

Enzyme Notes

Chapter 3 Supplement

Importance:

- ✓ Binding proteins that act as organic catalysts that speed up very slow organic reactions. Enzymes basically run our bodies.
- Organic reactions are incredibly slow! We need enzymes to speed up the processes.
- Enzymes act like an assembly line; there are specific steps along the way that each enzyme acts on.

Terms:

1. **Metabolism:** the sum of all chemical reactions in the body

2. **Enzymes**

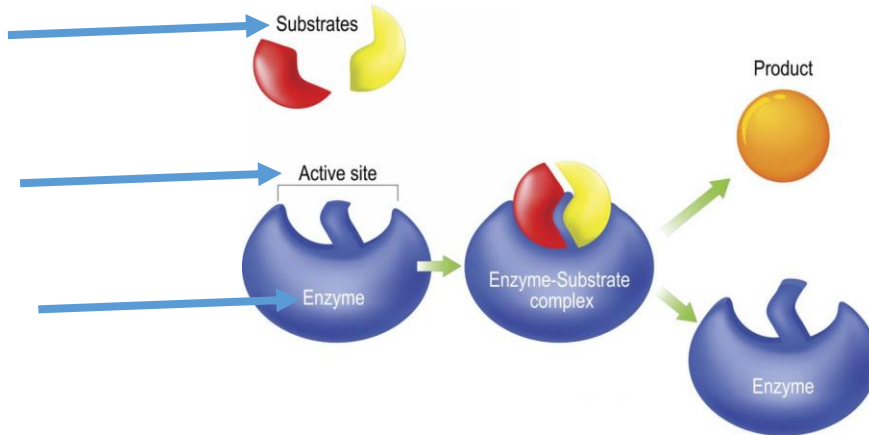
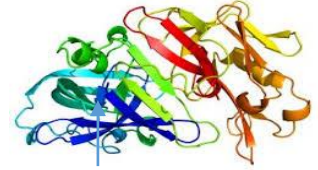
a. End in (-ase)

b. Binding proteins

c. **Parts of the Enzyme**

i. **Substrate:** molecule an enzyme is reacting with

ii. **Active site:** part of the enzyme the substrate binds to

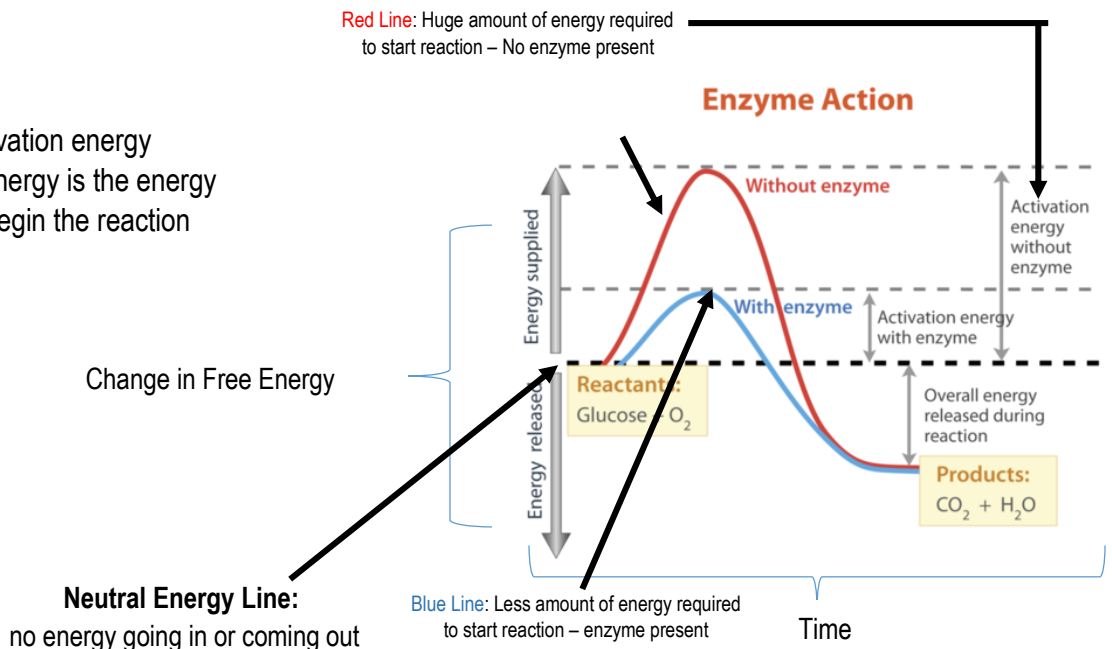


3. **Catalyst:** a substance that increases the rate of a chemical reaction without itself undergoing any permanent chemical change.

How Enzymes Works

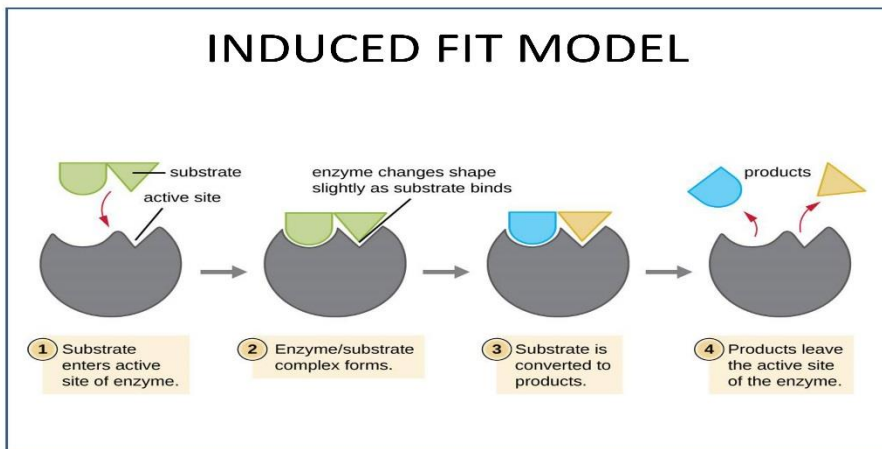
- ✓ Enzymes **lower** activation energy
 - Activation energy is the energy needed to begin the reaction

Note: Think of a sledding hill. It requires a ton of energy to walk up the hill; but if you use a lift or rope pull, you exert very little energy. The rope pull or lift is an enzyme.



Enzyme – Substrate Reactions (Induced Fit Model)

- ✓ **The Induced Fit Model**
 - **The enzyme binds to the substrate by conforming to the shape of the substrate**
 - In other words, the induced fit model shows that the enzyme may change its shape slightly to accommodate the substrate
- ✓ Enzymes are very specific and their shape **MUST** match up with their substrate. **(Enzymes = HIGHLY SPECIFIC)**
- ✓ **Enzymes function through contact. They must bind perfectly to function!!!**
- ✓ Enzymes **are recycled** during a reaction; enzymes are not used up in the reaction; they function until they dissolve or are denatured.



Things to Remember:

1. **Dehydration Synthesis (Condensation)** = monomer + monomer, remove water, and create a polymer
2. **Hydrolysis** = polymer, add water, break into monomer + monomer

Factors Effecting the rate of enzymatic reactions

1. pH levels
2. temperature – as temperature rises, more molecular collisions occur
3. stirring
4. concentration of substrate – as the amount of substrate increases, the chances for reactions to occur increases
5. presence of inhibitors
 - a. **inhibitors**: substances which alter the catalytic action of the enzyme and consequently slow down, or in some cases, stop catalysis.

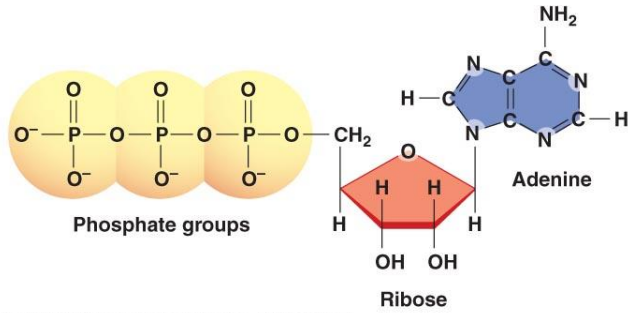
Denaturing of enzymes and examples

- ✓ **Denaturing**: the process of making an enzyme become inactive or causing them to not function;
 - **their structure is altered therefore its function is impacted; the protein is broken out of its 3-D shape**
- ✓ **How to denature an enzyme**
 1. temperature – raising the temperature
 2. strong shaking / stirring – increasing collisions, breaking the bonds and 3D shape
 3. acids/bases
 4. detergents

Energy Acids – Importance of ATP (ATP Coupling)

- ✓ **ATP** is a nucleic acid that functions as the energy currency of the cell.
- ✓ Many enzymatic reactions require this “easily obtainable” energy.

(a) **ATP consists of three phosphate groups, ribose, and adenine.**



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