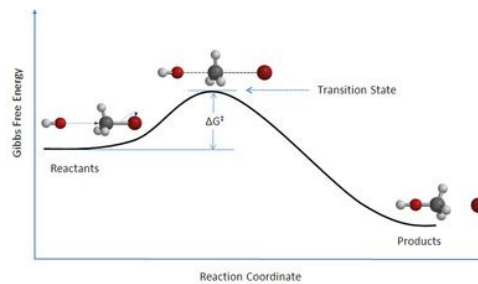


I) Overview of chemical reactions

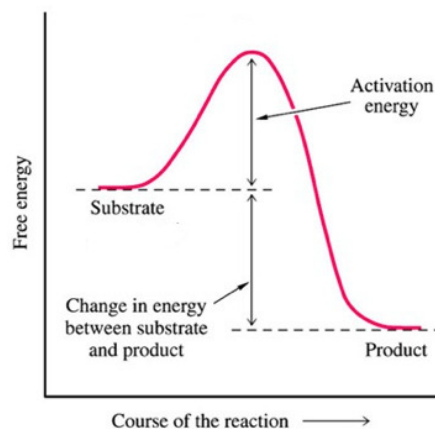
A) Parts of a chemical reaction

- 1) **Substrate:** the substance(s) you start with before the reaction takes place (also called reactants)
- 2) **Product:** the substance(s) you end up with after the reaction is over



B) Energy

- 1) **Activation energy** is the amount of energy that must be supplied in order for a chemical reaction to take place.
- 2) How energy is used/released during a chemical reaction:



II) Enzymes

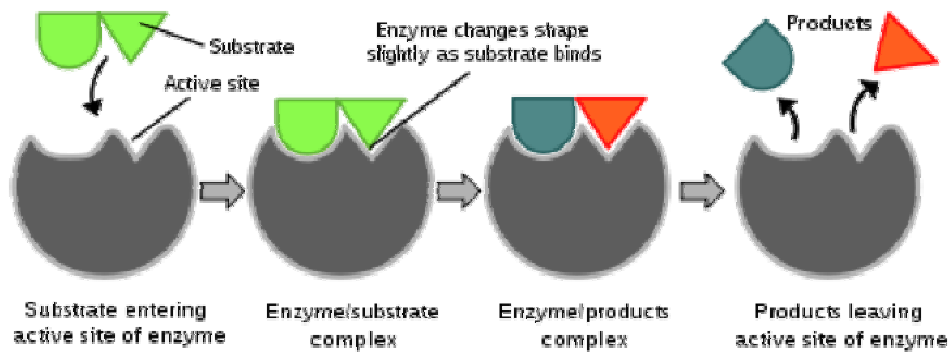
A) Structure

- 1) Most enzymes are proteins, although some are made out of RNA (called **ribozymes**).
- 2) An enzyme has an **active site**, which is where the substrate binds to the enzyme molecule.

3) Importance of enzyme shape

- (a) The shape (quaternary structure) of an enzyme determines what molecules it can react with. The substrate fits into the active site much like a key fits a lock.
- (b) Enzymes are **substrate-specific**. In other words, an enzyme will only work on **one type of substrate**.
- (c) An enzyme's shape is not changed during a chemical reaction. This means the same enzyme molecules can be used again and again.

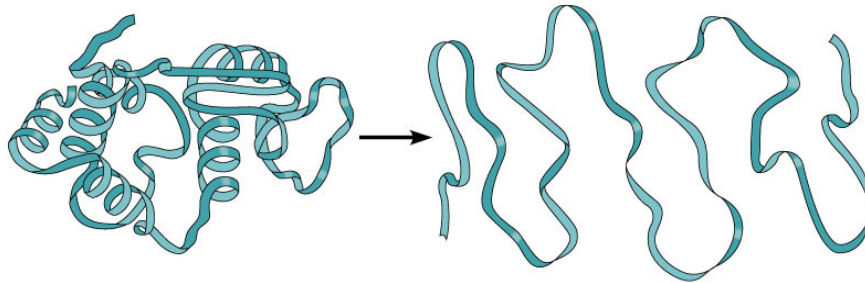
4) Labeled enzyme structures



B) Function

- 1) Enzymes function as biological catalysts. A **catalyst** is any substance that causes a chemical reaction to happen more easily.
- 2) Enzymes catalyze biochemical reactions by **lowering the reaction's activation energy**.

- 3) An enzyme's function depends on its shape. If an enzyme's shape is changed, it is said to be **denatured**. A denatured enzyme will function poorly, or not at all.



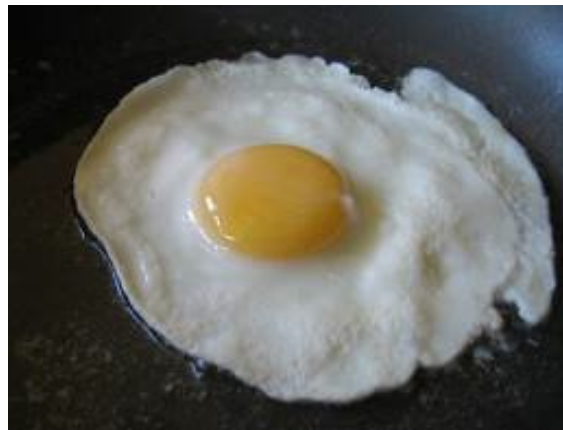
Active (functional) protein

Denatured protein

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There are two ways to denature an enzyme:

- (a) Expose it to high temperatures: this is what happens when you cook meat or eggs. The protein in meat/eggs denatures at high temperatures so it changes the shape (and texture, taste) of the molecules.



- (b) Expose it to a pH that is too high or low:
Ceviche is a raw fish dish that is soaked in lime juice (an acid), which gives it the texture of being cooked.



III) Enzyme-catalyzed reactions

- A) Enzymes are said to be similar to a lock and key:
- 1) Lock = enzyme
 - 2) Key = substrate
 - 3) Keyhole = active site

B) Enzymes lower activation energy

