NCERT Exemplar Solutions of Class 11 Biology – Chapter 14: Respiration in Plants

MULTIPLE CHOICE QUESTIONS

1. The ultimate electron acceptor of respiration in anaerobic organisms is:

a) Cytochrome

b) **Oxygen**

c) Hydrogen

d) Glucose

Solution: Answer: (b) Oxygen

Enhanced Explanation: Even in anaerobic organisms, when they do engage in respiration (not fermentation), oxygen serves as the ultimate electron acceptor. However, it's important to note that truly anaerobic organisms may use alternative electron acceptors like nitrate, sulfate, or other inorganic compounds in anaerobic respiration processes.

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2. Phosphorylation of glucose during glycolysis is catalysed by:

a) Phosphoglucomutase

b) Phosphoglucoisomerase

c) **Hexokinase**

d) Phosphorylase

Solution: Answer: (c) Hexokinase

Enhanced Explanation: Hexokinase catalyzes the first step of glycolysis, converting glucose to glucose-6-phosphate. This enzyme uses ATP to phosphorylate glucose, making it the key enzyme for glucose phosphorylation during glycolysis. The reaction is:
Glucose + ATP → Glucose-6-phosphate + ADP + H^+

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3. Pyruvic acid, the key product of glycolysis can have many metabolic fates. Under aerobic conditions, it forms:

a) Lactic acid

b) $CO_2 + H_2O$

c) **Acetyl CoA + CO_2**

d) Ethanol + CO_2

Solution: Answer: (c) Acetyl CoA + CO_2

Enhanced Explanation: Under aerobic conditions, pyruvic acid enters the mitochondria and undergoes oxidative decarboxylation catalyzed by pyruvate dehydrogenase complex, forming:
Pyruvic acid + CoA-SH + NAD^+ → Acetyl CoA + CO_2 + NADH + H^+
This acetyl CoA then enters the TCA cycle for further oxidation.

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4. Electron Transport System (ETS) is located in mitochondrial:

a) Outer membrane
b) Inter membrane space
c) **Inner membrane**
d) Matrix
Solution: Answer: (c) Inner membrane
Enhanced Explanation: The electron transport chain complexes (I, II, III, and IV) are embedded in the inner mitochondrial membrane. This location is crucial for creating the proton gradient across the membrane, which drives ATP synthesis through chemiosmosis.

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5. Which of the following exhibits the highest rate of respiration?
a) Growing shoot apex
b) **Germinating seed**
c) Root tip
d) Leaf bud
Solution: Answer: (b) Germinating seed
Enhanced Explanation: Germinating seeds show the highest respiration rate because:

- They need immediate energy for rapid cell division and growth
- Stored food materials are being rapidly mobilized
- Multiple metabolic pathways are highly active
- Both aerobic and anaerobic respiration may occur simultaneously

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6. Mitochondria are called powerhouses of the cell. Which of the following observations support this statement?
a) **Mitochondria synthesise ATP**
b) Mitochondria have a double membrane
c) The enzymes of the Krebs cycle are found in mitochondria
d) Mitochondria are found in almost all plants and animal cells
Solution: Answer: (a) Mitochondria synthesise ATP
Enhanced Explanation: While all options are true about mitochondria, option (a) directly explains why they're called "powerhouses." ATP is the universal energy currency of cells, and mitochondria produce the majority of cellular ATP through oxidative phosphorylation.

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7. The end product of oxidative phosphorylation is:
a) NADH
b) Oxygen
c) ADP
d) **ATP + H_2O**
Solution: Answer: (d) ATP + H_2O

Enhanced Explanation: Oxidative phosphorylation produces ATP from ADP and inorganic phosphate, with water as a byproduct when oxygen accepts electrons and protons:

$ADP + P_i + H^+ \rightarrow ATP + H_2O$ $½O_2 + 2H^+ + 2e^- \rightarrow H_2O$

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8. Match the following and choose the correct option:

Column I → **Column II** A. Molecular oxygen → ii. hydrogen acceptor

B. Electron acceptor → iii. cytochrome C

C. Pyruvate dehydrogenase → iv. acetyl CoA

D. Decarboxylation → i. α-Ketoglutaric acid

Solution: Answer: (a) A-ii, B-iii, C-iv, D-i

Enhanced Explanation:

- **A-ii:** Oxygen acts as the final hydrogen acceptor in the electron transport chain
- **B-iii:** Cytochrome C is an electron acceptor in the electron transport chain
- **C-iv:** Pyruvate dehydrogenase converts pyruvate to acetyl CoA
- **D-i:** α-Ketoglutaric acid undergoes decarboxylation in the TCA cycle

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