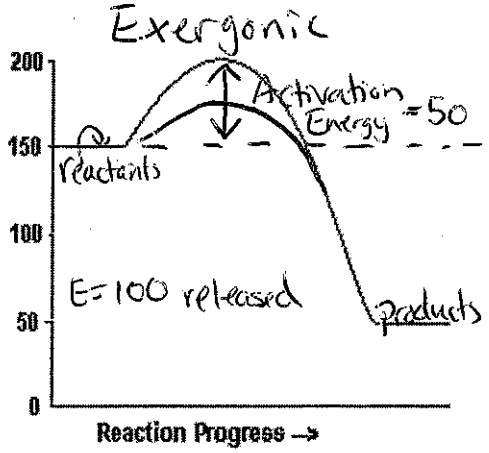
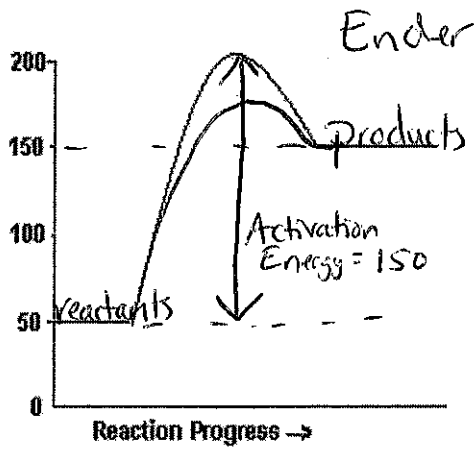
Enzyme Graphing Activity and Review Name Key

1. On the graph below, identify the products, reactants, activation energy and amount of energy released/absorbed. Calculate the Activation Energy of each and identify it as endergonic or exergonic.





E= 100 absorbed

E products − E reactants

= +100

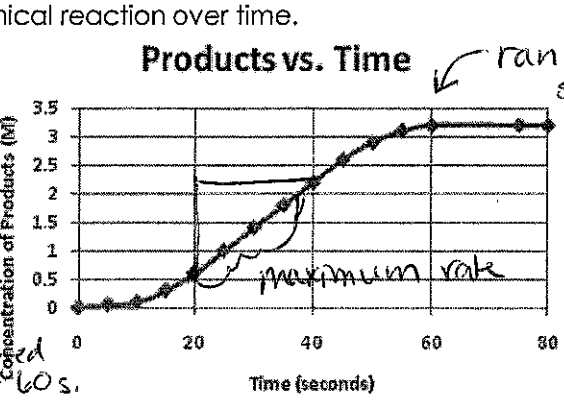
Sketch what the curve would look like for each graph if an enzyme was used.

See the green lines above (lowers the activation energy)

2. The graph below represents the products of a chemical reaction over time.

a. Describe what the graph is showing

The graph shows the amount of product produced over 80 seconds

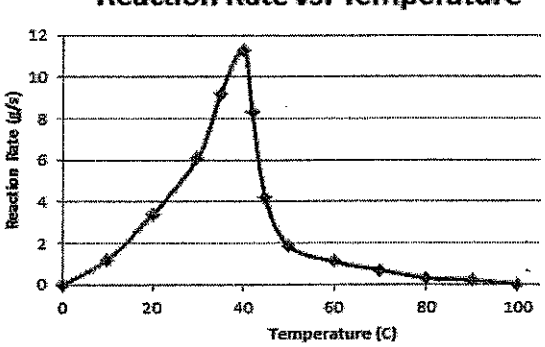


b. What information can be drawn or calculated from the graph? The reaction rate was slow at first (less product made per second). There was an increase in product formation per second with the highest rate from 20-40s. No product was formed after 60 s.

c. Calculate the maximum rate of reaction. When is the reaction proceeding at the maximum rate?

$$\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{2.2 - .5\,M}{20\ s} = \frac{1.7}{20s} =$$

3. The graph below shows the maximum rate of reaction at different temperatures



a. Explain what experiment/data led to this graph

This graph is showing the reaction rate at different temperatures. The experiment may have

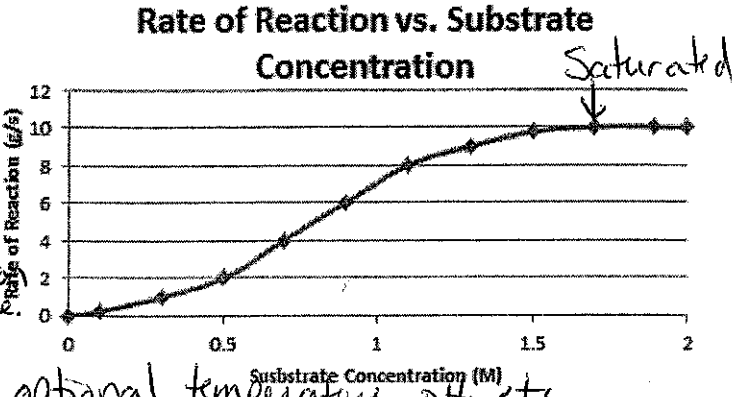
b. Explain the shape of the graph from 0-40 degrees

The reaction rate increased from 0 to 40 degrees. When molecules are cold, they move slower. The optimal temperature for the enzyme is 40°

c. Explain the shape of the graph from 40 degrees and above

The reaction rate decreases above 40°C. This is because the enzyme denatures (changes shape). Structure of a protein determines its function! In this case the change in shape decreased the function

4. The graph to the right shows how increasing the concentration of substrate affects the maximum rate of reaction of an enzyme-catalyzed reaction.



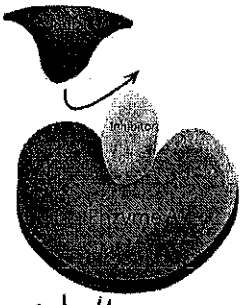
a. What happens after about 1.7M? Why do you think this occurs?

The reaction rate does not change. The enzyme is saturated. Adding more substrate does not change the reaction rate.

b. What is the maximum rate of reaction shown in this graph? How could you increase the maximum rate?

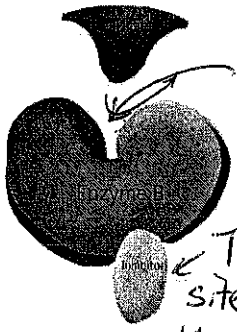
10 g/s - Make sure it is at optional temperature, pH, etc.

5. Label each inhibitor as a competitive inhibitor or a noncompetitive (allosteric inhibitor). Explain why!



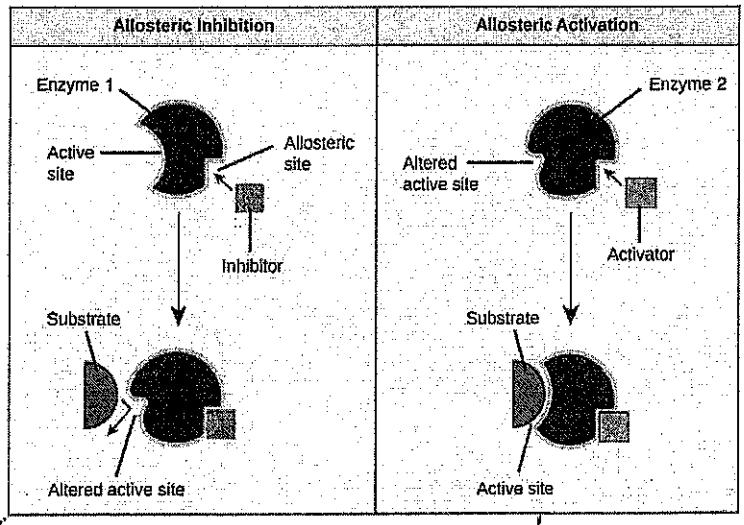
Competative

The inhibitor binds in the active site and "competes" for the site



The inhibitor binds in a site on the enzyme other than the active site (called an allosteric site). This changes the shape of the enzyme, including the active site. The substrate cannot bind

6. Below are pictures of an allosteric inhibitor and an allosteric activator. Explain how each impacts enzyme function.



The enzyme is "on", when the allosteric inhibitor binds, it changes the shape of the protein and turns it "off" → it inhibits it!

The enzyme is "off" when the activator is not bound. When the activator binds to the allosteric site it changes the shape of the enzyme and turns it "on" (a functioning active site).