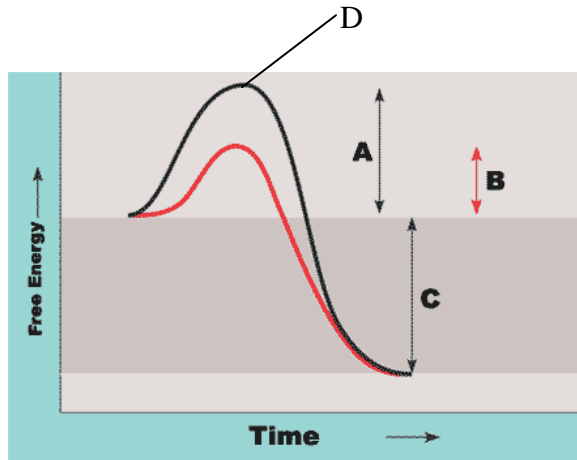


II. Enzymes

A. Enzymes speed up metabolic reactions by lowering energy barriers

- Catalysts _____ the rate of chemical reactions _____ being used up in the process
- Enzymes are _____ that act as biological catalysts
- Enzymes _____ the activation energy of a reaction
- Activation Energy = _____



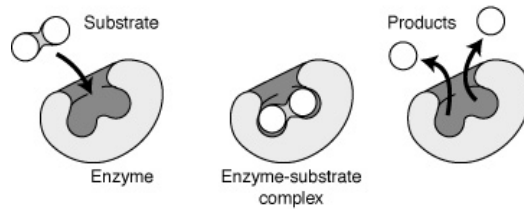
- Enzymes have _____ on the _____ (G) of the reaction, they just force the reaction to occur _____.
- Reactants can only breakdown when they have absorbed enough energy to reach the _____

B. Enzymes are substrate-specific

- The _____ of an enzyme is due to its 3D shape and the levels of organization in the protein
 - Primary -
 - Secondary -
 - Tertiary -
 - Quaternary -
- Parts of an Enzyme
 - Substrate =
 - Active Site =
- When the enzyme binds to the substrate, a temporary _____ is created.
- Enzymes emerge from the reaction in their _____.
- Induced Fit Model = refers to a _____ in shape to produce a _____ around the substrate
- How do enzymes lower the activation energy?

- Allows reactants to get into the _____ to react
- Stretches the substrate to cause _____ easier (helps reach the transition state faster)
- Creates a _____ more conducive for the reaction to occur
- _____ participation of the active site in the reaction – may bind to the substrate temporarily

C. The active site is an enzyme's catalytic center



D. A cell's physical and chemical environment affects enzyme activity

Factors Affecting Enzyme Activity

- _____
 - Up to a certain point, the velocity of an enzymatic reaction _____ with _____ temperatures
 - Increased Temperature = increase in _____ resulting in greater collisions between enzymes and molecules
 - Temperatures that get too high result in thermal agitation of the enzyme molecule
 - This enzyme becomes _____

Graph

- _____
 - The optimal range for most enzymes is pH 6-8
 - One exception: Pepsin: digestive enzyme in the stomach – works best at pH 2
 - An environment that is _____ or _____ can _____ an enzyme

Graph

- _____
 - Most enzymes can't tolerate environmental conditions that are _____ (salty)
 - This will also cause the enzyme to _____

4. Cofactors = _____ helpers that many enzymes require for catalytic activity
- Inorganic cofactors include: Mg, Ca, Fe, Cu, Zn, & Mn
 - Organic cofactors are called _____
 - ATP, Vitamins, and _____ (CoA) are also coenzymes
 - Cofactors can bind tightly to the active site of the enzyme permanently or they may bind loosely and release along with the substrate.

5. Enzyme Inhibitors

- Irreversible inhibition:
 - If the inhibitor attaches to the enzyme by _____ bonds, inhibition is usually irreversible
 - Reversible Inhibition:
 - Inhibitor attaches to the enzyme using _____ interactions
 - Reversible inhibition can be competitive or non-competitive
- A. Competitive – _____ the normal substrate molecule and _____ for admission into the active site
- They reduce the productivity of enzymes
 - Increasing the _____ reduces the effectiveness of competitive inhibitors
- B. Noncompetitive – Impede the enzymatic reactions by binding to a part of the enzyme _____
- This causes the enzyme to change its _____ rendering the active site unreceptive

III. The Regulation of Metabolism

A. Metabolic control often depends on allosteric regulation

Allosteric regulation = involves the _____ to an enzyme _____ at its active site

- This causes the enzyme to be _____ or _____ depending on the molecule
- ATP can inhibit activity while ADP can stimulate activity on the same enzyme

Cooperativity = _____ of enzyme activity when one substrate binds to _____ active site and stimulates the _____

Feedback inhibition = when a metabolic pathway is _____ by the inhibitory binding of the _____ to an enzyme

- This _____ the pathway from continuing
- Example: synthesis of amino acids

B. The location of enzymes within a cell helps order metabolism

- Some are grouped into complexes, some incorporated into membranes and others are contained inside organelles (lysosomes)
- Bacteria (prokaryotic cells) have enzymes located in the cytosol