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RAD II and DT II

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Final term

Discipline: BS Radiology (sec B)

BIOCHEMISTRY

Marks 50

Write note on following questions each carries equal marks

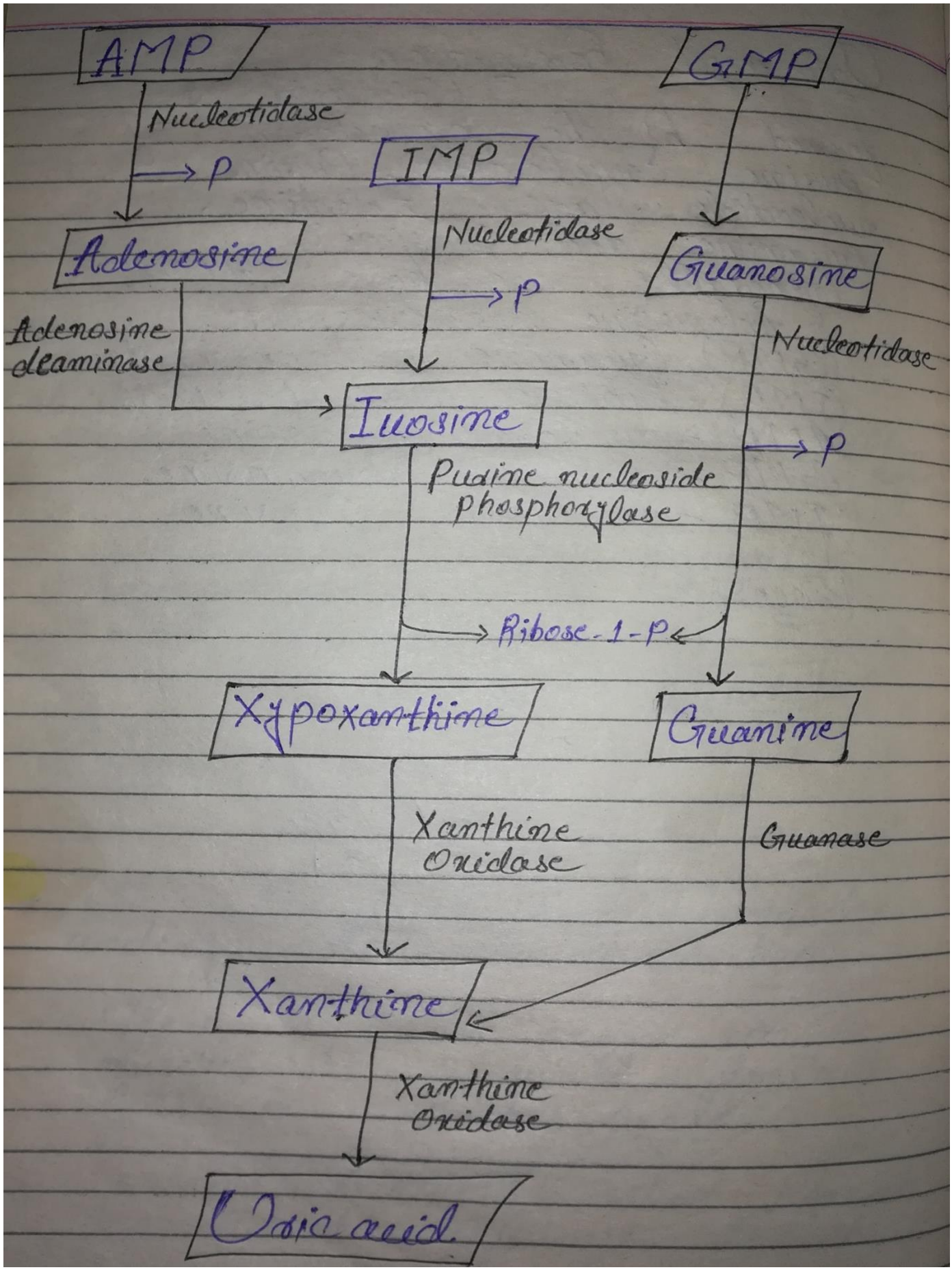
1)Write steps involve in uric acid formation

Answer:

Steps involved in Uric Acid Formation:

- Uric acid is formed by the breakdown of purine nucleotide.
- Purine nucleotides are adenosine, guanine and iuosine.
- Uric acid is synthesized mainly in the liver, intestines and other tissues such as muscles, kidneys and the vascular endothelium as the end product of an exogenous pool of purines, derived largely from animal proteins.
- In addition, liver and dying cells degrade their nucleic acids, adenine and guanine into uric acid.
- Deamination and dephosphorylation convert adenine and guanine to inosine and guanosine, respectively.
- The enzyme purine nucleoside phosphorylase converts inosine and guanosine to the purine bases, respectively hypoxanthine and guanine, which are both converted to xanthine via xanthine oxidase-oxidation of hypoxanthine and deamination of guanine by guanine deaminase.
- Xanthine is further oxidized by xanthine oxidase to uric acid .

Diagram:


AMP
GMP
Nucleotidase
P
IMP
Adenosine
Nucleotidase
P
Guanosine
Adenosine deaminase
Nucleotidase
P
Inosine
Purine nucleoside phosphorylase
Ribose-1-P
Xypoxanthine
Guanine
Xanthine Oxidase
Guanase
Xanthine
Xanthine Oxidase
Uric acid

2) Write down clinical significance of the following enzymes

Answer:

a)Alkaline phosphatase

Clinical Significance:

- ALP is an enzyme found in the liver and bone and is important for breaking down protiens.
- Higher than normal levels of ALP may indicate liver damage or disease , such as a blocked bile duct or certain bone diseases.

b) Creatine kinase

Clinical Significance:

- It is an enzyme found in the heart , brain, skeletal muscles and other tissues.
- Increased amounts of CK are released into the blood and when there is muscle damage.
- This test measures the amount of creatine kinase in the blood .
- The small amount of CK that is normally in the blood comes primarily from skeletal muscles .
- Any condition that causes muscle damage or interferes with muscle energy production or use can cause increase in CK , muscles diseases caused by high level of CK.

c) gamma-glutamyl transferase

Clinical Significance:

- The gamma-glutamyl transferase 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.

3) How many proteins are involve in electron transport chain and how do electrons move in the electron transport chain?

Answer:

Protiens Involve in Electron transport chain:

There are four protiens involved in electron transport chain:

1. **Flavin mononucleotide (FMN):**
   Flavin mononucleotide, or riboflavin-5′-phosphate, is a biomolecule produced from riboflavin by the enzyme riboflavin kinase and functions as the prosthetic group of various oxidoreductases, including NADH dehydrogenase, as well as cofactor in biological blue-light photo receptors.
2. **Iron–sulfur proteins (Fe.S):**
   proteins characterized by the presence of iron–sulfur clusters containing sulfide-linked di-, tri-, and tetrairon centers in variable oxidation states. Iron–sulfur clusters are found in a variety of metalloproteins, such as the ferredoxins, as well as NADH dehydrogenase, hydrogenases, coenzyme Q – cytochrome c reductase, succinate – coenzyme Q reductase and nitrogenase.
3. **Ubiquinone:**
   Ubiquinone (coenzyme Q) is a lipophilic metabolite that functions in the electron transport chain in the plasma membranes of prokaryotes, and the inner mitochondrial membranes of eukaryotes, apart from its roles as an antioxidant and in the regeneration of tocopherols.
4. **Cytochrome (c, b, a.a3):**

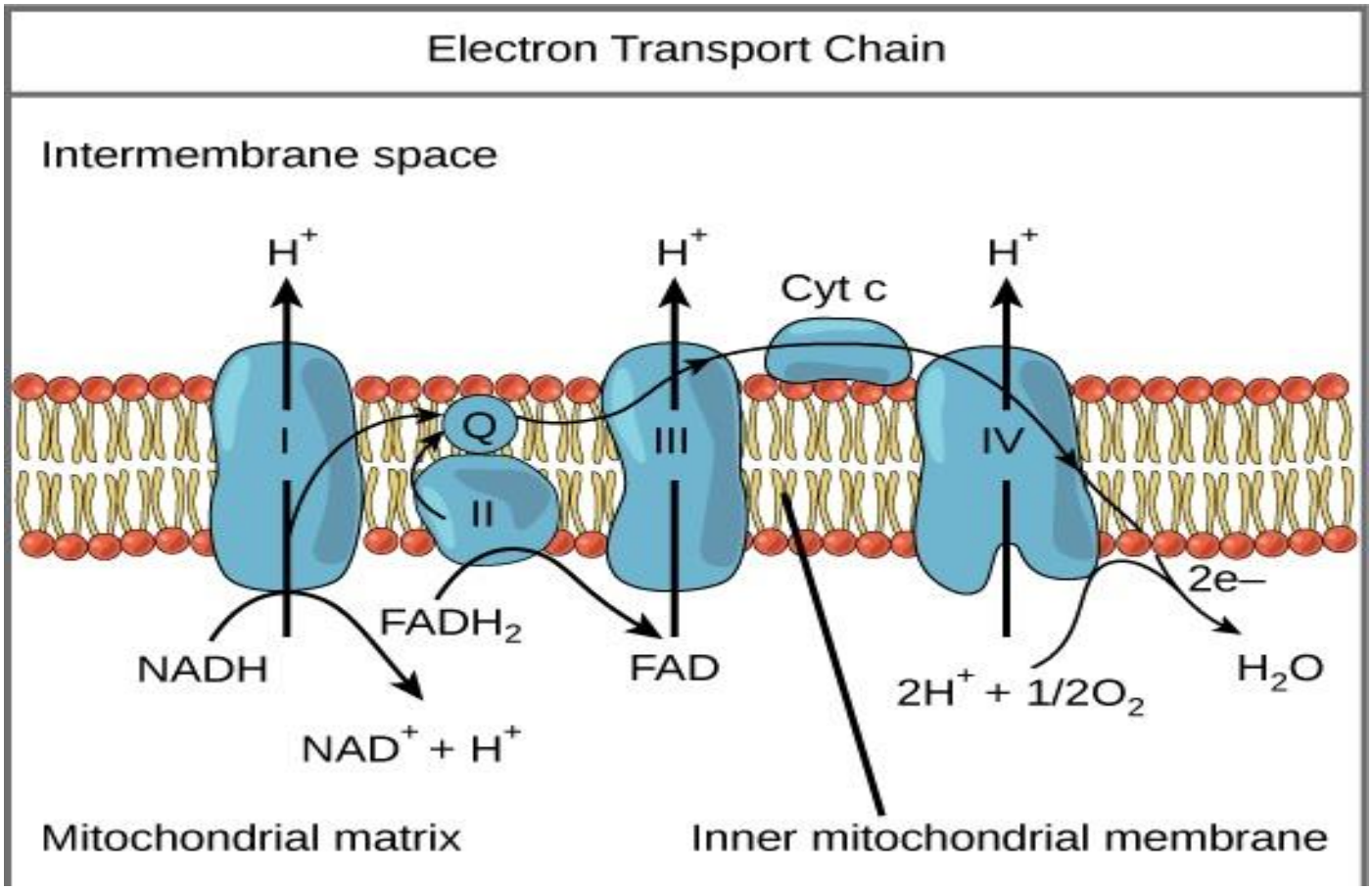
- Complex II itself is composed of several subunits, one of which is a b-type cytochrome while another one is a c-type cytochrome.
- Both domains are involved in electron transfer within the complex. Complex IV contains a cytochrome a/a3-domain that transfers electrons and catalyzes the reaction of oxygen to water.

Moving Of Electrons In Electron transport chain:

- In the electron transport chain, electrons are passed from one molecule to another, and energy released in these electron transfers is used to form an electrochemical gradient.
- In chemiosmosis, the energy stored in the gradient is used to make ATP.
- As the electrons travel through the chain, they go from a higher to a lower energy level, moving from less electron-hungry to more electron-hungry molecules.
- Energy is released in these “downhill” electron transfers, and several of the protein complexes use the released energy to pump protons from the mitochondrial matrix to the intermembrane space, forming a proton gradient.

- Electrons are passed from one member of the transport chain to another in a series of redox reactions.

Diagram:



4) Write down the four steps involved in beta oxidation?

Answer:

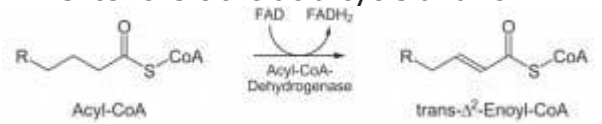
Four Steps Involved in beta oxidation:

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

1.Dehydrogenation:

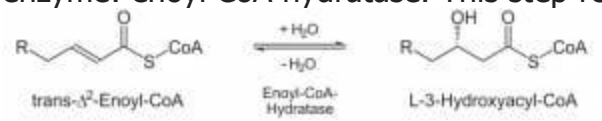
In the first step, acyl-CoA is oxidized by the enzyme acyl CoA dehydrogenase. A double bond is formed between the second and third carbons (C2 and C3) of the acyl-CoA

chain entering the beta oxidation cycle; the end product of this reaction is trans-Δ^2-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 .



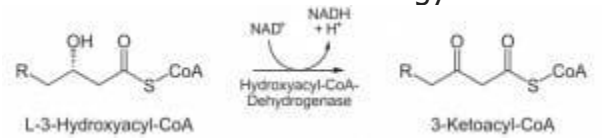
2. **Hydration**

In the second step, the double bond between C2 and C3 of trans-Δ^2-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.



3. **Oxidation**

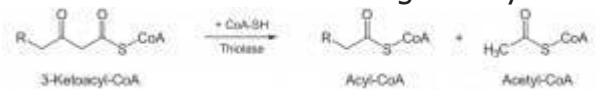
In the third step, the hydroxyl group in C2 of L-β-hydroxyacyl CoA is oxidized by NAD+ in a reaction that is catalyzed by 3-hydroxyacyl-CoA dehydrogenase. The end products are β-ketoacyl CoA and NADH + H. NADH will enter the citric acid cycle and produce ATP that will be used as energy.



4. **Thiolysis**

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 takes place in body?

Answer:

Uric Acid Formation:

- Uric acid is a chemical created when the body breaks down substances called purines.
- Purines are normally produced in the body and are also found in some foods and drinks. Foods with high content of purines include liver, anchovies, mackerel, dried beans and peas, and beer.
- If your body produces too much uric acid or does not remove enough of it, you can get sick.
- A high level of uric acid in the blood is called hyperuricemia.
- Uric acid is normally cleaned out of the blood by the kidneys, and passes out of the body along with urine.
- However, high levels of uric acid can accumulate in the body, either when the kidneys excrete too little uric acid or when the body produces too much uric acid.
- The high concentration of uric acid in the blood will eventually convert the acid into urate crystals, which can then accumulate around the joints and soft tissues. Deposits of the needle-like urate crystals are responsible for the inflammation and the painful symptoms of gout.

Normal Range Of Uric acid in Human Body:

Normal Uric acid levels are 2.4-6.0 mg/dL in female and 3.4-7.0 mg/dL in male.

- Most of it is excreted (removed from your body) in your urine, or passes through your intestines to regulate "normal" levels.

The End