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Question 1a. What are coenzymes?

A coenzyme is an organic non-protein compound that binds with an enzyme to catalyze a reaction. Coenzymes are often broadly called cofactors, but they are chemically different. A coenzyme cannot function alone, but can be reused several times when paired with an enzyme.

1b. differentiate between fat and water soluble vitamins

Water soluble vitamin

- Water soluble vitamins function as precursor for coenzymes and antioxidants.
- Water soluble vitamins are usually non-toxic since excess amounts of these vitamins are excreted in the urine.
- Water soluble vitamins are not stored extensively except vitamin B12, and so their intake has to be more frequent than that of other fat soluble vitamins which are stored.
- The water-soluble vitamins include the B-complex group and vitamin C, each of which offers the following health benefits:
 1. Vitamin B1 (thiamine) helps to release energy from foods and is important in maintaining nervous system function.
 2. Vitamin B2 (riboflavin) helps promotes good vision and healthy skin and is also important in converting the amino acid tryptophan into niacin.
 3. Vitamin B3 (niacin) aids in digestion, metabolism, and normal enzyme function as well as promoting healthy skin and nerves.
 4. Vitamin B6 (pyridoxine) aids in protein metabolism and the production of red

blood cell, insulin, and hemoglobin.

5. Folate (folic acid) also aids in protein metabolism and red blood cell formation and may reduce the risk of neural tube birth defects.
6. Vitamin B12 (cobalamin) aids in the production of normal red blood cells as well as the maintenance of the nervous system.
7. Biotin helps release energy from carbohydrates and aids in the metabolism of fats, proteins, and carbohydrates from food.
8. Pantothenic acid aids in metabolism and the formation of hormones.
9. Vitamin C (ascorbic acid) is central to iron absorption and collagen synthesis. It aids in wound healing and bone formation while improving overall immune function.

Fat soluble vitamin

- Fat soluble vitamins function as coenzymes, hormones and antioxidants.
- Fat soluble vitamins are toxic and even lethal when taken in excessive quantities.
- Fat soluble vitamins are stored.
- There are four types of fat-soluble vitamin, each of which offers different benefits:
 1. Vitamin A is integral to bone formation, tooth formation, and vision. It contributes to immune and cellular function while keeping the intestines working properly.
 2. Vitamin D aids in the development of teeth and bone by encouraging the absorption and metabolism of phosphorous and calcium.
 3. Vitamin E is an antioxidant that helps fight infection and keeps red blood cells healthy.
 4. Vitamin K is central to blood clotting and also keeps bones healthy.

1c. describe niacin in relation to its coenzymic function

Vitamin B3, 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 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, and loss of appetite, ulcers and emotional instability. On rare occasions (mainly in developing countries) people may experience severe deficiency, which leads to a condition known as pellagra. This condition is commonly characterized by the 4 D's: dermatitis, diarrhea, dementia and death. Pellagra literally means raw skin. The condition was named this because the skin of a patient develops a dark pigmented rash on areas exposed to bright sunlight.