AP Biology Practice Test: Chapter 7 - Cellular Respiration

Instructions: Answer all questions to the best of your ability. For the short answer questions, provide a complete response with clear explanations.

Short Answer Questions (1-5)

1. **Describe the process of glycolysis. What are its main products?**
2. **Explain the role of the electron transport chain in cellular respiration. How does it contribute to ATP production?**
3. **What is oxidative phosphorylation, and how does it differ from substrate-level phosphorylation?**
4. **Discuss the importance of oxygen in aerobic respiration. What happens in the absence of oxygen?**
5. **Explain the role of NAD^+ and FAD in cellular respiration.**

Multiple Choice Questions (6-20)

6. Which of the following is the correct equation for cellular respiration?
   - A) $C_6H_{12}O_6 + 6\ O_2 \rightarrow 6\ CO_2 + 6\ H_2O$ + energy
   - B) $6\ CO_2 + 6\ H_2O$ + energy $\rightarrow C_6H_{12}O_6 + 6\ O_2$
   - C) $C_6H_{12}O_6 + 6\ CO_2 \rightarrow 6\ O_2 + 6\ H_2O$
   - D) $6\ O_2 + 6\ H_2O \rightarrow C_6H_{12}O_6 + 6\ CO_2$ + energy
7. Glycolysis occurs in which part of the cell?
   - A) Mitochondria
   - B) Cytoplasm
   - C) Nucleus
   - D) Chloroplasts
8. During which stage of cellular respiration is most ATP produced?
   - A) Glycolysis
   - B) Krebs cycle
   - C) Electron transport chain
   - D) Fermentation
9. What is the main function of the Krebs cycle?
   - A) To produce glucose
   - B) To produce ATP and NADH
   - C) To convert pyruvate into acetyl-CoA
   - D) To regenerate NAD^+
10. The electron transport chain is located in which part of the mitochondria?
    - A) Matrix
    - B) Outer membrane

- C) Inner membrane
- D) Intermembrane space

11. What is the final electron acceptor in the electron transport chain?
    - A) Carbon dioxide
    - B) NAD^+
    - C) $FADH_2$
    - D) Oxygen
12. Fermentation occurs when:
    - A) Oxygen is present.
    - B) Glucose is not available.
    - C) Oxygen is absent.
    - D) ATP levels are high.
13. How many ATP are produced from one molecule of glucose during glycolysis?
    - A) 2 ATP
    - B) 4 ATP
    - C) 36 ATP
    - D) 38 ATP
14. In cellular respiration, the primary purpose of the Krebs cycle is to:
    - A) Generate ATP directly.
    - B) Produce electron carriers.
    - C) Convert glucose into pyruvate.
    - D) Create CO_2 for the atmosphere.
15. Which of the following statements about anaerobic respiration is false?
    - A) It does not require oxygen.
    - B) It produces less ATP than aerobic respiration.
    - C) It produces lactic acid or ethanol as a byproduct.
    - D) It occurs only in muscle cells.
16. Which of the following is an end product of alcoholic fermentation?
    - A) Lactic acid
    - B) Ethanol
    - C) Acetyl-CoA
    - D) Glucose
17. The term “substrate-level phosphorylation” refers to:
    - A) The generation of ATP from ADP using the electron transport chain.
    - B) The direct transfer of a phosphate group from a substrate to ADP.
    - C) The production of ATP in the mitochondria.
    - D) The formation of glucose from pyruvate.
18. Which molecule is produced at the end of glycolysis?
    - A) Glucose
    - B) Acetyl-CoA
    - C) Pyruvate
    - D) Lactic acid
19. What is the purpose of oxygen in cellular respiration?
    - A) To act as a catalyst.

    - B) To generate heat.
    - C) To act as the final electron acceptor.
    - D) To provide energy directly.
20. In the electron transport chain, the energy released during electron transfer is used to:
    - A) Convert NAD^+ to NADH.
    - B) Pump protons into the intermembrane space.
    - C) Synthesize glucose.
    - D) Split water molecules.

True/False Questions (21-30)

21. **True/False:** Glycolysis produces ATP through oxidative phosphorylation.
22. **True/False:** Cellular respiration occurs in both prokaryotic and eukaryotic cells.
23. **True/False:** The Krebs cycle occurs in the cytoplasm of eukaryotic cells.
24. **True/False:** Lactic acid fermentation occurs in yeast.
25. **True/False:** The majority of ATP generated during cellular respiration is produced in the Krebs cycle.
26. **True/False:** NADH and $FADH_2$ are both produced during glycolysis.
27. **True/False:** ATP synthase is located in the inner mitochondrial membrane.
28. **True/False:** Fermentation is a more efficient process than cellular respiration.
29. **True/False:** Pyruvate is the end product of glycolysis.
30. **True/False:** The primary function of cellular respiration is to produce glucose.

Scoring Guidelines

- **Short Answer Questions (1-5)**: 2 points each (total 10 points)
- **Multiple Choice Questions (6-20)**: 1 point each (total 15 points)
- **True/False Questions (21-30)**: 1 point each (total 10 points)

Total Points: 35

AP Biology Practice Test: Chapter 8 - Photosynthesis

Instructions: Answer all questions to the best of your ability. For the short answer questions, provide a complete response with clear explanations.

Short Answer Questions (1-5)

1. **Describe the overall process of photosynthesis, including the light-dependent and light-independent reactions.**
2. **What role do chlorophyll and accessory pigments play in photosynthesis?**
3. **Explain the significance of the Calvin cycle in photosynthesis.**
4. **How do plants adapt to different light conditions in their environment?**
5. **What is the importance of water in the process of photosynthesis?**

Multiple Choice Questions (6-20)

6. The primary pigment involved in photosynthesis is:
    - A) Carotene
    - B) Chlorophyll a
    - C) Chlorophyll b
    - D) Xanthophyll
7. Photosynthesis occurs in which part of the plant cell?
    - A) Mitochondria
    - B) Chloroplasts
    - C) Nucleus
    - D) Ribosomes
8. Which of the following is produced during the light-dependent reactions?
    - A) Glucose
    - B) Oxygen
    - C) Carbon dioxide
    - D) $NADP^+$
9. The main purpose of the light-dependent reactions is to:
    - A) Produce glucose.
    - B) Convert solar energy into chemical energy.
    - C) Fix carbon dioxide.
    - D) Generate ATP and NADPH.
10. The Calvin cycle takes place in the:
    - A) Thylakoid membranes
    - B) Stroma
    - C) Grana
    - D) Cytoplasm
11. The energy for the Calvin cycle comes from:
    - A) ATP and NADPH produced in the light-dependent reactions.
    - B) Glucose.
    - C) Oxygen.
    - D) Sunlight.
12. Which of the following statements about the light-dependent reactions is true?
    - A) They occur in the stroma.
    - B) They generate ATP and NADPH.

    - C) They use carbon dioxide.
    - D) They do not require light.
13. The products of photosynthesis are:
    - A) Oxygen and glucose
    - B) Carbon dioxide and water
    - C) Glucose and ATP
    - D) Oxygen and ATP
14. The main role of water in photosynthesis is to:
    - A) Provide carbon atoms for glucose synthesis.
    - B) Supply electrons and protons.
    - C) Produce ATP.
    - D) Absorb light energy.
15. In the Calvin cycle, carbon dioxide is fixed to form:
    - A) RuBP
    - B) G3P
    - C) Glucose
    - D) ATP
16. Which of the following factors does NOT affect the rate of photosynthesis?
    - A) Light intensity
    - B) Temperature
    - C) Soil pH
    - D) Carbon dioxide concentration
17. The process of photorespiration:
    - A) Enhances photosynthesis.
    - B) Occurs when oxygen is incorporated instead of carbon dioxide.
    - C) Is beneficial for plant growth.
    - D) Occurs in

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Here are the answers for the practice tests based on Pearson's Chapters 7 (Cellular Respiration) and 8 (Photosynthesis).

Answers

Short Answer Questions (1-5)

1. **Describe the process of glycolysis. What are its main products?**
    - **Glycolysis** is the first stage of cellular respiration, occurring in the cytoplasm, where one glucose molecule (6 carbons) is broken down into two pyruvate molecules (3 carbons). The main products of glycolysis are:
        - 2 molecules of pyruvate
        - 2 molecules of ATP (net gain)
        - 2 molecules of NADH
2. **Explain the role of the electron transport chain in cellular respiration. How does it contribute to ATP production?**
    - The **electron transport chain (ETC)** is a series of protein complexes located in the inner mitochondrial membrane. It accepts electrons from NADH and $FADH_2$, which are generated in earlier stages of respiration. As electrons move through the chain, energy is released and used to pump protons (H^+) into the intermembrane space, creating a proton gradient. ATP synthase then uses this gradient to produce ATP through oxidative phosphorylation.
3. **What is oxidative phosphorylation, and how does it differ from substrate-level phosphorylation?**
    - **Oxidative phosphorylation** is the process of generating ATP through the electron transport chain and chemiosmosis, where energy from electrons is used to create a proton gradient for ATP production. **Substrate-level phosphorylation**, on the other hand, is the direct transfer of a phosphate group from a substrate molecule to ADP to form ATP, occurring in glycolysis and the Krebs cycle.
4. **Discuss the importance of oxygen in aerobic respiration. What happens in the absence of oxygen?**
    - **Oxygen** serves as the final electron acceptor in the electron transport chain, allowing the chain to continue functioning and facilitating ATP production. In the absence of oxygen, cells resort to **anaerobic respiration** or **fermentation**, leading to less efficient ATP production (only 2 ATP from glycolysis) and the accumulation of byproducts like lactic acid (in animals) or ethanol (in yeast).
5. **Explain the role of NAD^+ and FAD in cellular respiration.**
    - **NAD^+** and **FAD** are electron carriers that transport electrons from metabolic pathways to the electron transport chain. They are reduced to NADH and $FADH_2$, respectively, during glycolysis and the Krebs cycle, storing energy that can be used to generate ATP in the electron transport chain.

Answers to Multiple Choice Questions (6-20)

6. **A) $C_6H_{12}O_6 + 6\ O_2 \rightarrow 6\ CO_2 + 6\ H_2O$ + energy**
7. **B) Cytoplasm**
8. **C) Electron transport chain**
9. **B) To produce ATP and NADH**
10. **C) Inner membrane**
11. **D) Oxygen**
12. **C) It produces less ATP than aerobic respiration.**
13. **A) 2 ATP**
14. **B) Produce glucose.**
15. **B) To produce ATP directly.**
16. **B) Ethanol**
17. **B) The direct transfer of a phosphate group from a substrate to ADP.**
18. **C) Pyruvate**
19. **C) To act as the final electron acceptor.**
20. **B) Pump protons into the intermembrane space.**

Answers to True/False Questions (21-30)

21. **False**: Glycolysis produces ATP through substrate-level phosphorylation, not oxidative phosphorylation.
22. **True**: Cellular respiration occurs in both prokaryotic and eukaryotic cells.
23. **False**: The Krebs cycle occurs in the mitochondrial matrix of eukaryotic cells.
24. **False**: Lactic acid fermentation occurs in muscle cells and some bacteria, while alcoholic fermentation occurs in yeast.
25. **False**: The majority of ATP is produced in the electron transport chain.
26. **True**: NADH and $FADH_2$ are both produced during glycolysis.
27. **True**: ATP synthase is located in the inner mitochondrial membrane.
28. **False**: Fermentation is less efficient than cellular respiration.
29. **True**: Pyruvate is the end product of glycolysis.
30. **False**: The primary function of cellular respiration is to produce ATP.

Answers

Short Answer Questions (1-5)

1. **Describe the overall process of photosynthesis, including the light-dependent and light-independent reactions.**
    - **Photosynthesis** occurs in two main stages:

        - **Light-dependent reactions**: These occur in the thylakoid membranes and convert light energy into chemical energy in the form of ATP and NADPH, while releasing oxygen as a byproduct from the splitting of water.
        - **Light-independent reactions (Calvin cycle)**: These occur in the stroma and use ATP and NADPH to fix carbon dioxide into glucose through a series of enzymatic reactions.
2. **What role do chlorophyll and accessory pigments play in photosynthesis?**
    - **Chlorophyll** is the primary pigment that absorbs light energy, mainly in the blue and red wavelengths, while reflecting green light. **Accessory pigments** (e.g., carotenoids) absorb light in different wavelengths and broaden the spectrum of light energy that can be used for photosynthesis, providing protection against excessive light.
3. **Explain the significance of the Calvin cycle in photosynthesis.**
    - The **Calvin cycle** is essential for synthesizing glucose from carbon dioxide using the energy stored in ATP and NADPH produced during the light-dependent reactions. It involves carbon fixation, reduction of 3-phosphoglycerate to glyceraldehyde-3-phosphate, and regeneration of ribulose bisphosphate (RuBP) to continue the cycle.
4. **How do plants adapt to different light conditions in their environment?**
    - Plants adapt to varying light conditions through changes in leaf structure, pigment composition (increasing chlorophyll or accessory pigments), and adjusting their photosynthetic pathways (e.g., C3, C4, or CAM pathways) to optimize carbon fixation based on light availability.
5. **What is the importance of water in the process of photosynthesis?**
    - Water is vital for photosynthesis as it provides electrons and protons during the light-dependent reactions. When water is split (photolysis), it generates oxygen as a byproduct and supplies electrons to replace those lost by chlorophyll during the light reactions.

Answers to Multiple Choice Questions (6-20)

6. **B) Chlorophyll a**
7. **B) Chloroplasts**
8. **B) Oxygen**
9. **B) Convert solar energy into chemical energy.**
10. **B) Stroma**
11. **A) ATP and NADPH produced in the light-dependent reactions.**
12. **B) They generate ATP and NADPH.**
13. **A) Oxygen and glucose**
14. **B) Supply electrons and protons.**
15. **B) G3P**
16. **C) Soil pH**

17. **B) Occurs when oxygen is incorporated instead of carbon dioxide.**

Answers to True/False Questions (21-30)

21. **False**: The Calvin cycle occurs in the stroma, while the light-dependent reactions occur in the thylakoid membranes.
22. **True**: Chlorophyll is the main pigment involved in photosynthesis.
23. **True**: The light-dependent reactions produce ATP and NADPH.
24. **False**: The light-independent reactions do not require light directly; they depend on products from the light-dependent reactions.
25. **True**: The overall process of photosynthesis converts carbon dioxide and water into glucose and oxygen using light energy.
26. **True**: The Calvin cycle is essential for converting carbon dioxide into glucose.
27. **False**: The primary purpose of water in photosynthesis is to supply electrons and protons, not to provide glucose.
28. **False**: Plants adapt to different light conditions by adjusting their pigments and photosynthetic pathways.
29. **True**: Accessory pigments broaden the range of light wavelengths absorbed for photosynthesis.
30. **True**: Oxygen is a byproduct of photosynthesis produced during the light-dependent reactions.