

# Difference Between Respiration and Cellular Respiration

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## Key Difference - Respiration vs Cellular Respiration

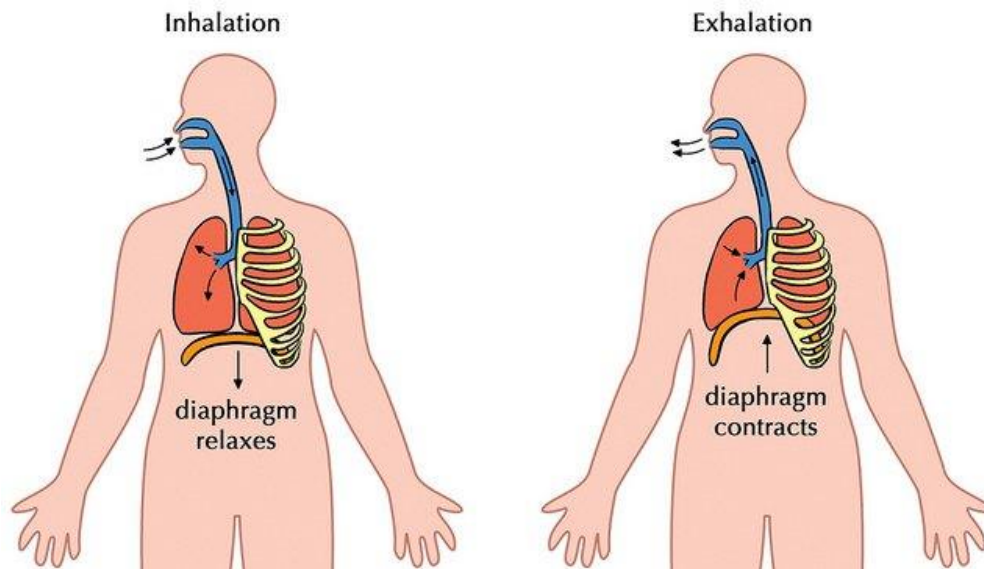
Respiration is mainly divided into two phases based on physiological and biochemical mechanisms. Those are physiological respiration (breathing) and cellular respiration. The physiological respiration is defined as the movement of [oxygen](#) (O<sub>2</sub>) molecules from outside environment to the [cells](#) in the inner [tissues](#) of the body and the movement of carbon dioxide (CO<sub>2</sub>) out of the body in the opposite direction. The other phase of the respiration could be defined as a biochemical reaction which is known as cellular respiration. Cellular respiration is of two types; [aerobic and anaerobic](#). The [glucose](#) breaks into carbon dioxide and water by using atmospheric oxygen that is gained in the physiological respiration by cells in the tissues. The energy is produced by cellular respiration, and this energy is stored in [ATP](#) molecules. The oxygen is present in this type of cellular respiration, so it is also called as aerobic cellular respiration. This energy is extremely important for catabolic (breaking reactions) and anabolic (synthesizing reactions) pathways in the metabolism. In bacteria, the cellular respiration is little bit different and takes place without oxygen. It is called as anaerobic cellular respiration. In anaerobic process, alcohol and carbon dioxide are produced instead of water. In human also the anaerobic type of cellular respiration is possible in the absence of oxygen. Two molecules of [lactic acids](#) are produced from a glucose molecule in humans' anaerobic respiration. Aerobic cellular respiration produces more energy (38ATP) than anaerobic cellular respiration (2ATP). The **key difference** between respiration and cellular respiration is, **respiration is the entire process which consists of two phases (physiological respiration and cellular respiration) whereas, cellular respiration is only one phase of the respiration process where glucose is converted to energy in the presence of oxygen in cellular level.**

## What is Respiration?

In physiology, respiration is described as the movement of oxygen molecules from outside environment to the inner cells and the movement of carbon dioxide from inner cells to the outside environment in the opposite direction. It is also known as breathing. The movement of oxygen into the cells is defined as [inhalation](#). And the movement of carbon dioxide to the outside environment is defined as exhalation.

Inhalation is an active process. The [diaphragm](#) is contracted, and internal height of the thoracic cavity is increased. The internal pressure decreases and atmospheric oxygen moves inside the respiratory tract. The exhalation is a passive process. During the

exhalation, the diaphragm relaxes and decreases the volume of the thoracic cavity. Then the internal pressure increases. Hence, carbon dioxide moves out of the respiratory tract to the outside environment. Inhalation brings oxygen to the lungs, and the gas exchange takes place between air in the [alveoli](#) and blood in the pulmonary [capillaries](#). The carbon dioxide in return moves from blood to alveoli air and out of the respiratory tract.



**Figure 01: Respiration**

In biochemical means, the respiration is defined as cellular respiration. In the cellular respiration, the glucose is broken down into carbon dioxide and water in the presence of oxygen. The resulted energy is stored in ATP where it is used in metabolism.

## What is Cellular Respiration?

Energy is needed to keep the life processes constantly. It is extremely important in life processes such as growth and development, movement, repair and the control of body temperature in [mammals](#) etc. The cellular respiration is an energy generating biochemical reaction which takes place in all living cells including [plants and animals](#). The energy that is released from glucose can be used in other living cells for biochemical reactions like [catabolic and anabolic](#) pathways.

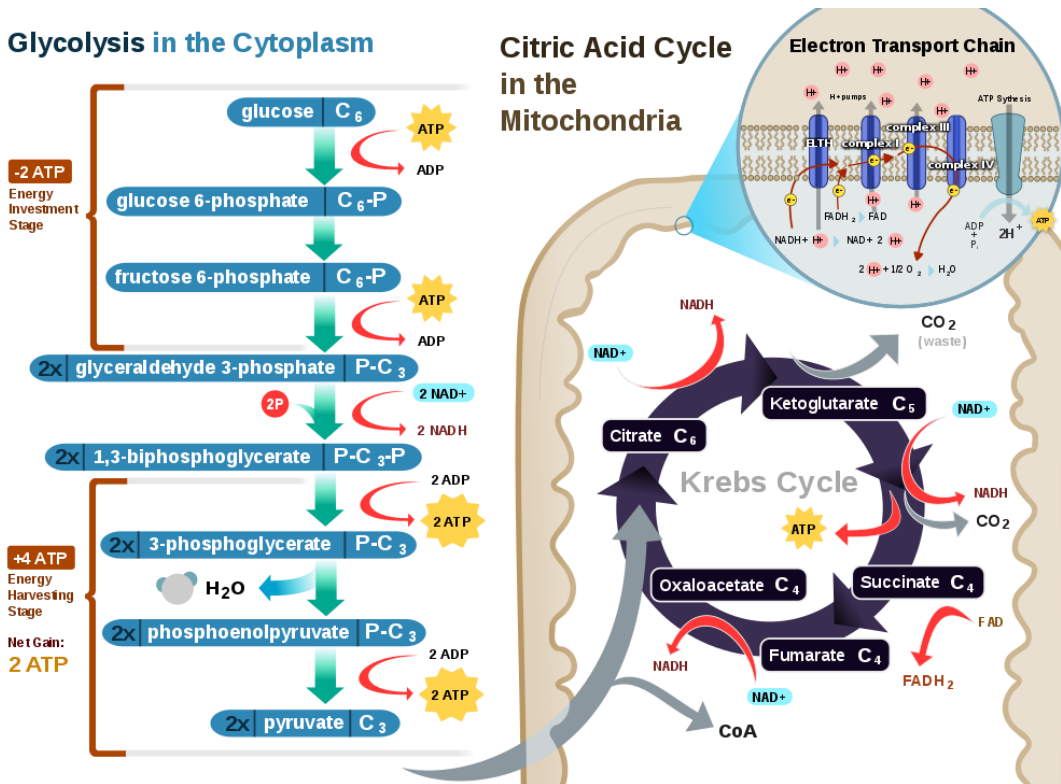


Figure 02: Cellular Respiration

The cellular respiration is divided into two different pathways based on presence and absence of oxygen. If cellular respiration occurs in the presence of oxygen, it is called as aerobic respiration. The aerobic respiration is produced more energy and more ATP (38 ATP).



The aerobic cellular respiration can be further classified into three cycles: glycolysis, [Krebs cycle](#) and [electron transport chain](#).

Anaerobic cellular respiration takes place without oxygen. It can be observed in both [bacteria](#) as well as in humans when oxygen is absent. In bacteria, glucose converts to alcohol and carbon dioxide in the absence of oxygen. It generates only 2ATP molecules.



The anaerobic respiration can also be observed when oxygen is not present in muscle cells of humans. In humans, anaerobic respiration process is produced two lactic acid molecules and 2 ATP.



So, it is evident the aerobic cellular respiration is much more important as it produces more energy (38ATP) than anaerobic cellular respiration that produces lower energy (2ATP).

## What are the Similarities Between Respiration and Cellular Respiration?

- Oxygen and carbon dioxide are involved in both processes.
- Both processes are extremely important for the human survival.
- Both processes help in maintaining the human metabolic pathways (catabolic and anabolic reactions)
- Both processes help in producing the energy required.

## What is the Difference Between Respiration and Cellular Respiration?

Respiration vs Cellular Respiration	
Respiration is the entire process which consists two phases (physiological respiration and cellular respiration).	Cellular respiration is only one part of the respiration process where glucose turns out to energy in the presence of oxygen in cellular level.
Reaction type	
Respiration is a combination of both physiological and biochemical reactions.	Cellular respiration is a biochemical reaction.
Breathing	
Breathing is a main integral phase of respiration.	Breathing is not the main phase of cellular respiration.
Physical and structural changes to the body	
Physical changes to the body take place (diaphragm contraction, relaxation, and intercostals muscles changes) during respiration.	Physical and structural changes to the body do not take place in cellular respiration.
Occurrence Level	
Respiration can be observed at both organ	Cellular respiration can only be observed at the

level and cellular level.

cellular level.

## Summary - Respiration vs Cellular Respiration

The respiration is mainly divided into two phases based on physiological and biochemical mechanisms. Those are physiological respiration and cellular respiration. The physiological respiration is defined as the movement of oxygen (O<sub>2</sub>) molecules from outside environment to the cells in the inner tissues of the body and the movement of carbon dioxide (CO<sub>2</sub>) out of the body in the opposite direction. The other phase of the respiration could be defined as a biochemical reaction which is known as cellular respiration. Cellular respiration is of two types; aerobic and anaerobic. The difference between respiration and cellular respiration is, respiration is the entire process which consists two phases (physiological respiration and cellular respiration) while the cellular respiration is only one phase of the respiration process where glucose turns out to energy in the presence of oxygen at cellular level.

### Reference:

1. Cellular respiration." Wikipedia, Wikimedia Foundation, 29 Oct. 2017. [Available here](#)
2. "Cellular respiration." Wikipedia, Wikimedia Foundation, 8 Nov. 2017. [Available here](#)

### Image Courtesy:

1. 'Inhalation and exhalation, diaphragm movement' by Siyavula Education ([CC BY 2.0](#)) via [Flickr](#)
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