# What is ATP and How Is Energy Produced in Cells?

Worksheet

ATP is produced when cells break down glucose through glycolysis, the Krebs cycle, and oxidative phosphorylation, capturing energy released as electron carriers (NADH, FADH) are used to make ATP via the electron transport chain.

**C@ce6H@ce12O@ce6 + 6O@ce2  ATP + CO@ce2 + H@ce2O**

## Questions

1. What does ATP stand for?

A) Adenosine triphosphate
B) Amino tri-protein
C) Active transport protein
D) Adenine transfer particle

2. Where does the electron transport chain occur?

A) Cytoplasm
B) Nucleus
C) Inner mitochondrial membrane
D) Golgi apparatus

3. About how much ATP does aerobic respiration yield per glucose?

A) 2 ATP
B) 4 ATP
C) ~30-32 ATP
D) 100 ATP

4. Which molecules donate electrons to the electron transport chain?

A) Glucose and oxygen
B) NADH and FADH
C) DNA and RNA
D) Water and CO

5. One glucose molecule is completely oxidized via aerobic respiration, producing 4 ATP directly, 10 NADH, and 2 FADH. Using modern P/O ratios (2.5 ATP per NADH, 1.5 ATP per FADH), what is the total ATP yield?

6. Glycolysis alone produces 2 net ATP and 2 NADH per glucose. How much ATP does glycolysis ultimately contribute once those NADH pass through the electron transport chain?

7. Without oxygen, a muscle cell can't run the electron transport chain and relies on glycolysis + fermentation only, yielding 2 ATP per glucose instead of ~32. What percentage of the aerobic yield is this?

8. Define: What is ATP?

9. Define: Where does most ATP get made in aerobic respiration?

10. Define: What are NADH and FADH?

# Answer Key

1. A) Adenosine triphosphate - ATP is adenosine triphosphate, the universal energy currency of cells.
2. C) Inner mitochondrial membrane - The electron transport chain sits in the inner mitochondrial membrane.
3. C) ~30-32 ATP - Using modern P/O ratios, aerobic respiration yields roughly 30-32 ATP per glucose.
4. B) NADH and FADH - NADH and FADH carry high-energy electrons to the electron transport chain.
5. ATP_total = ATP_direct + (NADH 2.5) + (FADH 1.5) ATP_total = 4 + (10 2.5) + (2 1.5) ATP_total = 4 + 25 + 3 ATP_total = 32 ATP
6. ATP from glycolysis = direct ATP + (NADH 2.5) = 2 + (2 2.5) = 2 + 5 = 7 ATP
7. Percentage = anaerobic ATP aerobic ATP 100 = 2 / 32 100 = 6.25%
8. Adenosine triphosphate - the cell's main energy-carrying molecule, released by breaking a high-energy phosphate bond.
9. In the mitochondria, during oxidative phosphorylation on the electron transport chain.
10. Electron carrier molecules that shuttle high-energy electrons to the electron transport chain to generate ATP.