

- Organic molecules are the molecules in living things
- There are four types of organic (carbon-based) molecules:

–Carbohydrates

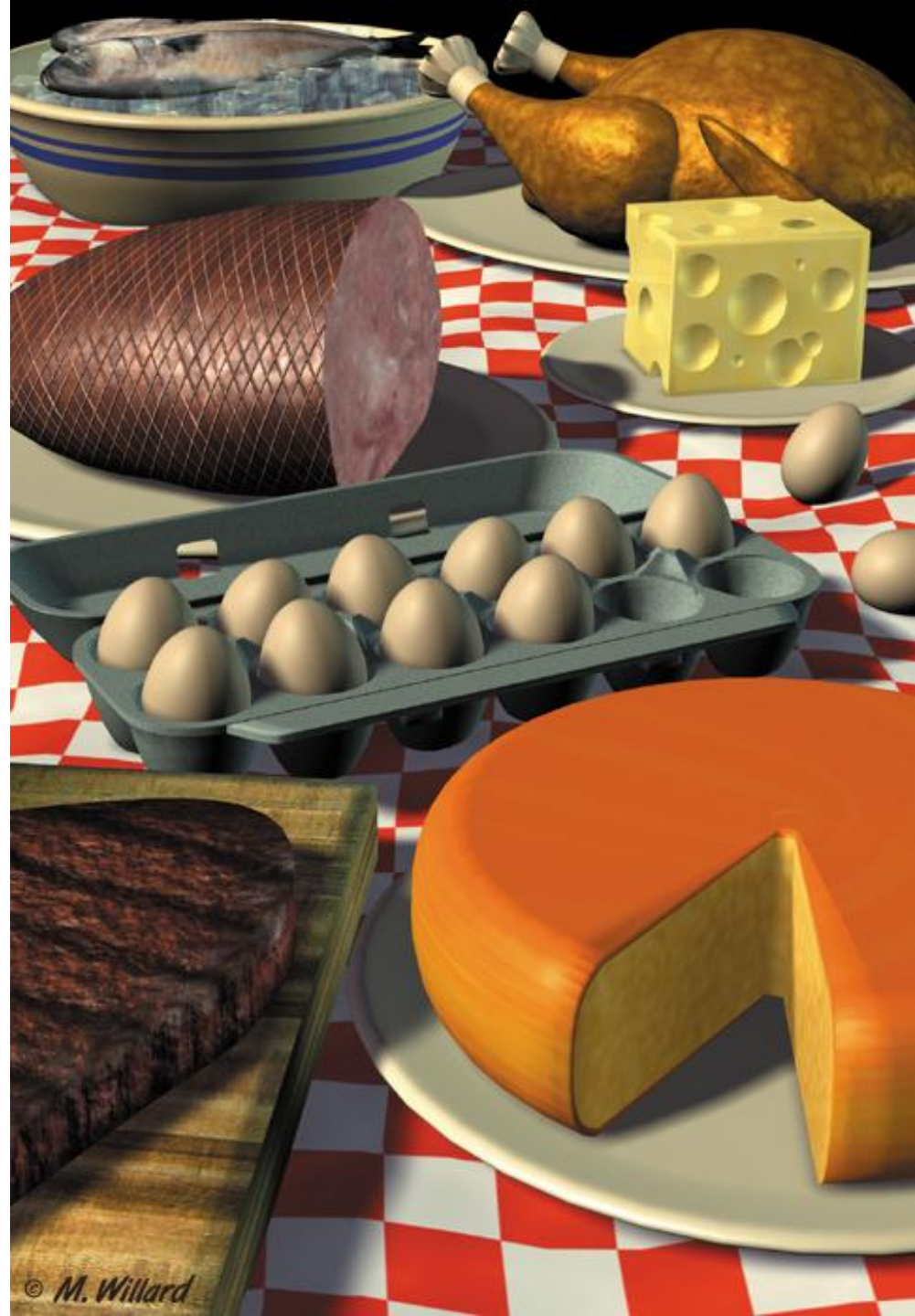
–Lipids (fats)

–Proteins

–Nucleic Acids

# Protein

- Muscles are made of proteins
- Enzymes are proteins
- Made from amino acid chains
- Found in meat, beans, dairy



Proteins make up about 15% of your total body mass and are involved in nearly every function in your body

Each protein in our body has a specific function.

# Some Functions include...

- 1.) Transporting substances
- 2.) Helping to speed reactions along
  - Enzymes
- 3.) Providing structural support
- 4.) Making hormones

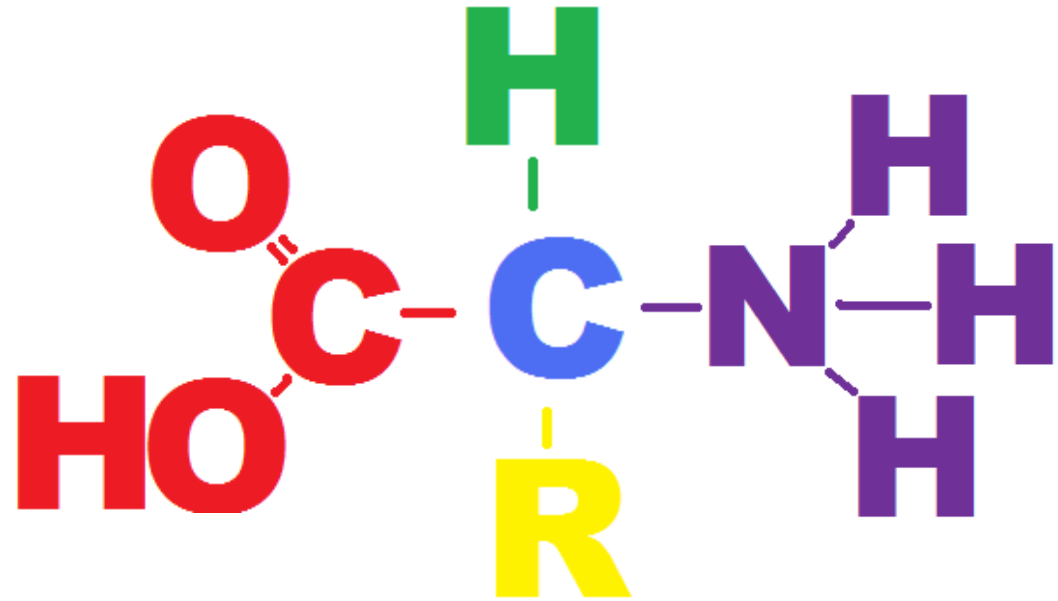
# Building Blocks/ Monomers of Protein

- Proteins are made from amino acids
  - Which means proteins are polymers and their monomers are amino acids
- There are 20 possible amino acids
- Each amino acid has a different shape

# Amino Acid Structure

Five parts:

- Carbon – all other parts attach to this
- Hydrogen
- Carboxyl group
- Amine group
- Side chain (unique in each type of amino acid)



# Shape and Function

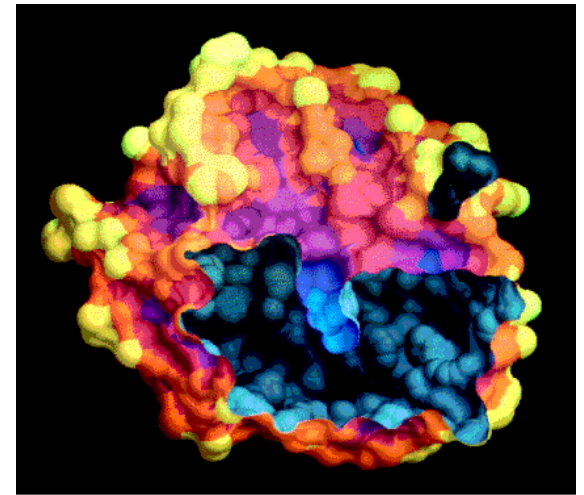
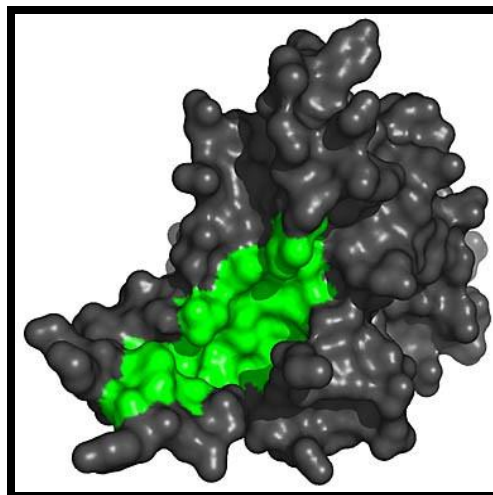
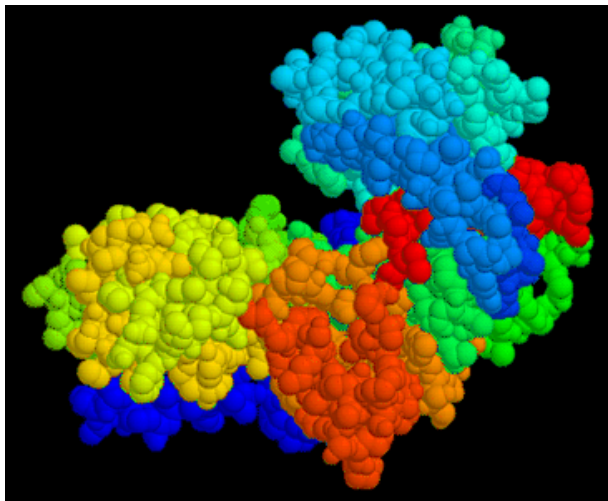
Tools have specific shapes that help them do their job





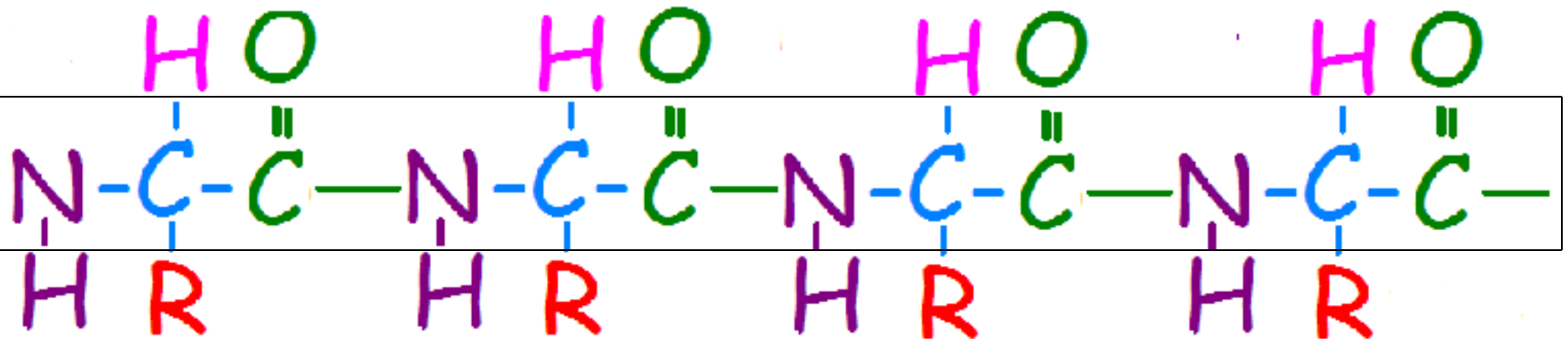
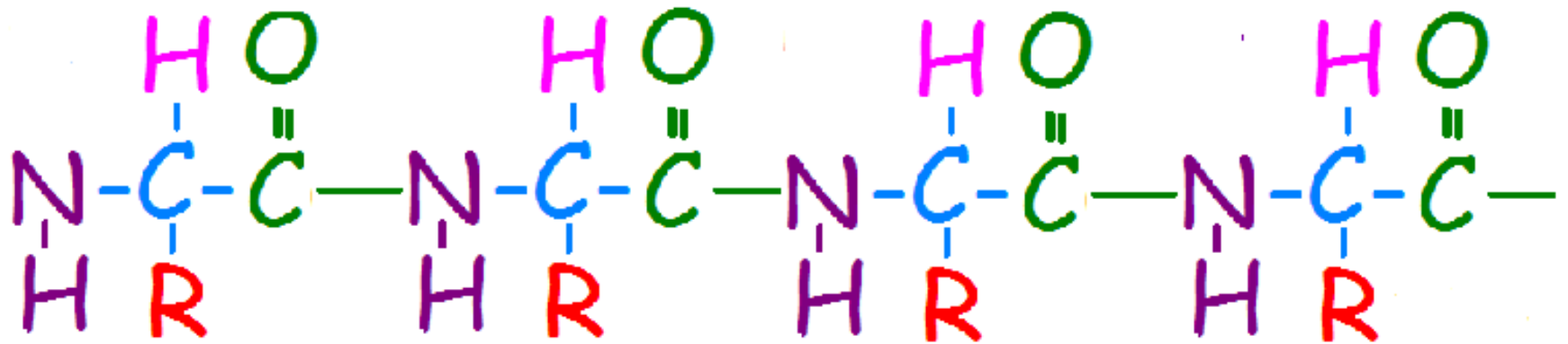
# Shape and Function

- Like a tool, a protein's shape also determines its function
- Each amino acid is shaped differently
- Each protein has different amino acid sequence; therefore, a different shape
  - The number and order in which the amino acids are joined define the protein's primary structure





Amino acids are joined together by peptide  
Bonds.



# Essential vs. Non-essential Amino Acids

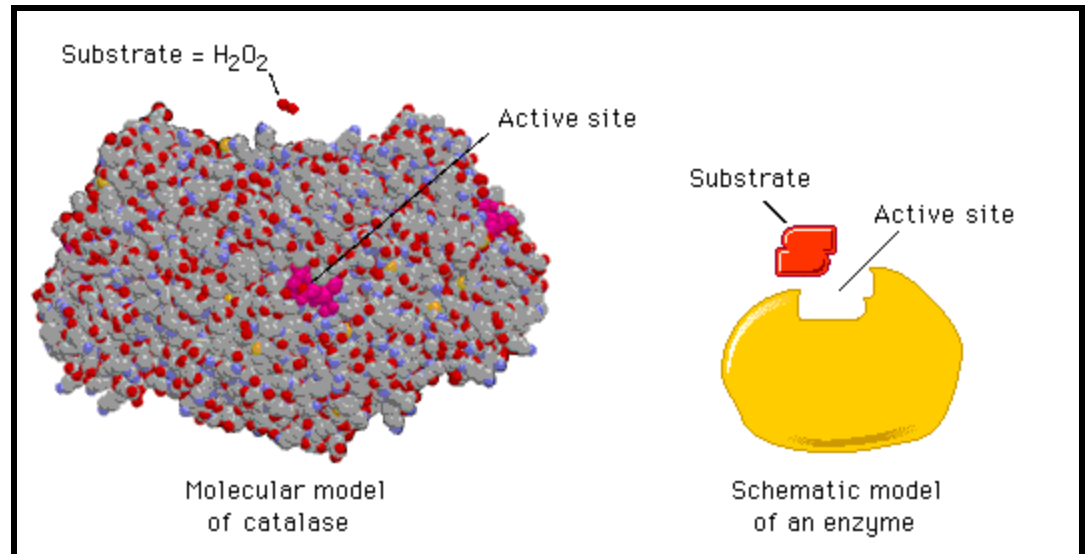


- 12 amino acids (non-essential) are made by the body
- 8 **essential** amino acids are not made by the body –you must get them from food



# Enzymes

- Protein molecules that facilitate reactions without being changed themselves
- Example: A stapler attaches paper together, but the stapler stays the same
- Example: a staple remover removes staples without being changed
- Digestive enzymes break down food

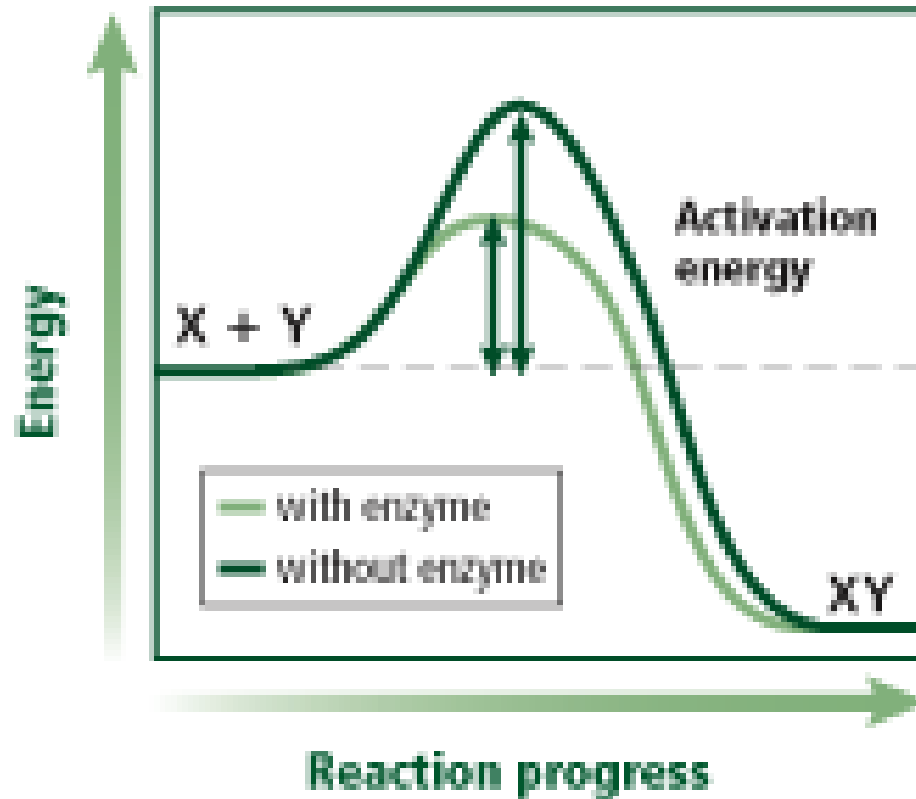


**ALL ENZYMES ARE PROTEINS, BUT  
NOT ALL PROTEINS ARE ENZYMES!!!**

# Energy of Reactions

- The minimum amount of energy needed for reactants to form products in a chemical reaction is the activation energy
- A catalyst is a substance that lowers the activation energy needed to start a chemical reaction
  - \*It does not increase how much product is made and it does not get used up in the reaction
- ENZYMES ARE BIOLOGICAL CATALYSTS

## Energy Diagram



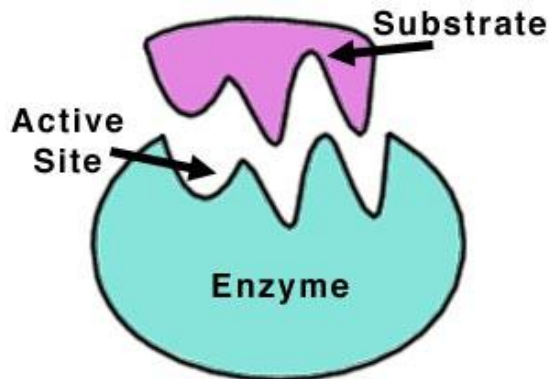
**Reactants** are the starting substances

**Products** are the substances formed during the reaction



# Enzymes: Substrates and Active Sites

- The reactants that bind to the enzyme are called substrates
- A specific location where a substrate binds on an enzyme is called the active site



enzymes are named for the chemicals that they "go to work" on.....

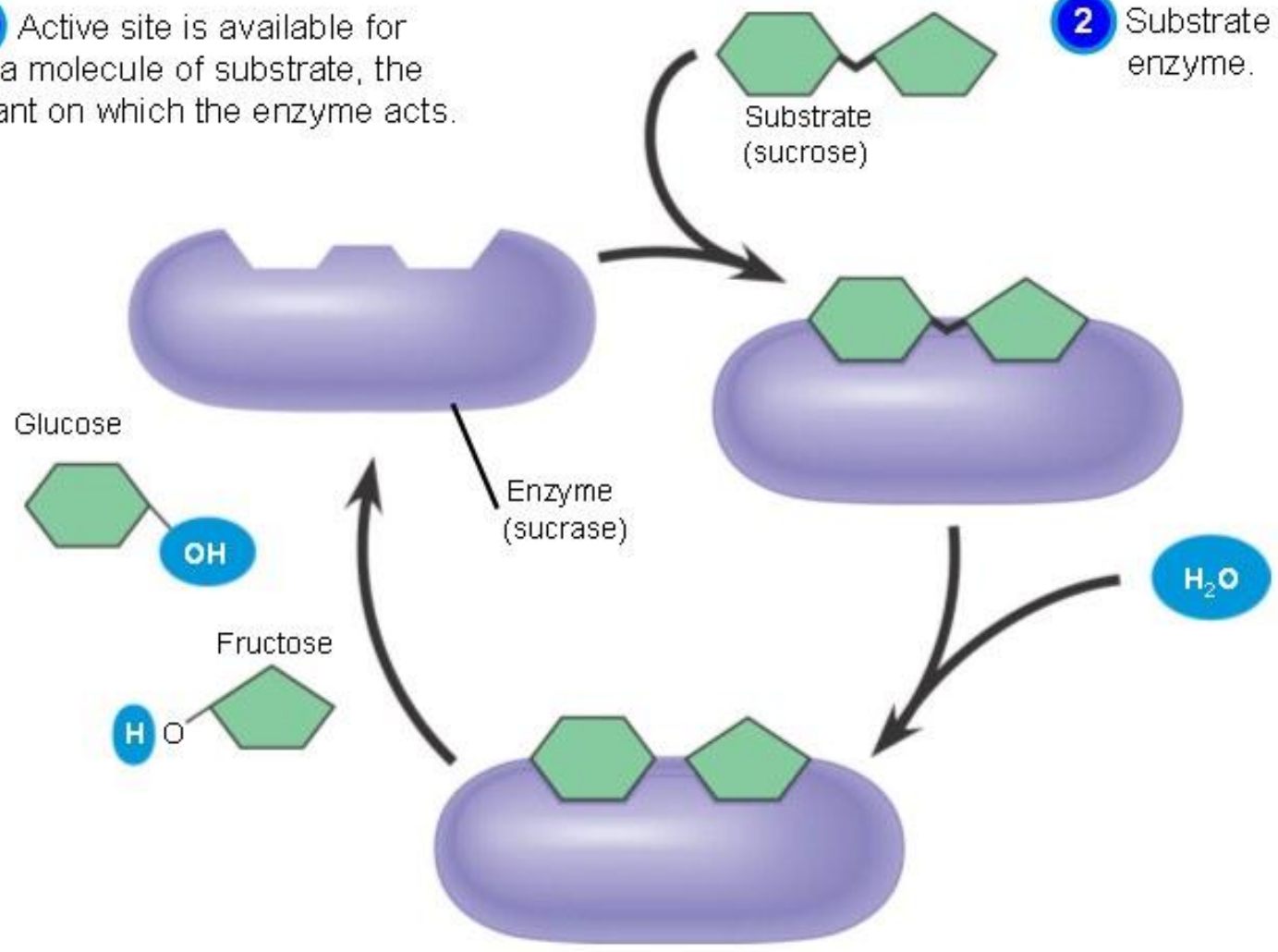
1.) enzyme names always end in -ASE

ex. LIPASE, LACTASE, SUCRASE

2.) the first part is what their substrate is

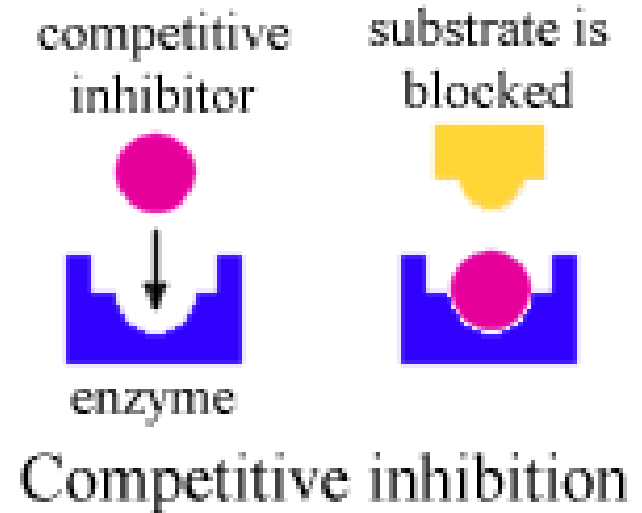
**1** Active site is available for a molecule of substrate, the reactant on which the enzyme acts.

**2** Substrate binds to enzyme.



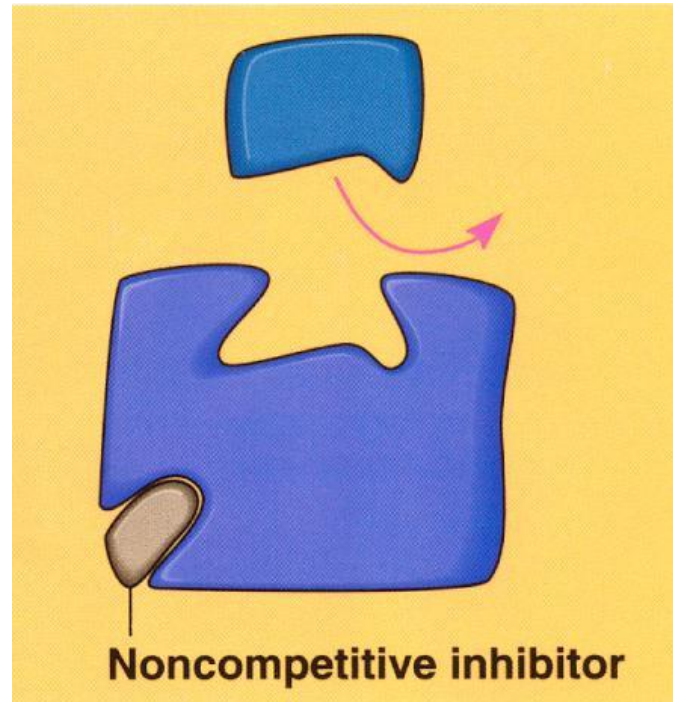
**3** Substrate is converted to products.

**4** Products are released.



**Competitive inhibitor**- a molecule that binds to an enzyme's active site and blocks the substrate from binding

- it keeps the enzyme from acting on the substrate



**Noncompetitive inhibitor**- molecule that binds to the enzyme somewhere other than the active site and affects the structure of the enzyme

- the substrate can no longer bind to the active site because it does not fit

# FACTORS THAT INFLUENCE (affect) ENZYME ACTION

## 1. temperature:

- generally, as the temperature increases, so does the enzyme action, until a point, when the enzyme starts not to work well.
- the temperature at which enzymes are most effective is called the **optimum temperature**.
- If it gets too hot, the enzyme falls apart (called *denaturation*) then it no longer works (like when you get a very high fever)

# FACTORS THAT INFLUENCE (affect) ENZYME ACTION

## 2. pH

(the pH scale)

- the measure of how acidic or basic something is
- the lower the pH, the more acidic, the higher the pH, the more basic
- the pH scale is measured from 0 to 14---7 is neutral
- Most enzymes work best at around 7 some enzymes work at other ranges
  - All Enzymes have a pH range- the pH must be in that range in order for them to work

# FACTORS THAT INFLUENCE (affect) ENZYME ACTION

## 3. amounts of enzymes and substrates

\* adding more of either the enzyme or substrate will increase the rate of the reaction...until you reach a point where the enzyme cannot work any faster- then the activity level of enzyme action levels off.



# Quiz

1. What is the building block/monomer of protein?
2. What kind of things in the body are made of protein?
3. What determines the shape and function of the protein?
4. What is the name of a protein that changes the rate of reactions?
5. What is an essential amino acid?