# What is the Krebs Cycle?

Worksheet

The Krebs cycle is a series of eight enzyme-catalyzed reactions in the mitochondrial matrix that oxidize acetyl-CoA, producing 3 NADH, 1 FADH2, 1 GTP (ATP), and 2 CO2 per turn.

$$\text{Acetyl-CoA} + 3\,\text{NAD}^+ + \text{FAD} + \text{GDP} + P_i \rightarrow 2\,CO_2 + 3\,\text{NA}$$

## Questions

1. Where in the cell does the Krebs cycle occur?

A) Cytoplasm
B) Mitochondrial matrix
C) Nucleus
D) Golgi apparatus

2. What molecule combines with acetyl-CoA to start the cycle?

A) Oxaloacetate
B) Citrate
C) Pyruvate
D) Glucose

3. How many NADH molecules are produced per turn of the Krebs cycle?

A) 1
B) 2
C) 3
D) 4

4. How many total turns of the Krebs cycle occur per glucose molecule?

A) 1
B) 2
C) 3
D) 4

5. One acetyl-CoA molecule enters the Krebs cycle for a single turn. How many NADH, FADH2, GTP, and CO2 are produced?

6. A cell fully oxidizes one glucose molecule. Glycolysis yields 2 pyruvate, which become 2 acetyl-CoA, so the Krebs cycle turns twice. Find the total NADH, FADH2, and GTP produced by the Krebs cycle.

7. Using ATP-equivalent conversion factors (NADH 2.5 ATP, FADH2 1.5 ATP, GTP = 1 ATP), calculate the total ATP yield from 2 Krebs cycle turns.

8. Define: Where does the Krebs cycle take place?

9. Define: What molecule enters the Krebs cycle?

10. Define: What are the main products of one turn of the Krebs cycle?

# Answer Key

1. B) Mitochondrial matrix - The Krebs cycle enzymes are located in the mitochondrial matrix.
2. A) Oxaloacetate - Acetyl-CoA + oxaloacetate citrate is the first step.
3. C) 3 - Each turn produces 3 NADH molecules.
4. B) 2 - One glucose yields 2 pyruvate 2 acetyl-CoA 2 turns of the cycle.
5. Per turn: 3 NADH 1 FADH 1 GTP 2 CO
6. 2 turns 3 NADH = 6 NADH 2 turns 1 FADH = 2 FADH 2 turns 1 GTP = 2 GTP
7. NADH: 6 2.5 = 15 ATP FADH: 2 1.5 = 3 ATP GTP: 2 1 = 2 ATP Total = 15 + 3 + 2 = 20 ATP
8. In the mitochondrial matrix of eukaryotic cells.
9. Acetyl-CoA, derived from the oxidation of pyruvate.
10. 3 NADH, 1 FADH, 1 GTP (ATP), and 2 CO.