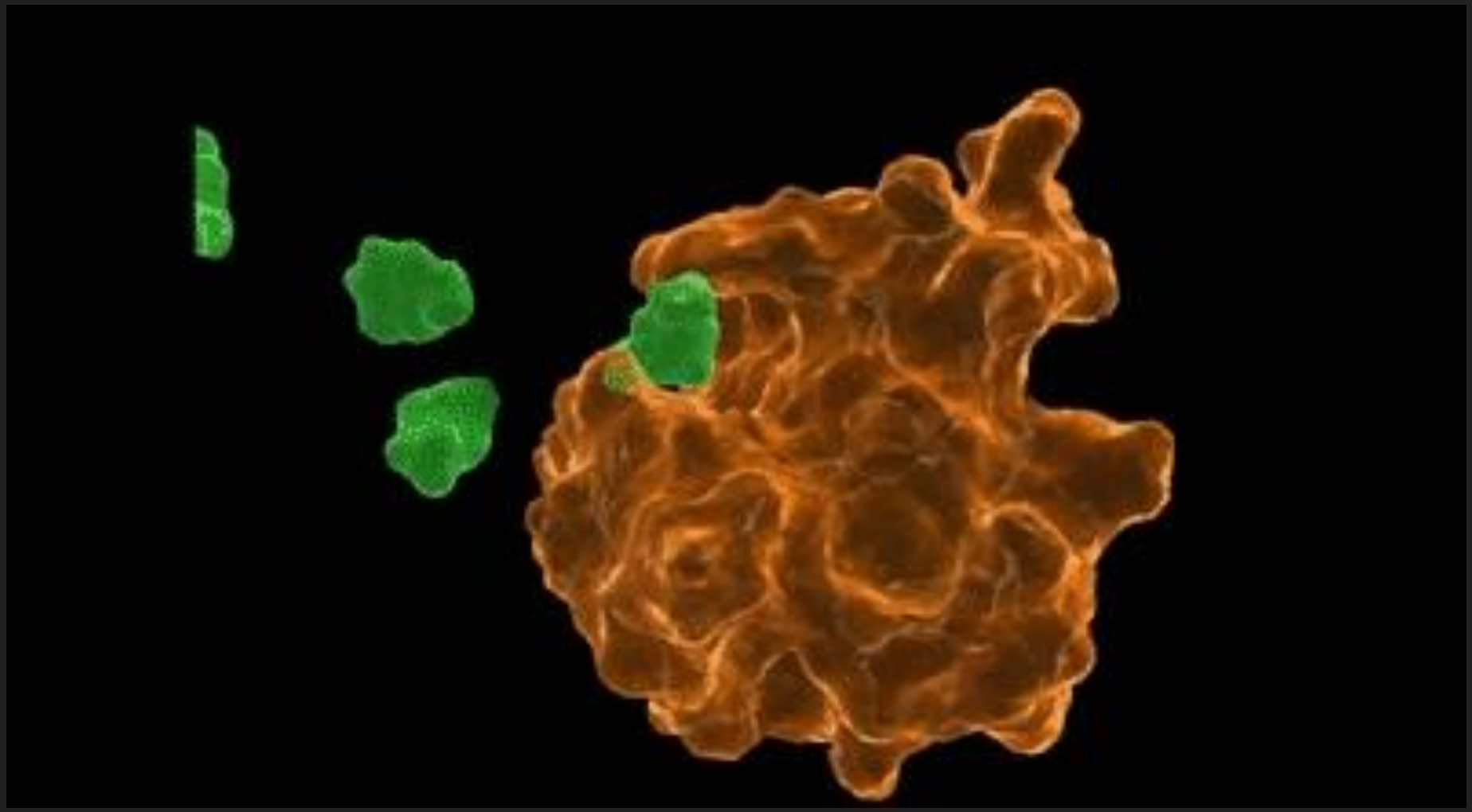
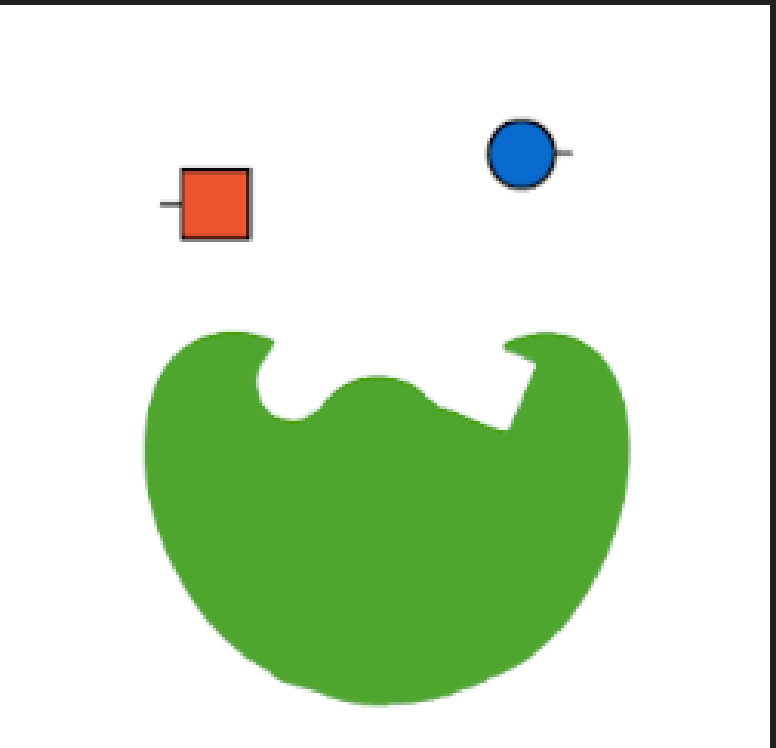
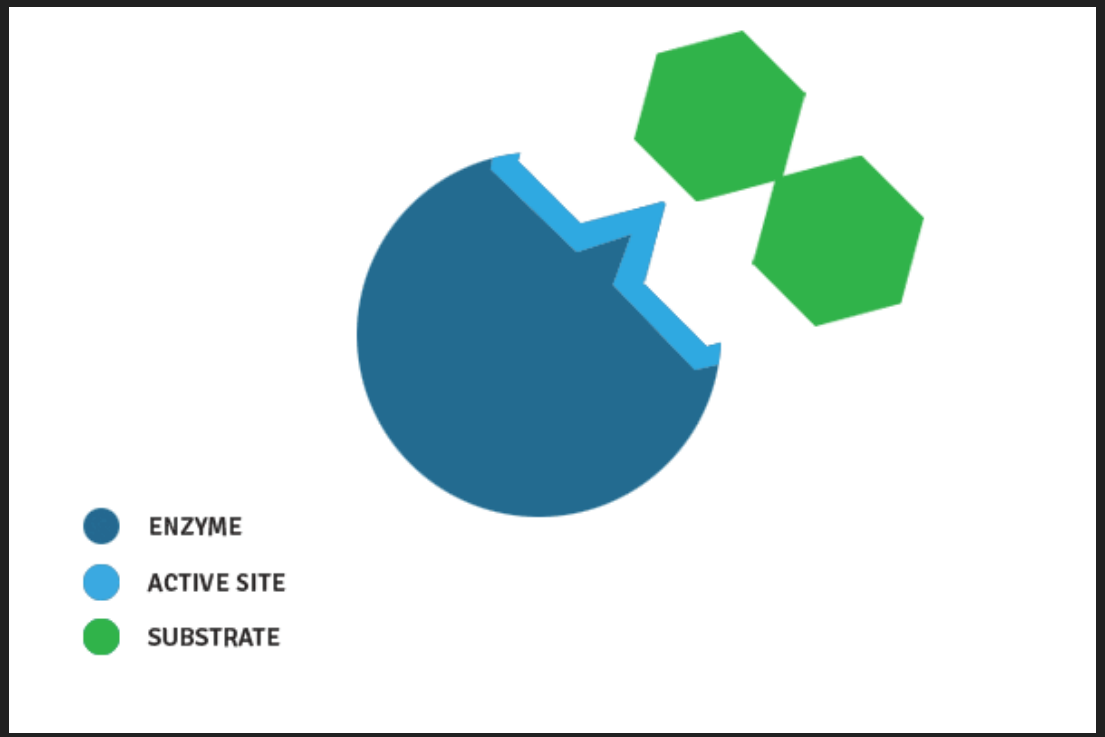
ENZYMES



Definition of Enzymes:

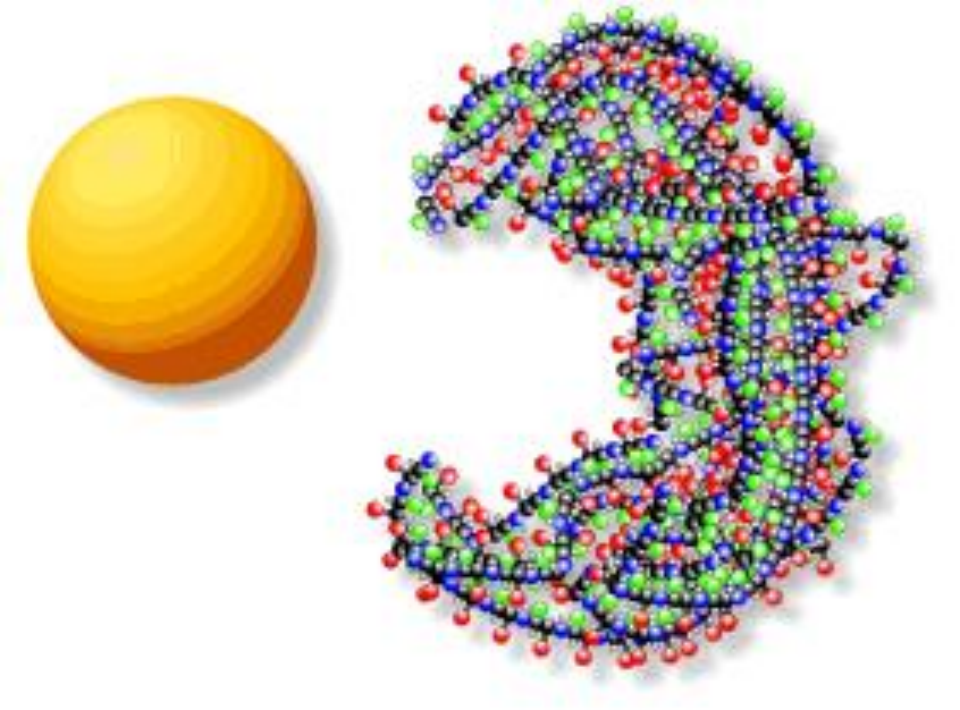
A type of protein that catalyzes a specific chemical reaction in a cell.

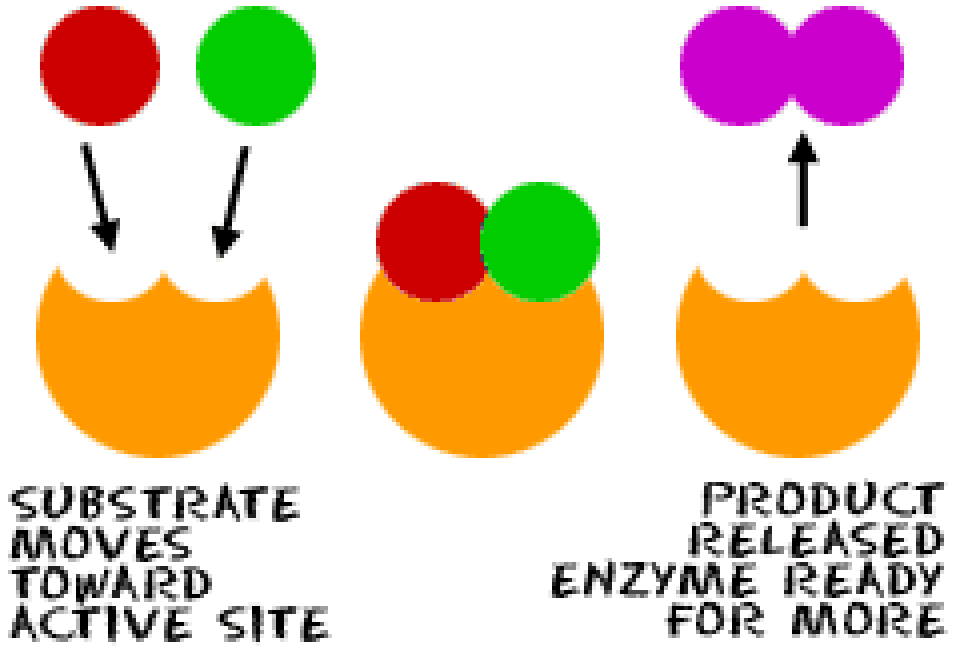




Enzymes are Catalysts

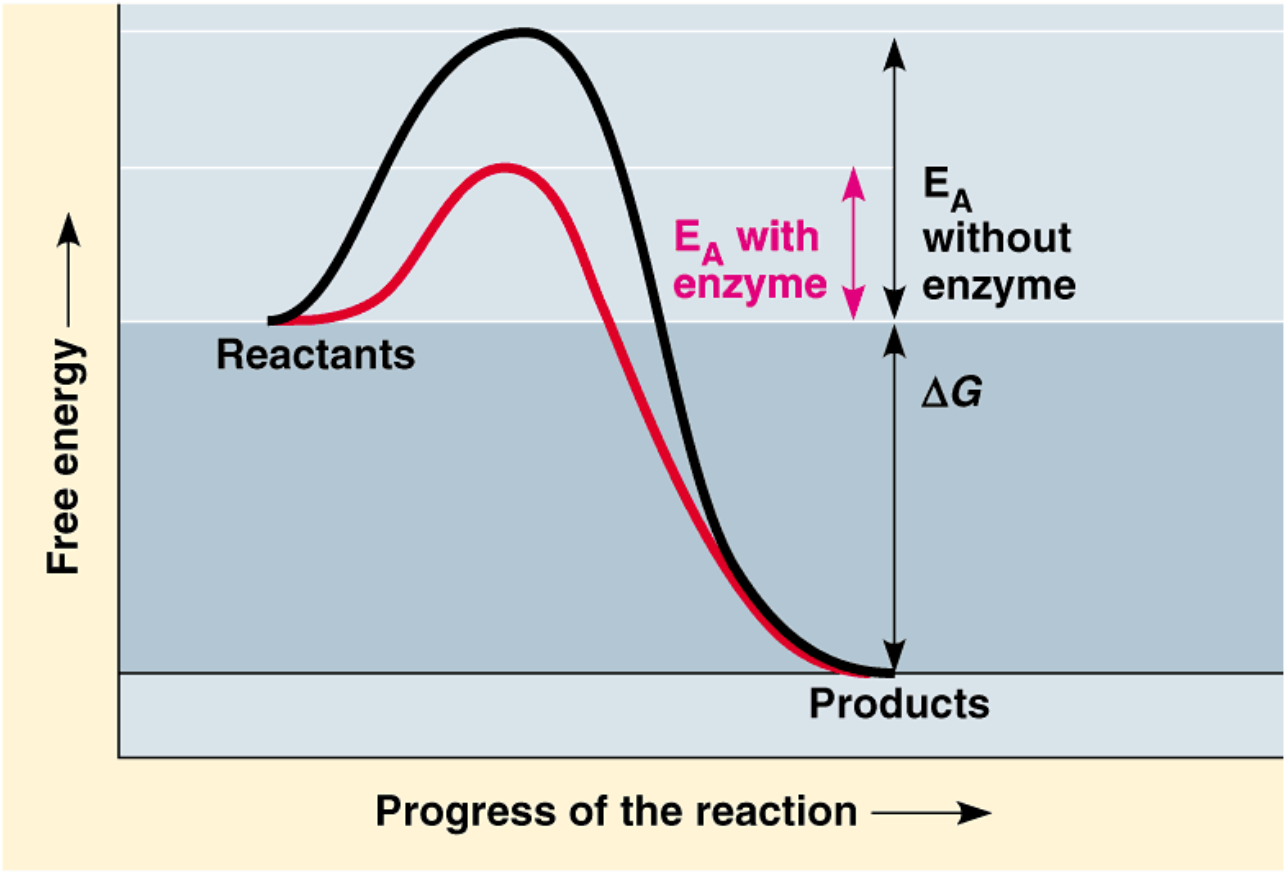
A catalyst is a substance that speeds up a chemical reaction without being used up in the reaction.





Enzyme are Catalysts

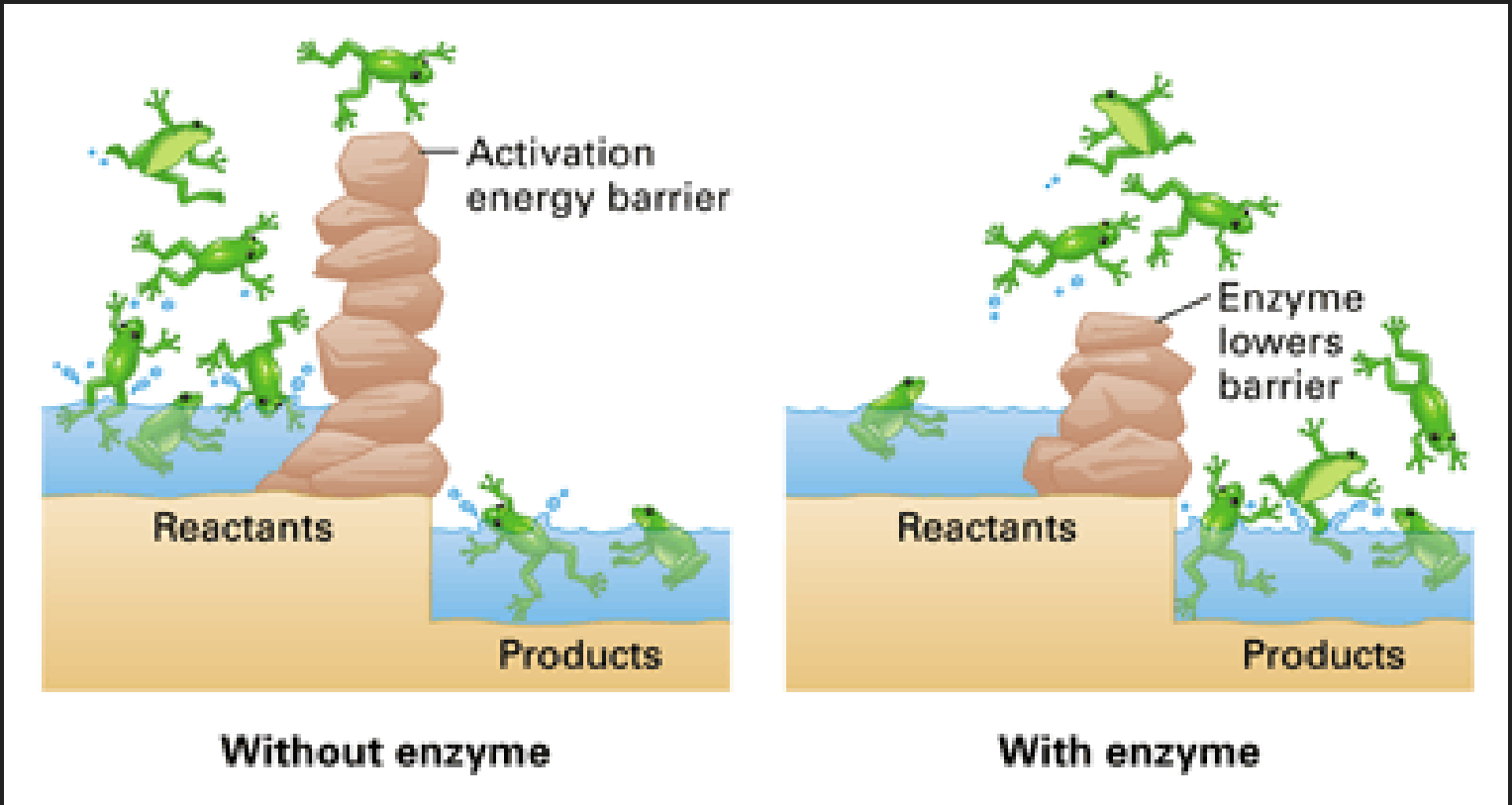
Enzymes speed up chemical reactions, by lowering a reaction's activation energy.



Chemical reactions need an input of energy to get started. This is called activation energy.

Enzymes are Catalysts

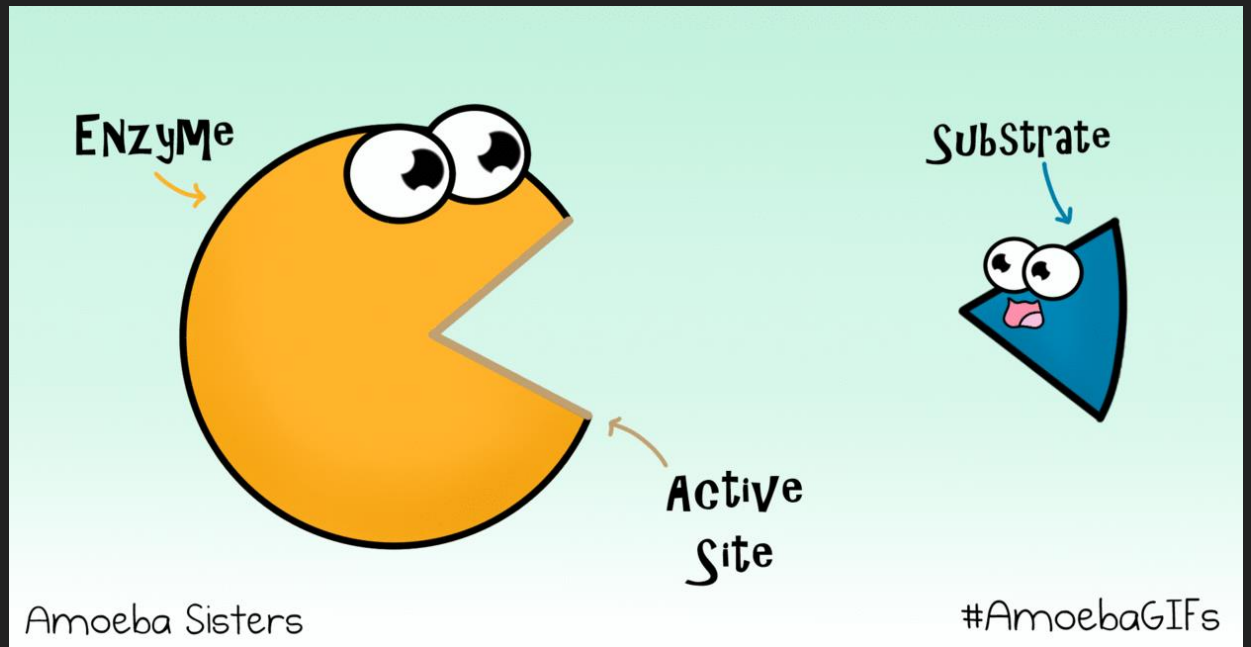
Lowering activation energy allows chemical reactions to happen faster, at lower temperatures.
(Higher temperatures could damage the cell)



Some helpful terminology:

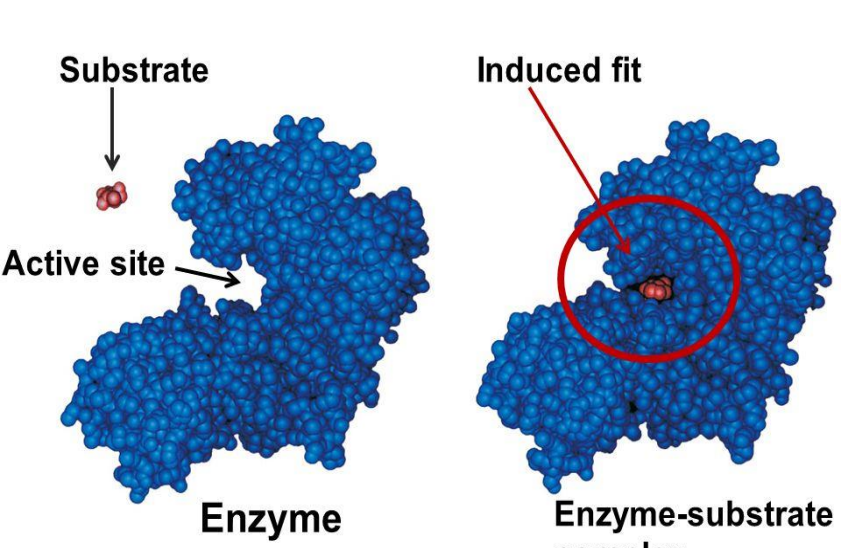
SUBSTRATE: The substance (**reactants**) that an enzyme acts on and makes more reactive. This could be another protein, lipid, carbohydrate or nucleic acid.

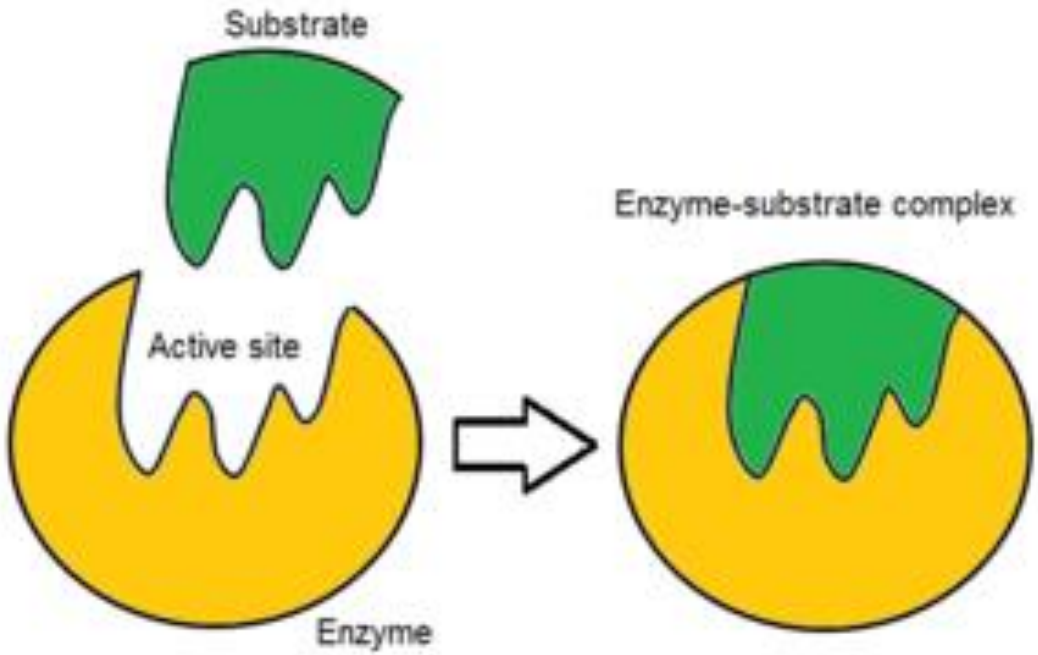
- Ex. Lactase (enzyme) that acts on lactose (substrate)



ACTIVE SITE:

- The **area of an enzyme molecule** which **binds to the substrate.**



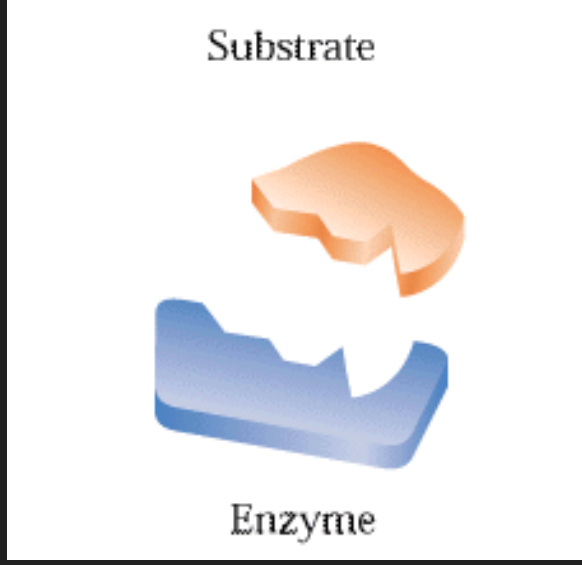


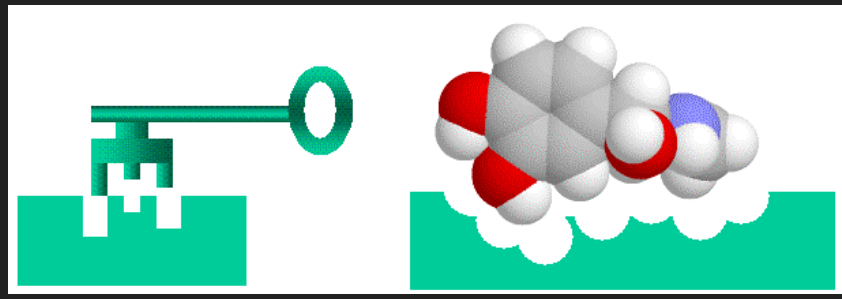
"Lock and Key"

For an enzyme to work on a specific substrate, its shape must match the shape of the enzyme's active site.

This is called the "lock and key" model.

The active site would be the lock.
The substrate would be the key

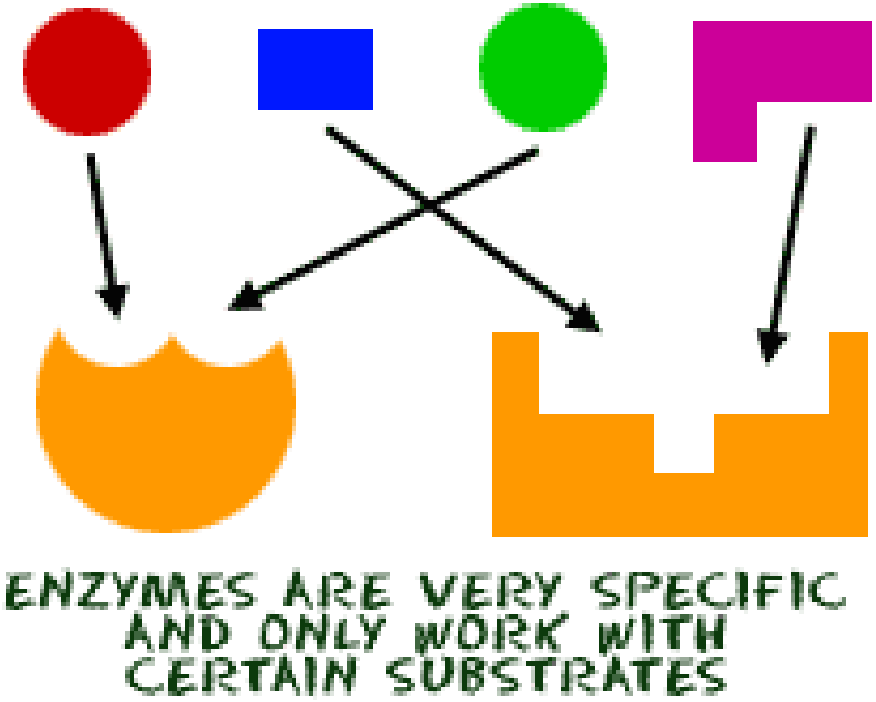




"Lock and Key"…Specificity

A **different** substrate would need a different "Lock" or enzyme!

This is called: SPECIFICITY!

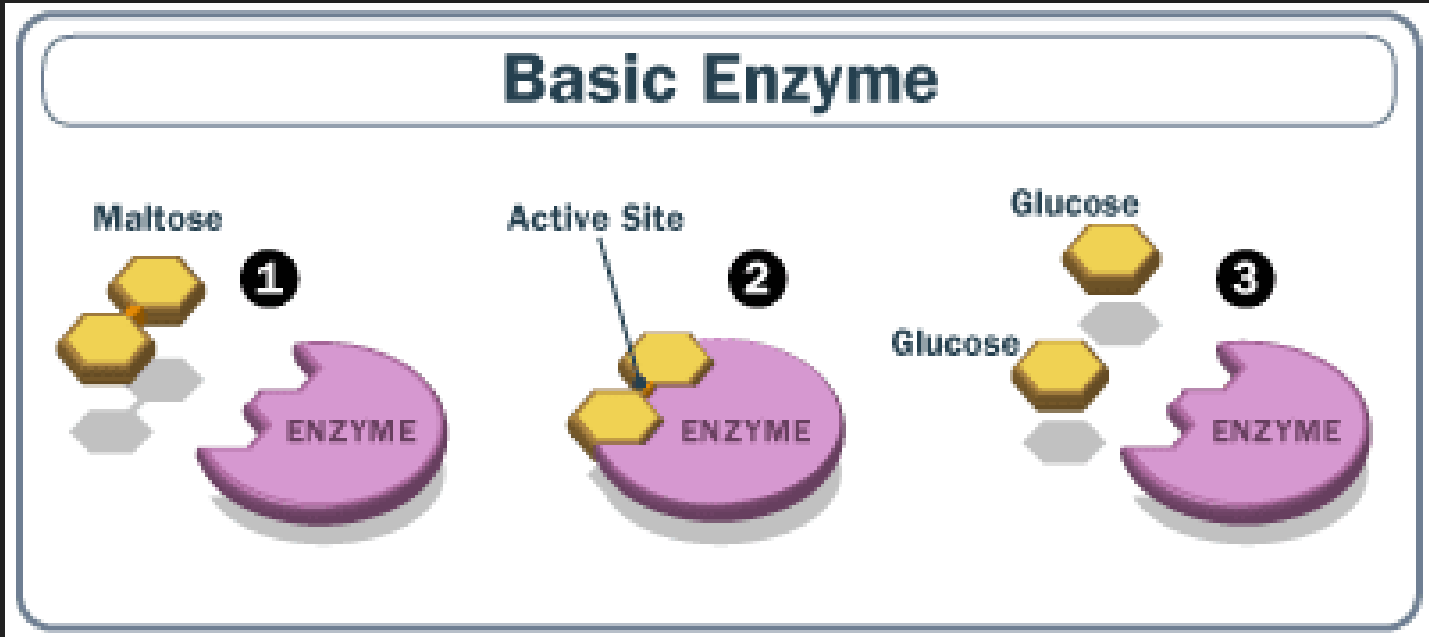


Example

Maltose is a sugar made of two glucoses.

Maltase is the specific enzyme that breaks maltose into glucose.

Other enzymes won't do this.

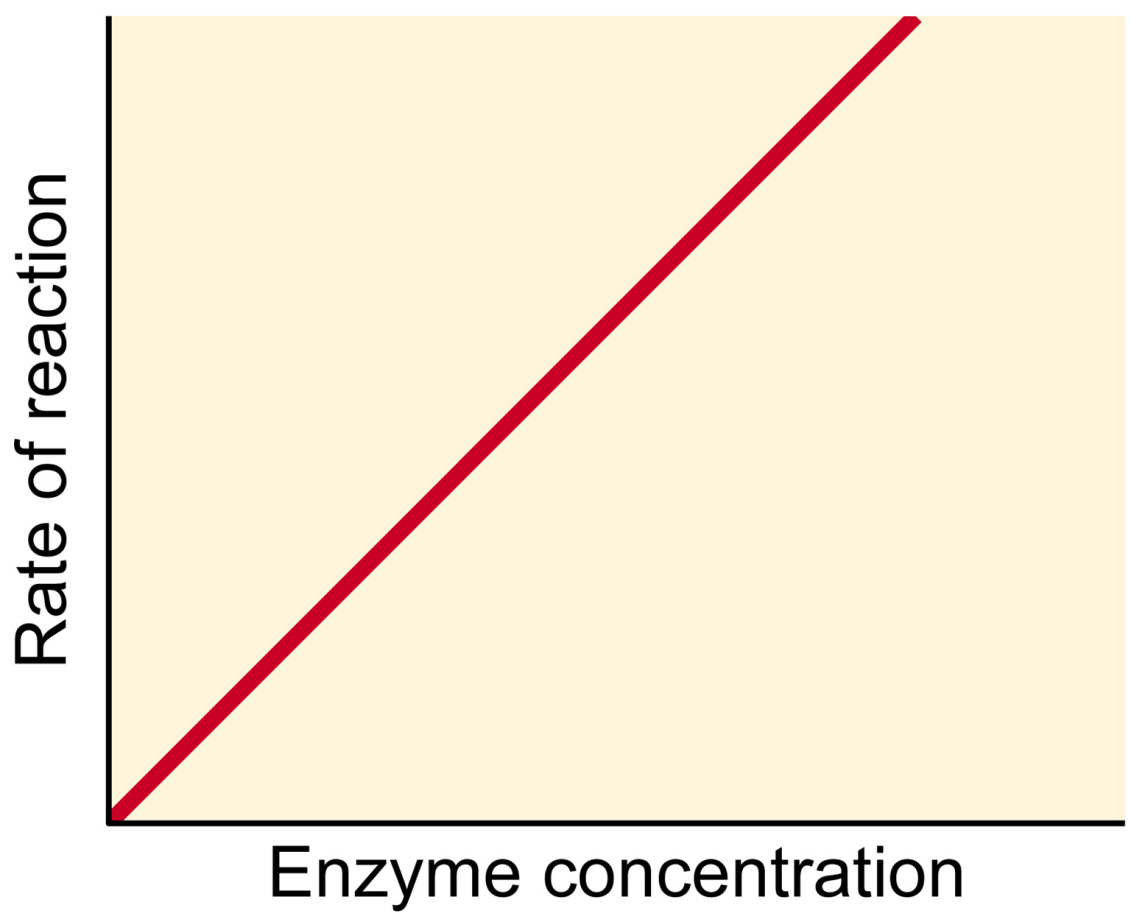


RATE OF REACTIONS:

The time it takes to break down a given amount of substrate into a given amount of product.

Example:

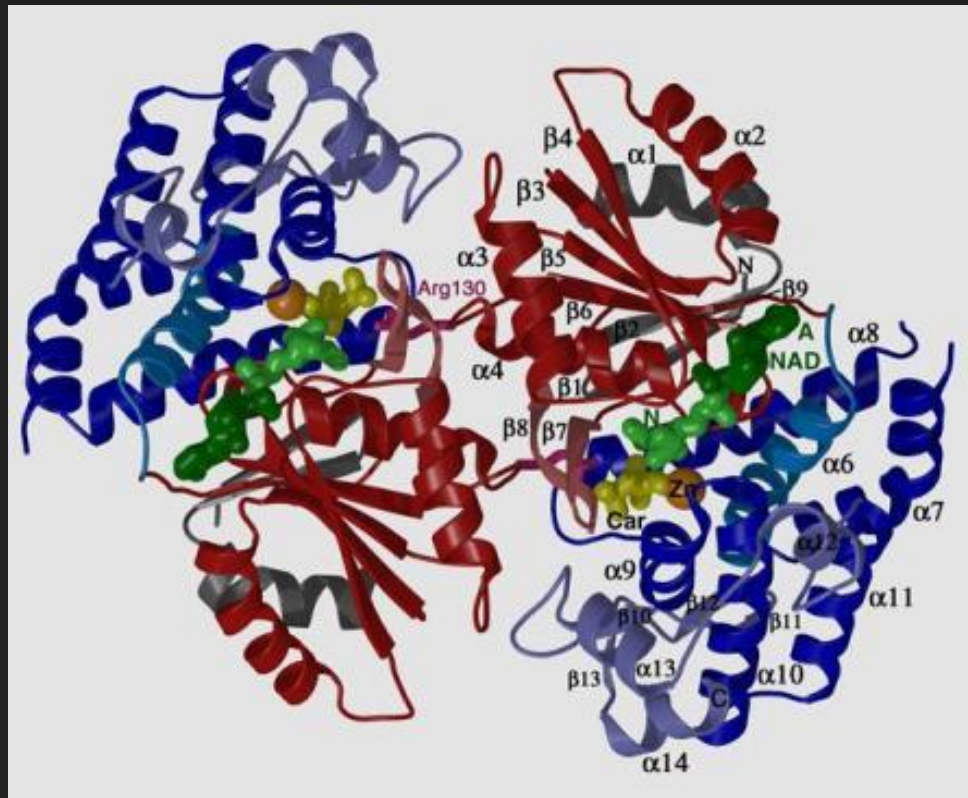
The more enzyme present, the faster the substrate will be broken down.



THE WHOLE ENZYME STRUCTURE:

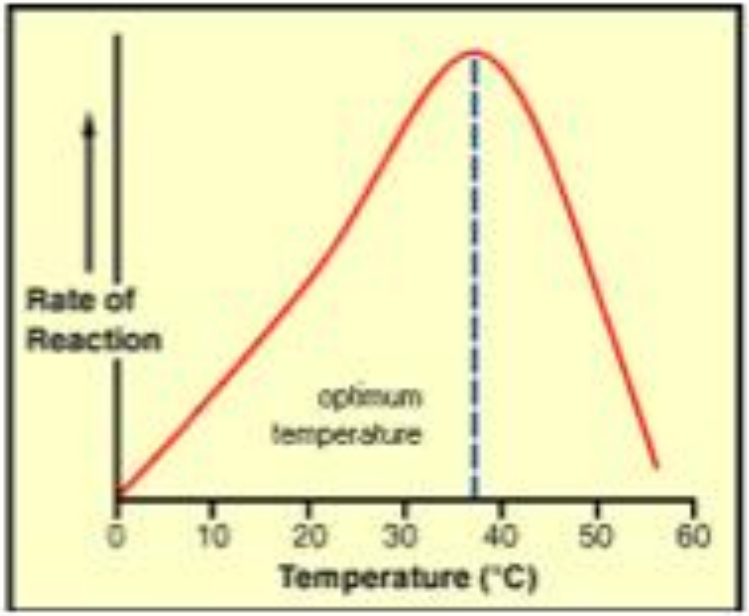
Enzymes are a type of protein, made up of one or more polypeptide chains.

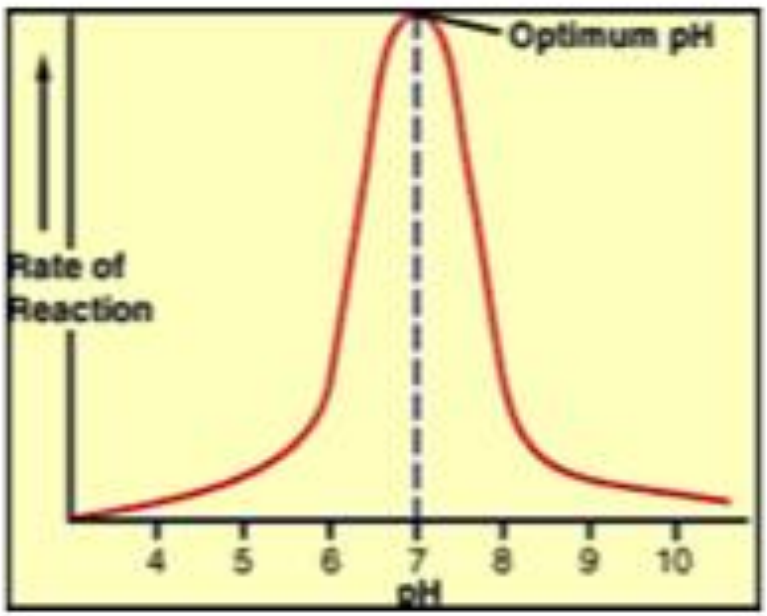
Remember that polypeptides fold into a specific 3D shape to become a functional protein (enzyme).



ENZYME OPTIMUMS

Each enzyme has an optimum temperature and pH they work best at. The rate of the reaction will be the highest at this optimum.

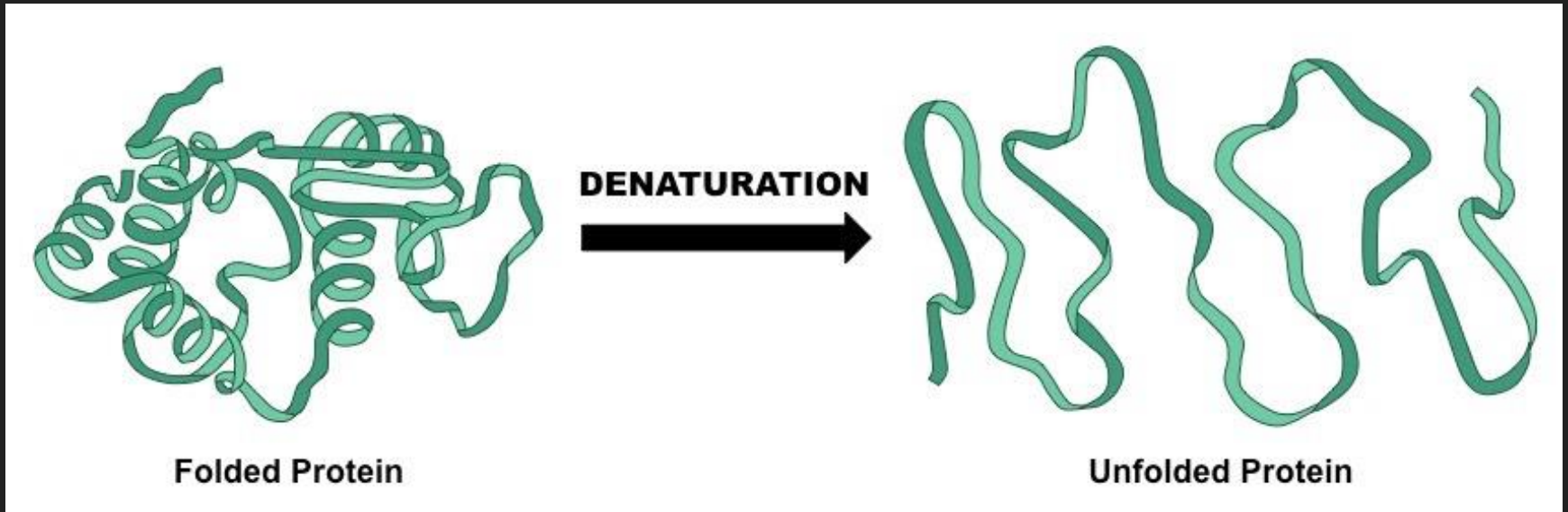


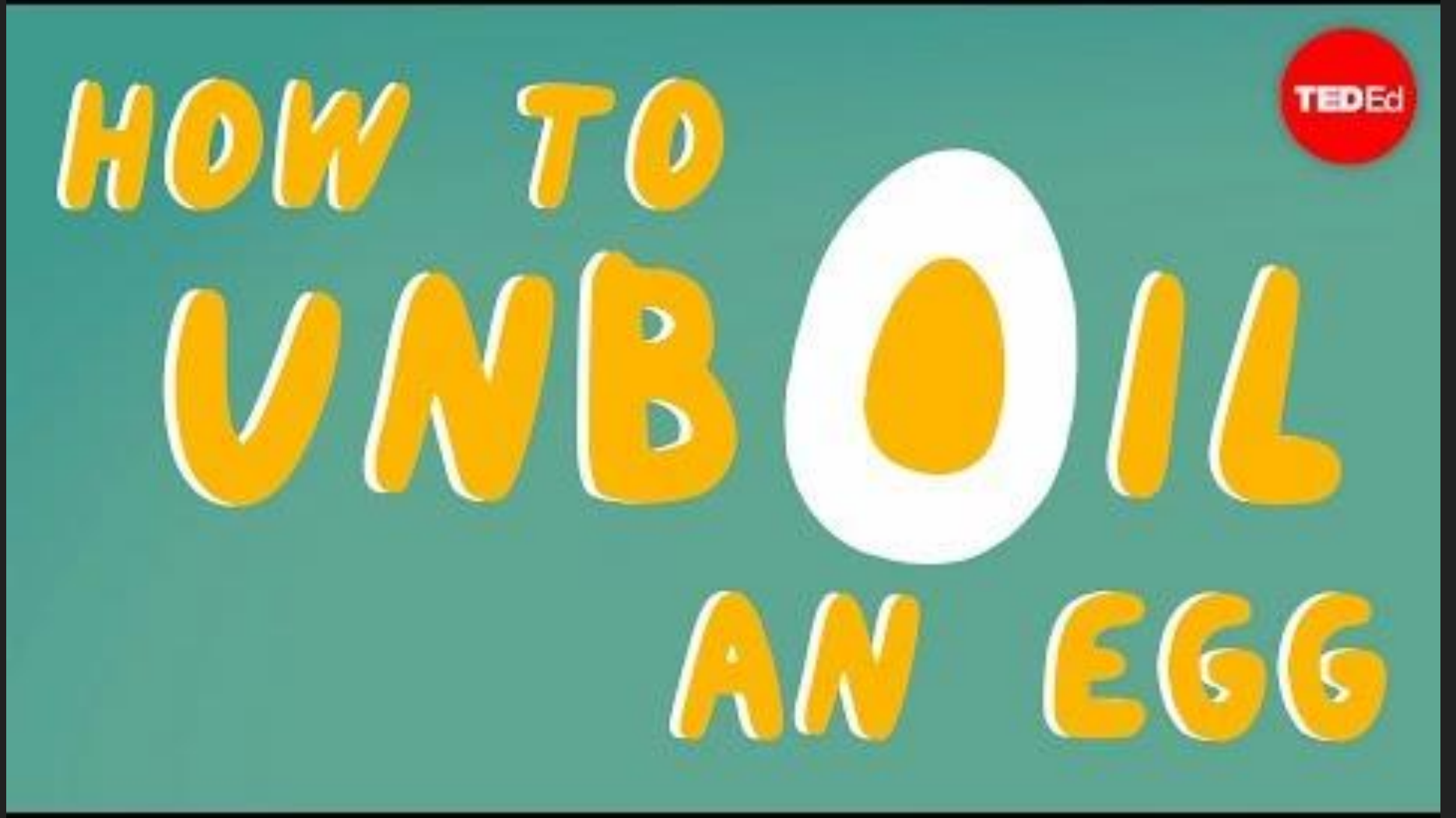


Denaturation:

If enzymes are exposed to temperatures or pHs that are too far from the optimum, the protein may unravel due to peptide bonds breaking.
This is called denaturation.

This unravels the enzyme, destroying the 3D shape and active site. The enzyme will no longer work.

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