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**Assignment**

**1a. What are Coenzymes**

**b. Differentiate between Fat and Water Soluble Vitamins**

**c. Describe Niacin in relation to its Coenzymic function**

**Answer**

1A. **Coenzymes**

A coenzyme is an organic non-protein compound that binds with an enzyme to catalyse 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. Coenzymes are small molecules. They cannot by themselves catalyse a reaction but they can help enzymes to do so. In technical terms, coenzymes are organic non-protein molecules that bind with the protein molecule (apo-enzyme) to form the active enzyme (holoenzyme). A number of the water-soluble vitamins such as vitamins B1, B2 and B6 serve as coenzymes.

B. **Differences between Fat and Water Soluble Vitamins**

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| **Water Soluble Vitamins** | **Fat Soluble Vitamins** |
| * It is water soluble | * It is fat soluble |
| * Absorption is simple | * Absorption requires bile salt |
| * No carrier proteins present | * Carrier proteins present |
| * No form of storage needed | * Stored in the liver |
| * It is excreted | * It is not excreted |
| * They function as precursor for co-enzymes and anti-oxidant | * They function as co-enzyme hormones and anti-oxidant |

C. **Niacin in relation to its coenzymic functions.**

Vitamin B3, also known as niacin or nicotinic acid, is a water-soluble vitamin, used by the human body as nicotinamide (also called ‘niacinamide’) to form the coenzymes Nicotinamide Adenine Dinucleotide (NAD) and Nicotinamide Adenine Dinucleotide Phosphate (NADP).

NAD+ and NADP are involved in oxidation and reduction reactions catalysed by dehydrogenase in metabolism. They are therefore involved in many metabolic pathways of carbohydrate, lipid and protein. Generally, NAD+ linked dehydrogenase catalyse oxidation and reduction reactions in oxidative pathways e.g Citric Acid Cycle and Glycolysis.

Insulin-dependent diabetes mellitus in children, often called ‘type 1 diabetes’, is known to result from the autoimmune destruction of insulin-secreting cells in the pancreas. Evidence from in vitro and animal research indicates that high levels of vitamin B3 (nicotinamide) protect insulin-producing pancreas cells from inflammatory white blood cells and reactive oxygen species. Therefore, nicotinamide might help to delay the onset of insulin dependence in individuals with type 1 diabetes. Note that Unlike nicotinamide, nicotinic acid has not been found effective in the prevention of type 1 diabetes.