

Enzyme Cut-outs Activity

Objective: Enzymes are proteins that help chemical reactions occur at a faster rate by lowering the energy needed for the reactions. First, the enzymes react with a substrate to form an enzyme-substrate complex (like a lock and key). Once this complex is formed, the substrate becomes a product or products and leaves the enzyme. The enzyme can then repeat the reaction with more substrate. The enzyme is shaped so it will react with only one specific substrate. On the next page are shapes of enzymes, substrates, and products. Your job will be to cut them out, manipulate them, glue them, and explain the reaction that occurs. Complete Parts A, B, C, D.

Materials

directions and class notes
cut-out sheet

colored paper
scissors

glue
pen or pencil

Part A

Vocabulary—define the following terms (hint: you can use your notes!)

enzyme –
catalyst –
chemical reaction –
activation energy –
substrate –
active site –
denatured –

Part B

- Using one sheet of the cut-out paper, cut out all the enzymes, substrates, and products.
- Organize the cut outs on the colored paper so the pieces demonstrate this equation:
enzyme + substrate → enzyme-substrate complex → enzyme + product 1 + product 2
- Glue the cut outs in the appropriate places on the colored paper.
- Label** the cutouts that you glued as the following compounds:
 Enzyme = lactase
 Substrate = lactose
 Products = glucose and galactose
- With the above terms and equation, **explain** what happened (write your explanation on the same side of construction paper). Use as many vocabulary words from Part A as you can.

Part C

- Use the remaining cut out pieces for this part.
- Follow the directions as above, this time demonstrating this equation:
Enzyme + substrate 1 + substrate 2 → enzyme-substrate complex → enzyme + product
- Label** the cutouts as the following compounds:
 Enzyme = Sucrase
 Substrates = glucose and fructose
 Product = sucrose
- With the above terms and equation, **explain** what happened (write your explanation on the same side of construction paper). Use as many vocabulary words from Part A as you can.

Part D

Each enzyme works best at a certain temperature and pH. Below or above an enzyme's optimal temperature or optimal pH, the reaction is slower.

1. Using the table and grid below, **graph** the data to determine the optimum temperature for the enzyme catalase which speeds up the following reaction: $\text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{O}_2$.
2. Describe the line that you just drew; what happens as temperature increases?
3. What is the optimum temperature for enzyme activity in this reaction? _____

Temp (°C)	Reaction Rate (mol/min)
5	0
10	5
20	15
25	20
30	22.5
35	25
40	22.5
42.5	15
45	0
50	0
55	0
60	0



