

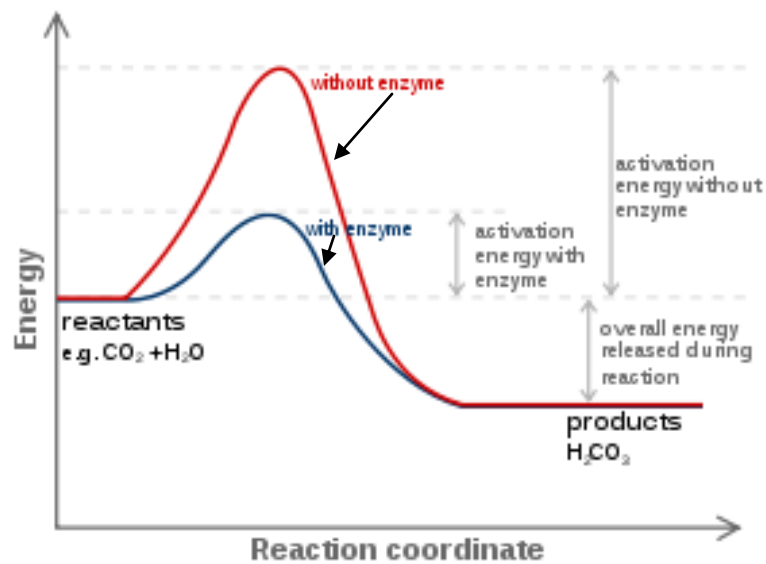
The Role of Enzymes in Maintaining Homeostasis

- All enzymes are considered what type of organic compound? What are their building blocks then?

All enzymes are proteins and therefore are made up of amino acids

- Enzymes help maintain homeostasis in organisms:
 - Why would a person rather take the elevator than the stairs?
Elevators help people get places faster and with less energy
 - How are enzymes like elevators for chemical reactions?

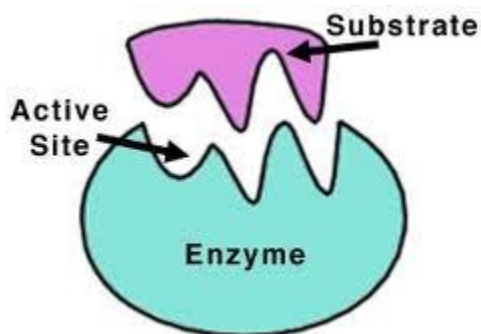
Enzymes are like elevators for chemical reactions because they help reactions happen faster and with less energy



- **Enzyme Specificity:**

- Specificity =
Each enzyme only works on one particular molecule
- Where else have we seen structures in a cell that rely on specificity?
Cell membrane receptors (like antennae sticking out of cell membrane) have specific shapes that only recognize certain molecules controlling what enters and leaves the cell and allows for communication with other cells
- Lock and Key Model:

Enzymes fit with the substance they work on like a key fits into a specific lock. (only one theory of how enzymes and substrates work together, there are others)

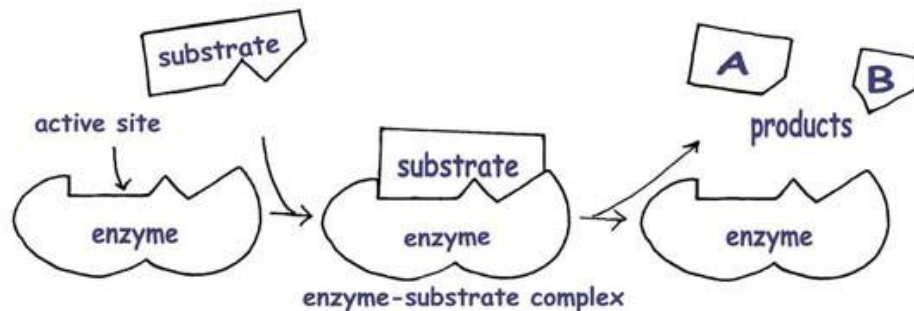


- What factor enables this particular enzyme to fit with this particular substrate?
SHAPE
- What is a substrate? A substrate is a substance an enzyme works on.
- **Enzymes typically end in -ase** and the name of the enzyme is after its substrate. What would the enzyme protease help digest? Protease helps to digest protein (prote- tells us it works on a protein and the -ase tells us it is an enzyme)

- What is a catalyst? Why are enzymes considered organic catalysts?

A catalyst is a helper. Enzymes are proteins and are therefore organic and they help reactions occur faster and with less energy.

Mechanism of enzyme activity



When an enzyme assists with a reaction, it forms an **enzyme-substrate complex**, where the enzyme fits together perfectly with the substrate like interlocking pieces of a puzzle.

- Which of these molecules is altered at the end of the reaction shown above?

Substrate → products

- Which of these molecules remains unchanged at the end of the reaction?

The enzyme (enzymes are reused!)

Enzymes are involved in many types of chemical reactions occurring regularly inside organisms. Two examples are:

Digestion = to break down

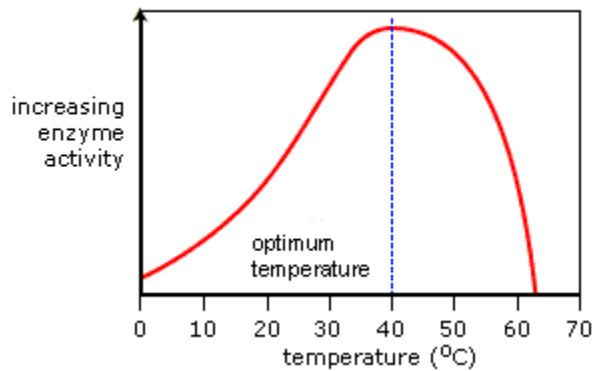
Synthesis = to join together small building blocks into larger, more complex molecules.

Which type of reaction is shown in the diagram above? How do you know?

Digestion- the substrate is broken into two smaller pieces

Factors affecting enzyme activity: Enzymes are unchanged during the chemical reactions that they catalyze under normal environmental conditions for that reaction. There are however some factors that can influence the rate of these reactions.

- Enzymes function in a narrow range of factors such as **temperature and pH**
- There are ideal or **OPTIMAL** levels for these factors at which enzymes function at their maximum rate
 - **Temperature:** Each enzyme works best in a specific range of temperature.



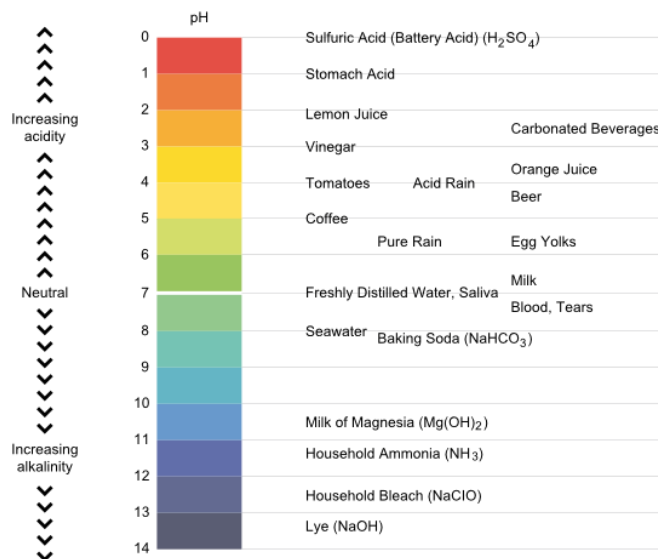
What is the optimal temperature for this enzyme?

40°C

- What is the optimal temperature for enzymes in the human body?

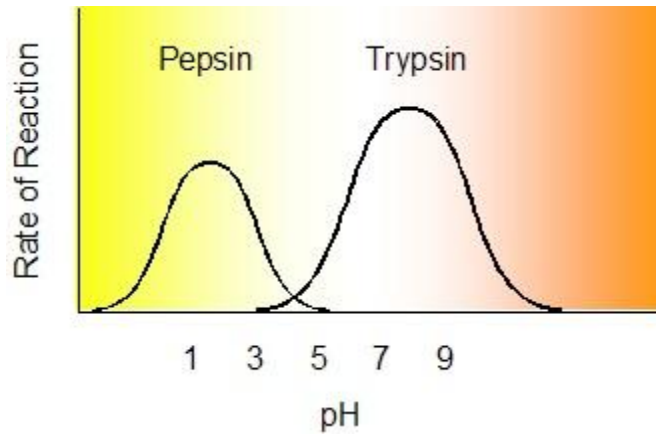
37 °C

- **pH =**



What is the optimal pH for enzymes in our stomach?

Approximately a pH of 1-2



What is the optimal pH of pepsin? What pH range is this considered?

1.5- acidic

What is the optimal pH of trypsin? What pH range is this considered?

8- slightly basic

Denaturing enzymes:

What does it mean to be denatured?

To be denatured means to change the shape of

What can cause enzymes to be denatured?

Putting an enzyme in a temperature or pH outside of the optimal range (extreme heat, extreme cold, etc.) can cause the shape of the enzyme to be changed.

How does denaturing enzymes disrupt homeostasis?

Denaturing enzymes can disrupt homeostasis because if the shape of the enzyme is changed it cannot properly fit with its substrate and therefore cannot help out with the reaction as effectively or at all. The reaction will slow down or could stop altogether if enough of the enzyme has been denatured.

