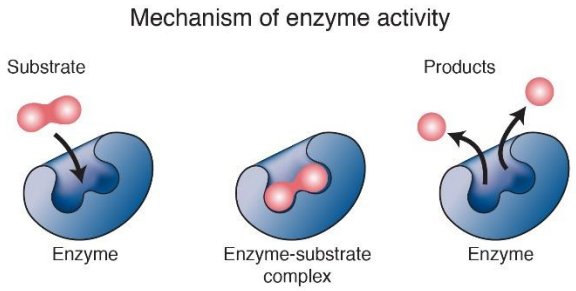
What is Enzyme?

An enzyme is a biological catalyst and is almost always a protein. It speeds up the rate of a specific chemical reaction in the cell. The enzyme is not destroyed during the reaction and is used over and over.

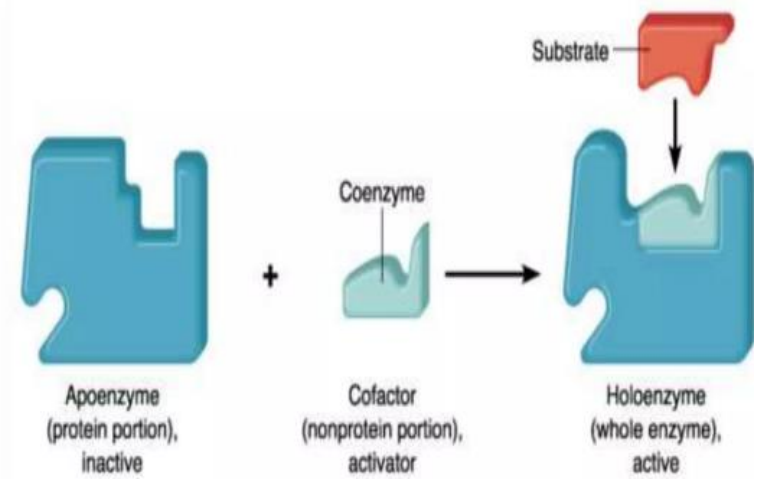


What is Coenzyme?

A coenzyme is defined as an organic molecule that binds to the active sites of certain enzymes to assist in the catalysis of a reaction.

Examples of coenzymes: nicotineamideadenine dinucleotide (NAD), nicotineamide adenine dinucelotide phosphate (NADP), and flavin adenine dinucleotide (FAD). These three coenzymes are involved in oxidation or hydrogen transfer.

- An **enzyme** is a protein that functions as a catalyst to mediate and **speed a chemical reaction.**
- **Coenzyme** is a substance that **enhances the action of an enzyme**.
- The catalytic activity of enzymes mostly depends on the presence of **non-protein compounds called coenzymes**.
- coenzymes **cannot be isolated from apoenzymes** without denaturation of the enzyme proteins.



What is Apoenzyme?

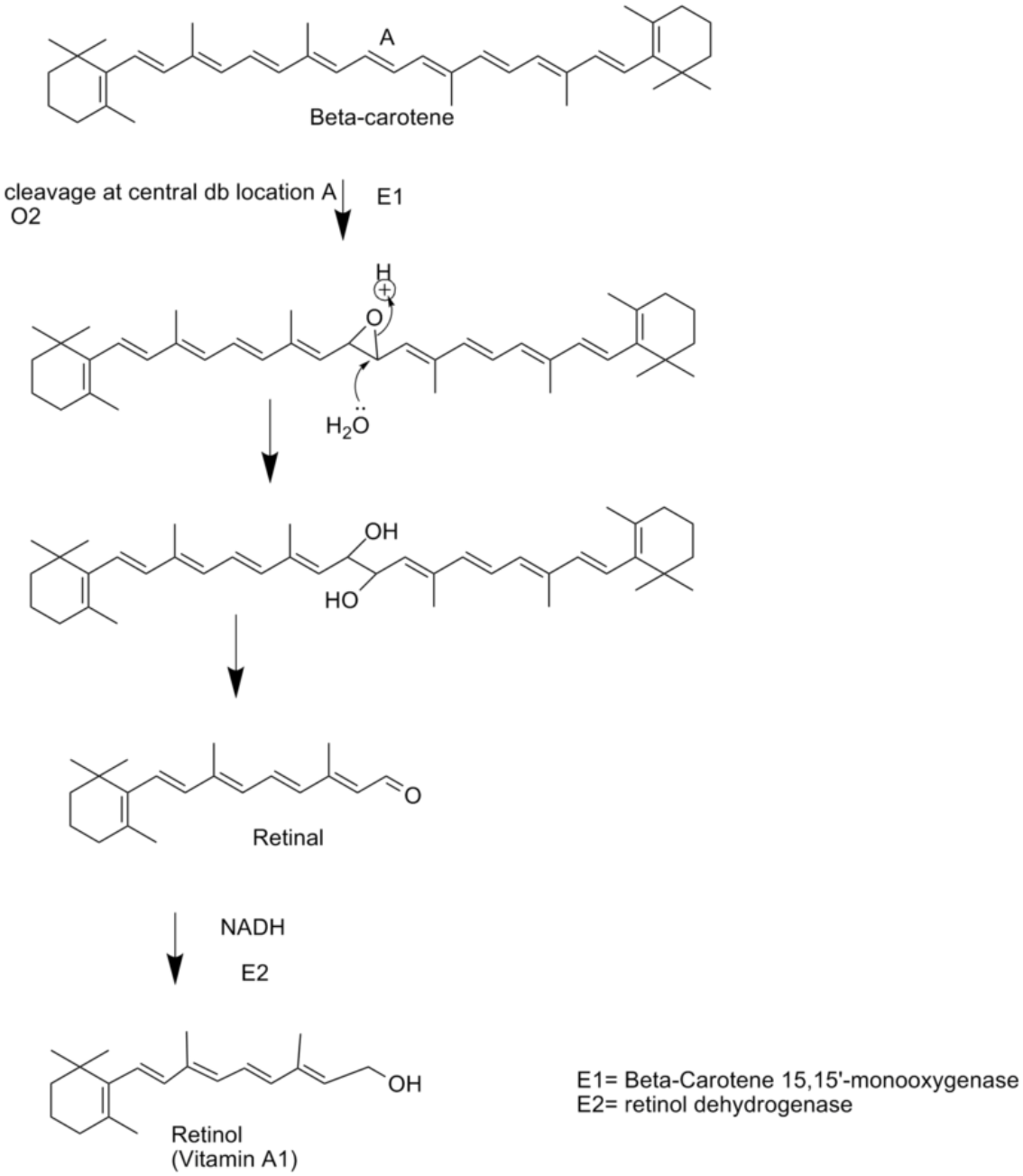
Apoenzyme or apoprotein is an enzymatically inactive protein part of an enzyme, which requires a cofactor for its activity.

Not all the enzymes require a cofactor. Enzymes that do not require any cofactor are known as simple enzymes, e.g. pepsin, trypsin, etc.

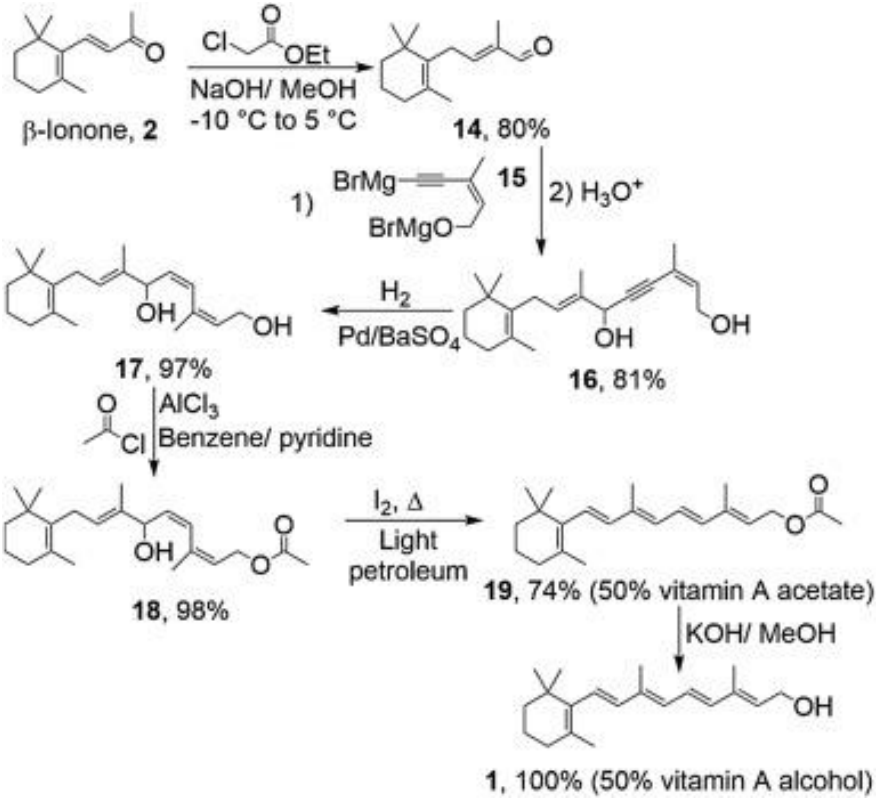
What is Holoenzyme?

A biochemically active compound formed by the combination of an enzyme with a coenzyme.

Write down the biosynthesis of Vitamin -A



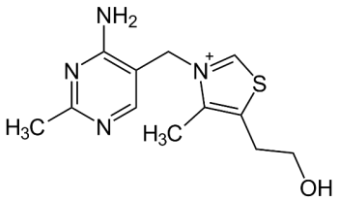
Write down the laboratory synthesis of Vitamin -A



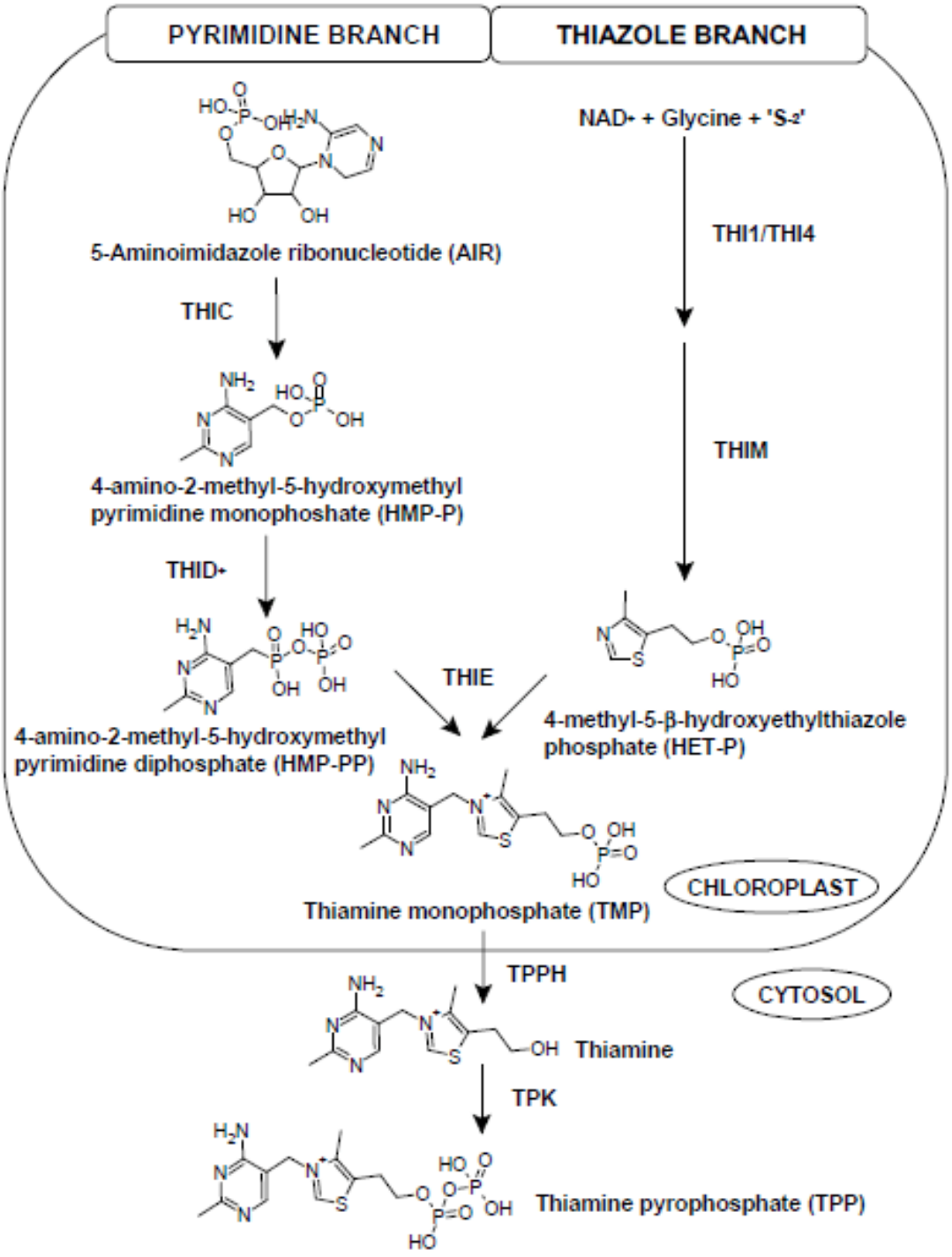
Vitamin B1

B vitamins act as coenzymes in several enzymatic processes that support every aspect of cellular physiological functioning, including major functions within the brain and nervous system.

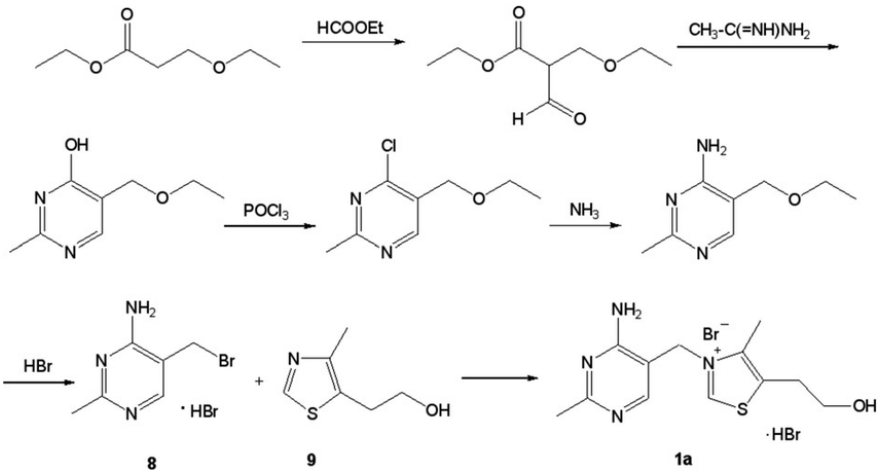
Thiamine (thiamine), or vitamin B1, is a water-soluble vitamin found naturally in some foods, added to foods, and sold as a supplement. Thiamine plays a vital role in the growth and function of various cells. [1] Only small amounts are stored in the liver, so a daily intake of thiamine-rich foods is needed.



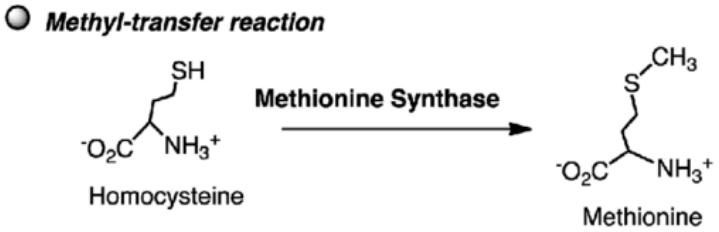
Write down the biosynthesis of Vitamin -B1



Write down the laboratory synthesis of Vitamin -B1



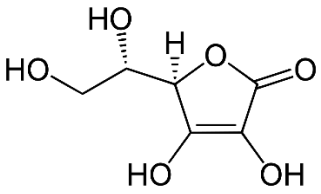
Reaction or function of Vitamin B1 in biological system



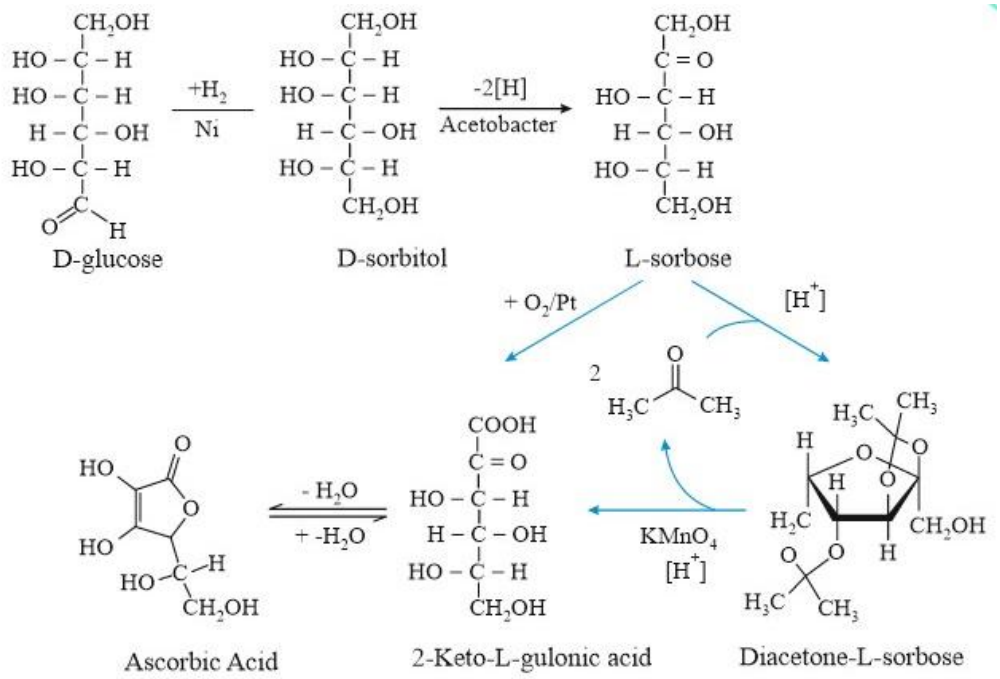
Vitamin C

Vitamin C (also known as ascorbic acid and ascorbate) is a water-soluble vitamin found in citrus and other fruits and vegetables, also sold as a dietary supplement.

It is used to prevent and treat scurvy. Vitamin C is an essential nutrient involved in the repair of tissue, the formation of collagen, and the enzymatic production of certain neurotransmitters. It is required for the functioning of several enzymes and is important for immune system function. It also functions as an antioxidant. Most animals are able to synthesize their own vitamin C.

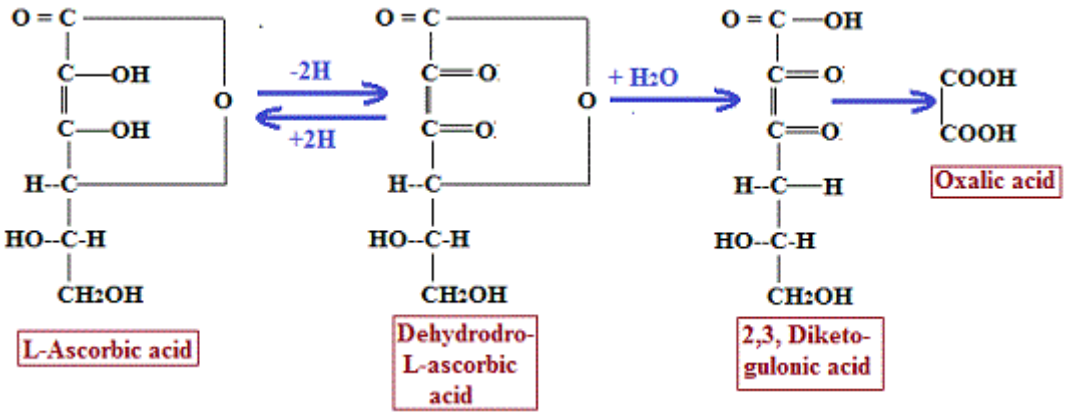


Write the biochemical synthesis of Vitamin C

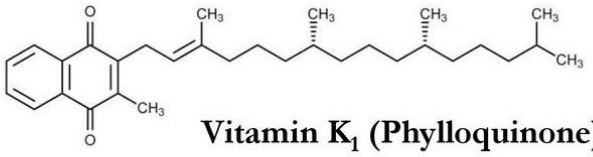


Reaction or function of Vitamin C in biological system

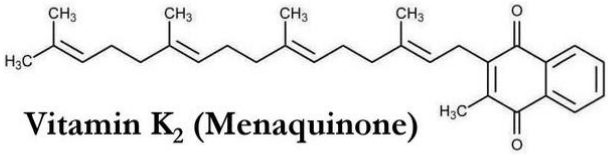
It typically reacts with oxidants of the reactive oxygen species, such as the hydroxyl radical. On exposure to oxygen, ascorbic acid will undergo further oxidative decomposition to various products including diketogulonic acid, xylonic acid, threonic acid and oxalic acid.



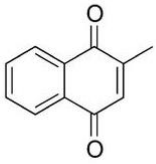
Vitamin K family



Vitamin K_1 (Phylloquinone)

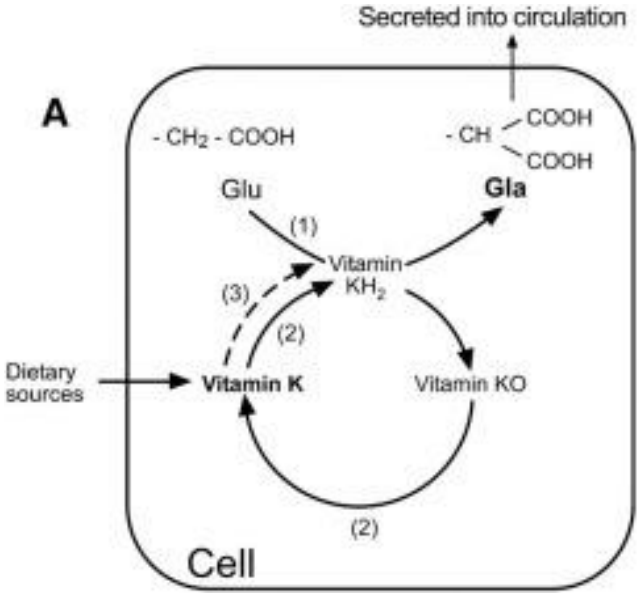


Vitamin K_2 (Menaquinone)



Vitamin K_3 (Menadione)

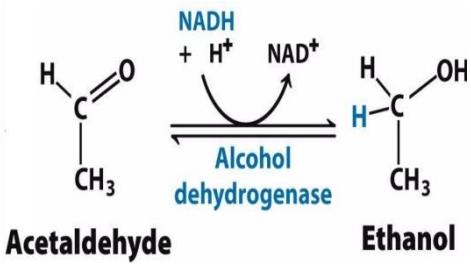
Reaction or function of Vitamin K in biological system

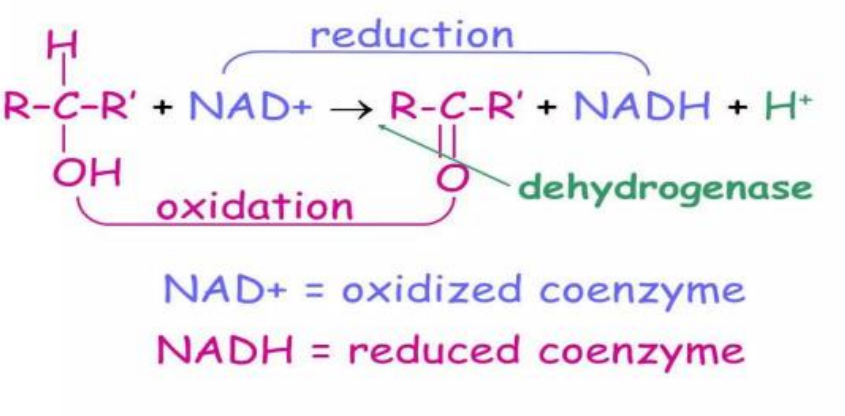


NAD & FAD

The conversion of NAD from its oxidized form (NAD^+) to its reduced form (NADH), and back, provides the cell with a mechanism for accepting and donating electrons. NAD^+/NADH plays a significant role in the reactions associated with glycolysis, oxidative phosphorylation, and fermentation.

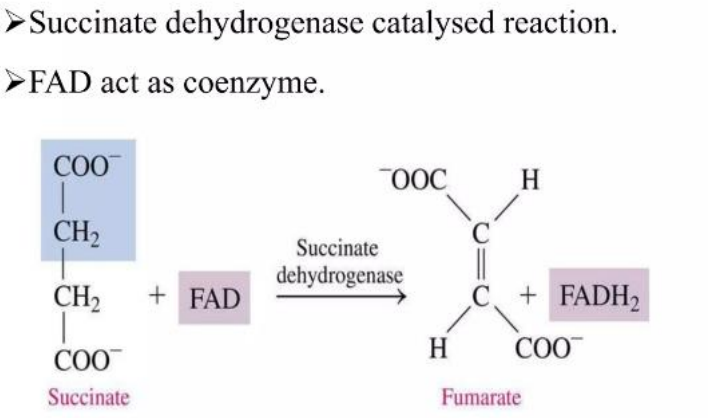
A chemical reaction of NAD in biological system





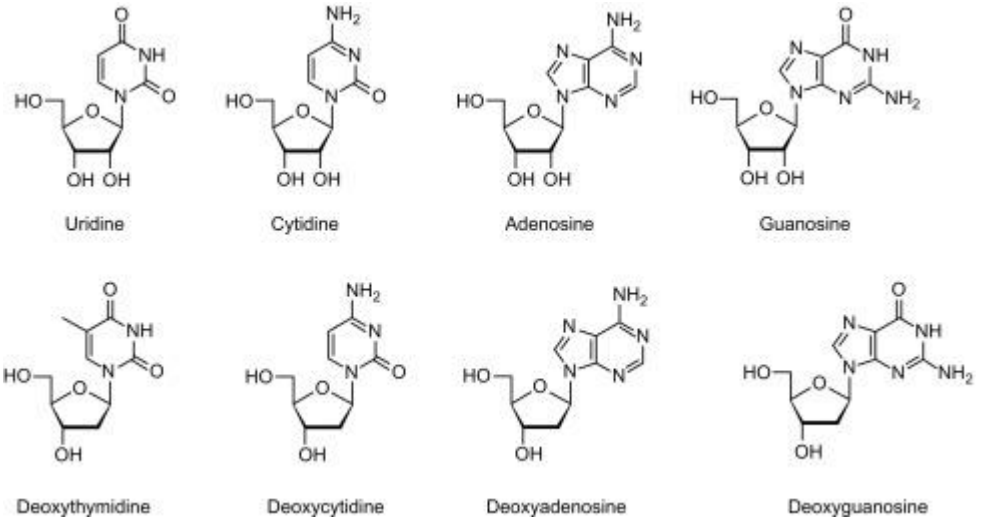
FAD-dependent proteins function in a large variety of metabolic pathways including electron transport, DNA repair, nucleotide biosynthesis, beta-oxidation of fatty acids, amino acid catabolism, as well as synthesis of other cofactors such as CoA, CoQ and heme groups.

A chemical reaction of FAD in biological system



Nucleosides, nucleotides and ATP, DNA and various types of RNA & protein biosynthesis.

Nucleosides are the structural subunit of nucleic acids such as DNA and RNA. A nucleoside, composed of a nucleobase, is either a pyrimidine (cytosine, thymine or uracil) or a purine (adenine or guanine), a five carbon sugar which is either ribose or deoxyribose.

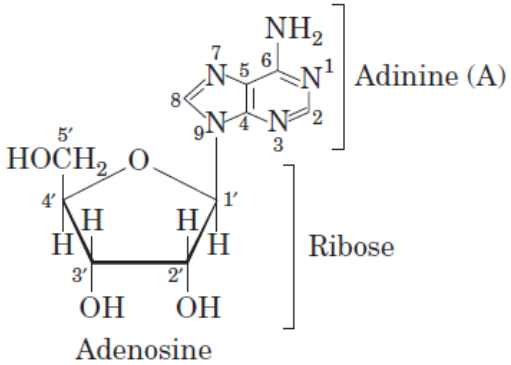


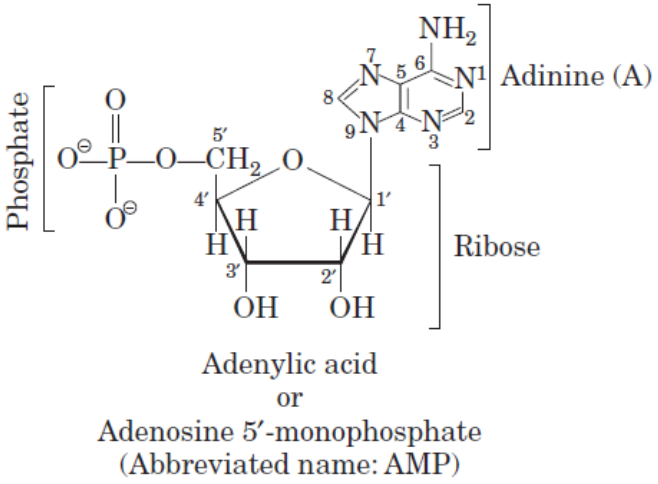
A nucleotide is one of the structural components, or building blocks, of DNA and RNA. A nucleotide consists of a base (one of four chemicals: adenine, thymine, guanine, and cytosine) plus a molecule of sugar and one of phosphoric acid.

Nucleosides and nucleotides of RNA molecule in which the sugar part is ribose:

Ribonucleosides | Ribinucleotides

1. **Base : Adenine**

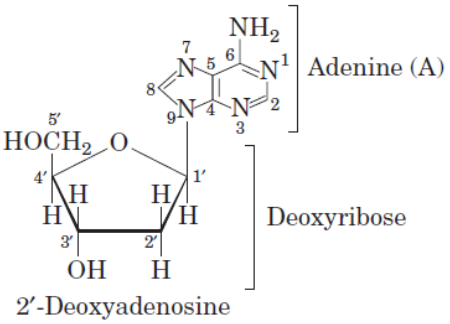




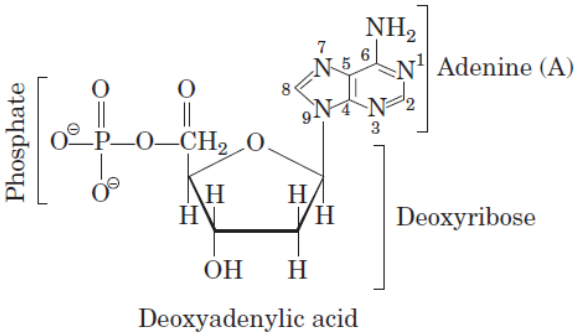
Nucleosides and nucleotides of DNA molecule in which the sugar part is 2-deoxyribose:

Deoxyribonucleosides	Deoxyribonucleotides

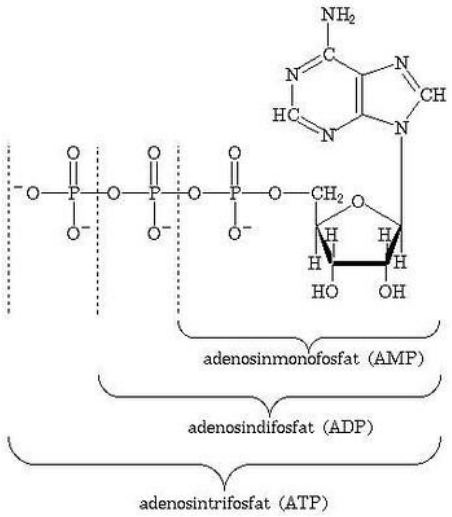
1. Base: Adenine

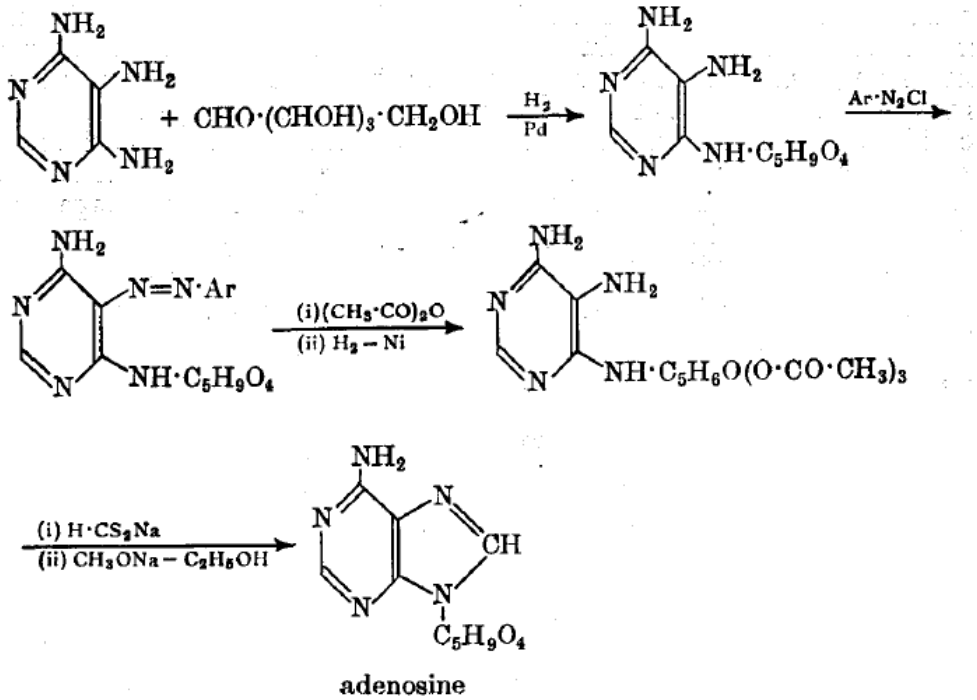


2′-Deoxyadenosine



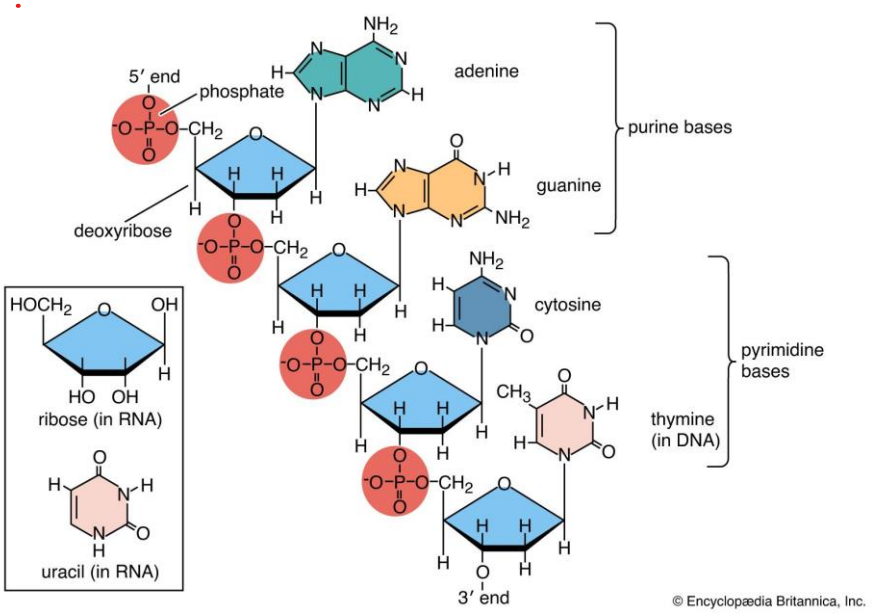
Deoxyadenylic acid
or
2′-Deoxyadenosine-5′-monophosphate (dAMP)

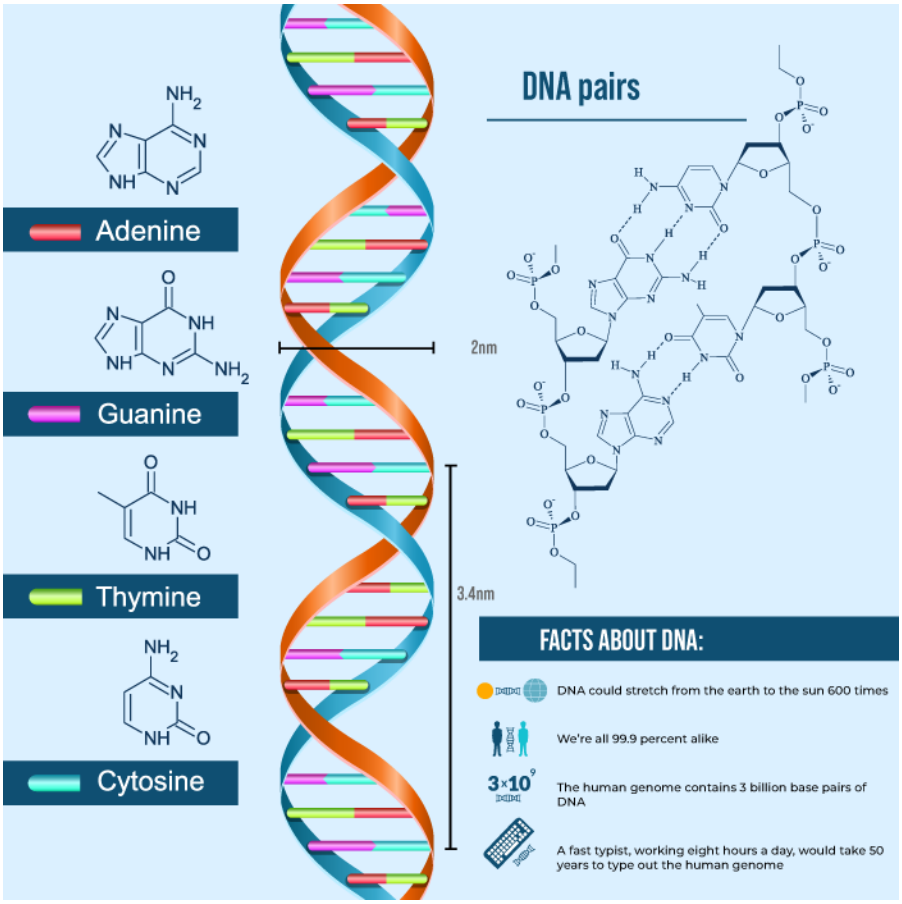




adenosine

Nucleic acids are macromolecules that store genetic information and enable protein production. Nucleic acids include DNA and RNA. These molecules are composed of long strands of nucleotides. Nucleotides are composed of a nitrogenous base, a five-carbon sugar, and a phosphate





Different types of RNA

There are various types of RNA, out which most well-known and most commonly studied in the human body are:

- **tRNA – Transfer RNA**

The transfer RNA is held responsible for choosing the correct protein or the amino acids required by the body in-turn helping the ribosomes. It is located at the endpoints of each amino acid. This is also called as soluble RNA and it forms a link between the messenger RNA and the amino acid.

- **rRNA-Ribosomal RNA**

The rRNA is the component of the ribosome and are located within the in the cytoplasm of a cell, where ribosomes are found. In all living cells, the ribosomal RNA plays a fundamental role in the synthesis and translation of mRNA into proteins. The rRNA is mainly composed of cellular RNA and are the most predominant RNA within the cells of all living beings.

- **mRNA – Messenger RNA**

This type of RNA functions by transferring the genetic material into the ribosomes and pass the instructions about the type of proteins, required by the body cells. Based on the functions, these types of RNA are called the messenger RNA. Therefore, the mRNA plays a vital role in the process of transcription or during the protein synthesis process.

Functions of nucleic acids (DNA & RNA) in body

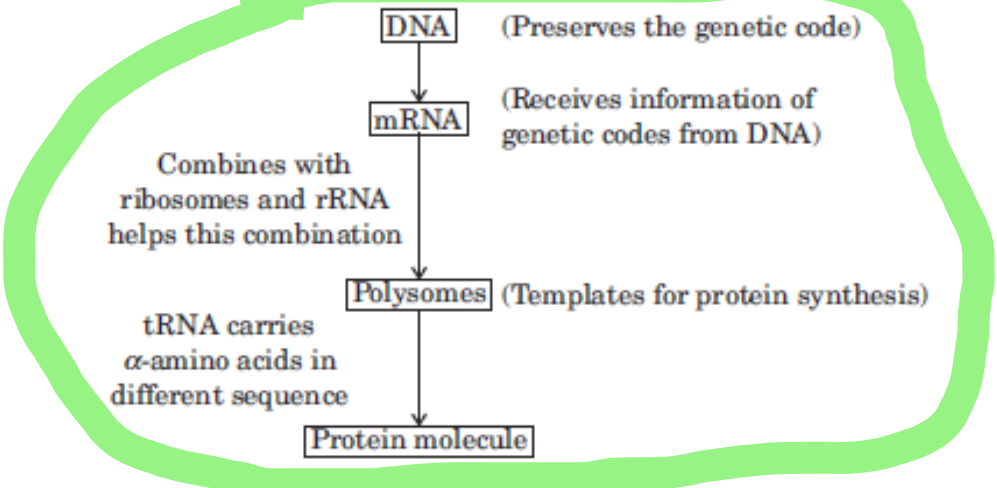
What are the main roles of DNA & RNA?

The main role of DNA is to carry genetic information and dictate the process of protein synthesis. DNA provides the set of instructions to direct the cell to produce proteins vital for cell function.

The two nucleic acids DNA and RNA play a very important role in the existence of all forms of life. Their functions are given below:

DNA (i) It acts as a template for RNA which controls the synthesis of proteins. (ii) The entire structural and functional make up of the cell is controlled by DNA. (iii) Self replication (ability to build another molecule of its own kind) is a unique property of DNA and hence it is responsible for passing on heredity trait from one generation to another. (iv) When DNA is exposed to electromagnetic radiations (e.g., X-rays, UV rays, γ-rays) and some specific chemicals, it undergoes mutation (change in the sequence of heterocyclic bases along the strands). This change is reflected in the subsequent generations.

RNA (i) Synthesis of proteins are controlled by RNA. In fact, RNA molecules are responsible to maintain the α-amino acid sequence in protein molecules during their syntheses. There are three different types of RNA molecules. They are designated as mRNA (messenger RNA), rRNA (ribosome RNA) and tRNA (transfer RNA). The job of each type of RNA is different. The scheme for protein synthesis is given below:



(ii) The process of learning and memory storage is controlled by RNA.