

NAME : ONWUMA CHIBUOGWU OBI DEPARTMENT :MEDICAL LABORATORY  
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#### QUESTION

- 1a. What are coenzymes  
b. Differentiate between fat and water soluble vitamins c. Describe niacin in relation to its coenzymic function

#### ANSWERS

1a. 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.

These are reusable non-protein molecules that contain carbon (organic). They bind loosely to an enzyme at the active site to help catalyze reactions. Most are vitamins, vitamin derivatives, or form from nucleotides.

b. Difference between fat and water soluble vitamin

i. Fat soluble vitamins absorb first to the lymph and then to the blood while

Water soluble vitamin absorbed directly into the blood

ii. The transport for fat soluble vitamin many requires protein carriers while The transport for water soluble vitamin travels freely

iii. Fat soluble vitamins are not soluble in water while Water soluble vitamin are soluble in water

iv. Fat soluble vitamins are less readily excreted and tends to remain in fat storage site while Water soluble vitamin the kidney detect and remove excess in urine for excretion

v. Fat soluble vitamins are likely to reach toxic levels when consumed from supplements while Water soluble vitamin are possible to reach toxic levels when consumed from supplements

c. Niacin in relation to its coenzyme function :The coenzyme are for oxidation reduction reaction, NAD<sup>+</sup> and NADP<sup>+</sup> are involved in various oxidation and reduction reactions catalyzed by dehydrogenases in metabolism.

Enzyme:

NAD dependent Glyceraldehyde-3-phosphate dehydrogenase Pyruvate dehydrogenase

PATHWAY

Glycolysis: Glyceraldehyde-3 phosphate to 1,3-bisphosphoglycerate

ENZYME:

$\alpha$ -Ketoglutarate dehydrogenase  $\beta$ -Hydroxy acyl-CoA dehydrogenase

PATHWAY:

Oxidative decarboxylation of pyruvate to acetyl-CoA

TCA cycle:  $\alpha$ -ketoglutarate to succinyl-CoA  $\beta$ -Oxidation of fatty acid:  $\beta$ - Hydroxy acyl-CoA to  $\beta$ -Keto acyl-CoA

ENZYME:

NADP dependent Glucose-6-phosphate dehydrogenase Malic enzyme

Pentose phosphate pathway: Glucose 6-phosphate to 6-phosphogluconolactone Transfer of acetyl-CoA from mitochondria to cytosol

ENZYME:

NADPH dependent 3-Ketoacyl reductase HMG CoA reductase

PATHWAY:

Fatty acid synthesis: 3 Ketoacyl enzyme to 3-Hydroxyacyl enzyme

Cholesterol synthesis: HMG-CoA to Mevalonate