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## 1 ] coenzyme

A coenzyme is a substance that works with an enzyme to initiate or aid the function of the enzyme. It can be considered a helper molecule for a biochemical reaction. Coenzymes are small, nonproteinaceous molecules that provide a transfer site for a functioning enzyme. They are intermediate carriers of an atom or group of atoms, allowing a reaction to occur. Coenzymes are not considered part of an enzyme's structure. They are sometimes referred to as cosubstrates.

Coenzymes cannot function on their own and require the presence of an enzyme. Some enzymes require several coenzymes and cofactors. Coenzymes are nonprotein organic molecules that bind loosely to an enzyme. Many are vitamins or are derived from vitamins. Many coenzymes contain adenosine monophosphate . Coenzymes may be described as either cosubstrates or prosthetic groups.

### Coenzyme Examples

The B vitamins serve as coenzymes essential for enzymes to form fats, carbohydrates, and proteins.

An example of a nonvitamin coenzyme is S-adenosyl methionine, which transfers a methyl group in bacteria as well as in eukaryotes and archaea.

2] Differentiate between fat and water soluble vitamins;

### Water-Soluble Vitamins

Water-soluble vitamins are those that are dissolved in water and readily absorbed into tissues for immediate use. Because they are not stored in the body, they need to be replenished regularly in our diet. Any excess of water-soluble vitamins is quickly excreted in urine and will rarely accumulate to toxic levels. With that being said, certain types of water-soluble vitamin, such as vitamin C, can cause diarrhea if taken in excess.

The water-soluble vitamins include the B-complex group and vitamin C

### Fat-Soluble Vitamins

Fat-soluble vitamins are dissolved in fats. They are absorbed by fat globules that travel through the small intestines and distributed through the body in the bloodstream. Unlike water-soluble vitamins, excess fat-soluble vitamins are stored in the liver and fatty (adipose) tissues for future use. They are found most abundantly in high-fat foods and are better absorbed if eaten with fat.

There are four types of fat-soluble vitamin, each of which offers different benefits:

- **Vitamin A** is integral to bone formation, tooth formation, and vision. It contributes to immune and cellular function while keeping the intestines working properly.
- **Vitamin D** aids in the development of teeth and bone by encouraging the absorption and metabolism of phosphorous and calcium.

- **Vitamin E** is an antioxidant that helps fight infection and keeps red blood cells healthy.
- **Vitamin K** is central to blood clotting and also keeps bones healthy.

### 3] Description Vitamin B<sub>3</sub>

Vitamin B<sub>3</sub>, generally referred to as niacin, is a water-soluble vitamin. This vitamin can generally be found in two distinctive forms, namely nicotinic acid and nicotinamide. These substances are used by the body to form the coenzymes NAD and NADP. Niacin coenzymes degrade carbohydrates, fats, proteins and alcohols and synthesize fatty acids and cholesterol. They play a role in cell signaling. niacin (nicotinic acid) is essential for specific oxidation–reduction reactions in the body. A deficiency of niacin causes diarrhea, dermatitis, and dementia. Niacin (or vitamin B<sub>3</sub>) is a water-soluble B vitamin that has multiple necessary biologic effects, particularly energy metabolism. Niacin is defined collectively as nicotinamide and nicotinic acid, both of which fulfill the vitamin functions of niacin carried out by the bioactive forms NAD. Niacin is converted to NAD, NADH, which serve necessary roles in oxidative respiration as electron carriers. NADP and NADPH are also niacin-dependant biomolecules which are important in synthesis of nucleic acids, fatty acids, and cholesterol.

### Functions Vitamin B<sub>3</sub>

Niacin assists functions of the nervous and digestive system. It plays a role in food metabolism and in the formation of red blood cells and skin. NAD and NADP are coenzymes that are part of the energy production system of the body. This system works by means of oxidation and reduction (redox) reactions. Niacin deficiency

occurrence causes many symptoms, such as fatigue, headaches, dry skin, loss of appetite, ulcers and emotional instability.

### Vitamin B<sub>3</sub> in food

Niacin is part of a range of foods, for example meat, fish, bread, yeast, nuts, seeds, soy beans, potatoes, dried fruit, tomatoes and peas. Milk, green-leaved vegetables and coffee and tea also provide some niacin. Cereals may be fortified with niacin. Some foods, such as corn, may release niacin upon cooking