

Course Title: Medical Biochemistry II

RAD 2nd, Sec A

Student Name:

Student ID:

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”.

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

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

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

Q5. What is the function of carnitine shuttle system? Write down the stages and steps involved in Beta oxidation of Lipids.

Name.... Tahsin kamal

I'd...16131

Section...A

QUESTION NO 05

Ans

Carnitine shuttle:-

The carnitine shuttle represents a mechanism by which long chain fatty-acids, which are impermeable to the mitochondrial membranes, and transported into the mitochondrial matrix for the purpose beta oxidation and energy production.

Function:-

- **It is responsible for transferring of long chain fatty acids across the barrier of the inner mitochondrial membrane to gain access to the enzyme of beta oxidation.**
- **In living cells carnitine is required for the transport of fatty acids from the cytosol into the mitochondria during the breakdown of lipids (fats) for the generation of metabolic energy.**
- **It is widely available is a nutritional supplement.**

Beta oxidation of lipids:-

Definition:-

Beta oxidation is the catabolic process by which fatty acid molecules are broken down to generate acetyl Co-A.

Use of NADH₂ and FADH₂:-

Acetyl Co-A enters the citric acid cycle while NADH and FADH₂ produced in beta oxidation process is used in electron transport chain.

Occurrence:-

Beta oxidation of fatty acid occur in mitochondria.

Substrate:-

Free fatty acids, H₂O.

Products:-

One acetyl CoA, one NADH, and one FADH₂ for every removal of a two-carbon group from the fatty acid chain.

Stages involved in beta oxidation:-

Three stages are involved in beta oxidation of fatty acid;

- **Activation of fatty acid occurring in the cytoplasm**

- **Transport of fatty acid into mitochondria**
- **Beta oxidation in the** mitochondrial matrix

QN 1

And. • The byproducts of most catabolic processes are NADH and FADH₂

- 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).

QN. 2

Ans...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: Adenosine deaminase (ADA) is a metalloenzyme involved in the metabolic degradation of 6-aminopurine nucleosides

: Nucleotidase is an enzyme, which is involved in the hydrolysis of a nucleotide to form a nucleoside and a phosphate. Due to this role, nucleotidase is known as a hydrolytic enzyme.

: Enoyl-CoA hydratase (ECH) catalyzes the second step in the physiologically important beta-oxidation pathway of fatty acid metabolism.

QN .3

Ans nucleotide

..any of a group of molecules that, when linked together, form the building blocks of DNA or RNA: composed of a phosphate group, the bases adenine, cytosine, guanine, and thymine, and a pentose sugar, in RNA the thymine base being replaced by uracil.

: A nucleoside consists of a nitrogenous base covalently attached to a sugar (ribose or deoxyribose) but without the phosphate group

DNA is self replicating

1.The DNA helix geometry is in the form of B and can be damaged by exposure of ultra-violet rays.

2.It is a long polymer chain.L

3 DNA produces regular helix i.e. it is spirely twisted

4.Quantity of DNA is fixed for cell

5 .It is of two types: intra nuclear and extra nuclear.

6 Life of DNA is long

RNA

7.It is synthesised from DNA when needed.

8.The RNA helix geometry is in the form of A. It is more resistant to damage by ultra-violet rays.

9.It is shorter polymer.

10.It produces secondary helix or pseudo helix as its stranded may get folded at places.

12.The quantity of RNA for a cell is variable.

13.It is of four types: m-RNA, t-RNA and r-RNA.

14.Its life is short. Some RNA's have very shorter life but some have longer but in all its life is short.

QN.4

Ans. QNo 4) Why Dickens and Horecker's Pathway is called HMP pathway. Enlist the enzymes used in PPP Pathway.?

ANS . The HMP pathway is also called Warburg_Dicken-

Horecker pathway. it is used by heterofermentative lactic acid bacteria.

Bacillus spp, and pseudomonas spp. Ribose phosphate ribose phosphate can be used for synthesis of ribose and Deoxyribose precursors in nucleic acids.

Enzymes used in PPP pathway

- Glucose 6-phosphate Dehydrogenase
- Gluconolactonase

6-phosphogluconate Dehydrogenase enzymes

Involved in non oxidative phase

Ribose 5-phosphate 3-epimerase

- Isomerase enzyme
- Epimerase enzyme
- Transketolase enzyme ▪ Transaldolase enzyme

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