**Course Title: Basic Biochemistry**

**Summer Semester (mid & final)**

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**Max Marks: 80**

**Note: There are total 7 questions.**

**Each question from 1 to 5 carry 10 marks,**

**While question 6 and 7 carry 15 marks each with grand total of 80 marks.**

**ATTEMPT all questions.**

**Avoid copy paste material from any source, as it may deduct your marks.**

Q1: Define Dickens and Horecker’s Pathway also explain irreversible phase of HMP pathway. Enlist the enzymes used in non-Oxidative phase of HMP Pathway.

Ans

Dickens shunt - a secondary pathway for the oxidation of d-glucose (not occurring in skeletal muscle), generating reducing power in the cytoplasm outside the mitochondria and synthesizing pentoses and a few other sugars. Synonym(s): pentose phosphate pathway; Warburg-Lipmann-Dickens-Horecker shunt.

The hexose monophosphate shunt, also known as the pentose phosphate pathway, is a unique pathway used to create products essential in the body for many reasons. The HMP shunt is an alternative pathway to glycolysis and is used to produce ribose-5-phosphate and nicotinamide adenine dinucleotide phosphate (NADPH). This pathway occurs in the oxidative and non-oxidative phases, each comprising a series of reactions. The HMP shunt also has significance in the medical world, as enzyme or co-factor deficiencies can have potentially fatal implications on the affected patients.

Q2: What are the steps and enzymes involved in Glycolysis.

ANS

Glycolysis is the metabolic process that serves as the foundation for both aerobic and anaerobic cellular respiration. In glycolysis, glucose is converted into pyruvate. Glucose is a six- memebered ring molecule found in the blood and is usually a result of the breakdown of carbohydrates into sugars. It enters cells through specific transporter proteins that move it from outside the cell into the cell’s cytosol. All of the glycolytic enzymes are found in the cytosol.

The overall reaction of glycolysis which occurs in the cytoplasm is represented simply as:

C6H12O6 + 2 NAD+ + 2 ADP + 2 P —–> 2 pyruvic acid, (CH3(C=O)COOH + 2 ATP + 2 NADH + 2 H+

Q3: Discuss digestion and absorption of Carbohydrates.

ANS

Digestion Of carbohydrates

=> the major source of carbohydrates are found in plants.

=>dietary carbohydrates consists of:

Polysaccharide: starch, glycogen and cellulose.

Diasaccarides: sucrose and maltos.

Manosaccride: glucose and fructose

Manosaccride: does not need digestion

Absorption of carbohydrates

The end product of carbohydrate digestion are glucose,furctose,gluctsose the are the reaily absorbed through the intestinal mucosal cells into the blood streem two mechanism are the responsible for the absorption of these sugars. ●facilated transport, with concentration gradient

● active transport, aganist concentration gradient

Q4: Explain step by step the Tricarboxylic acid cycle.

Ans

The citric acid cycle (CAC) – also known as the TCA cycle (tricarboxylic acid cycle) or the Krebs cycle is a series of chemical reactions used by all aerobic organisms to release stored energy through the oxidation of acetyl-CoA derived from carbohydrates, fats, and proteins. In addition,

the cycle provides precursors of certain amino acids, as well as the reducing agent NADH, that are used in numerous other reactions. Its central importance to many biochemical pathways suggests that it was one of the earliest components of metabolism and may have originated abiogenically.

Even though it is branded as a 'cycle', it is not necessary for metabolites to follow only one specific route; at least three segments of the citric acid cycle have been recognized

Steps

Substrates Products Enzyme Reaction type Comment

0 / 10 Oxaloacetate + Acetyl CoA + H2O Citrate + CoA-SH Citrate synthase Aldol condensation irreversible, extends the 4C oxaloacetate to a 6C molecule

1 Citrate cis-Aconitate + H2O Aconitase Dehydration reversible isomerisation

2 cis-Aconitate + H2O Isocitrate Hydration

3 Isocitrate + NAD+ Oxalosuccinate + NADH + H + Isocitrate dehydrogenase Oxidation generates NADH (equivalent of 2.5 ATP)

4 Oxalosuccinate α-Ketoglutarate + CO2 Decarboxylation rate-limiting, irreversible stage, generates a 5C molecule

5 α-Ketoglutarate + NAD+ + CoA-SH Succinyl-CoA + NADH + H+ + CO2 α-Ketoglutarate

dehydrogenase Oxidative

decarboxylation irreversible stage, generates NADH (equivalent of 2.5 ATP), regenerates the 4C chain (CoA excluded)

6 Succinyl-CoA + GDP + Pi Succinate + CoA-SH + GTP Succinyl-CoA synthetase substrate-level

phosphorylation or ADP→ATP instead of GDP→GTP,[15] generates 1 ATP or equivalent.

Condensation reaction of GDP + Pi and hydrolysis of succinyl-CoA involve the H2O needed for balanced equation.

7 Succinate + ubiquinone (Q) Fumarate + ubiquinol (QH2) Succinate dehydrogenase Oxidation uses FAD as a prosthetic group (FAD→FADH2 in the first step of the reaction) in the enzyme.[15]

These two electrons are later transferred to QH2 during Complex II of the ETC, where they generate the equivalent of 1.5 ATP

8 Fumarate + H2O L-Malate Fumarase Hydration Hydration of C-C double bond

Q5: Differentiate between Fat and oil also explain “solid fat is beneficial for health or oil”.

Ans

(A)Differences between fat and oil:

Fats:- solid at room temperature.

: more saturated

: high melting point

: more stable

Oil

Liquid at room temperature

: relatively unsaturated

: low melting point

: almost unstable

B)

Solid fats are fats that are solid at room temperature, like beef fat, butter, and shortening.

Solid fats mainly come from animal foods and can also be made from vegetable oils through a process called hydrogenation.

Some common solid fats are: butter.

Q6: What are the macromolecules found in Plasmalema also discuss the Bilaminar structure of Cell membrane.

Ans

Macromolecule that are found in plasma membrain are following

Lipids

Lipids

● provide the basic structer of biological membrain

●plasma membrain contain lipids about 20 to 40% by weight

Protiens●

protiens are present 55% by weight

● it forms the main bulk of plasma membrain

●they are embeded in membrain and provide channels for transport of ions/nutrients

Carbohydrates●

they are present in varying amount in different cells

● polysaccaride are present in amount of 5% by weight

BILAMINAR STRUCTURE OF PLASMALEMA

▪They are gorter and grendel

▪ The membrain made up of two lipids molecule

▪ they are hyprophobic end,towards interior,water hating

▪also hydrophilic end,towards outer boundry, water loving

Q7: Discuss amino acids on the basis of requirement in protein synthesis also enlist the Acidic, Aliphatic and Basic amino acids.

ANS

Both animal and plant proteins are made up of about 20 common amino acids.

The proportion of these amino acids varies as a characteristic of a given protein, but all food proteins—with the exception of gelatin—contain some of each.

Amino nitrogen accounts for approximately 16% of the weight of proteins.

Amino acids are required for the synthesis of body protein and other important nitrogen-containing compounds, such as creatine, peptide hormones, and some neurotransmitters.

Although allowances are expressed as protein, a the biological requirement is for amino acids.

Proteins and other nitrogenous compounds are being degraded and resynthesized continuously. Several times more protein is turned over daily within the body than is ordinarily consumed, indicating that reutilization of amino acids is a major feature of the economy of protein metabolism.

This process of recapture is not completely efficient, and some amino acids are lost by oxidative catabolism. Metabolic products of amino acids (urea, creatinine, uric acid, and other nitrogenous products) are excreted in the urine; nitrogen is also lost in feces, sweat, and other body secretions and in sloughed skin, hair, and nails. A continuous supply of dietary amino acids is required to replace these losses, even after growth has ceased.