

Topic: Enzymes

Summary: Students will be introduced to the enzyme-substrate system, activation energy, 3D modeling, and how temperature affects enzyme activity.

NGSS Standards: HS-LS1-3. Homeostasis and enzymes. Plan and investigate to provide evidence that feedback mechanisms maintain homeostasis

Time Length: 90 minutes

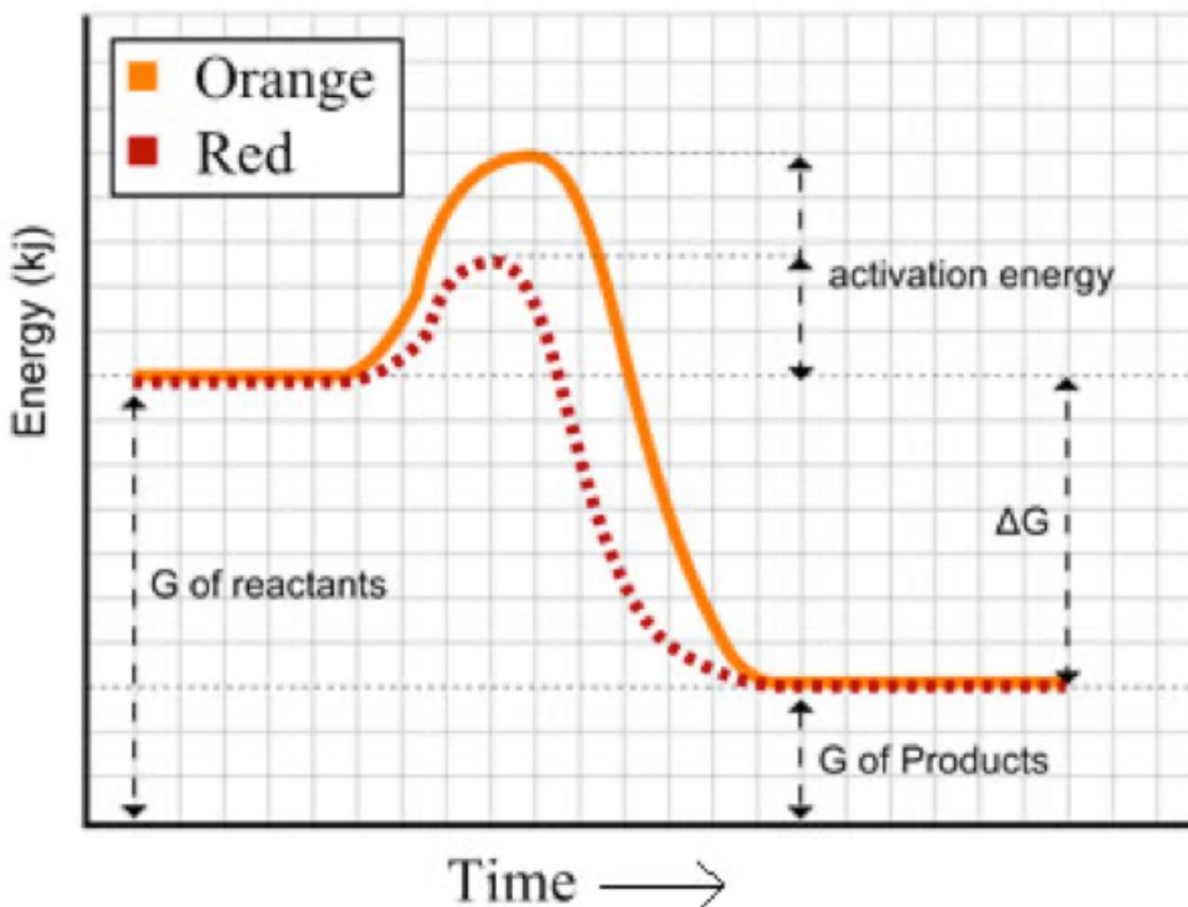
Materials: Class notes or textbook or online textbook

Procedures:

1. Tell the students which section they are to use in the textbook or their associated lecture notes. Students are then going to read the section and answer the questions on the worksheet

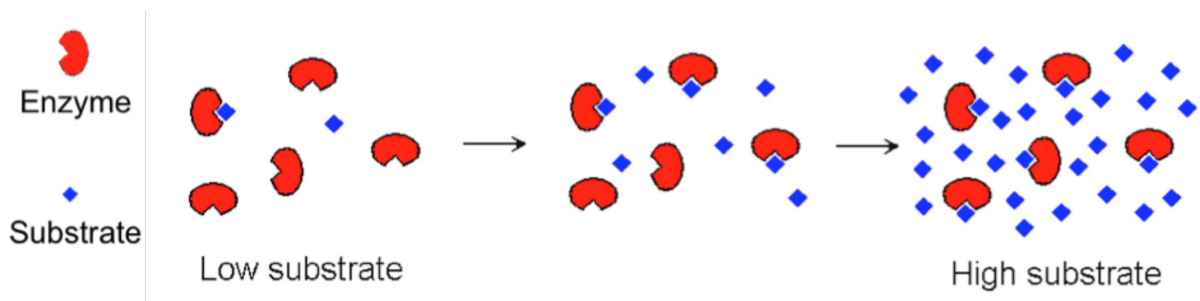
Accommodations: Allow students with an IEP modification to skip the reasoning questions (4, 6, 11, 13, 15). Students with an IEP can take the handout home if they need extra time.

Enzyme Worksheet

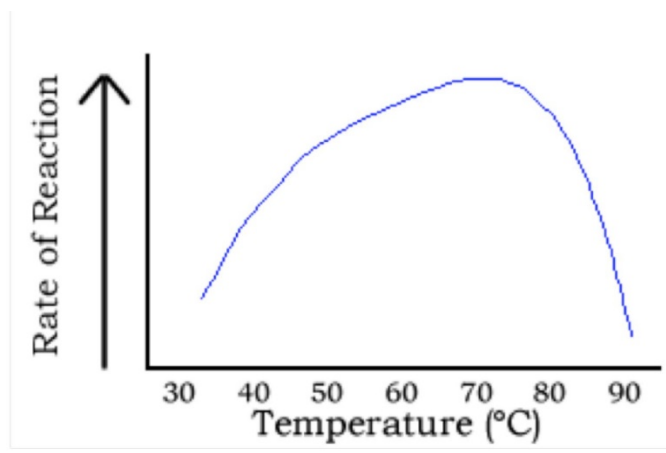


1. Use the graph above for hints on how to answer questions 1-6. In order for a chemical reaction to take place, _____ energy is required.
2. The main purpose of an enzyme is to reduce the _____ energy of a chemical reaction.
3. *Circle your answer.* The dotted red line or the solid orange line represents a chemical reaction **without an enzyme**.
4. Explain your reasoning on how you came to answer question 3.

5. *Circle your answer.* The dotted red line or the solid orange line represents a chemical reaction **with an enzyme**.
6. Explain your reasoning on how you came to answer question 5.



7. *Circle your answer.* Use the diagram above to answer questions 7-11. Pretend the substrate represents food. In the low substrate environment, the enzyme could break apart 100 substrates quickly or slowly
8. *Circle your answer.* In the medium substrate environment, the enzyme could break apart 100 substrates quickly or slowly
9. *Circle your answer.* In the high substrate environment, would the enzymes work faster or slower or at the same speed as the medium substrate environment to break apart 100 substrates.
10. *Circle your answer.* If the substrate totally changed shape, would the same enzyme be able to break apart 100 substrates? Yes or No
11. Explain your reasoning supporting your answer in question 10.



12. In the graph above, at what temperature would the enzyme have the highest rate of reaction? _____

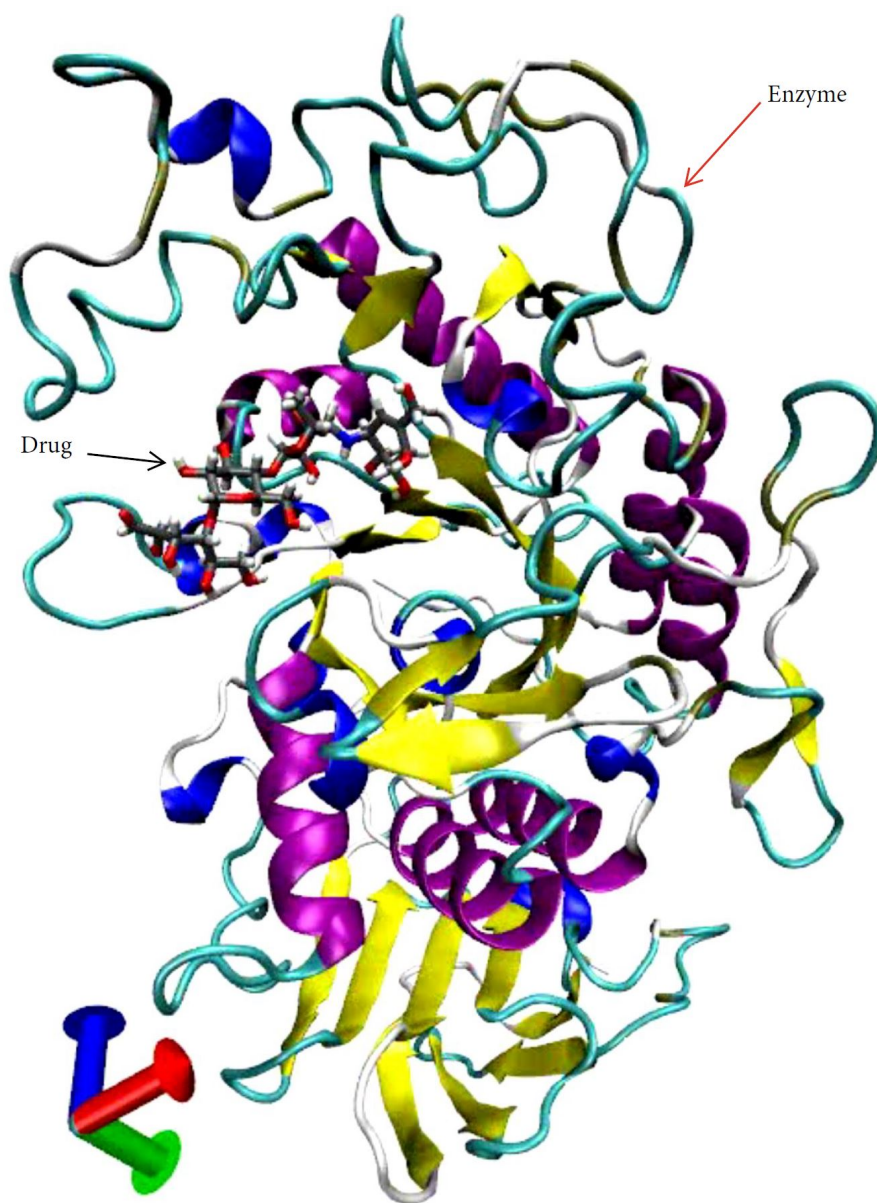
13. Explain what does it mean for the enzyme to have a high rate of reaction?

14. *Circle your answer.* Does temperature affect enzyme activity? Yes or No

15. Explain your reasoning supporting your answer in question 14.

16. What type of macromolecule are enzymes?

3D Model



Use the 3D model above to answer the following questions 17-20.

17. The alpha helices are colored purple in the diagram above. What level of protein structure are alpha helices? _____ Tell me what you know about alpha helices.

18. The beta pleated sheets are colored yellow in the diagram above. What level of protein structure are beta pleated sheets? _____. What is the difference between beta pleated sheets and alpha helices?

19. *Circle your answer.* The figure above illustrates a drug (Acarbose) entering the active site of an enzyme (alpha-glucosidase). This is an example of which type of inhibition? Competitive or non-competitive?

20. Which type of inhibition would it be if the drug was bound to the allosteric site rather than the active site?

For questions 21-25, refer to the simulation being shown at the front of the class.

21. What is the full name of the abbreviated amino acid?
_____. What is its R group? Draw the structure using the space below.

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23. What is the full name of the abbreviated amino acid?

_____. What is its R group? Draw the structure using the space below.

24. What is the full name of the abbreviated amino acid?

_____. What is its R group? Draw the structure using the space below.

25. What is the full name of the abbreviated amino acid?

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