

NCERT Solutions for 11th Class Biology: Chapter 14- Respiration in Plants



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NCERT Solutions for 11th Class Biology: Chapter 14-Respiration in Plants

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Exercises

1. Differentiate between

(a) Respiration and Combustion

(b) Glycolysis and Krebs' cycle

(c) Aerobic respiration and Fermentation

Answer

(a) Respiration and Combustion

Respiration

It is a biochemical process.

It occurs inside the cells.

It is a biologically-controlled process.

No light is produced

ATP is generated.

Enzymes are required

Combustion

It is a physiochemical process.

It does not occur inside cells.

It is an uncontrolled process.

Light may be produced

ATP is not generated.

Enzymes are not required

(b) Glycolysis and Krebs' cycle

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Glycolysis

The breakdown of glucose to pyruvic acid is called glycolysis.

It is a linear pathway.

It occurs in the cell cytoplasm.

It occurs in all living beings.

It generates 2 NADH_2 and 2 ATP molecules on the breakdown of one glucose molecule.

No carbon dioxide evolved

Krebs' cycle

The further processing of pyruvic acid through aerobic route is called Krebs' cycle.

It is a cyclic pathway.

It occurs in the mitochondrial matrix.

It occurs in aerobic respiration.

It produces 6 NADH_2 , 2 FADH_2 , and 2 ATP molecules on the breakdown of two acetyl-CoA molecules.

Carbon dioxide evolved

(c) Aerobic respiration and Fermentation**Aerobic respiration**

The complete oxidation of organic substances in the presence of oxygen.

It occurs in the cytoplasm and

Fermentation

The incomplete oxidation of glucose in the absence of oxygen.

It occurs in the cytoplasm

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mitochondria

The end products are carbon dioxide and water

Complete oxidation of the respiratory substrate takes place

About 36 ATP molecules are produced

The end products are ethyl alcohol and carbon dioxide

Incomplete oxidation of the respiratory substrate takes place

Only 2 ATP molecules are produced

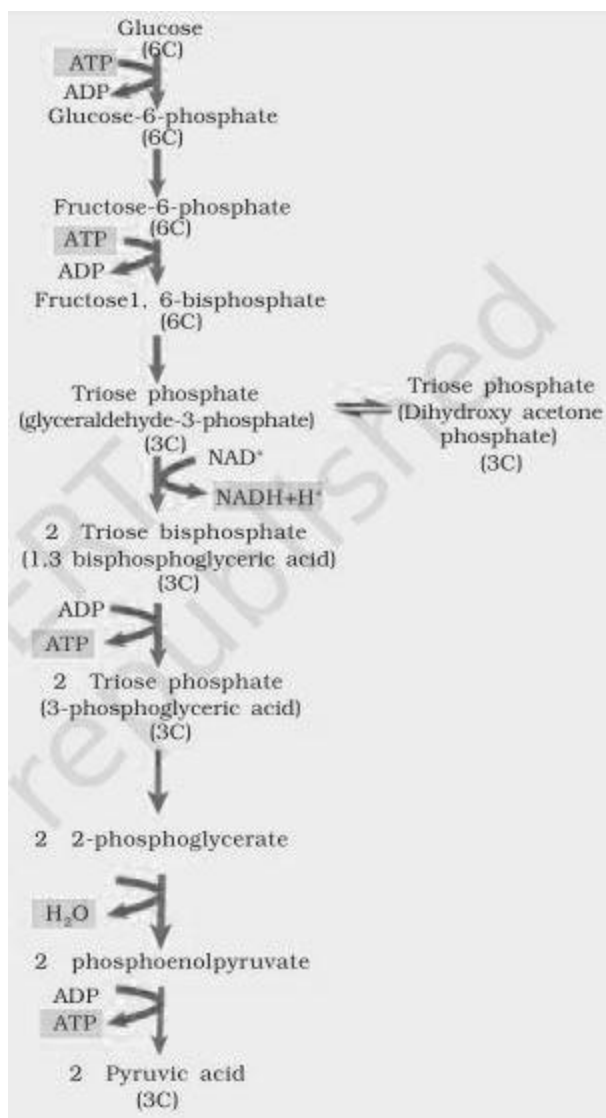
2. What are respiratory substrates? Name the most common respiratory substrate.

Answer

A compound which is oxidized during respiration is called respiratory substrate. Glucose is the most common respiratory substrate.

3. Give the schematic representation of glycolysis?

Answer



4. What are the main steps in aerobic respiration? Where does it take place?

Answer

The main steps in aerobic respiration and places of their occurrence are:

→ Glycolytic breakdown of glucose in to pyruvic acid in cytoplasm.

→ Krebs cycle in matrix of mitochondria

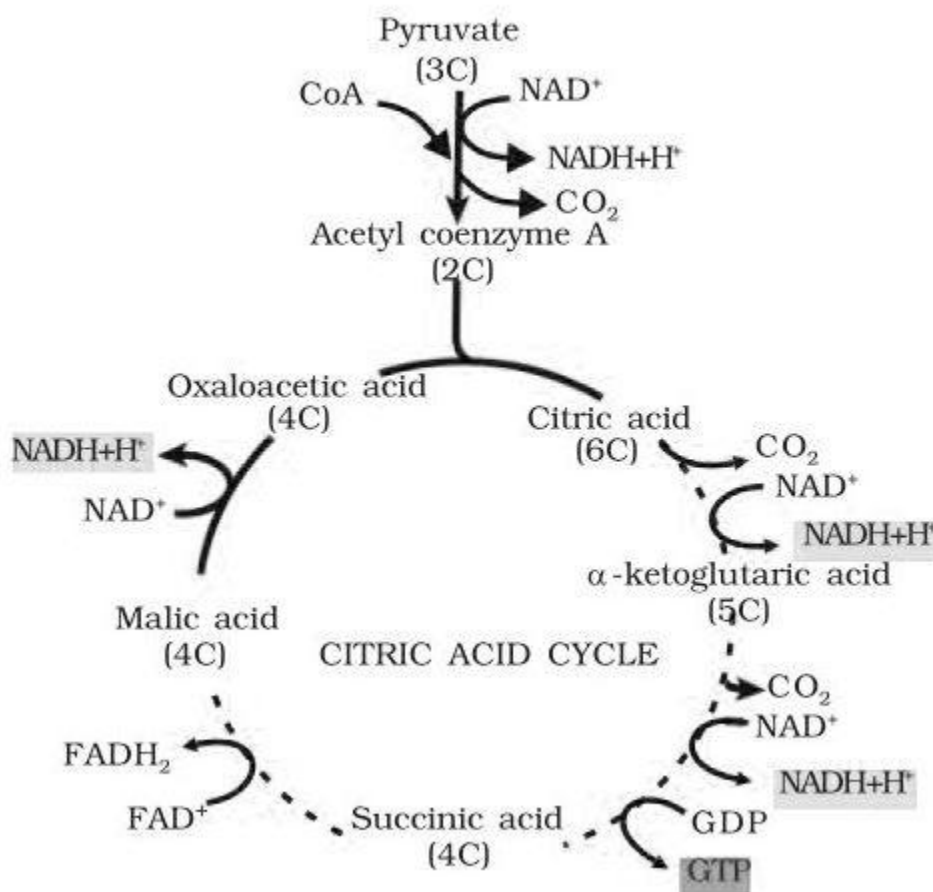
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→ Electron transport system in inner mitochondrial membrane

→ Oxidative phosphorylation in the inner mitochondrial membrane.

5. Give the schematic representation of an overall view of Krebs cycle.

Answer



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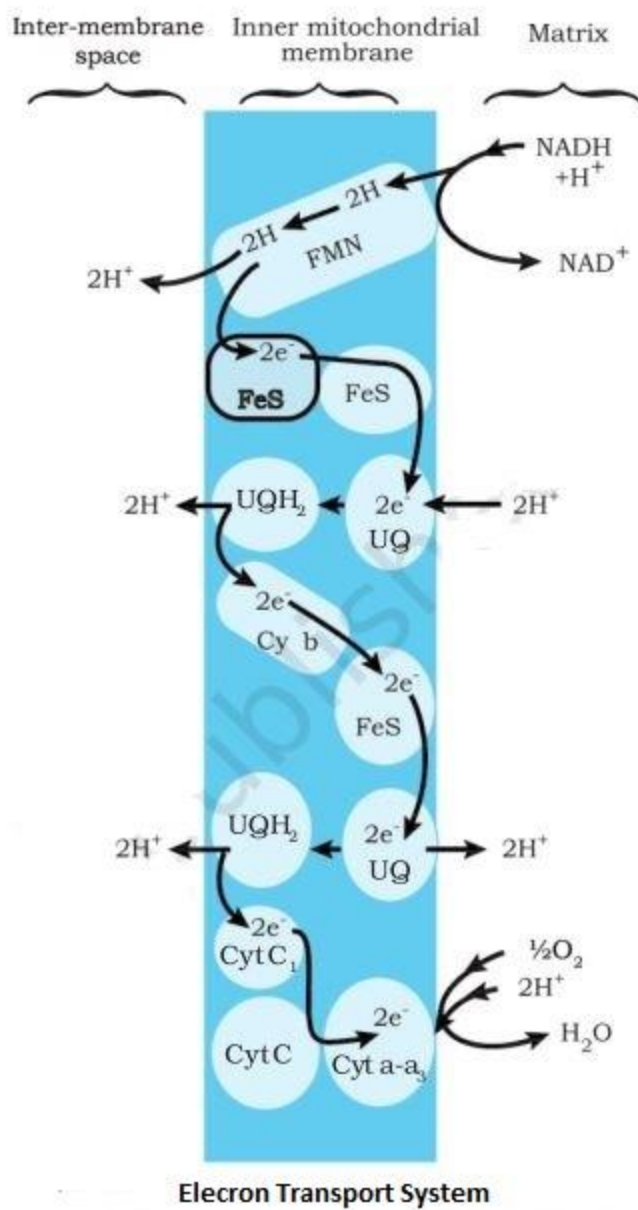
6. Explain ETS.

Answer

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The metabolic pathway through which the electron passes from one carrier to another is called the electron transport system (ETS). It is located in the inner mitochondrial membrane. Electrons from NADH produced in the mitochondrial matrix during citric acid cycle are oxidised by an NADH dehydrogenase (complex I), and electrons are then transferred to ubiquinone located within the inner membrane. Ubiquinone also receives reducing equivalents via FADH_2 (complex II) that is generated during oxidation of succinate in the citric acid cycle. The reduced ubiquinone (ubiquinol) is then oxidised with the transfer of electrons to cytochrome c via cytochrome bc 1 complex (complex III). The cytochrome c acts as a mobile carrier between complex III and cytochrome c oxidase complex, containing cytochrome a and a_3 , along with copper centres (complex IV).

During the transfer of electrons from each complex, the process is accompanied by the production of ATP from ADP and inorganic phosphate by the action ATP synthase (complex V). The amount of ATP produced depends on the molecule, which has been oxidized. 2 ATP molecules are produced by the oxidation of one molecule of NADH. One molecule of FADH_2 , on oxidation, gives 3 ATP molecules.



7. Distinguish between the following:

(a) Aerobic respiration and Anaerobic respiration

(b) Glycolysis and Fermentation

(c) Glycolysis and Citric acid Cycle

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Answer

(a) Aerobic respiration and Anaerobic respiration

Aerobic respiration	Anaerobic respiration
It takes place in the presence of oxygen.	It takes place in the absence of oxygen.
It occurs in cytoplasm and mitochondria.	It occurs in cytoplasm
The end products of aerobic respiration are carbon dioxide and water.	The end products of fermentation are ethyl alcohol and carbon-dioxide.
Complete oxidation of respiratory substrate takes place.	Incomplete oxidation of respiratory substrate takes place.
36-38 ATP molecules are produced.	Only 2 ATP molecules are produced.

(b) Glycolysis and Fermentation

Glycolysis occurs during aerobic and anaerobic	Fermentation is a type of anaerobic respiration.
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respiration.

The end products of aerobic respiration is pyruvic acid

The end products of aerobic respiration is ethanol or lactic acid

(c) Glycolysis and Citric acid Cycle

Glycolysis

Citric acid Cycle

It is a linear pathway.

It is a cyclic pathway.

It occurs in the cell cytoplasm.

It occurs in the mitochondrial matrix.

It occurs in all living beings.

It occurs in aerobic respiration.

It generates 2 NADH_2 and 2 ATP molecules on the breakdown of one glucose molecule.

It generates 6 NADH_2 , 2 FADH_2 , and 2 ATP molecules on the breakdown of two acetyl-CoA molecules.

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

Answer

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

- There is a sequential, orderly pathway functioning, with one substrate forming the next and with glycolysis, TCA cycle and ETS pathway following one after another.

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- The NADH synthesised in glycolysis is transferred into the mitochondria and undergoes oxidative phosphorylation.
- None of the intermediates in the pathway are utilised to synthesise any other compound.
- Only glucose is being respired – no other alternative substrates are entering in the pathway at any of the intermediary stages.

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

Answer

The breaking down process occurring within the organism is known as catabolic process and the synthesis process is known as anabolism. The respiratory pathway involves both the catabolic and anabolic process, so it is referred as amphibolic pathway.

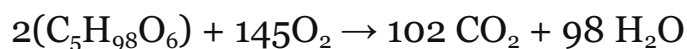
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10. Define RQ. What is its value for fats?

Answer

The ratio of the volume of CO₂ evolved to the volume of O₂ consumed in respiration is called the respiratory quotient (RQ). The RQ for carbohydrates is 1. The RQ for fat and protein is less than 1.

For example: Calculations for a fatty acid, tripalmitin



RQ = Volume of CO₂ evolved/Volume of O₂ consumed

$$= 102 \text{CO}_2/145\text{O}_2 = 0.7$$

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11. What is oxidative phosphorylation?

Answer

The generation of ATP from ADP during electron transport system by utilizing the energy obtained during oxidative reaction is called oxidative phosphorylation.

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

Answer

The significance of step-wise release of energy in respiration are:

- It facilitates the utilization of the relatively higher proportion of the energy in ATP synthesis.
- The activities of enzymes for the different steps may be enhanced or inhibited by specific compounds. This provides a mean of controlling the rate of the pathway and the energy output according to the need of the cell.
- The same pathway may be utilized for forming intermediates used in the synthesis of other biomolecules like amino acids.

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- Chapter 3: Plant Kingdom
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- Chapter 5: Morphology of Flowering Plants
- Chapter 6: Anatomy of Flowering Plants
- Chapter 7: Structural Organisation in Animals
- Chapter 8: Cell-The Unit of Life
- Chapter 9: Biomolecules
- Chapter 10: Cell Cycle and Cell Division
- Chapter 11: Transport in Plants
- Chapter 12: Mineral Nutrition
- Chapter 13: Photosynthesis in Higher Plants
- Chapter 14: Respiration in Plants
- Chapter 15: Plant - Growth and Development
- Chapter 16: Digestion and Absorption
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- Chapter 19: Excretory Products and Their Elimination
- Chapter 20: Locomotion and Movement
- Chapter 21: Neural Control and Coordination
- Chapter 22: Chemical Coordination and Integration

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