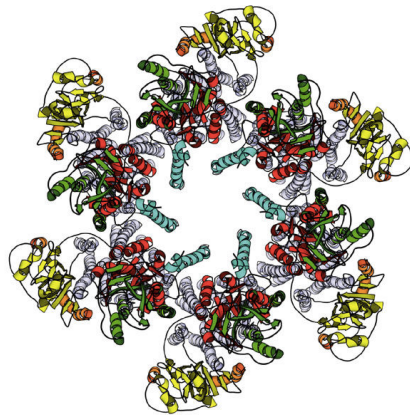


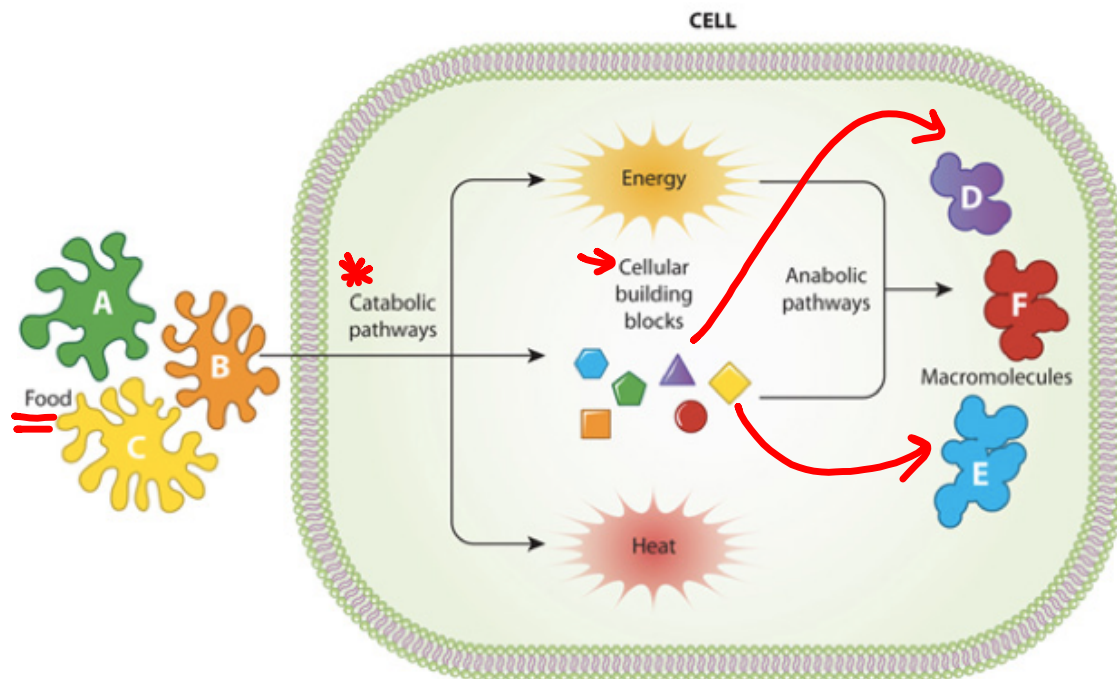
Introduction to Enzymes



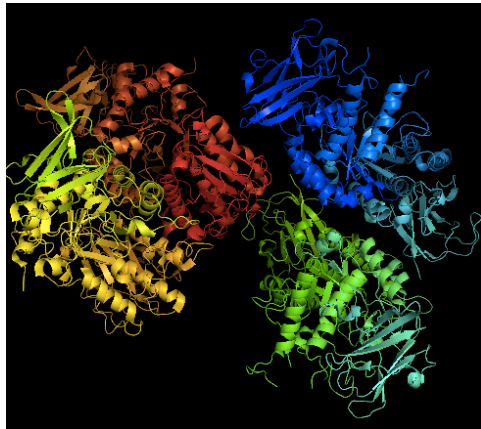
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Chemical reactions are constantly occurring in your cells.

Remember that energy cannot be created or destroyed, but it can change form.



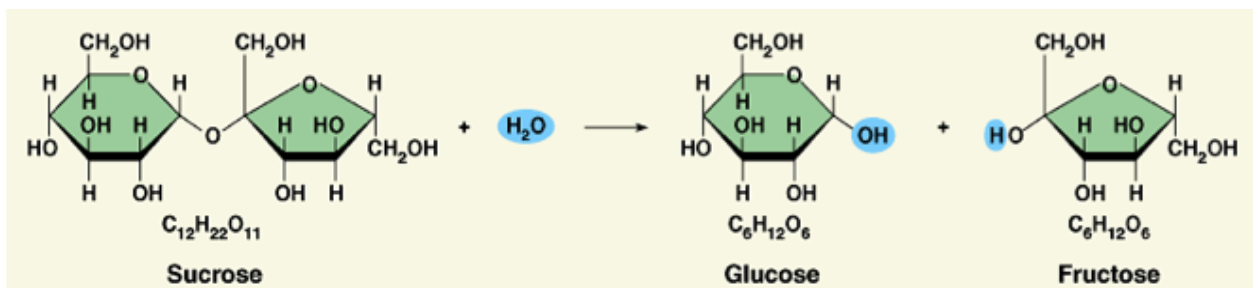
Enzymes are biological catalysts.



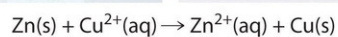
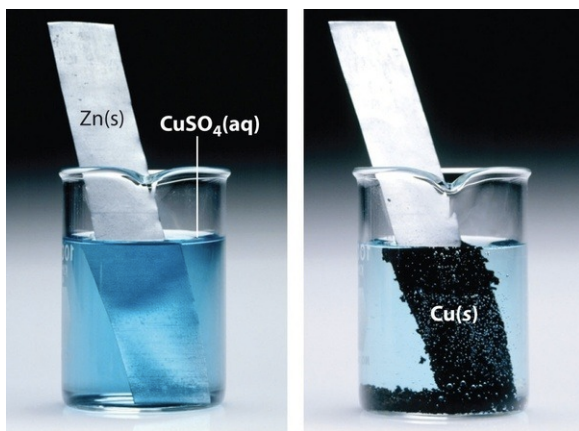
Speeds up
Chemical
reactions by....
lowers
activation
energy

What does that mean?

What is happening in this reaction?



Some processes are **spontaneous** at room temperature. There is sufficient energy to overcome the energy barrier.

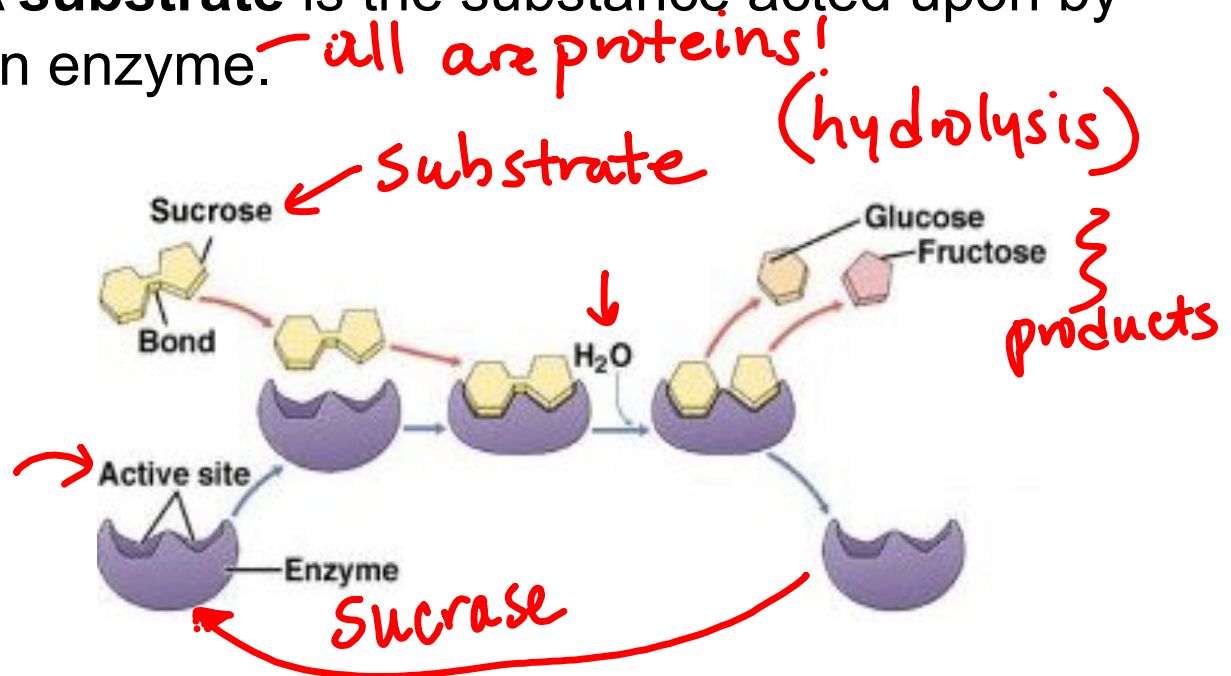


Other reactions require additional energy or help from a catalyst to occur at room temperature.

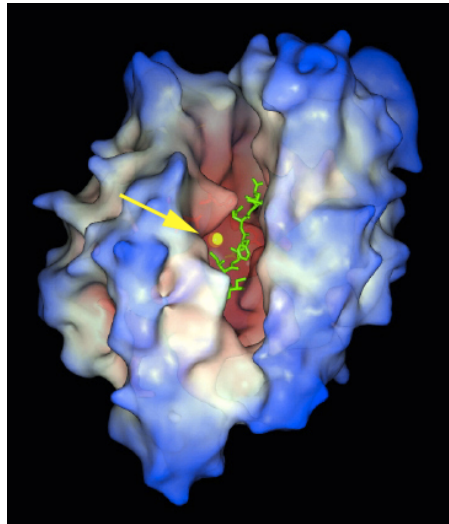
These reactions include the breakdown of proteins, DNA and other complex molecules.

Why do we need these reactions? Why can't we just add heat to speed up the reactions?

A **substrate** is the substance acted upon by an enzyme.

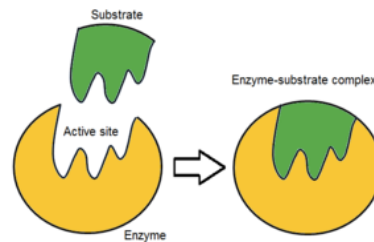


The **active site** of an enzyme is a pocket or groove on the surface of the protein into which the substrate fits.

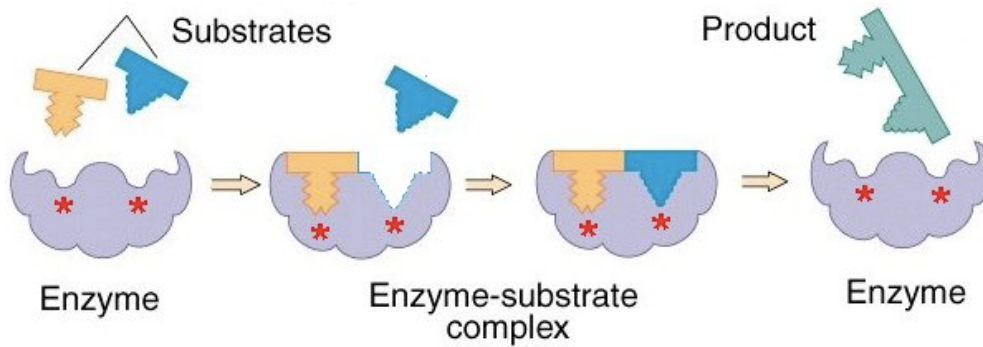


Two Models:

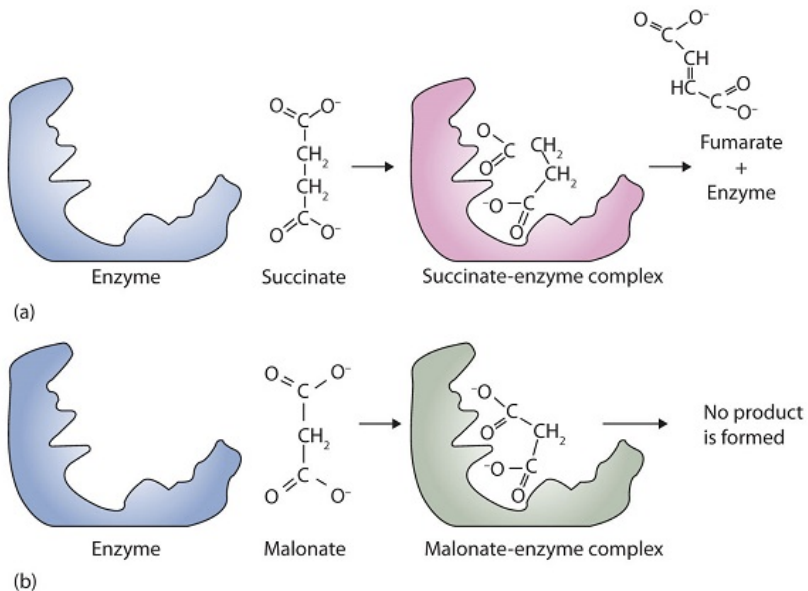
1) Lock and Key



2) Induced Fit



In most cases, substrates are held in the active site by electrostatic interactions or H-bonds.



A single enzyme molecule can catalyze thousands of rounds of a reaction per second.

Enzymes are regenerated at the end of a reaction.

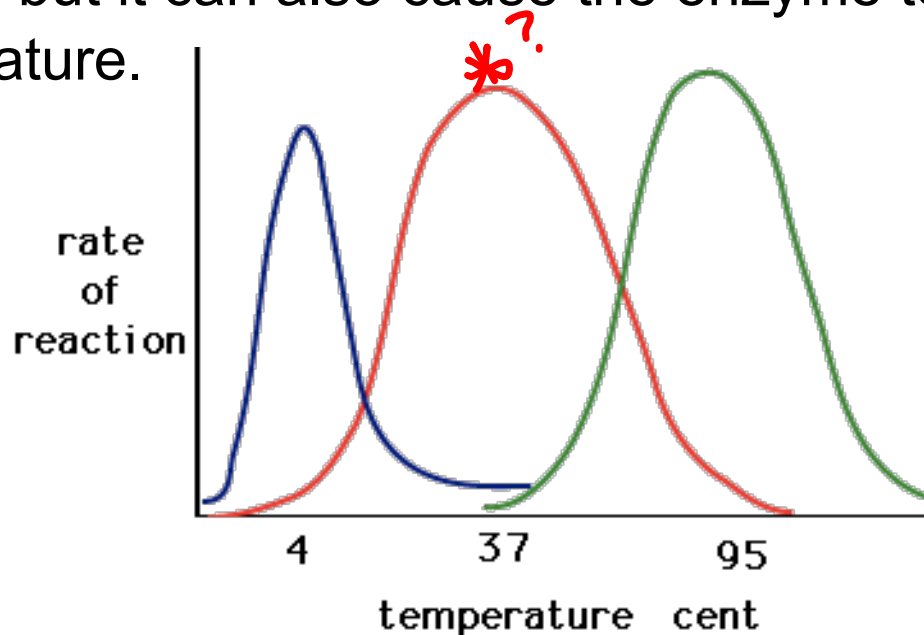
Most metabolic enzymes can catalyze both the forward and the reverse reaction. The direction depends on **equilibrium**.

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

An enzyme needs specific higher order structures in order to function correctly.

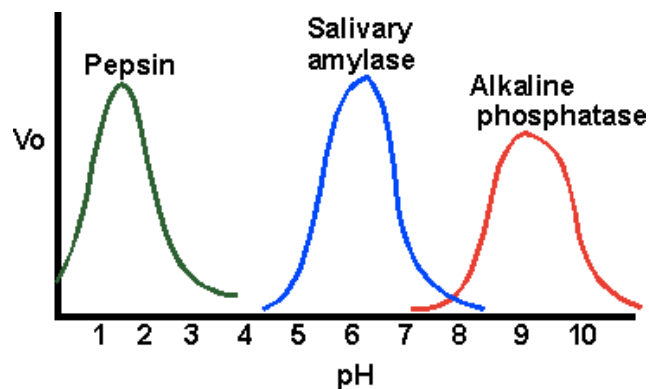
What are some factors that affect enzyme activity?

Temperature can increase the number of collisions between the substrate and the active site, but it can also cause the enzyme to denature.



pH also influences the shape of molecules.

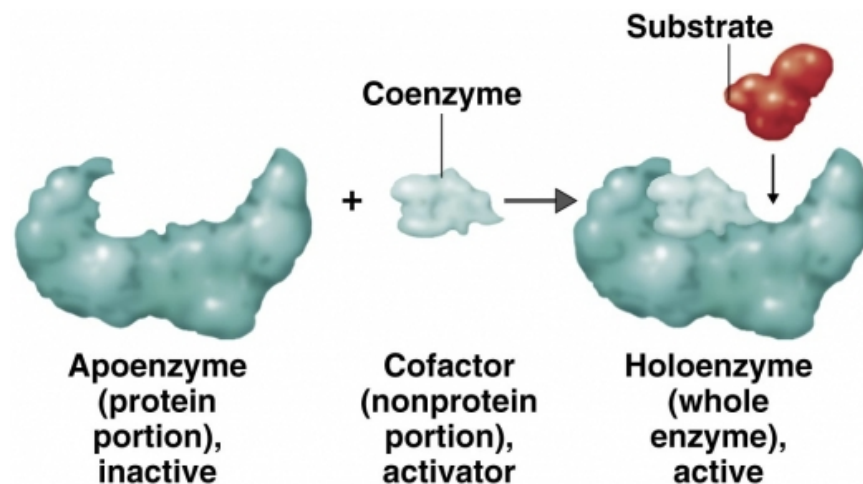
For most human enzymes, the optimal pH range is 6-8.



Coenzymes and **cofactors** can also affect enzyme activity.

Both work to change the active site conformation to improve binding to a substrate.

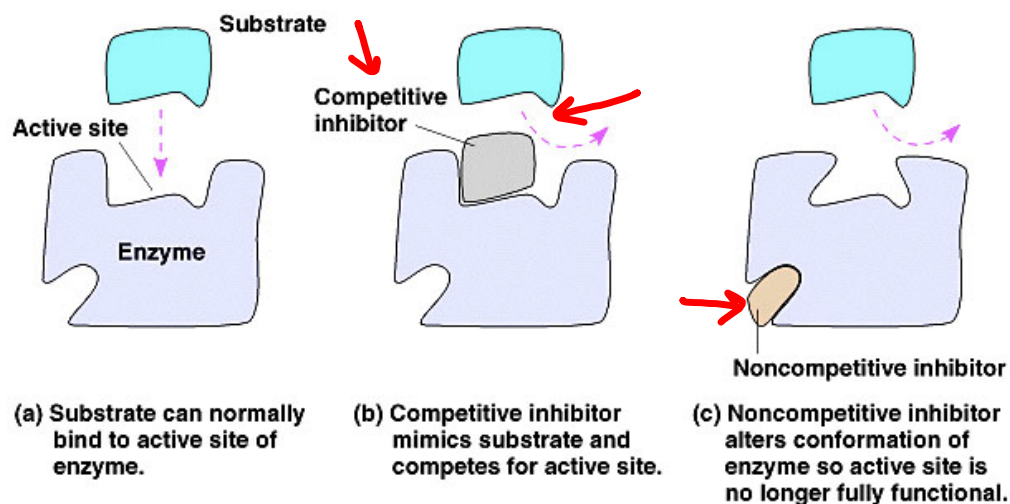
Coenzymes are vitamins (organic), whereas cofactors are metals (inorganic).



Inhibitors (competitive or non-competitive) can slow down or stop enzyme activity.

Both types of inhibitors prevent the enzyme-substrate complex from forming.

Figure 6.14 Enzyme inhibition



Review Questions:

What type of organic molecule is an enzyme?

proteins (4°)

Define the term catalyst.

speeds up chemical rxns

Explain how the structure and function of an enzyme are related. (Hint: Use the terms active site and substrate)

What are some factors that affect the activity of an enzyme?

pH, Temp, []

enzyme
substrate
inhibitors
coenzymes