

Enzymes

Enzymes are biological catalysts that lower the activation energy of chemical reactions.

Biological Catalysts

Substances which lower the amount of energy needed to activate a chemical reaction, without being consumed in the reaction, are called **catalysts**. Enzymes are biological catalysts, generally composed of proteins. *By lowering the activation energy, chemical reactions generally occur more rapidly.*

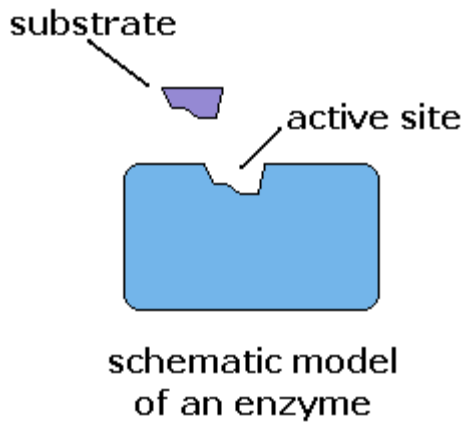
Most enzymes are proteins. Like other proteins, enzymes are produced by a cell's ribosomes. Ribosomes produce specific enzymes to act on specific substances, called **substrates**. For example, the enzyme *catalase* assists in the breakdown of hydrogen peroxide into water and oxygen. In this case, hydrogen peroxide is catalase's substrate.

Many of the chemical reactions that occur in cells are catalyzed by enzymes. The activation energy for many reactions is simply too high to overcome without enzymes, and the reaction will not occur at all in the absence of an enzyme. Without enzymes catalyzing metabolic reactions, cells would not be able to perform metabolism quickly enough to support life.

Since enzymes are not consumed in a chemical reaction, their concentration will remain constant unless the cell triggers for re-uptake of the enzymes. Cells can control chemical reactions by producing or removing enzymes. Reaction rates can be increased by increasing the production of enzymes in environments highly concentrated with substrate.

Enzymes are also important for the synthesis of new molecules. For example, RNA polymerase is an enzyme that is essential to the process of transcription. Molecules of mRNA are transcribed by RNA polymerases and later new protein molecules are synthesized based on the instructions coded in the mRNA.

The shape of an enzyme determines how it works. Most enzymes have a surface with one or more deep folds. The folds make pockets, which are called **active sites**. The active sites match folds in the substrate's surface. Thus, a particular enzyme fits against its substrate like two adjacent puzzle pieces.



An enzyme's shape is key to how the enzyme functions.

If its shape is changed, the enzyme may not function as well or at all. Changes in temperature and pH can affect the shape of an enzyme's active sites. Therefore, enzymes are only able to work properly in a certain temperature and pH range.

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The following video discusses enzymes and pH. Click on the play button to start the video.



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