NCERT solutions for class 11 biology chapter 14 Respiration In Plants

Q1. Differentiate between

(a) Respiration and Combustion

Answer:

Respiration	Combustion
It takes place inside the living cells	It is a non-cellular process
It is a biochemical process	It is a physiochemical process
Energy is released in steps as chemical bonds are broken in steps	Energy is released in a single step as all chemical reactions take place simultaneously
Most of the energy is in the form of ATP	ATP formation does not occur
It requires enzymes	It is non-enzymatic process

Q1. Differentiate between

(b) Glycolysis and Krebs’ cycle

Answer:

Glycolysis	Krebs cycle
Glycolysis takes place inside the cytoplasm	It occurs inside mitochondria
It is a straight or linear pathway	It is a cyclic process
This process is common to both aerobic and anaerobic respiration	This process occurs only in aerobic respiration
It breaks down one molecule of glucose into two molecules of pyruvate	It breaks down pyruvate completely into carbon dioxide and water
It consumes two ATP molecules	It does not consume ATP

Q1. Differentiate between (c) Aerobic respiration and Fermentation

Answer:

Aerobic respiration	Fermentation
It is an intracellular process	Fermentation can occur both intracellularly and extracellularly

It is not economically exploited	It is economically exploited in the production of wine, bread etc.
It is a type of respiration that utilises oxygen to breakdown a respiratory substrate.	It is an enzyme controlled breakdown and transformation of organic nutrients

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Q2. What are respiratory substrates? Name the most common respiratory substrate.

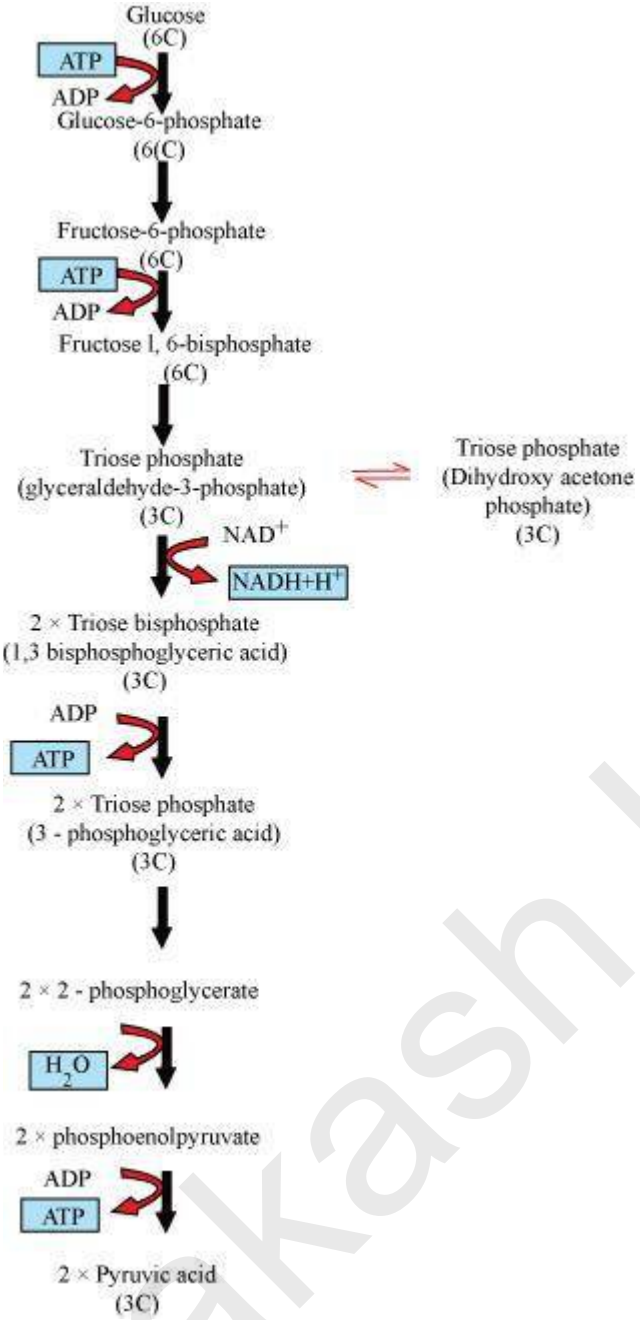
Answer:

Respiratory substrates are those organic substances which are oxidised during respiration to liberate energy inside the living cells. The common respiratory substrates are carbohydrates, proteins, fats and organic acids.

Q3. Give the schematic representation of glycolysis?

Answer:

Schematic representation of glycolysis is as follows:



Q4. <u>What are the main steps in aerobic respiration? Where does it take place?</u>

Answer:

The main steps of aerobic respiration are as follows:

1. Glycolysis- Cytoplasm

2. Krebs cycle- Matrix of mitochondria

3. Electron transport system- Inner mitochondrial membrane

4. Oxidative phosphorylation- Oxysome in the inner mitochondrial membrane.

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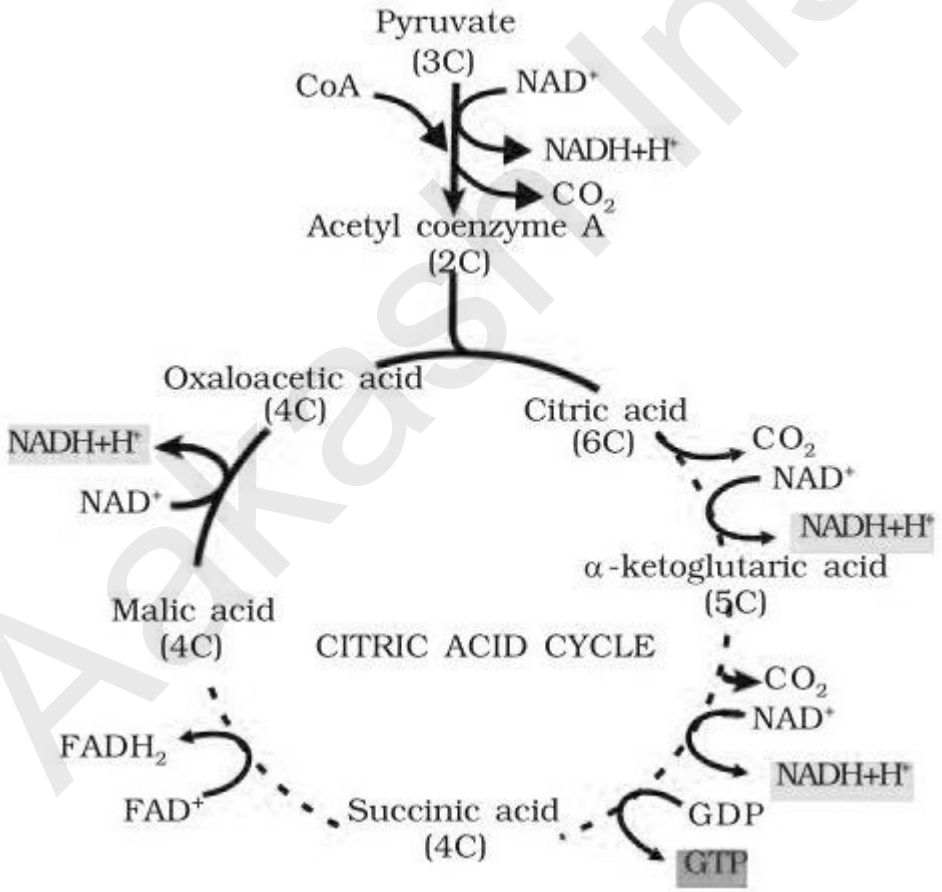
Q5. Give the schematic representation of an overall view of Krebs' cycle.

Answer:

Schematic representation of the Krebs cycle



Q7. Distinguish between the following:

(a) Aerobic respiration and Anaerobic respiration

Answer:

Aerobic respiration	Anaerobic respiration
It involves the exchange of gases	Exchange of gases is absent
It uses oxygen for breaking the respiratory material into simple substances	It does not use oxygen for the breakdown of respiratory substrates.
Respiratory material is completely broken	Respiratory material is partially broken
It involves electron transport	Electron transport is absent

Q7. Distinguish between the following:

(b) Glycolysis and Fermentation

Answer:

Glycolysis	Fermentation

It is the first step of respiration which occurs without the requirement of oxygen and is common to both aerobic and anaerobic modes of respiration	It is anaerobic respiration or respiration which does not require oxygen
Glycolysis produces pyruvic acid	Fermentation produces different products such as ethanol and lactic acid.
IT produces two molecules of NADH per glucose molecule	It uses NADH produced during glycolysis.

Q7. Distinguish between the following:

(c) Glycolysis and Citric acid Cycle

Answer:

Glycolysis	Citric acid cycle
It takes place inside the cytoplasm	It takes place in mitochondria

It is the first step of respiration in which glucose is broken down to the level of pyruvate.	It is the second step of respiration wherein an active acetyl group is broken down completely

Q8. What are the assumptions made during the calculation of net gain of ATP?

Answer:

The assumptions made during the calculation of net gain of ATP are as follows:

1. It is assumed that various parts of aerobic respiration such as glycolysis, TCA cycle, and ETS occur in a sequential and orderly pathway.

2. NADH produced during the process of glycolysis enters into mitochondria to undergo oxidative phosphorylation.

3. The glucose molecule is assumed to be the only substrate while it is assumed that no other molecule enters the pathway at intermediate stages.

4. The intermediates produced during respiration are not utilized in any other process.

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Q9. Discuss "The respiratory pathway is an amphibolic pathway."

Answer:

The respiratory pathway is an amphibolic pathway

An amphibolic pathway refers to a pathway in which both catabolic and anabolic reactions take place. The products of some reactions are used to synthesise other

products. Carbohydrates are broken down to glucose before entering respiratory pathways. Fats get converted into fatty acids and glycerol whereas fatty acids get converted into acetyl CoA before entering the respiration. In a similar manner, proteins are converted into amino acids, which enter respiration after deamination. During the synthesis of fatty acids, acetyl CoA is withdrawn from the respiratory pathway. Also, in the synthesis of proteins, respiratory substrates get withdrawn. Thus, respiration involves both anabolism and catabolism in anabolism. Therefore, respiration can be termed as an amphibolic pathway as it involves both anabolism and catabolism.

Q10. Define RQ. What is its value for fats?

Answer:

The respiratory quotient is defined as the ratio of the volume of CO_2 evolved to the volume of O_2consumed during respiration. The value of respiratory quotient depends on the type of respiratory substrate. The value of RQ for various respiratory substrates is as follows:

Carbohydrates- 1

Fat - 0.7

Organic acids- more than 1

Proteins - less than 1

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Q11. What is oxidative phosphorylation?

Answer:

Oxidative phosphorylation

Oxidative phosphorylation is the synthesis of energy-rich ATP molecules with the help of energy liberated during oxidation of reduced coenzymes (NADH and FADH2) produced in respiration. TH enzyme required for the synthesis is called ATP synthase. It is the fifth complex of ETS. During this process, a number of oxidation-reduction reactions occur and lead to the generation of a proton gradient. The enzyme ATP synthase (complex V) consists of F_0 and F_1 components. The Fl headpiece is a peripheral membrane protein complex and contains the site for ATP synthesis from ADP and inorganic phosphate whereas F_0 component is a part of the membrane protein complex, which acts as a channel for the crossing of the protons from the inner mitochondrial membrane to the mitochondrial matrix. For every two protons passing through $F_0 - F_1$ complex, synthesis of one ATP molecule takes place.

Q12. What is the significance of step-wise release of energy in respiration?

Answer:

The process of respiration takes place in a stepwise manner including steps like glycolysis, TCA cycle, ETS, and oxidative phosphorylation. During respiration, the production of ATP also in each phase takes place in a stepwise manner. The products formed in one step of respiration becomes the substrate of the other pathway. Various molecules produced during respiration are involved in other biochemical processes also. Different respiratory substrates enter and withdraw from the pathway on necessity. The ATP also gets utilized wherever required and the rate of reactions of enzymes are also controlled. Therefore, the stepwise release of energy makes the system more efficient in extracting as well as storing energy.