Course Title: Medical Biochemistry II
DT 2nd, Sec A
Lab Assignment

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Note: Avoid copy paste material, as it may deduct your marks.

Q1. Explain the process of Uric Acid Formation.

Ans:1:

- Uric Acid:
- Uric Acid is a white tasteless odorless crystalline product of protein metabolism, found in the blood and urine, as well as trace amounts found in the various organs of the body. It can build up and form stones or crystals in various disease states.
- Uric acid is a heterocyclic purine derivative

  that is the final oxidation product

  of **purine** metabolism.

- It is produced by the enzyme **xanthine** oxidase, which oxidizes oxypurines such as **xanthine** into uric acid. In most mammals, except humans and higher primates, the enzyme uricase further oxidizes uric acid to **allantoin**. Uric acid is also the end product of **nitrogen** metabolism in birds and reptiles.
- In such species, it is excreted in feces as a dry mass. Humans produce only small quantities of uric acid with excess accumulation leading to a type of arthritis known as gout.

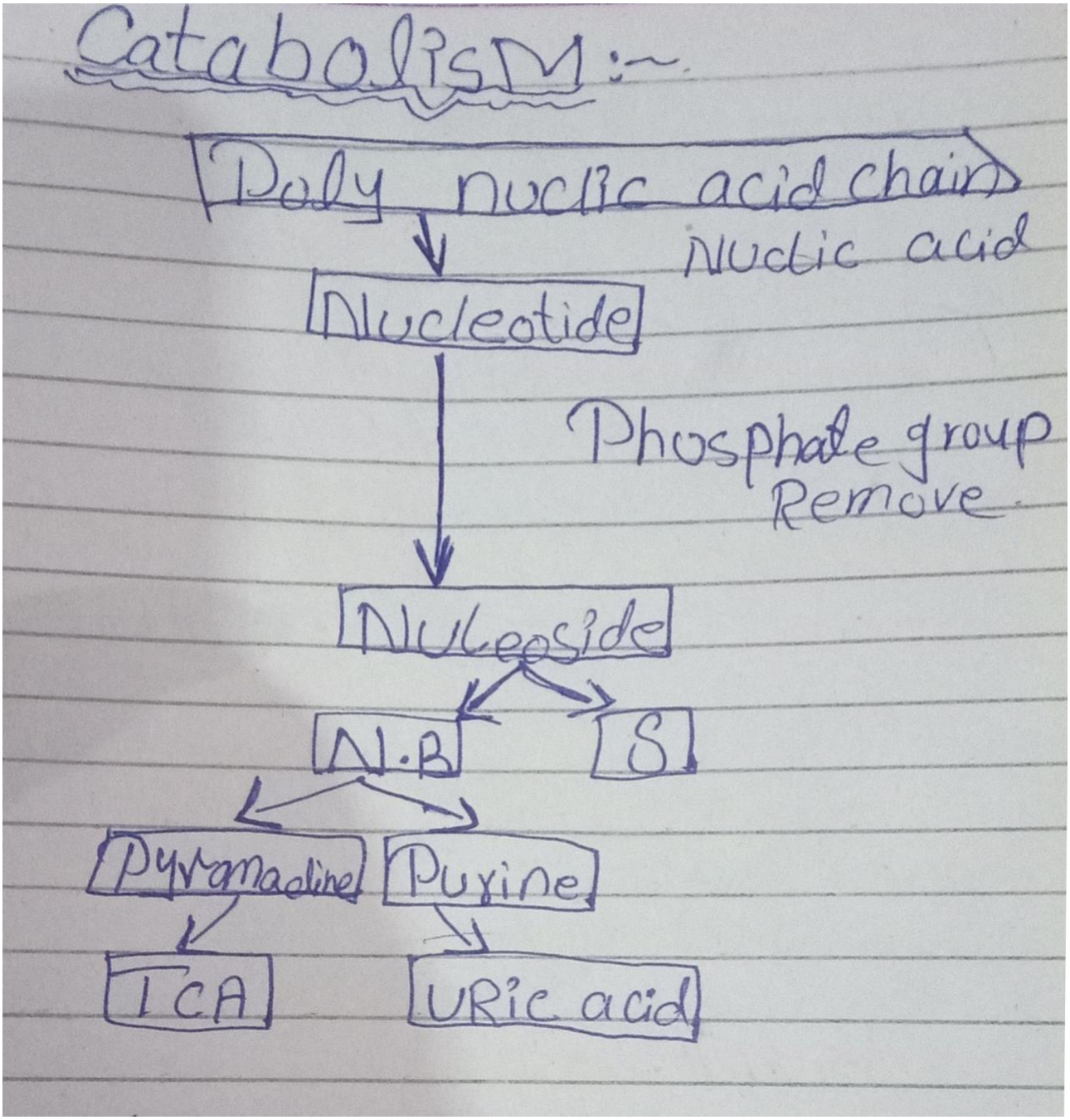
- The loss of uricase in higher primates parallels the similar loss of the ability to synthesize **ascorbic acid vitamin C**. This may be because in higher primates uric acid partially replaces **ascorbic acid**. .
- Uric acid is found to be associated with Lesch-Nyhan syndrome and xanthinuria type I, which are inborn errors of metabolism.

★Formation:

- The formation of uric acid is through the enzyme **xanthine** oxidase, which oxidizes oxypurines.

- Normally a small amount of uric acid is present in the body, but when there is an excess amount in the blood, called hyperuricemia, this can lead to gout and formation of kidney stones.

- Structure


Catabolism :-
Poly nucleic acid chain
Nucleic acid
Nucleotide
Phosphate group
Remove
Nucleoside
N.B
S
Pyramadine
Purine
TCA
URic acid

CATABolism:- of PURin:

Purine

Adinen ⟷ Guanine

★ Adinen and guanine have same Process and they both break down into the uric acid with the same Process.

Adenosine mano Phosphate

↓ N·B+P+S → Phosphate group Remove

Adenosine (N·B+S)

↓ NH_3 group remove → Adenosine deaminasee enzyme.

Inosine

↓ (N·B+S) Sugar group remove → Nucleoside Phosphate.

Hypoxanthine

↓ added O2 xanthine oxidase.

Xanthine

↓ added O2 xanthine oxidase

Uric acid

Q2. Discuss all the protein complexes used in Electron transport chain?

Ans :2:

- Cellular Respiration :

Ans:Cellular respiration is a set of metabolic reactions and processes that take place in the cells of organisms to

convert biochemical energy from nutrients into adenosine triphosphate (ATP), and then release waste products. o The first step of cellular respiration is glycolysis. Glycolysis occurs in the cytoplasm and involves the splitting of one molecule of glucose into two molecules of the chemical compound pyruvate. In all,

molecules of ATP and molecules of NADH (high energy, electron carrying molecule) are generated.

o The second step, called the citric acid cycle or Krebs cycle, is when pyruvate is transported into the

mitochondria. Pyruvate is further oxidized in the Krebs cycle producing more molecules of ATP, as well as

NADH and FADH 2 molecules.

o Electrons from NADH and FADH2

are transferred to the third step of cellular respiration, the electron

transport chain.

ELECTRON TRANSPORT CHAIN:

- The byproducts of most catabolic processes are NADH and FAD

Metabolic processes use NADH and FADH2

to transport electrons.

• These electrons are passed from NADH or FADH2

to membrane bound electron carriers which are then

passed on to other electron carriers until they are finally given to oxygen resulting in the production of

water.

- As electrons are passed from one electron carrier to another hydrogen ions are transported into the intermembrane space at three specific points in the chain.
- The transportation of hydrogen ions creates a greater concentration of hydrogen ions in the intermembrane

space than in the matrix which can then be used to drive ATP Synthase and produce ATP (a high energy

molecule).

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- Occurrence:
- The electron transport chain is where most of the energy cells need to operate is generated.This chain is actully a series of protein complex cavries molecules with the inner membrane of cell mitochondria .

- *Protein Complexes in the ETC:*
- There are four protein complexes that are part of the electron transport chain that functions to pass
- electrons down the chain. A fifth protein complex serves to transport hydrogen ions back into the matrix.
- These complexes are embedded within the inner mitochondrial membrane.
- Complex I:
- NADH transfers two electrons to Complex I resulting in four H+

- ions being pumped across the inner
- membrane. NADH is oxidized to NAD+
- , which is recycled back into the Krebs cycle. Electrons are
- transferred from Complex I to a carrier molecule ubiquinone (Q) or CoQ, which is reduced to ubiquinol.
- Ubiquinol carries the electrons to Complex III..
- Complex II:
- FADH2

- transfers electrons to Complex II and the electrons are passed along to ubiquinone (Q). Q is reduced
- to ubiquinol, which carries the electrons to Complex III. No H+
- ions are transported to the intermembrane
- space in this process.
- Complex III
- The passage of electrons to Complex III drives the transport of four more H+
- ions across the inner membrane.

- While electrons are passed to another electron carrier protein cytochrome C.
- Complex IV:
- Cytochrome C passes electrons to the final protein complex in the chain, Complex IV. Two H+
- ions are
- pumped across the inner membrane. The electrons are then passed from Complex IV to an oxygen (O2
- molecule, causing the molecule to split. The resulting oxygen atoms quickly grab H+

- ions to form two
- molecules of water.
- ATP Synthase:
- ATP synthase, also called complex V, uses the ETC generated proton gradient across the inner mitochondrial membrane to form ATP. ATP-synthase contains up of F0 and F1 subunits, which act as a rotational motor system. F0 is hydrophobic and embedded in the inner mitochondrial membrane. It contains a proton corridor that is protonated

and deprotonated repeatedly as H+ ions flow down the gradient from intermembrane space to matrix. The alternating ionization of F0 causes rotation, which alters the orientation of the F1 subunits. F1 is hydrophilic and faces the mitochondrial matrix. Conformational changes in F1 subunits catalyze the formation of ATP from ADP and Pi. For every 4 H+ ions, 1 ATP is produced. ATP-synthase can also be forced to run in reverse, consuming ATP to produce a

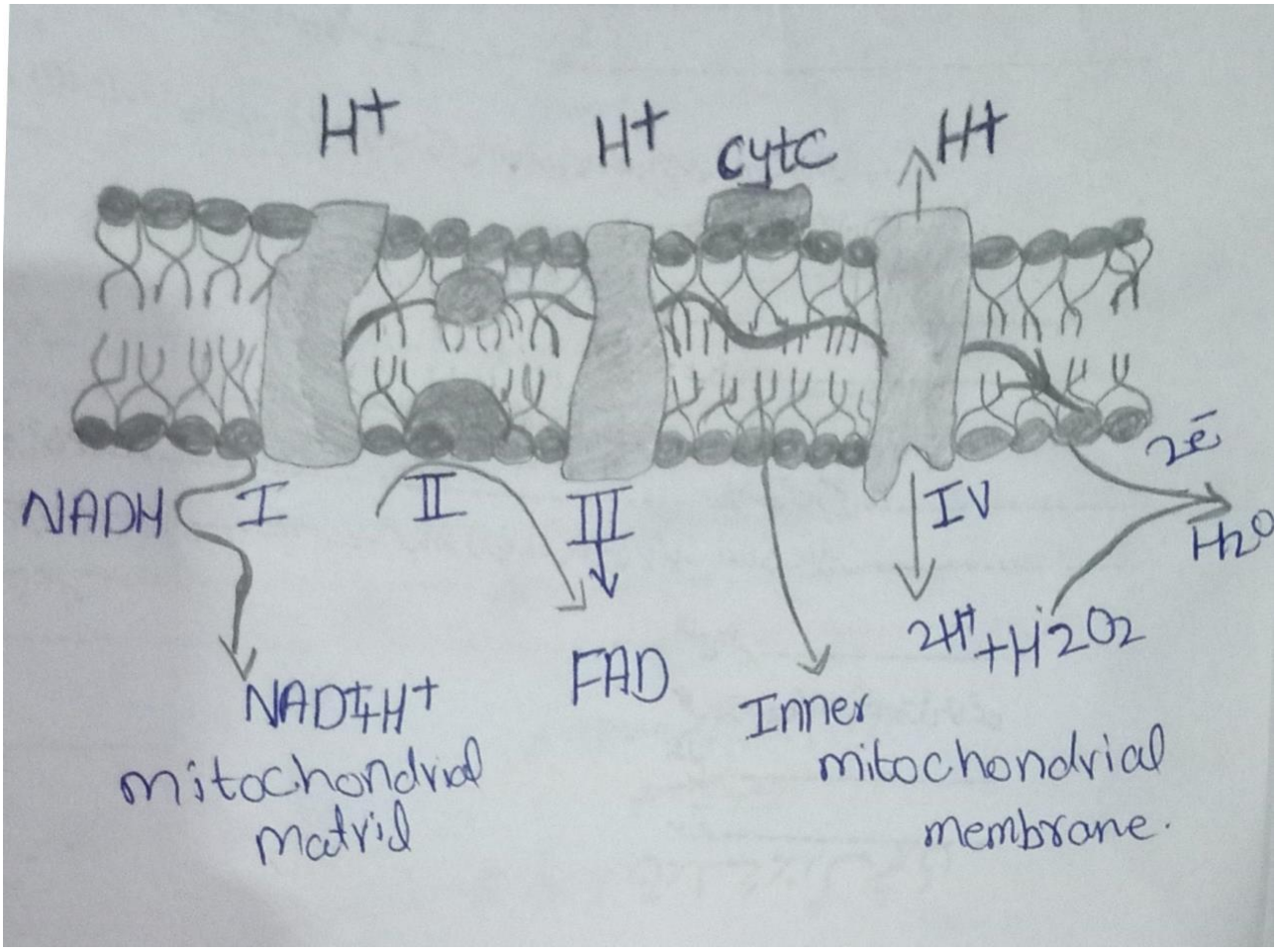
hydrogen gradient, as is seen in some bacteria.

- Electron Transport Chain:

- The electron transport chain is a series of protein complexes found in the inner membrane of the
- mitochondria. Electrons are passed from one member of the transport chain to another in a series of redox
- reactions.
- Chemiosmosis

- Energy released in electron transport chain reactions is captured by ATP synthase , which is then used to make
- ATP in a process called Chemiososis.
- Chemiosmosis is the movement of ions across a semipermeable membrane, down their electrochemical
- gradient (unequal concentrations of an ion across a permeable membrane).
- Oxidative phosphorylation:
- Oxidative phosphorylation

- Oxidative phosphorylation is made up of two closely connected processes the electron transport
- chain and chemiosmosis.
- OR
- Together, the electron transport chain and chemiosmosis make up oxidative phosphorylation.



Electron Transport Chain:

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