Vocabulary

- Chemical Reactions
- Enzymes
- Catalysts
- Activation Energy
- Substrates
- Products
- Active Site
- Enzyme-Substrate Complex

Enzyme Activity Lab

Directions: Use the lab interactive to test the effects of temperature and pH on enzyme activity. Follow the directions below to enter in settings.

Effects of Temperature on Enzyme Activity

Use the data table below to write in your results.

Temperature	10 °	25 °	60 °
# of products after 1 minute			

Trial 1: Temperature at 10°

Step 1: Enter the following values into the interactive:

- Enzymes – 2
- Substrates – 20
- Inhibitors – 0
- Temperature – 10
- Container – 400
- pH – 7

Step 2: Click "setup."

Step 3: Use the Stop Watch tool to time for one minute. Click on the red arrow, set the timer to one minute (1:00), and click "Set."

Step 4: Press "Start" on the stopwatch and then immediately press "start" on the interactive. Let the interactive run for one minute. Observe each enzyme (green blob) as it randomly moves about the given space. When an enzyme bumps into a substrate (blue dot) in just the right orientation, it will catalyze the chemical reaction that turns the substrate into a product (red dot). Press "stop" on the interactive when one minute is over.

Step 5: Count the number of products (red dots) that were produced and record in the data table above. Click "Back" to reset the stopwatch.

Trial 2: Temperature at 25°

Step 1: Enter the following values into the interactive:

- Enzymes – 2
- Substrates – 20
- Inhibitors – 0
- Temperature – 25
- Container – 400
- pH – 7

Repeat steps 2-5.

Trial 3: Temperature at 60°

Step 1: Enter the following values into the interactive:

- Enzymes – 2
- Substrates – 20
- Inhibitors – 0
- Temperature – 60
- Container – 400
- pH – 7

Repeat steps 2-5.

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1. Describe how temperature affects the action of enzymes. Refer to the data you collected to support your answer.

2. Why do you think temperature had this effect? Do you think there is an optimal temperature for enzyme activity? You may need to go back to the Enzyme Activity Lab and run additional trials before you respond.

Effects of pH on Enzyme Activity

Use the data table below to write in your results.

pH	1 (acidic)	7 (neutral)	14 (basic)
# of products after 1 minute			

Trial 1: pH at 1

Step 1: Enter the following values into the interactive:

- Enzymes – 2
- Substrates – 20
- Inhibitors – 0
- Temperature – 25
- Container – 400
- pH – 1

Step 2: Click "setup."

Step 3: Use the Stop Watch tool to time for one minute. Click on the red arrow, set the timer to one minute (1:00), and click "Set."

Step 4: Press "Start" on the stopwatch and then immediately press "start" on the interactive. Press "stop" on the interactive when one minute is over.

Step 5: Count the number of products (red dots) that were produced and record in the data table above. Click "Back" to reset the stopwatch.

Trial 2: pH at 7

Step 1: Enter the following values into the interactive:

- Enzymes – 2
- Substrates – 20
- Inhibitors – 0
- Temperature – 25
- Container – 400
- pH – 7

Repeat steps 2-5.

Trial 3: pH at 14

Step 1: Enter the following values into the interactive:

- Enzymes – 2
- Substrates – 20
- Inhibitors – 0
- Temperature – 25
- Container – 400
- pH – 14

Repeat steps 2-5.

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3. Describe how pH affects the action of enzymes. Refer to the data you collected to support your answer.

4. Why do you think changing pH had this effect? Do you think there is an optimal pH for enzyme activity? You may need to go back to the Enzyme Activity Lab and run additional trials before you respond.

CHALLENGE: Design and conduct an experiment to study the effect of increasing substrate concentration on enzyme activity. Create a data table in the space below to write in your results. Use the Enzyme Activity Lab to carry out your experiment.

5. Describe how substrate concentration affects the action of enzymes. Refer to the data you collected to support your answer.