

Course Title: Medical Biochemistry II

DT 2nd, Sec A

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Max Marks: 50

Note: There are FIVE questions, each carry 10 marks with grand total of 50 marks

ATTEMPT all questions

Avoid copy paste material, as it may deduct your marks

Q1. Explain the process of “ATP synthesis coupled with electron flow”.

Ans: **ATP Synthase:**

ATP synthase moves H^+ ions that were pumped out of the matrix by the electron transport chain back into the

matrix. The energy from the influx of protons into the matrix is used to generate ATP by the phosphorylation (addition of a phosphate) of ADP. The movement of ions across the selectively permeable mitochondrial membrane and down their electrochemical gradient is called chemiosmosis.

IMPORTANT:

NADH generates more ATP than $FADH_2$. For every NADH molecule that is oxidized, 10 H^+ ions are

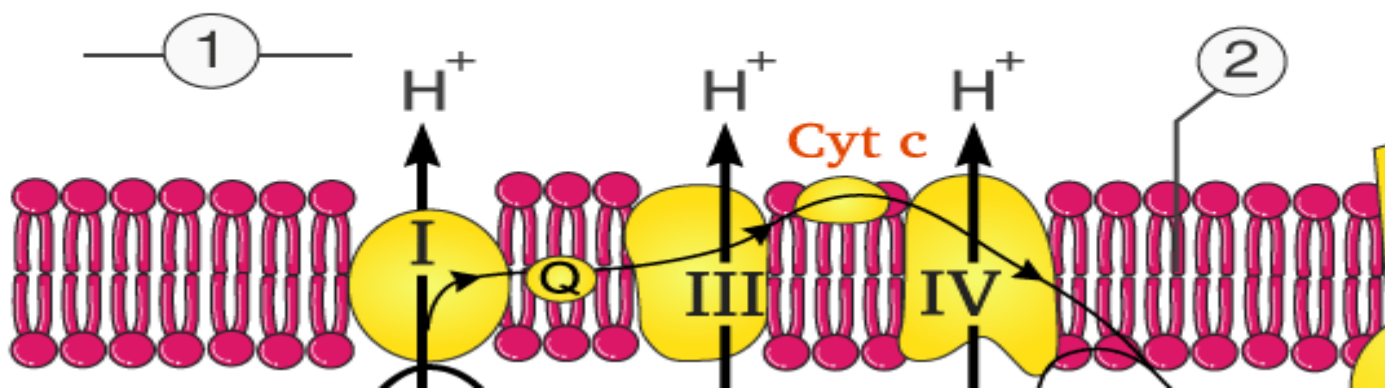
pumped into the intermembrane space. This yields about three ATP molecules.

Because $FADH_2$ enters

the chain at a later stage (Complex II), only six H^+ ions are transferred to the intermembrane space.

This accounts for about two ATP molecules.

ELECTRON TRANSPORT CHAIN



Q2. Write the reactions that are catalyzed by the following enzymes.

- i. Acyl CoA dehydrogenase
- ii. Adenosine deaminase
- iii. Nucleotidase
- iv. Gluconolactonase
- v. Enoyl-CoA hydratase

Ans: **i. Acyl-CoA dehydrogenase.** Acyl-CoA dehydrogenases (ACADs) are a class of enzymes that function to catalyze the initial step in each cycle of fatty acid β -oxidation in the mitochondria of cells.

II Adenosine deaminase (also known as Adenosine aminohydrolase or ADA is an enzyme involved in purine metabolism

Conversion of adenosine to inosine it is catalyzed by Adenosine deaminase

Adenosine + H₂O → Inosine + NH₃

Inosine has the purine termed hypoxanthine in its molecule

iii.A Nucleotidase is a hydrolytic enzyme that catalyzes the hydrolysis of a nucleotide into a nucleoside and a phosphate

A nucleotide + H₂O = a nucleoside + phosphate

FOR EXAMPLE

it converts Adenosine mono phosphate to Adenosine and guanosine mono phosphate to guanosine

iv. D_glucono 1,5_lactose + h₂o → D, gluconate

Thus the two substrates of this enzyme are D, glucono 1,5 lactose and h₂o where as its product is D, gluconate

v. Enoyl-CoA hydratase catalyzes the second step beta-oxidation pathway of fatty acid metabolism.

Q3. Define nucleotide, nucleoside and differentiate between DNA and RNA.

Ans: **Nucleotide:**

It is compound consist of nucleoside linked to a phosphate group . nucleotide from the basic structure unit of nuclic acid such as dna.

Nucleoside:

Nucleoside are glycosylamines that can be thought of an nucleotides without phosphate group . a nucleoside consist of simply of nucleobase and five carbon sugar.

DEFERENCE BETWEEN DNA AND RNA

DNA:

1:sugar moiety is deoxyribose.

2:double stand molecules.

3: bases are not modified.

4 : no natural dna is catalytic.

5:the life time od dna is comperatively high.

6: present in the nucleus mitochondria and chloroplast.

RNA:

1. Sugar moiety is ribose.
2. Single stand molecule.
3. Bases are modified.
4. Rna can be catalytic.
5. Rna is short lived .
6. Present in mitochondria ribosomes cytosole and nucleus.

Q4. Why Dickens and Horecker's Pathway is called HMP pathway. Enlist the enzymes used in PPP Pathway.

Ans:

Reason 1: Because it will be started from a compound called glucose 6 phosphate. Glucose contain 6 carbon and one phosphate group are attach on carbon no

Reason 2:

Dickens frank English biochemist 1899:

Dickens shunt a secondary pathway for the oxidation of D-glucose(not occurring in skeletal muscle) generating reducing power in the cytoplasm out side the mitochondria and synthesizing pentose and a few other sugar synonym ,pentose phosphate pathway,.

Enzyme name used in oxidative phase of ppp pathway:

- 1: glucose 6 phosphate enzymes.
- 2: gluconotactonase enzymes.
- 3:6 phosphogluconate dehydrogenase .

Enzymes name used in non oxidative phase of ppp pathway:

- 1: isomerase enzyme
- 2: epimerase enzymes.
- 3: transketolase enzyme.

Q5. What is the function of carnitine shuttle system? Write down the stages and steps

involved in Beta oxidation of Lipids.

Ans: Function of carnitine shuttle system:

The carnitine shuttle represent a mechanism by which long chain fatty acid ,which are impermeable to the mitochondrial membrane ,are transpoted in to the mitochondrial matrix for the purpose beta oxidation and energy production.

STAGES INVOLVED IN BETA OXIDATION:

Three stages involved in beta oxidation of fatty acid.

1. Activation of fatty acids occurring in the cytoplasm.
2. Transport of fatty acids into mitochondria.
3. Beta-Oxidation in the mitochondrial matrix.

β -Oxidation Of Activated Fatty Acids:

These steps are repeated until all the carbons of fatty acyl-CoA are converted to

acetyl-CoA. The 4 steps are:

- **Dehydrogenation**
- **Hydration**
- **Dehydrogenation**
- **Cleavage**