

Enzymes - Goal 4.1.3

Living organisms are dependent on certain **chemical** reactions that normally would occur too slowly or require too much **energy** to be practical.

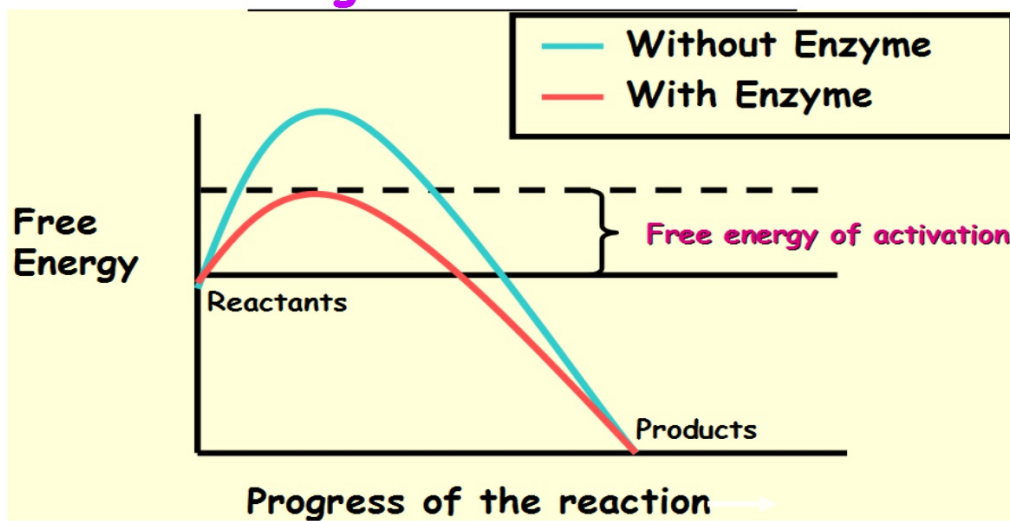
To make these reactions possible, special **proteins** called **enzymes** are used.



What do enzymes do?

ENZYMES...

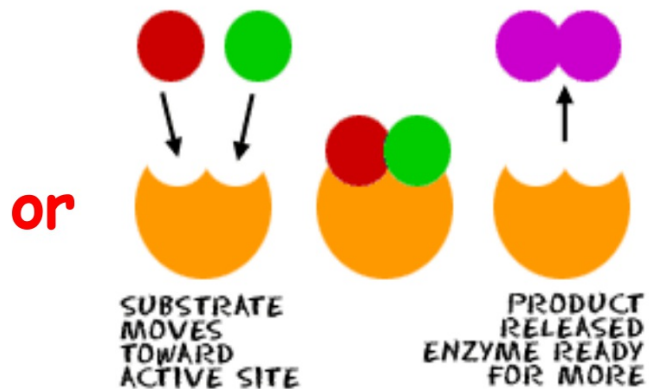
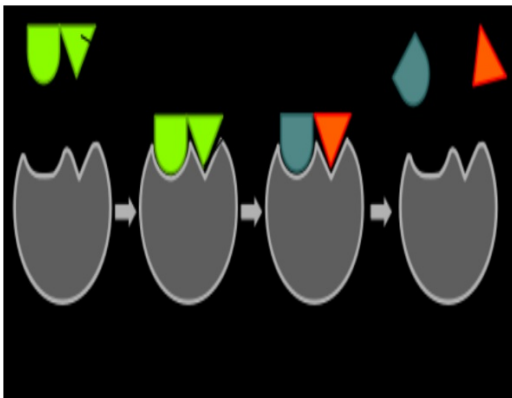
1. Act as **catalyst** that **lower** the amount of **energy (activation energy)** needed for a **chemical reaction to begin**



What do enzymes do?

ENZYMES...

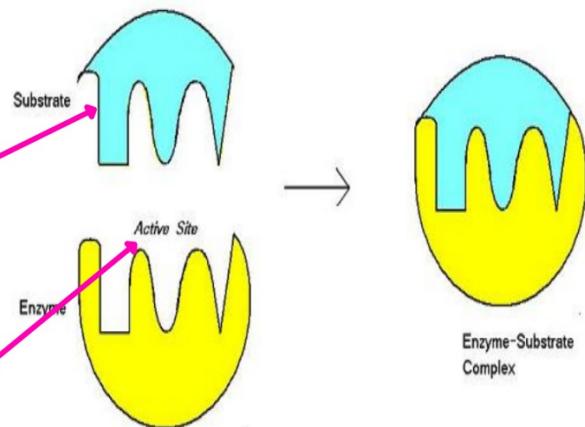
2. Speed up the reaction
3. break down organic compounds
4. build organic compounds



How does an enzyme work?

1. Enzymes are very **specific**. They work only on certain substances called **substrates**.

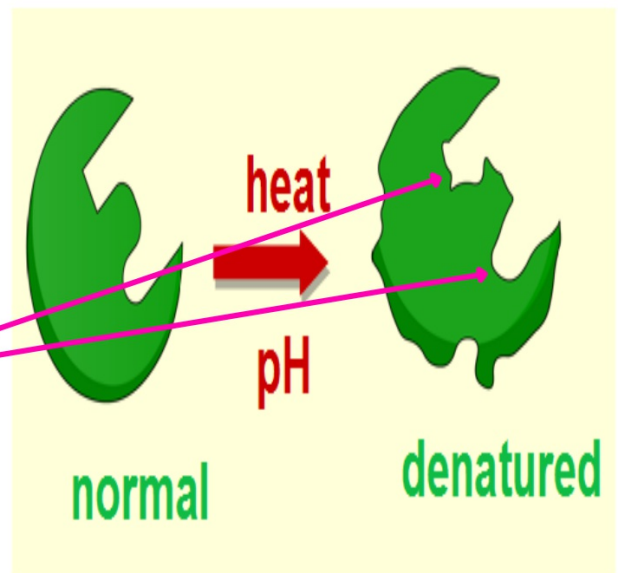
2. Each type of enzyme has an area on it that is called the **active site**.



Lock-and-key Model - The substrate and enzyme active site have complementary shapes

How does an enzyme work?

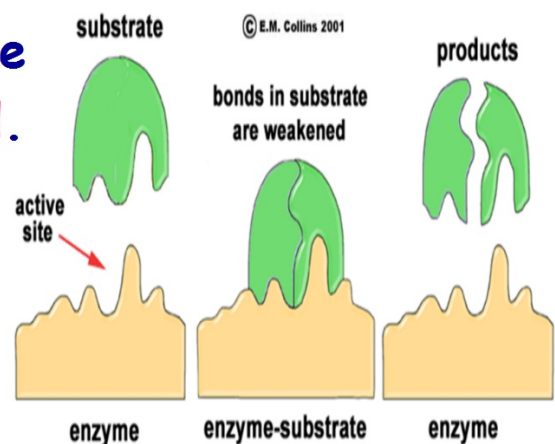
The active site of the enzyme and the shape of the substrate **fit** together like the pieces of a **puzzle** or lock and **key**. If the shape of the substrate doesn't fit the **active** site, then that enzyme will not work with that substrate.



How does an enzyme work?

3. Once the **substrate** fits the active site it stays there until the **reaction is finished**.

4. When the reaction is complete, the product is **released**, and the enzyme, which has not been changed during the **reaction**, can be used in another process.



http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter2/animation__how_enzymes_work.html

Label Enzyme

ENZYME-SUBSTRATE

COMPLEX

SUBSTRATE

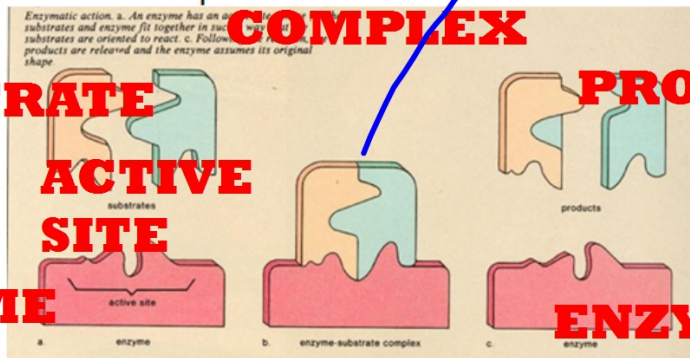
ACTIVE

SITE

ENZYME

PRODUCT

ENZYME



SUBSTRATE

PRODUCT

ACTIVE SITE

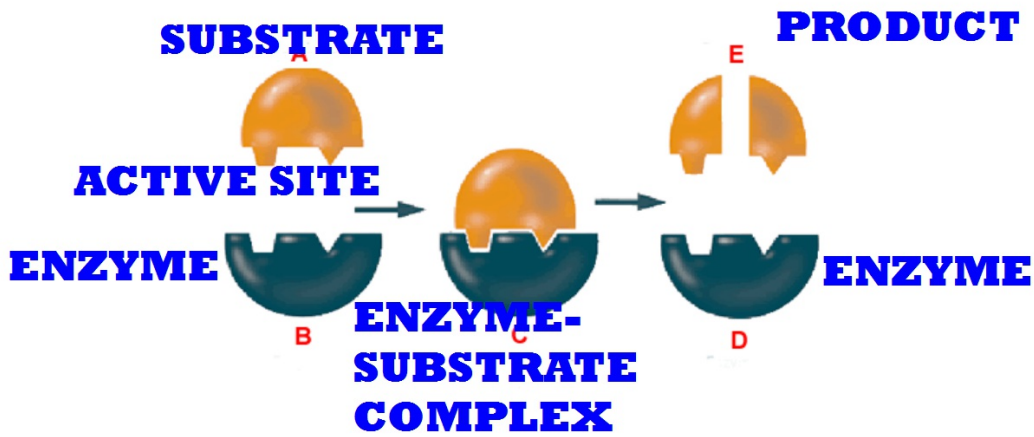
ENZYME

B

**ENZYME-SUBSTRATE
COMPLEX**

D

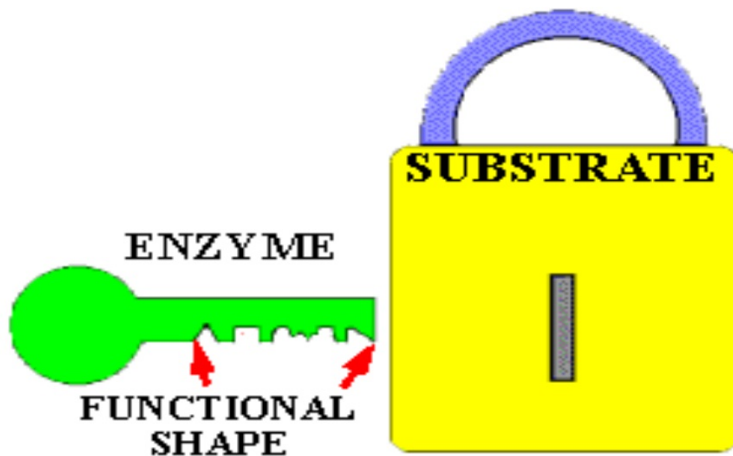
ENZYME



Affecting Enzyme Activity

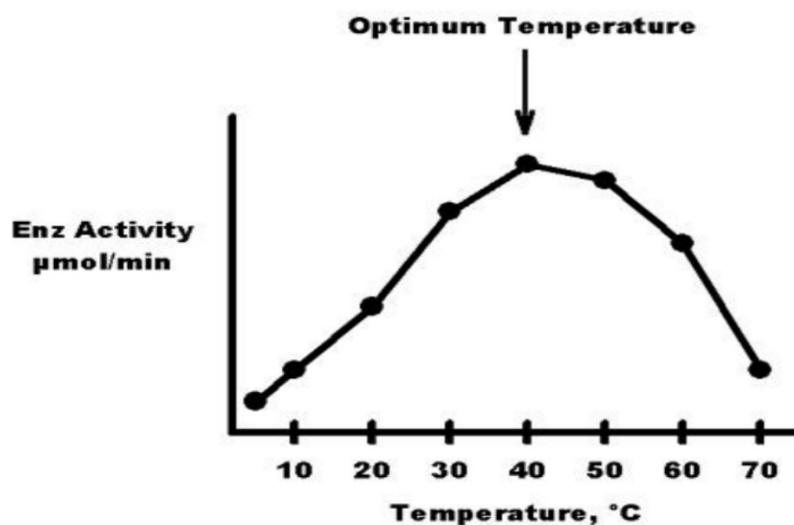
Anything affecting the chemical reaction can affect how well an enzyme works.

1. **Concentration** - if there is a higher concentration of **substrate** present, then there is a greater **chance** that the substrate will fit into the **active** site, and the rate increases



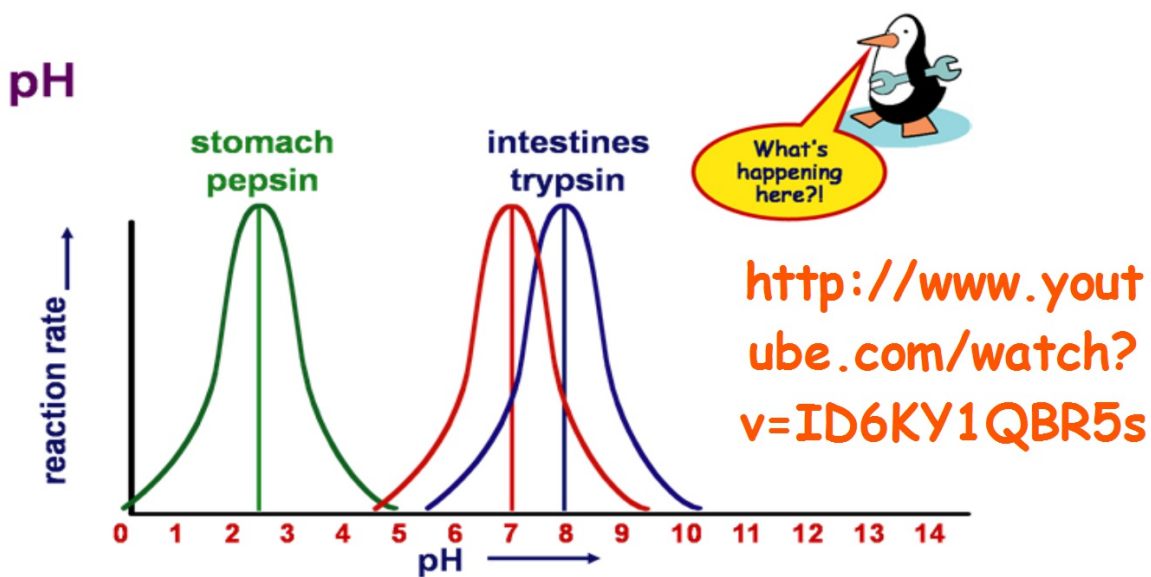
Affecting Enzyme Activity

2. **Temperature** - most enzymes in your body work best around 37°C. If the temperature is much **higher** than the enzyme changes **shape** (denature), the substrate will not **fit**, and the reaction will slow down.



Affecting Enzyme Activity

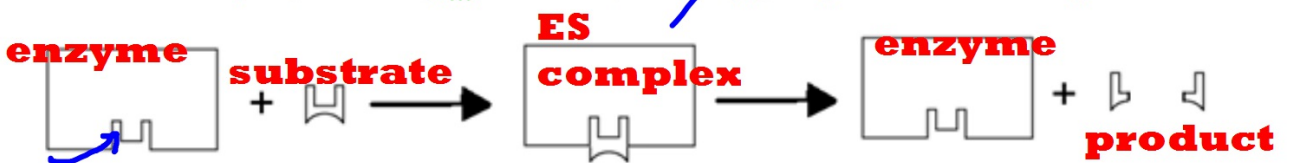
3. pH - most enzymes have a **small** pH range that allows them to work most efficiently. If the pH gets higher or **lower**, then the enzyme will change shape (**denature**), the substrate will not fit, and the reaction will **slow** down.



4.1.3 - Enzymes

Label the image below using the terms:

Enzyme, Substrate(s), Active Site, Product(s), Enzyme-Substrate Complex



active site

1. Enzymes are what type of organic molecule? **protein**
2. What determines the shape of an enzyme? **active site**
3. Are enzymes reusable? Why or why not? **yes - they don't change shape**
4. How do pH and temperature alter the activity of an enzyme? What is this called? **denature it - change the shape**

5. What is the optimum pH for enzyme X? **3**
Is this an acid or base? **acid - less than 7**
6. What is the optimum pH for enzyme Y? **9**
Is this an acid or base? **base - more than 7**

