What is Aerobic Cellular Respiration?

Worksheet

Aerobic respiration is the oxygen-dependent breakdown of glucose into CO2 and water, producing roughly 30-32 ATP per glucose molecule through glycolysis, the Krebs cycle, and the electron transport chain.

Questions

1. Where does glycolysis take place?

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

2. Which stage produces the most ATP in aerobic respiration?

A) Glycolysis
B) Pyruvate oxidation
C) Krebs cycle
D) Oxidative phosphorylation

3. What is the final electron acceptor in aerobic respiration?

A) NAD+
B) Pyruvate
C) Oxygen
D) Glucose

4. Approximately how much net ATP is produced per glucose molecule in aerobic respiration?

A) 2 ATP
B) 8 ATP
C) 30-32 ATP
D) 100 ATP

5. One glucose molecule is fully broken down through glycolysis, the Krebs cycle, and oxidative phosphorylation. Roughly how much net ATP does the cell gain?

6. A muscle cell processes 5 glucose molecules aerobically. Using an estimate of 30 ATP per glucose, how much total ATP is produced?

7. During glycolysis, 2 ATP are invested and 4 ATP are generated per glucose. What is the net ATP yield of glycolysis alone?

8. Define: What are the four stages of aerobic respiration?

9. Define: Where does glycolysis occur?

10. Define: How much net ATP does glycolysis produce per glucose?

Answer Key

1. B) Cytoplasm - Glycolysis occurs in the cytoplasm and does not require oxygen or mitochondria.

2. D) Oxidative phosphorylation - Oxidative phosphorylation (electron transport chain + chemiosmosis) generates roughly 26-28 of the ~30-32 total ATP.

3. C) Oxygen - Oxygen accepts electrons at the end of the electron transport chain, forming water.

4. C) 30-32 ATP - Combining glycolysis, the Krebs cycle, and oxidative phosphorylation yields roughly 30-32 ATP per glucose.

5. Glycolysis nets 2 ATP directly. The Krebs cycle nets 2 more ATP directly (from 2 turns per glucose). Oxidative phosphorylation from the resulting NADH/FADH2 yields roughly 26-28 ATP, for a total of about 30-32 ATP per glucose.

6. ATP per glucose 30. Total ATP = 30 5 glucose molecules. Total ATP = 150 ATP molecules.

7. Net ATP = ATP generated ATP invested. Net ATP = 4 2. Net ATP = 2 ATP per glucose.

8. Glycolysis, pyruvate oxidation, the Krebs cycle, and oxidative phosphorylation (electron transport chain).

9. In the cytoplasm, outside the mitochondria.

10. 2 ATP net (4 produced, 2 invested).