pennies	Trial 4- total # of pennies
1st interval				
2nd interval				
3rd interval				
4th interval				
5th interval				
6th interval				

Questions:

1. For the data in table 2 make a line graph. Your graph should have the time periods on the x-axis and the number of pennies on the y-axis. Make four different lines (one for each trial) on the same graph making sure to label each line (making them each a different color would help.)
2. Compare the four lines on your graph. Which two trials were you able to pick up the most pennies and why?
3. If we assume that the hand represents the enzyme, what happened to the active site during trial 2?
4. What environmental factors affect enzyme shape?
5. How might chemicals affect you if they acted like the glove (inhibitor) during your bodily chemical reactions?

