

**Course Title: Medical Biochemistry II**

**DT 2<sup>nd</sup>, Sec A**

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**Max Marks: 50**

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

**ATTEMPT all questions**

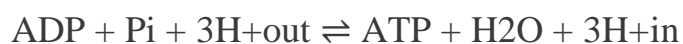
**Avoid copy paste material, as it may deduct your marks**

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

**Answer:**

ATP synthase is an enzyme that creates the energy storage molecule adenosine triphosphate (ATP), forming it from adenosine diphosphate (ADP) and inorganic phosphate (Pi). The overall reaction catalyzed by ATP synthase is:



The formation of ATP from ADP and Pi is energetically unfavorable and would normally proceed in the reverse direction. In order to drive this reaction forward, ATP synthase couples ATP synthesis during cellular respiration to an electrochemical gradient created by the difference in proton (H<sup>+</sup>) concentration across the mitochondrial plasma membrane in eukaryotes or the plasma membrane in bacteria. During photosynthesis in plants, ATP is synthesized by ATP synthase using a proton

gradient created in the thylakoid lumen through the thylakoid membrane and into the chloroplast stroma.

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

*i. Acyl CoA dehydrogenase:*

The acyl-CoA dehydrogenases (ACADs) are enzymes that catalyze the  $\alpha,\beta$ -dehydrogenation of acyl-CoA esters in fatty acid and amino acid catabolism.

*ii. Adenosine deaminase:*

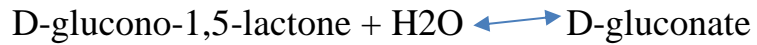
The function of the adenosine deaminase enzyme is to eliminate a molecule called deoxyadenosine, which is generated when DNA is broken down. Adenosine deaminase converts deoxyadenosine, which is toxic to lymphocytes, to another molecule called deoxyinosine, which is not harmful.

*iii. Nucleotidase:*

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

*iv. Gluconolactonase:*

This enzyme belongs to the family of hydrolases. A gluconolactonase is an enzyme that catalyzes the chemical reaction.



v. **Enoyl-CoA hydratase:**

ECH is essential to metabolizing fatty acids in beta oxidation to produce both acetyl CoA and energy in the form of ATP.

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

**Answer:**

**Nucleotide:**

A nucleotide is the basic building block of nucleic acids. RNA and DNA are polymers made of long chains of nucleotides. A nucleotide consists of a sugar molecule (either ribose in RNA or deoxyribose in DNA) attached to a phosphate group and a nitrogen-containing base.

**Nucleoside:**

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

**Difference between RNA and DNA:**

1- DNA has four nitrogen bases adenine, thymine, cytosine, and guanine and for RNA instead of thymine, it has uracil.

2- DNA is double-stranded and RNA is single-stranded.

3- RNA can leave the nucleus and DNA can't.

4- DNA is a long polymer with deoxyriboses and phosphate backbone. RNA is a polymer with a ribose and phosphate backbone.

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

**Answer:**

This pathway is also called the hexose monophosphate shunt. It has been called the latter because it involves some reactions of the glycolytic pathway and therefore has been viewed as a shunt of glycolysis..

**Enzymes in PPP:**

\*G6PD

\*SIRT2

\*Glucose-6-phosphate dehydrogenase

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

**Answer:**

**Function of carnitine shuttle system:**

The carnitine shuttle is responsible for transferring long-chain fatty acids across the barrier of the inner mitochondrial membrane to gain access to the enzymes of beta-oxidation.

**Steps involved in Beta oxidation of Lipids:**

Beta oxidation takes place in four steps:

1-dehydrogenation,

2-hydration,

3- oxidation

4-thyolysis