What is Cellular Respiration?

Worksheet

Cellular respiration converts glucose and oxygen into carbon dioxide, water, and usable energy (ATP), following the equation C6H12O6 + 6O2 6CO2 + 6H2O + ATP (energy).

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{Energy (A}$$

Questions

1. What are the reactants of cellular respiration?

A) Carbon dioxide and water
B) Glucose and oxygen
C) ATP and oxygen
D) Glucose and carbon dioxide

2. Where does glycolysis take place?

A) Mitochondrial matrix
B) Cytoplasm
C) Nucleus
D) Inner mitochondrial membrane

3. Which stage produces the most ATP?

A) Glycolysis
B) Krebs cycle
C) Electron transport chain
D) Pyruvate oxidation

4. What happens to pyruvate when oxygen is unavailable?

A) It enters the Krebs cycle normally
B) It converts to lactic acid or ethanol via fermentation
C) It becomes glucose again
D) It is expelled from the cell unchanged

5. A muscle cell runs out of oxygen during intense sprinting. How does it keep producing ATP?

6. A cell fully respires 1 glucose molecule aerobically. Roughly how many ATP molecules does it net overall?

7. Why do muscle cells have far more mitochondria than skin cells?

8. Define: What is the overall equation for cellular respiration?

9. Define: Where does glycolysis occur?

10. Define: Where does the electron transport chain occur?

Answer Key

1. B) Glucose and oxygen - Glucose and oxygen are broken down to release energy.

2. B) Cytoplasm - Glycolysis is the only stage that occurs outside the mitochondria, in the cytoplasm.

3. C) Electron transport chain - The electron transport chain generates roughly 32-34 of the total ~36-38 ATP.

4. B) It converts to lactic acid or ethanol via fermentation - Without oxygen, cells ferment pyruvate to regenerate NAD+ for glycolysis to continue.

5. Without oxygen, the electron transport chain cannot run (it needs O2 as the final electron acceptor) The cell switches to anaerobic fermentation, converting pyruvate into lactic acid This regenerates NAD+ so glycolysis can continue producing a small amount of ATP

6. Glycolysis nets about 2 ATP The Krebs cycle nets about 2 ATP The electron transport chain produces roughly 32-34 ATP Total is approximately 36-38 ATP per glucose molecule

7. Mitochondria are the site of the Krebs cycle and electron transport chain - the ATP-heavy stages of respiration Muscle cells need large, continuous amounts of ATP for contraction More mitochondria means a greater aerobic ATP production capacity to meet that demand

8. C6H12O6 + 6O2 6CO2 + 6H2O + ATP

9. In the cytoplasm of the cell.

10. On the inner mitochondrial membrane.