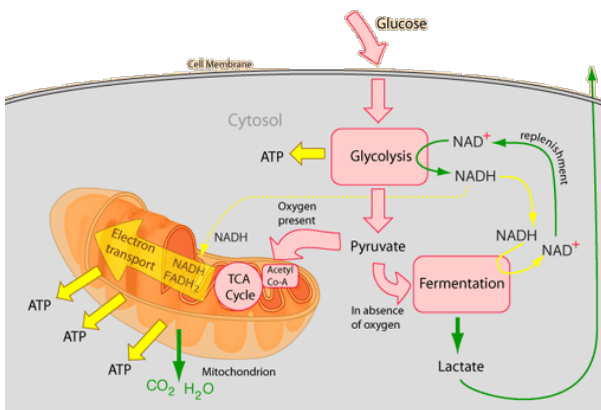


# Introduction to Cell Respiration

Created: Wednesday, 27 July 2011 05:53 | Published: Wednesday, 27 July 2011 05:53 | Written by [Super User](#) | [Print](#)

## Cellular Respiration



**Cellular respiration** is the process by which glucose molecules are broken down to release energy for cell metabolism. The process involves many steps, each occurring in precise order, with each step controlled by an enzyme. This allows the energy in the glucose molecule to be released in small amounts so the whole reaction is much safer and easier to manage. It normally requires oxygen and it is then called aerobic respiration. It also takes place without oxygen. Without oxygen present, this is called anaerobic respiration but less energy is extracted from the glucose molecule in anaerobic respiration.

## Definition - Respiration

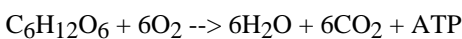
**Tissue respiration** - the chemical reactions within cells which release energy from our food

**External respiration** - using lungs to obtain the oxygen for tissue respiration and to remove waste gases.

## Aerobic Respiration:

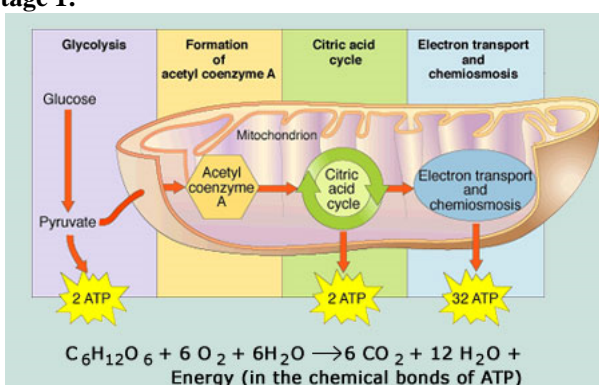
Respiration that involves [oxygen](#) is called aerobic respiration. It begins with cytosol but it's completed in mitochondria. The cytosol is the cytoplasm excluding the cell organelles. The waste products are carbon dioxide and water. About 55% of the energy in a glucose molecule is converted to chemical energy which can be used by the cell. The rest is lost as heat.

Glucose + oxygen -> water + carbon dioxide (+ energy)



## Two stages of Aerobic Respiration

Stage 1:



This is the breakdown of the 6 carbon glucose into 3 carbon compounds

(pyruvate). It does not require oxygen and only release a small amount of energy for the cell. It takes place only in the cytosol of

the cell.

### Stage 2:

The process requires oxygen and releases a large amount of energy for the cell. When oxygen is present, the pyruvates from stage 1 enter mitochondrion of the cell and are slowly dismantled. To cause the energy to be released and carbon di oxide and water are waste products. Most organism respire aerobically and so need oxygen- they are called aerobes.

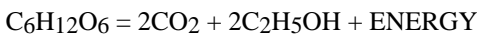
## Anaerobic Respiration:

The organism which respire without the help of oxygen is called anaerobes. Anaerobic respiration is the breakdown of glucose for energy without the use of oxygen.

Anaerobic respiration is respiration without using oxygen. This is different in plants and animals.

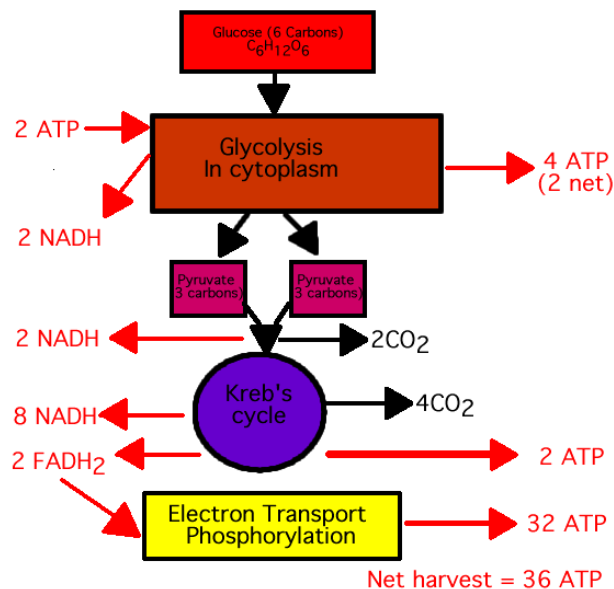
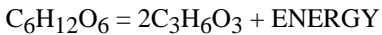
### In plants:

Glucose = carbon dioxide + ethanol (alcohol) + ENERGY



### In animals:

Glucose = lactic acid + ENERGY



It captures about 3% of the energy in each glucose molecule which is enough for many single celled organisms but it not enough for a large active multicellular organism. During strenuous exercise the muscles may not receive all the oxygen they need each minute. During that time anaerobic respiration can provide extra energy but in the process the lactic acid that forms may cause cramps and the person builds up an oxygen debt. If the person rapidly and deeply breathes, this problem can be rectified.

## Advantages of Aerobic and Anaerobic Respiration:

Aerobic respiration is more efficient and releases more energy per amount of fuel used. Anaerobic respiration produces much less energy than aerobic respiration and as a result the organism grows much slower. The advantage of anaerobic respiration would be that the organism can specialize in particular parts of the environment such where aerobic organisms can't live, and thus have no competition for resources. If an organism can use aerobic respiration and anaerobic respiration it will use aerobic respiration whenever possible as it produces the most energy.

## What is the difference between the Aerobic and Anaerobic Respiration?

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### Reference Links:

- [http://en.wikipedia.org/wiki/Nucleic\\_acid](http://en.wikipedia.org/wiki/Nucleic_acid)
- [http://en.wikipedia.org/wiki/Anaerobic\\_respiration](http://en.wikipedia.org/wiki/Anaerobic_respiration)
- [http://en.wikipedia.org/wiki/Cellular\\_respiration](http://en.wikipedia.org/wiki/Cellular_respiration)
- [http://en.wikipedia.org/wiki/Aerobic\\_organism](http://en.wikipedia.org/wiki/Aerobic_organism)
- [http://en.wikipedia.org/wiki/Cell\\_%28biology%29](http://en.wikipedia.org/wiki/Cell_%28biology%29)
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