

Enzymes



The food we eat cannot be absorbed by our bodies the way it is.
It must be broken down....

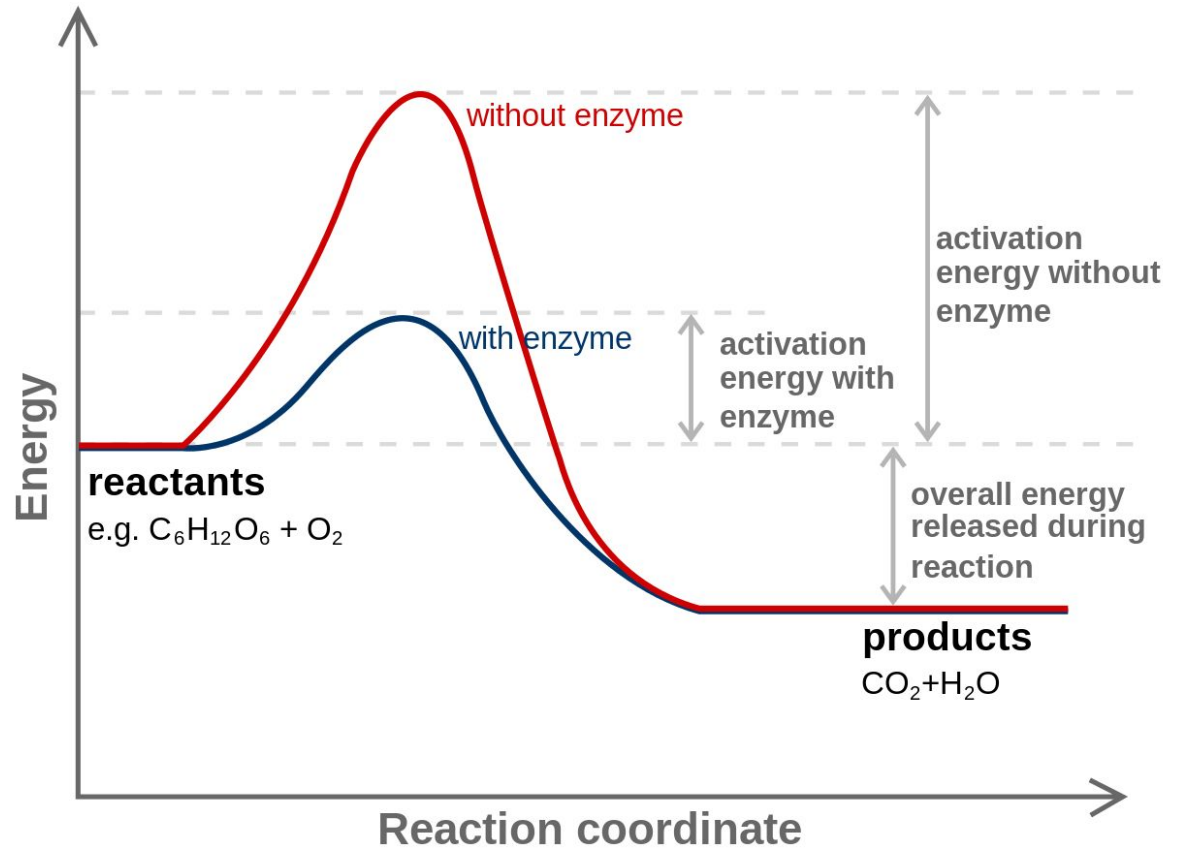
..... BY ENZYMES!!!



What are enzymes?

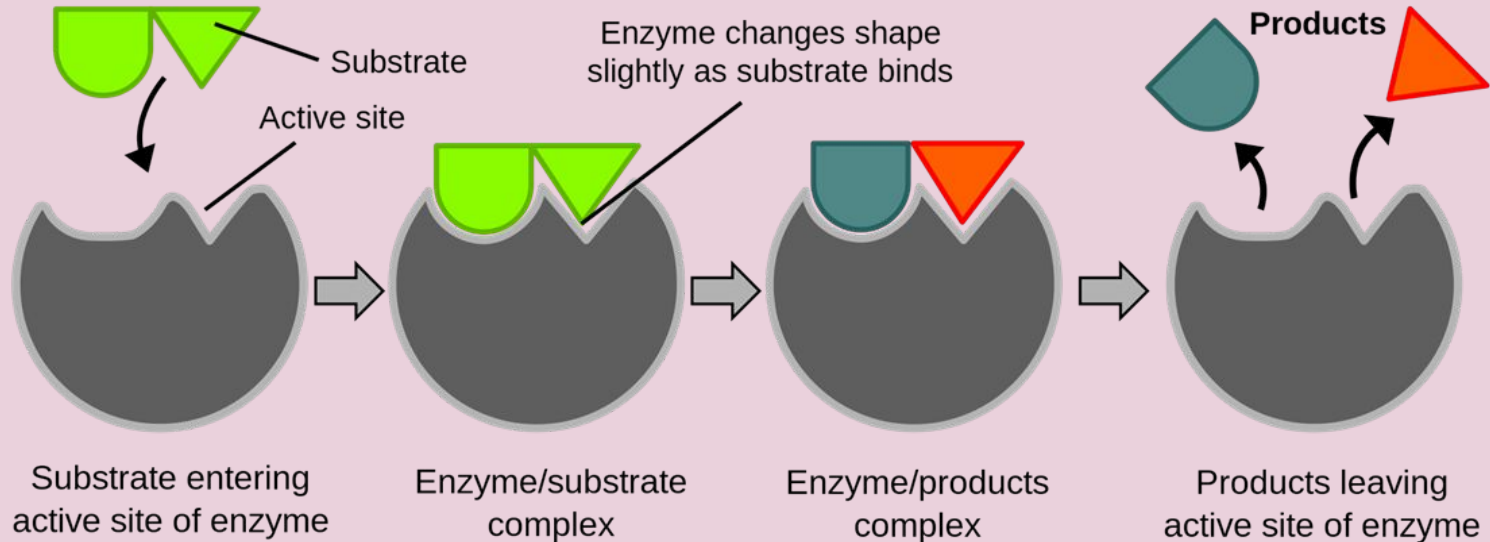
- Proteins (made of amino acids)
- Biological catalysts (found in living things)
- End in -ase (catalase, lactase, sucrase, helicase)
- Specific for one reaction (only work with one substrate)
- Speed up chemical reactions by lowering activation energy
 - Activation energy - the free energy that must be added to a system to get reactants to transition into products
- They weaken bonds that hold molecules together, lowering the energy needed to begin the reaction
 - This results in a faster reaction overall

Enzymes and Activation Energy



How do enzymes work?

- Join with **substrates**, at a location on the enzyme called the **active site**
- Together they make an enzyme-substrate complex
- After the reaction, the substrate has been changed into product
- Enzymes can facilitate catabolic or anabolic reactions



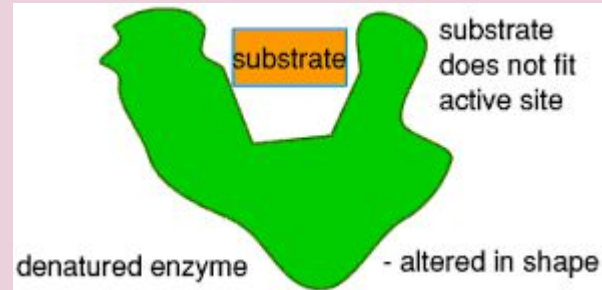
- After the reaction:
 - Enzyme remains unchanged
 - Free to catalyze more reactions
- **Enzymes work under a specific set of conditions**
 - **Can be affected by temperature and pH changes, substrate concentrations**

Enzymes work best at optimum temperatures and pH

Extreme temperature and pH can change the shape of the enzyme, affecting its ability to bind with the substrate

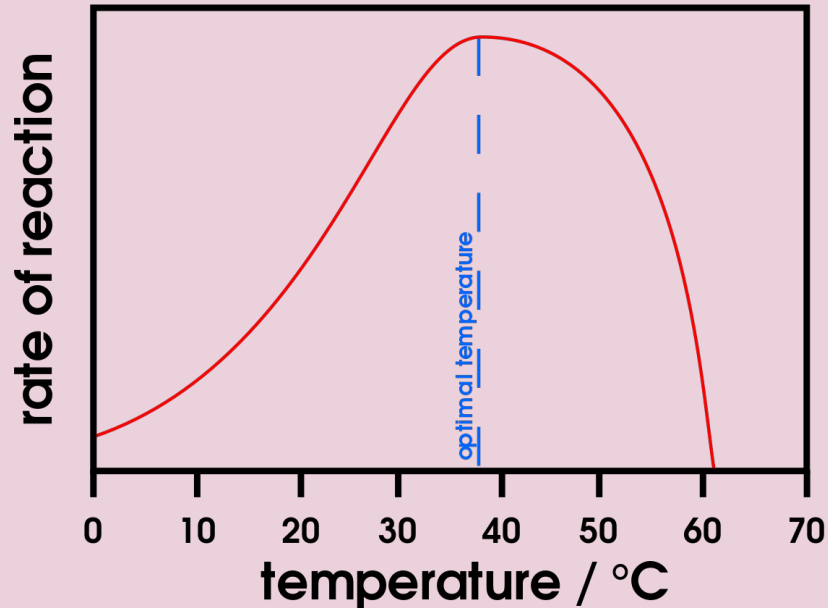
Conditions too far from ideal, change the shape of the active site; a process known as **DENATURING**.

Enzymes in the human body work at 37°C; optimum pH depends on where in the body the enzyme is active



Think - Pair - Share

With a partner, develop a reason why the graph below has the shape it does.



Enzymes reaction rates are affected by substrate levels

- Reactions involving enzymes will increase with increasing substrate levels...BUT only to a certain point
- At some stage, all active sites will be occupied, and adding more substrate will have no effect - the reaction will hit a plateau

