

9.2 The Process of Cellular Respiration

Name: _____

Biology

Date: _____ Period: _____

Lesson Objectives

- Describe what happens during glycolysis.
- Describe what happens during the Krebs cycle.
- Explain how high-energy electrons are used by the electron transport chain.
- Identify how much ATP cellular respiration generates.

Glycolysis - The word **glycolysis** literally means “sugar-breaking.” The end result is 2 molecules of a 3-carbon molecule called pyruvic acid.

- 2 ATP molecules are used at the start of glycolysis to get the process started.
- High-energy electrons are passed to the electron carrier **NAD⁺**, forming two molecules of NADH.
- 4 ATP are synthesized during glycolysis for a net gain of 2 ATP.

The Krebs Cycle The second stage of cellular respiration is the **Krebs cycle**, which operates only when oxygen is available. The Krebs cycle is a series of energy-extracting reactions.

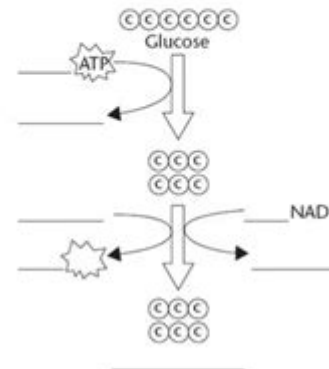
- Pyruvic acid produced by glycolysis enters mitochondria. In the innermost compartment of a mitochondrion, or the **matrix**, pyruvic acid molecules are broken down into carbon dioxide and acetyl-CoA molecules.
- Acetyl-CoA combines with a 4-carbon compound, producing a 6-carbon molecule—citric acid. Energy released by the breaking and rearranging of carbon bonds is captured in ATP, NADH, and FADH₂.
- The Krebs cycle produces four types of products:
 1. high-energy electron carriers (NADH and FADH₂)
 2. carbon dioxide
 3. 2 ATP molecules (per glucose molecule)
 4. the 4-carbon molecule needed to start the cycle again

Electron Transport and ATP Synthesis The electron transport chain uses the high-energy electrons from glycolysis and the Krebs cycle to convert ADP into ATP.

- The electron carriers produced during glycolysis and the Krebs cycle bring high-energy electrons to the electron transport chain. Oxygen is the final electron acceptor.
- The passing of electrons through the electron transport chain causes H⁺ ions to build up in the intermembrane space, making it positively charged relative to the matrix.
- The charge difference across the membrane forces H⁺ ions through channels in enzymes known as ATP synthases. As the ATP synthases spin, a phosphate group is added to ADP, generating ATP.

The Totals Together, glycolysis, the Krebs cycle, and the electron transport chain generate about 36 molecules of ATP per molecule of glucose.

Glycolysis - Complete the diagram by writing on the lines provided the names and numbers of molecules used and produced during glycolysis.



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Chapter 3, Lesson 3 Activity Sheet Answers . 1. Yes, liquids have density. If the liquid has mass and takes up volume, then it must have density according to $D=m/v$. You can

find the density of water by dividing the mass of a sample of water by the volume of the sample. Yes, they should. Although the larger amount of water was heavier, it also had more volume. The smaller amount of water was ...

Chapter 3, Lesson 3 Activity Sheet Answers

Chapter 6, Lesson 1 Activity Sheet Answers . 1. In the chemical reaction that causes a candle to burn, the reactants are molecules in the wax and oxygen in the air. 2. When a candle burns, the products of the reaction are carbon dioxide and water vapor. 3. Oxygen from the air is one of the reactants in the chemical reaction that makes the flame. When a jar is placed over the candle the flame ...

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