What Are Mitochondria and How Does Cellular Respiration Work?

Worksheet

Cellular respiration is the process by which cells break down glucose using oxygen to produce ATP, carbon dioxide and water; most of it occurs in the mitochondria's matrix and inner membrane (cristae).

Questions

1. Where does the Krebs cycle take place?

A) Cytoplasm
B) Mitochondrial matrix
C) Nucleus
D) Cell membrane

2. Approximately how much ATP does one glucose molecule yield in full aerobic respiration?

A) 2 ATP
B) 4 ATP
C) 36-38 ATP
D) 100 ATP

3. Which stage of respiration does NOT require oxygen?

A) Electron transport chain
B) Krebs cycle
C) Glycolysis
D) Oxidative phosphorylation

4. What is the final electron acceptor in the electron transport chain?

A) Glucose
B) Carbon dioxide
C) Oxygen
D) Pyruvate

5. One glucose molecule undergoes full cellular respiration and yields 36 ATP total. If glycolysis gives 2 ATP and the Krebs cycle gives 2 ATP, how many ATP come from the electron transport chain?

6. A muscle cell respires 5 glucose molecules aerobically, each yielding 36 ATP. How much total ATP is produced?

7. Without oxygen, a cell can only complete glycolysis (net 2 ATP) then fermentation. How much ATP does it lose per glucose compared to aerobic respiration (36 ATP)?

8. Define: What is the main job of mitochondria?

9. Define: What are the 3 main stages of cellular respiration?

10. Define: Where does glycolysis occur?

Answer Key

1. B) Mitochondrial matrix - The Krebs cycle occurs in the mitochondrial matrix.
2. C) 36-38 ATP - Aerobic respiration yields roughly 36-38 ATP per glucose molecule.
3. C) Glycolysis - Glycolysis occurs in the cytoplasm and doesn't need oxygen.
4. C) Oxygen - Oxygen accepts electrons at the end of the chain, forming water.
5. Total ATP = 36 ATP from glycolysis + Krebs = 2 + 2 = 4 ATP from ETC = 36 4 = 32 ATP
6. ATP per glucose = 36 Number of glucose = 5 Total ATP = 5 36 = 180 ATP
7. Aerobic ATP = 36, Anaerobic ATP = 2 ATP lost = 36 2 = 34 ATP per glucose This shows why oxygen dramatically increases energy yield
8. To produce ATP (cellular energy) through aerobic cellular respiration.
9. Glycolysis, the Krebs cycle, and the electron transport chain.
10. In the cytoplasm, outside the mitochondria - it doesn't need oxygen.