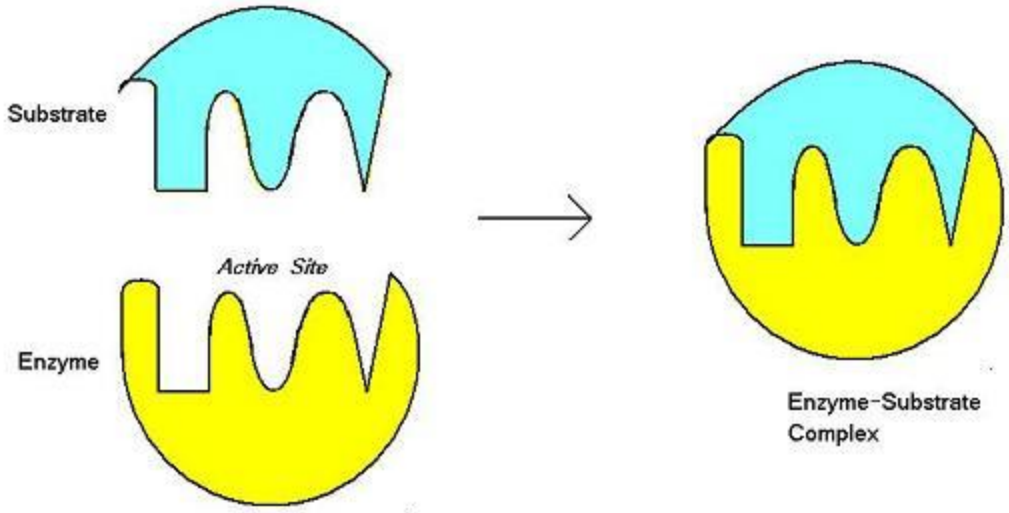
CHEMICAL REACTIONS AND ENZYMES

WHAT ARE ENZYMES?

- Enzymes are PROTEINS
- FUNCTIONS:
  - Increases the rate of chemical reactions
    - Chemical reactions occur about 1 MILLION times faster with an enzyme than they would without one.
  - Decreases the activation energy of a chemical reaction.
    - Activation energy is the energy needed to start a chemical reaction.

ENZYME SPECIFICITY

ENZYMES HAVE A VERY SPECIFIC SHAPE



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

Enzymes are SUBSTRATE SPECIFIC.

- Each enzyme has a particular place where the substrates bind known as the ACTIVE SITE

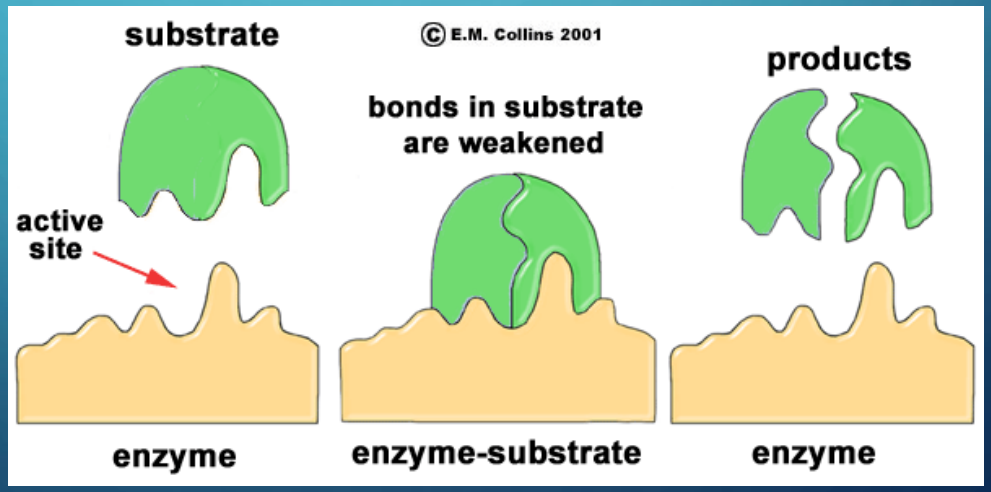
Each enzyme's active site has a specific shape which only allows the substrate with the same shape to bind to it.

PARTS OF A CHEMICAL REACTION

- SUBSTRATE
  - The substance an enzyme breaks apart or builds up)
- ACTIVE SITE
  - The place on the enzyme where the substrates bind
- PRODUCT
  - After the chemical reaction has occurred, the product is released from the enzyme.

HOW AN ENZYME WORKS

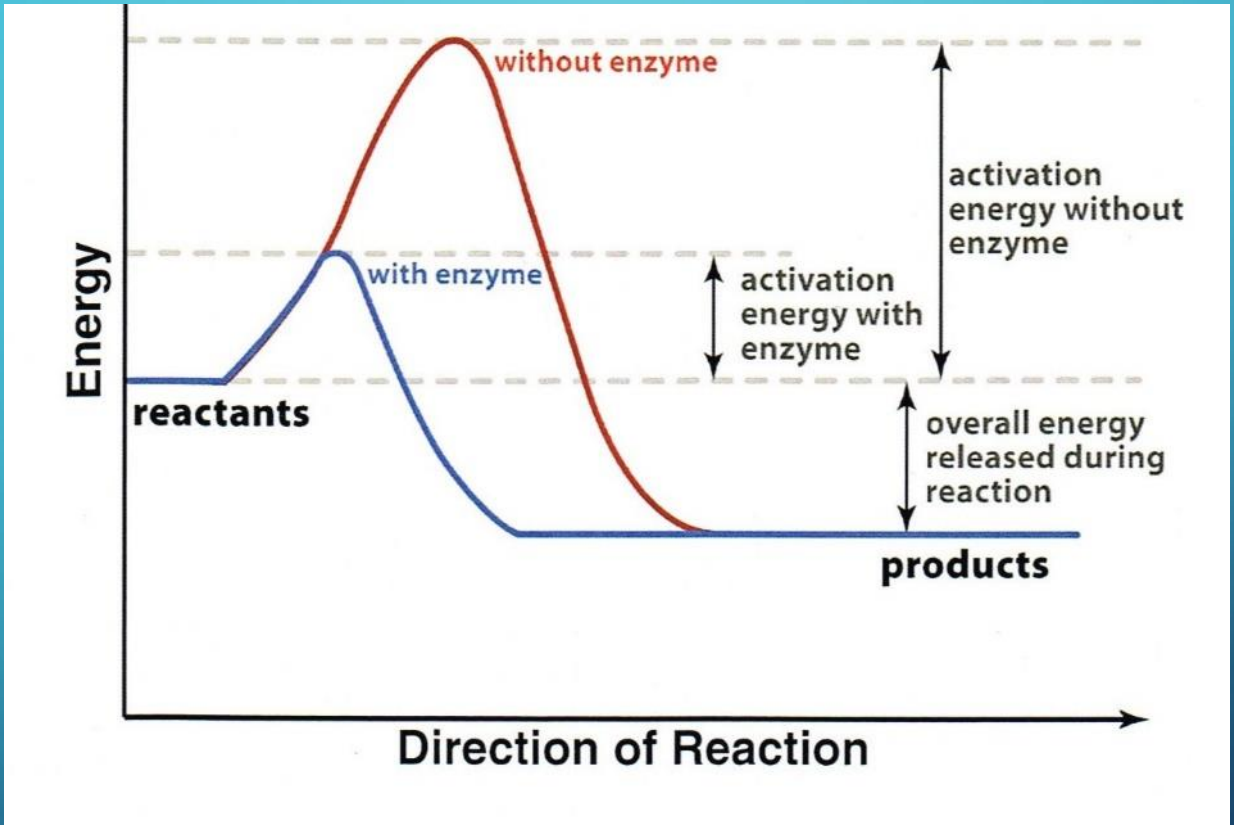
1. The substrate binds to the enzyme at the active site.
3. The bond between the two molecules in the substrate is broken (or connected), forming products.
4. The products are released.
5. The enzyme goes on to be reused by another reaction.
6. The reverse can happen too! Two subtrates could attach and be bonded together by the enzyme.



ENZYMES FUNCTION BEST AT SPECIFIC CONDITIONS

- Environmental factors within the cell can affect how an enzyme functions.
  - HIGH TEMPERATURES
    - High temperatures can denature (breakdown) an enzyme, changing its shape.
  - LOW TEMPERATURES
    - Low temperatures can slow down the activation energy necessary for a chemical reaction to occur.
  - OPTIMAL TEMPERATURE
    - Optimal temperature is somewhere in between. The activation energy necessary for a chemical reaction to occur is at its maximum.
  - pH
    - Enzymes function best in environments where the pH range is 6-8.
      - The exception is digestive enzymes which function better when the pH is at a range around 2

EFFECT OF ENZYME ON ACTIVATION ENERGY



WHAT HAPPENS TO THE ENZYME AFTER THE CELLULAR REACTION IS OVER?

The enzyme goes on to catalyze another reaction!

Enzymes are used over and over again!