

ATP Production Overview

by Sophia



WHAT'S COVERED

In this lesson, you will learn about the processes that occur in cellular respiration in order to produce ATP for a cell. Specifically, this lesson will cover:

1. Cellular Respiration Process

Cellular respiration is the process in which ATP is produced.

ATP stands for **adenosine triphosphate**, which is basically an energy storage molecule used by cells.

In this process, organic molecules, which are molecules that contain carbon are broken down to produce ATP energy. ATP is the main source of energy used by cells. Substances or organic molecules, such as glucose, lipids, and proteins, can be broken down to make ATP.

The most important substance we're going to focus on is glucose. Glucose is used as an energy source faster than lipids and proteins. Therefore, it has the potential to produce ATP rapidly. Extra steps have to happen in order for lipids and proteins to produce ATP.



TERMS TO KNOW

Cellular Respiration

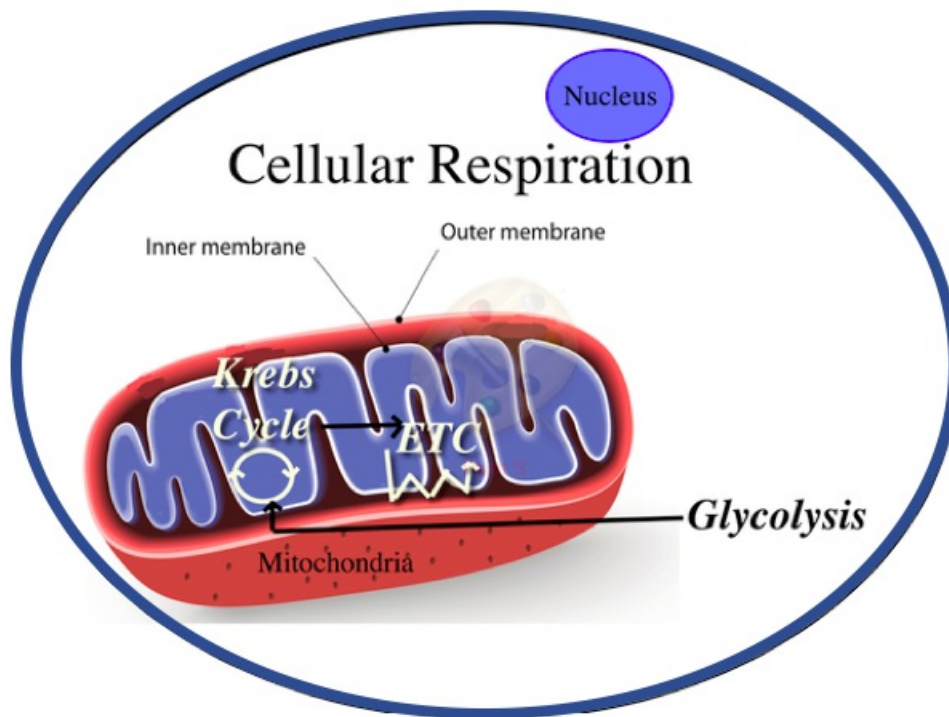
The process of converting molecules, such as proteins, fats, and carbohydrates, into cellular energy.

Adenosine Triphosphate (ATP)

The primary form of energy used by cells to perform work. It is the nucleotide adenine (A) with three phosphate groups instead of one.

2. Cellular Respiration Stages

There are three stages to cellular respiration.



2a. Glycolysis

To initiate this process, a glucose molecule will enter the first stage of cellular respiration, which is **glycolysis**. This occurs in the cytoplasm of the cell.

It's an **anaerobic** process, meaning that it does not require oxygen to occur. From glycolysis, we'll have some products produced that will be transferred into our other stages of cellular respiration.



TERMS TO KNOW

Glycolysis

The first step in cellular respiration; the process of breaking down glucose into pyruvate that takes place in the cytoplasm of cells; is an anaerobic process.

Anaerobic

A process in which oxygen is absent.

2b. Krebs Cycle

The next stage of cellular respiration is **the Krebs cycle**, which occurs in the mitochondria of the cell.

Mitochondria are cellular organelles found within our cells. The Krebs cycle occurs within the inner membrane of the mitochondria. The Krebs cycle is an **aerobic** process, which means it needs oxygen to occur. Some of the products from the Krebs cycle will then be transferred into our next stage, which is the electron transport chain.



TERMS TO KNOW

The Krebs Cycle

A series of chemical reactions used to generate energy, aerobically, from the pyruvate generated by glycolysis and catabolism of carbohydrates, proteins, and lipids.

Aerobic

A process requiring oxygen.

2c. Electron Transport Chain

The **electronic transport chain** is the third stage of cellular respiration. This occurs across the inner membrane of the mitochondria.

The electron transport chain is an aerobic process which requires oxygen. At the end of the cellular respiration process, you end up with a net gain of 36 ATP molecules for every one glucose molecule that entered the process. Each of these different stages produces some ATP, but the vast majority of our ATP is produced in the electron transport chain.



TERM TO KNOW

Electron Transport System

A series of reactions that couple electron donors with electron acceptors with the result of transferring H^+ ions across cell membranes to generate ATP.

3. ATP as a Nucleotide

ATP is actually a nucleotide and thus contains a type of sugar. There is a ribose sugar attached to both the adenine base and the three phosphates. The energy is stored in the bond between the extra phosphates. ATP can give away or take on extra phosphates; when it has that extra phosphate on it, this is where the stored energy is located.



SUMMARY

This lesson has been an overview of ATP production. Specifically, you learned about the **cellular respiration process**, the three steps of which are glycolysis, the Krebs cycle, and the electron transport chain. Finally, you learned about **ATP as a nucleotide**.

Keep up the learning and have a great day!

Source: THIS WORK IS ADAPTED FROM SOPHIA AUTHOR AMANDA SODERLIND



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Cellular Respiration

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Electron Transport System

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Glycolysis

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Krebs Cycle

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