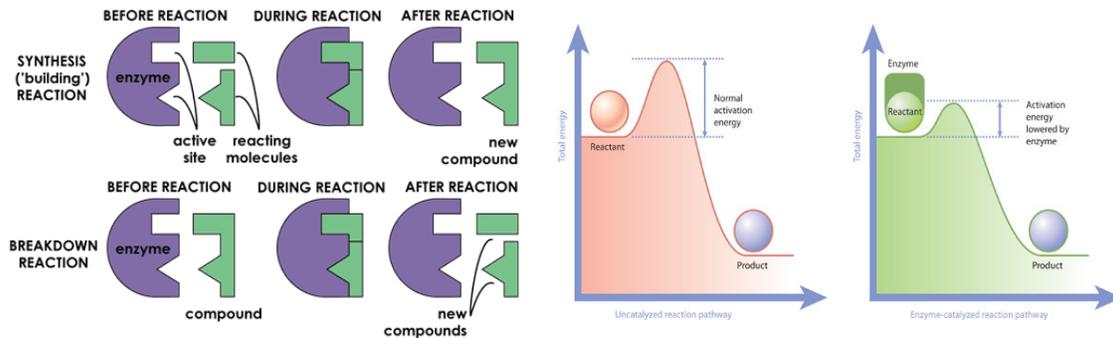
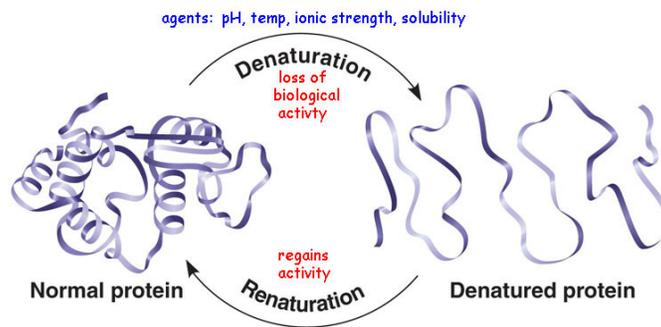


- Enzymes:** are biological catalysts made of proteins formed in unique 3-dimensional shapes. They increase the rate of chemical reactions (by reducing the activation energy of reactions) without themselves being chemically changed at the end of the reactions.
- Lock and Key hypothesis:**
 - Actions of enzymes are specific to the targeted substrates.
 - **Enzyme= "Lock", Substrate="Key"**
 - The specificity of an enzymes action is due to the shape of substrate and the enzyme active sites being complimentary to each other just like a Lock and a key.
 - Enzymes only need to be present in small quantity since they are reuse after their actions.



- Denaturation** is the change in a three-dimensional structure of an enzyme or any other solution proteins, caused by heat or chemicals such as acids or alkalis.



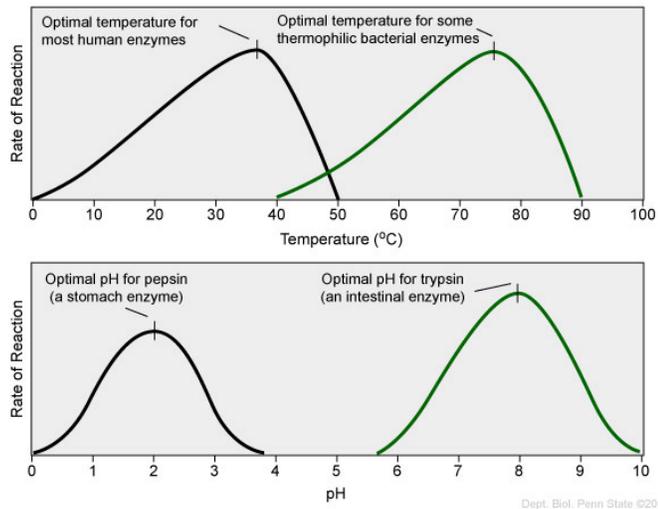
4. Enzymes-catalyzed processes

- **Break down** substances:
 - Digestion of food substances by breaking down of larger food molecules into smaller water soluble molecules which are diffusible through cells membrane in order to be absorbed by the body.
 - Amylase: digest starch to maltose.
 - Maltase: digest maltose to glucose.
 - Proteases: digest proteins to amino acids.

- Lipase: digest lipid to fatty acids and glycerol
- Breakdown of toxic substances such as H₂O₂ by liver's enzymes.
- Breakdown of glucose during cells respiration.
- **Build up** substances: synthesis of complex substances within cells
 - Photosynthesis dark stage synthesis of glucose by chloroplasts.
 - Building various proteins from amino acids.
 - Building glycogen or starch from glucose for storage.

5. Factors affecting enzymes

Optimal Temperature and pH



- **Temperature:**
 - Enzymes are less active at very low temperature.
 - Rising temperature increases the rate of reaction by higher collision rate between enzymes and substrates. Enzymes are **twice** as active when **temperature is raised by 10 degree** C till the optimum temperature is reached.
 - Beyond optimum temperature, enzymes start to denature and lost their ability to catalyze the reaction.
- **pH level:**
 - Different Enzymes structures are specific at different pH level. Extreme deviation of pH environment denatures the enzymes.
- **Limiting factor** (Substrate and enzyme Concentrations):
 - When the limiting factor of a reaction is the enzymes concentration, increasing the enzyme concentration will increase the rate of reaction.
 - Increase substrates concentration increases the rate of reaction when enzymes concentration is not the limiting factor.