Difference Between Inspiration and Expiration

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Key Difference - Inspiration vs Expiration

Breathing is the process of moving air in and out of the lungs in order to facilitate the gaseous exchange within the internal environment. It is also known as respiration or ventilation. The scientific basis of breathing is the activity of bringing oxygen (O_2) in and flushing out carbon dioxide (CO_2) out of the lungs. All aerobic creatures need oxygen for cellular respiration. The two lungs are the primary important organs of the respiratory system. The other important components of the respiratory system are trachea (called as windpipe) which further branches into bronchi and bronchiole. The process of respiration is divided into two distinguished phases defined as inspiration (inhalation) and expiration (exhalation). During the inspiration process, the diaphragm contracts and pulls downward, while the muscles between the ribs contract and pull upward. This activity increases the size of the thoracic cavity and decreases its pressure. As a result, air rushes into the lungs and fills it immediately. During the expiration process, the diaphragm relaxes and the volume of thoracic cavity decreases gradually. The pressure within it increases while the lungs contract and forces the air out. The breathing rate or the respiratory rate is determined as 12 to18 breaths per minute. The **key difference** between inspiration and respiration is, **the inspiration is an active process which brings air into the lungs while the expiration is a passive process which excludes air out of the lungs.**

What is Inspiration?

Diaphragm is the principal structure (muscle) of the respiration. It is a dome shaped muscular membranous structure. The diaphragm separates the thoracic (chest) from the abdominal cavities in mammals. The muscles of the diaphragm arise from the lower part of the sternum (breast bone). The lower six ribs and the lumbar (loin) vertebrae of the spine are attached to a central membranous tendon. By contracting the diaphragm, it increases the internal height of the thoracic cavity. Thus, it lowers its internal pressure. The rib cage moves up and out and the diaphragm flattens to increase the internal space. This process causes the outside air to enter into the lungs. Hence, it is known as inspiration.

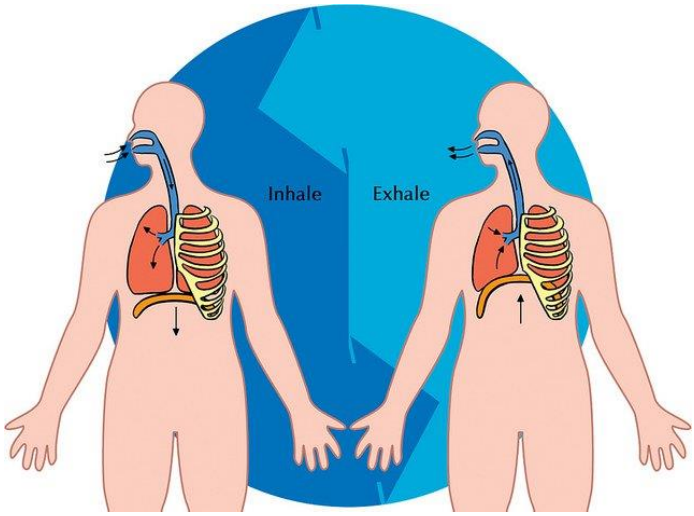

Figure 01: Inspiration and Expiration

It is normally estimated that the air breathe contains 21% oxygen (O_2) and 0.04% of CO_2. As we do exercises, the amount of oxygen needed, is increased. This increases oxygen uptake and it creates breathing faster. This increased oxygen uptake is known as VO_2. This is termed as "the amount of oxygen our body uses per minute". This can be used as a measurement to determine our fitness level. The maximum VO_2 is called as **VO_2 max.** It is assumed that higher the VO_2 max is, higher our fitness level is. In inspiration, it is extremely important to know the terminologies **inspiratory capacity** and **inspiratory reserved volume.** "Inspiratory capacity" is defined as the maximum amount that can breathe in (after a normal breathe out). On the other hand, the term "inspiratory reserved volume" is described as, after the normal breathing this is the extra volume that we can breathe in.

What is Expiration?

Expiration is the flow of the breath out of an organism. This is also known as **exhalation**. In humans, it is the process of moving air out of the lungs through airways into the external environment during the process of breathing. During expiration, the intercostal muscles and diaphragm are relaxed, hence returning to their starting position. This decreases the internal space and increases the internal pressure. It is further decreasing the size of the thoracic cavity. Thus, the lungs force the air out.

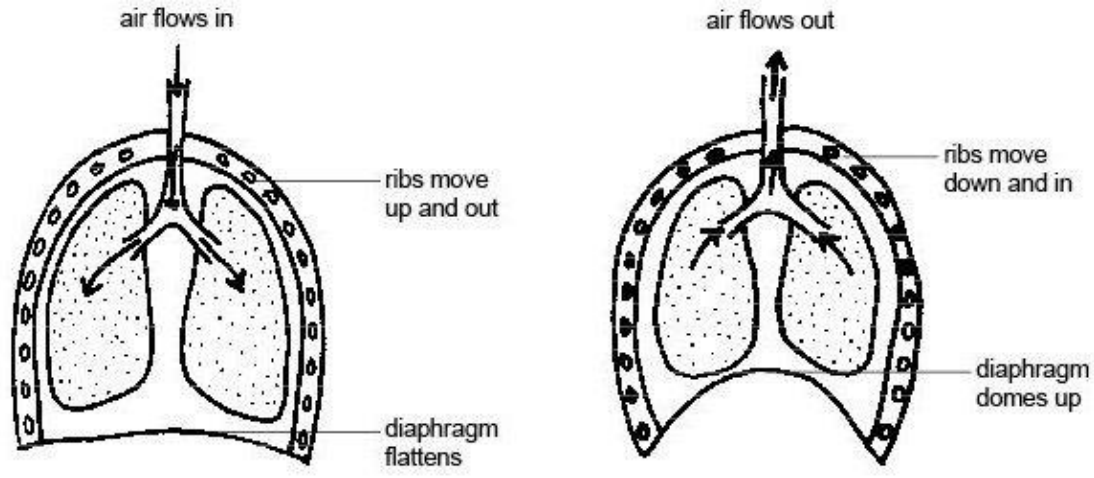

Figure 02: Lung Expiration and Inspiration

When measuring the lungs activity, the terms "**expiratory reserved volume**" and "**residual volume**" are highly important. The "expiratory reserved volume" is termed, after a normal breathing out. This is the extra volume that we can breathe out. The "residual volume" is defined as the amount of air left out in the lungs after we breathe out as much as possible. It is also estimated in a normal breathing out there are 17% O_2 and 4% of CO_2.

What are the Similarities Between Inspiration and Expiration?

- Both phases are main parts of the respiration process.
- In both instances, the diaphragm involves by making structural changes in order to facilitate inspiration and expiration.
- Oxygen and carbon dioxide are present in both cases in different volumes.
- Both phases are vital for human survival.

What is the Difference Between Inspiration and Expiration?

Inspiration vs Expiration	
Inspiration is the intake of the air into the lungs.	Expiration is the expulsion of the air out of the lungs.
State of the process	
Inspiration is an active process.	Expiration is a passive process.
Muscle Changes	
In inspiration, the external intercostals	In expiration, the external intercostals

muscles are contracted and internal intercostals muscles are relaxed.	muscles are relaxed and internal intercostals muscles are contracted.
Rib cage Movement	
In inspiration, rib cage moves forward and outward.	In expiration, the rib cage moves downward and inward.
Diaphragm Contraction	
In inspiration, the diaphragm contracts and flattens.	In expiration, the diaphragm relaxes and becomes original dome shaped.
Size of the Thoracic Cavity	
In inspiration, the size of the thoracic cavity increases.	In expiration, the size of the thoracic cavity decreases.
Internal Pressure	
In inspiration, the air pressure in lungs is less than the atmospheric pressure.	In expiration, the air pressure in the lungs is higher than the atmospheric pressure.

Summary - Inspiration vs Expiration

Breathing is the process of moving air in and out of lungs in order to facilitate the gas exchange within the body. It is also known as respiration or ventilation. The process of breathing is mostly done by bringing oxygen (O_2) in and flushing out carbon dioxide (CO_2) from the lungs. Respiration is divided into two distinguished phases; inspiration (inhalation) and expiration (exhalation). The respiratory rate indicates vital signs of serious diseases related to respiratory system. The difference between inspiration and expiration is, the inspiration is an active process where it brings air into the lungs while expiration is a passive process, which is the expulsion of the air out of the lungs.

Reference:

1.“Home.” TeachPE.com. Available here
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