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Diploma in Pharmacy 2nd Year
Biochemistry & Clinical Pathology
Important Questions
Chapter 8 : Metabolism

Questions	Page No
Q1. Describe Krebs Cycle.	3
Q2. Write about diseases related to Abnormal metabolism of Carbohydrates.	4
Q3. Write a note on Urea Cycle.	5
Q4. Write about diseases related to Abnormal Metabolism of Amino Acids.	6
Q5. Give a short note on Biological Oxidation.	6
Q6. Write a note on Ketogenesis.	7

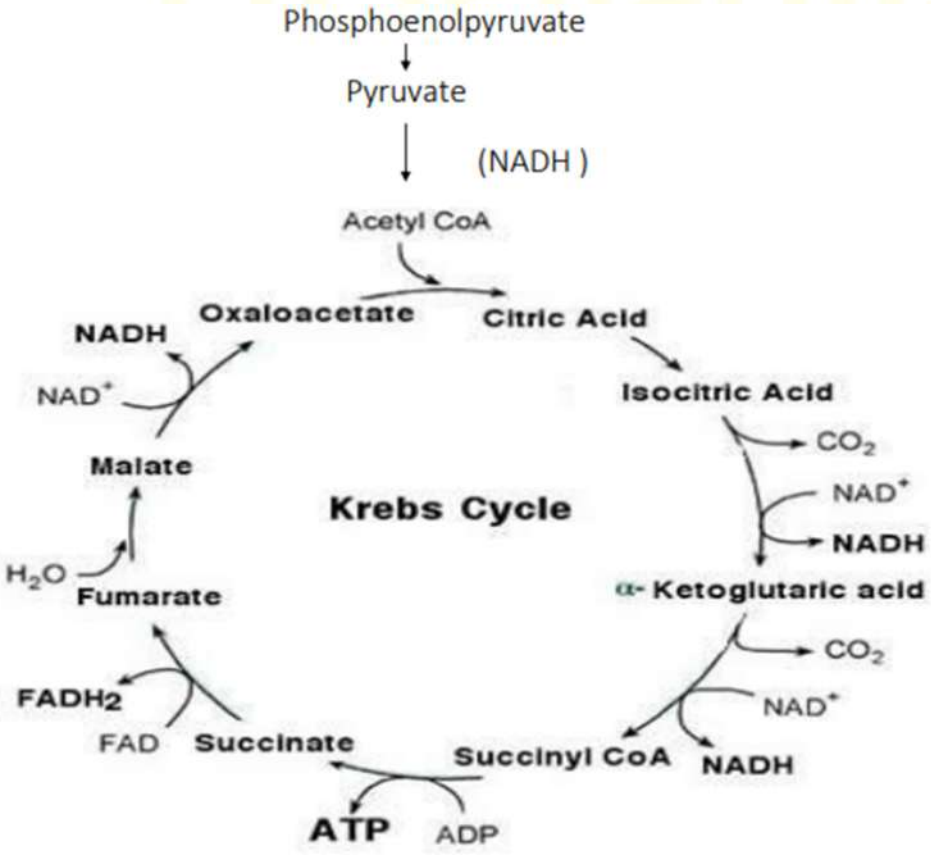
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Chapter 8
Metabolism
IMPORTANT Questions

Q1. Describe Krebs Cycle.

Ans.

- It is the common metabolic Pathway for Carbohydrates , Fats and protein .
- First time , Hans Crebs had given the reaction of Citric Acid Cycle , that is why it is called Crebs Cycle.
- The end product of glycolysis Pyruvate , enters into mitochondria by Active Transport , and Converted into Acetyl Co-A .
- Now Acetyl Co-A enters into Crebs Cycle , which occurs in the matrix of Mitochondria .
- When one crebs cycle completed in the presence of optimum amount of O2 12 ATPs are generated .
- Catabolism of one glucose in aerobic Condition (if O2 is present in mitochondria) gives 38 ATP , including :
    - 8 ATPs in Glycolysis
    - 6 ATPs in conversion of Pyruvate to Acetyl-CoA .
    - 24 ATPs in Crebs cycle .



Q2. Write about diseases related to Abnormal metabolism of Carbohydrates.

Ans. Diseases Related to Abnormal Metabolism of Carbohydrates

1) Diabetes Mellitus

- ⇨ Diabetes Mellitus is a inherited or acquired disease occurs due to defect in insulin secretion or insulin action or both , in which blood sugar level is high for long time.
- ⇨ It is also called Hyperglycemia.

Symptoms

- Presence of sugar in urine
- Increase thirst
- Increase frequency of urination
- extreme hunger
- fatigue
- blurred vision
- Headache
- frequent infection
- delay in healing of cuts and wounds
- Itchy skin

2) Galactosaemia

- ➢ It is genetic disorder in which body unable to metabolise galactose sugar , and blood galactose level increased. The absence or non-Functionality of Galactose - 1- Phosphate Uridylyltransferase Enzyme is responsible for this disorder.

Symptoms

- Appetite loss
- Jaundice
- Enlargement of Liver
- Liver damage
- Abdominal swelling due to fluid accumulation

3) Glycogen Storage Disease (GSD)

- ➢ The breakdown of glycogen to glucose is facilitated by some enzymes , if they gets blocked , the glycogen accumulate in the liver and muscles and Glycogen Storage Disease developed.

4) Glucose -6- Phosphate Dehydrogenase Deficiency Disease

- ➢ It is a genetic disorder in which the quantity of Glucose -6- Phosphate Dehydrogenase decreased and causes breakdown of Premature RBCs . This destruction of RBCs is called Haemolysis , and causes Haemolytic anaemia

Q3. Write a note on Urea Cycle.

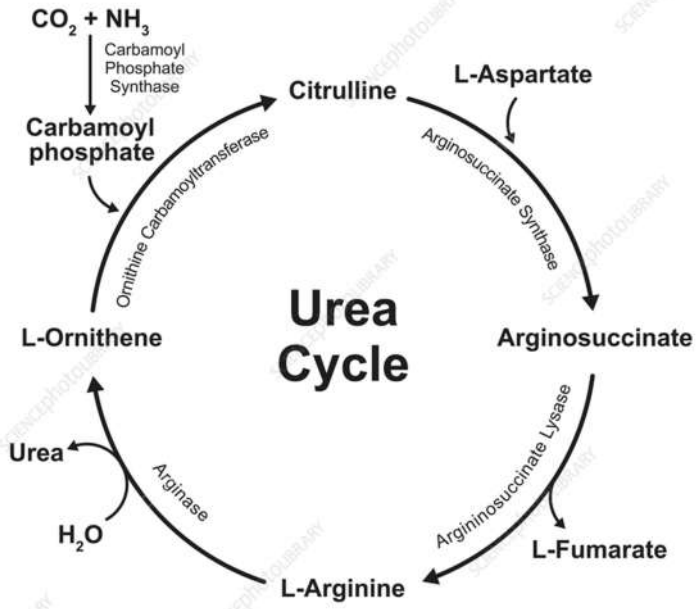
Ans.

Urea cycle

- Ammonia is constantly being liberated in the metabolism of amino acids (mostly) and other nitrogenous compounds. At the physiological pH, ammonia exists as ammonium (NH_4+) ion. Ammonium ions are very important to maintain acid-base balance of the body.
- The production of NH_3 occurs from the amino acids (transamination and deamination), biogenic amines, amino group of purines and pyrimidines and by the action of intestinal bacteria (urease) on urea.

Introduction about urea cycle

- Urea is the end product of protein metabolism (amino acid metabolism). The nitrogen of amino acids, converted to ammonia, is toxic to the body. It is converted to urea and detoxified. As such, urea accounts for 80-90% of the nitrogen containing substances excreted in urine.
- Urea is synthesized in liver and transported to kidneys for excretion in urine. Urea cycle is the first metabolic cycle that was elucidated by Hans Krebs and Kurt Henseleit (1932), hence it is known as Krebs-Henseleit cycle. The individual reactions, however, were described in more detail later on by Ratner and Cohen. Urea has two amino (NH_2) groups, one derived from NH_3 and the other from aspartate. Carbon atom is supplied by CO_2. Urea synthesis is a five-step cyclic process, with five distinct enzymes. The first two enzymes are present in mitochondria while the rest are localized in cytosol



Q4. Write about diseases related to Abnormal Metabolism of Amino Acids.

Ans.

Diseases Related to Abnormal Metabolism of Amino Acids

1) Albinism : It is a Group of inherited disorder it develops when tyrosine metabolism does not occur properly , and then synthesis of melanin becomes very low or no melanin production . Melanin is a pigment , so the affected person has little or no colour in hair and skin . this condition increases the risk of skin cancer

2) Tyrosinemia : It is a inherited disorder in which metabolism of t yrosin badly affected and accumulate in body tissues , and because of its toxic effect many of problems created .

Symptoms :

- Bloody stool
- Diarrhoea
- Fatigue
- Vomiting.
- Painful wounds on skin,
- Red eyes
- convulsion
- intelactual
- Intellectual disability.

Q5. Give a short note on Biological Oxidation.

Ans.

Biological Oxidation

→ Oxidation is a reaction with oxygen directly or indirectly / removal of hydrogen or electron .
→ This reaction carried out by enzymes .
→ The electron released by this reaction accepted by Electron acceptors (NAD , FAD) , and then formation of ATP occurs , this process takes place in living tissues , and necessary for survival so it is called Biological Oxidation .

Electron Transport Chain and Oxidative Phosphorylation

- Electron Transport Chain is a series of protein complex and other molecules that accept and transfers electron from NADH and $FADH_2$ to Oxygen , when they combine with oxygen the synthesis of ATP occurs.
- In formation of ATP Phosphorus is used and Oxidation - Reduction reaction involved that is why it called Oxidative phosphorylation.

Q6. Write a note on Ketogenesis.

Ans.

Ketogenesis

- → The synthesis of ketone bodies occurs in the liver. The enzymes for ketone body synthesis are located in the mitochondrial matrix. Ketone bodies are water-soluble and energy yielding. Acetyl CoA, formed by oxidation of fatty acids, pyruvate or some amino acids, is the precursor for ketone bodies.
- → The three main types of ketone bodies produced are acetone, acetoacetate, and beta-hydroxybutyrate. Ketone bodies can be used by the brain and other tissues as an alternative energy source when glucose is scarce, and they are also involved in regulating blood glucose levels and reducing inflammation.
- → However, excessive production of ketone bodies can lead to a condition known as ketoacidosis, which is a potentially lifethreatening metabolic state characterized by high levels of ketone bodies in the blood.

Ketogenesis occurs through the following reactions

1. Two moles of acetyl CoA condense to form acetoacetyl CoA. This reaction is catalysed by thiolase, an enzyme involved in the final step of E-oxidation. Hence, acetoacetate synthesis is appropriately regarded as the reversal of thiolase reaction of fatty acid oxidation.
2. Acetoacetyl CoA combines with another molecule of acetyl CoA to produce β-hydroxy β-methyl glutaryl CoA (HMG CoA). HMG CoA synthase, catalysing this reaction, regulates the synthesis of ketone bodies. 3. HMG CoA lyase cleaves HMG CoA to produce acetoacetate and acetyl CoA.
3. Acetoacetate can undergo spontaneous decarboxylation to form acetone.
4. Acetoacetate can be reduced by a dehydrogenase to β-hydroxybutyrate.

