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**COURSE:BS RADIOLOGY ( 2ND SEMESTER) SEC B**

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**PAPER:BIOCHEMISTRY**

1.Write step involved in uric acid formation.

Ans1. The kidneys filter unwanted substances from the blood and produce urine to excrete them. There are three main steps of urine formation: glomerular filtration, reabsorption, and secretion.

Chemical formula: C5H4N4O3

Heat capacity (C): 166.15 J K−1 mol−1 (at 24.0 °C)

Solubility in water: 6 mg/100 mL (at 20 °C)

•**Glomerular Filtration:**

Inside the glomerulus, blood pressure pushes fluid from capillaries into the glomerular capsule through a specialized layer of cells. This layer, the filtration membrane, allows water and small solutes to pass but blocks blood cells and large proteins. Those components remain in the bloodstream. The filtrate (the fluid that has passed through the membrane) flows from the glomerular capsule further into the nephron.

•**Reabsorption:**

The glomerulus filters water and small solutes out of the bloodstream. The resulting filtrate contains waste, but also other substances the body needs: essential ions, glucose, amino acids, and smaller proteins. When the filtrate exits the glomerulus, it flows into a duct in the nephron called the renal tubule. As it moves, the needed substances and some water are reabsorbed through the tube wall into adjacent capillaries. This reabsorption of vital nutrients from the filtrate is the second step in urine creation.

•**Secretion:**

The filtrate absorbed in the glomerulus flows through the renal tubule, where nutrients and water are reabsorbed into capillaries. At the same time, waste ions and hydrogen ions pass from the capillaries into the renal tubule. This process is called secretion. The secreted ions combine with the remaining filtrate and become urine. The urine flows out of the nephron tubule into a collecting duct. It passes out of the kidney through the renal pelvis, into the ureter, and down to the bladder.

2.Write down the clinical significance of the following enzymes.

a) Alkaline phosphatase

b)Creatine kinase

c) gamma- glutamyl transferase

Ans2. **Clinical significance:**

1) **Alkaline phosphatase:**

. The majority of sustained elevated ALP levels are associated with disorders of the liver or bone, or both. ... Since production is increased in response to cholestasis, serum ALP activity provides a sensitive indicator of obstructive and space-occupying lesions of the liver.

Elevated level during healing of fractures active growth and during the 3rd trimester of pregnancy.

l2) **Creatine kinase:**

Creatine kinase (CK) has several functions in cellular energy metabolism. It catalyzes the reversible transfer of high-energy phosphate from ATP to creatine, facilitating storage of energy in the form of phosphocreatine. In muscle cells, this extra energy buffer plays a pivotal role in maintaining ATP homeostasis.

Evelation of creatine kinase is an indication of damage to muscle .CK value is increased in myocardial infarction in muscle injury such as muscular dystrophy

CK rises measurably with in a 4-6 hour period maximal values are observed with in 24 hours .after which time the activity return to normal

3) **Gamma glutamyl transferase:**

The gamma-glutamyl transferase (GGT) test may be used to determine the cause of elevated alkaline phosphatase (ALP). Both ALP and GGT are elevated in disease of the bile ducts and in some liver diseases, but only ALP will be elevated in bone disease.

Moderate revelation observed in infective hepatitis and prostate cancer.

Normal range : 10-30 U/L

**3**.How many protein are involved in electron transport chain and how do electron move in the electron transport chain .

Ans3.  **Protein involved in Electron transport:**

There are four protein complexes (labeled complex I-IV) in the electron transport chain, which are involved in moving electrons from NADH and FADH2 to molecular oxygen. Complex I establishes the hydrogen ion gradient by pumping four hydrogen ions across the membrane from the matrix into the intermembrane space.

**•Moving electron in electron transport chain:**

The electron transport chain (ETC) is a series of complexes that transfer electrons from electron donors to electron acceptors via redox (both reduction and oxidation occurring simultaneously) reactions, and couples this electron transfer with the transfer of protons (H+ ions) across a membrane. The electron transport chain is built up of peptides, enzymes, and other molecules

The flow of electrons through the electron transport chain is an exergonic process. The energy from the redox reactions create an electrochemical proton gradient that drives the synthesis of adenosine triphosphate (ATP). In aerobic respiration, the flow of electrons terminates with molecular oxygen being the final electron receptor. In anaerobic respiration, other electron acceptors are used, such as sulfate.

4.Write down the four step of beta oxidation.

Ans4. **Beta oxidation:**

Beta oxidation is a metabolic process involving multiple steps by which fatty acid molecules are broken down to produce energy

Beta oxidation takes place in four steps: dehydrogenation, hydration, oxidation and thyolisis. Each step is catalyzed by a distinct enzyme.

**Steps of beta oxidation:**

**•Dehydrogenation:**

In the first step, acyl-CoA is oxidized by the enzyme acyl CoA dehydrogenase. A double bond is formed between the second and third carbons (C2 and C3) of the acyl-CoA chain entering the beta oxidation cycle; the end product of this reaction is trans-Δ2-enoyl-CoA (trans-delta 2-enoyl CoA). This step uses FAD and produces FADH2, which will enter the citric acid cycle and form ATP to be used as energy.

•**Hydration:.**

In the second step, the double bond between C2 and C3 of trans-Δ2-enoyl-CoA is hydrated, forming the end product L-β-hydroxyacyl CoA, which has a hydroxyl group (OH) in C2, in place of the double bond. This reaction is catalyzed by another enzyme: enoyl CoA hydratase. This step requires water.

•**Oxidation:**

In the third step, the hydroxyl group in C2 of L-β-hydroxyacyl CoA is oxidized by NAD+ in a reaction that is catalyzed by 3-hydroxyacyl-CoA dehydrogenase. The end products are β-ketoacyl CoA and NADH + H. NADH will enter the citric acid cycle and produce ATP that will be used as energy.

•**Thylosis:**

Finally, in the fourth step, β-ketoacyl CoA is cleaved by a thiol group (SH) of another CoA molecule (CoA-SH). The enzyme that catalyzes this reaction is β-ketothiolase. The cleavage takes place between C2 and C3; therefore, the end products are an acetyl-CoA molecule with the original two first carbons (C1 and C2), and an acyl-CoA chain two carbons shorter than the original acyl-CoA chain that entered the beta oxidation cycle.

5.How uric acid formation take place in body.

Ans5. **Uric acid formation:**

Main site of urine acid formation is liver from where it is carried to kidney normally 500-600 mg uric acid is synthesized .Major part is exctretes in urine.Some uric acid excreted in bile.

**Step of formation of uric acid:**

Uric acid is formed in the body by brake down of purine ( adenosine, guanosine)

**Adenosine:**

1. Converstion of adenosine to inosine. It is catalyzed by adenosine deaminase.

Adenosine +H2O 《 adenosine deaminase 》---------- Inosine +NH3

1. Converstion of inosine to hypoxanthine with the help of enzyme purine nucleoside phosphorylase.

Inosine+ H3PO4 《purine nucleoside phosphorylase》---------- hypoxanthine +ribose phosphate

1. Oxidation of hypoxanthine to xanthine. It is catalyzed by xanthine oxidase.

Hypoxanthine+ H2O +O2 《xanthine oxidase 》----------xanthine+H2O

1. Oxidation of xanthine to uric acid. It is catalyzed by xanthine oxidase .

Xanthine+H2O +O2 《xanthine oxidase》------------- **Uric** **acid +H2O**

**To guanosine:**

* 1. Conversion of guanosine to guanine. This reaction is catalyzed by purine nucleotiside phosphorylase.

Guanosine+H3PO4 《purine nucleoside phosphorylase》-------guanine +ribose phosphate

* 1. Conversion of guanine to xanthine .it is catalyzed by guanase ,also called guanine deaminase.

Guanine + H2O 《guanase 》---------- xanthine+NH3

* 1. Oxidation of xanthine to uric acid by the enzyme xanthine oxidase

Xanthine+H2O+O2 《xanthine oxidase 》--------- **uric acid +H2O**

**………THE END ………**