بسم الله الرحمن الرحيم

Respiratory Physiology:

In **physiology**, **respiration** is the movement of oxygen from the outside environment to the cells within tissues, and the transport of carbon dioxide in the opposite direction.

The physiological definition of respiration differs from the biochemical definition, which refers to a metabolic process by which an organism obtains energy by oxidising nutrients and releasing waste products. Although physiologic respiration is necessary to sustain cellular respiration and thus life in animals.

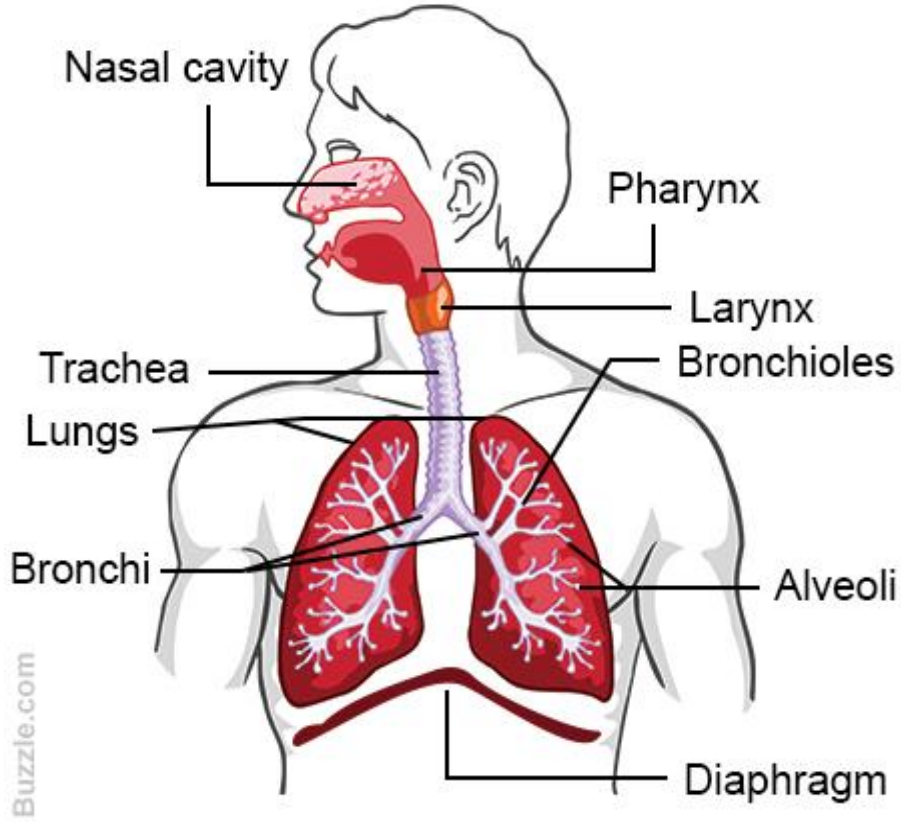
In animals with lungs, physiological respiration involves respiratory cycles of inhaled and exhaled breaths. Inhalation (breathing in) is usually an active movement. The contraction of the diaphragm muscle cause a pressure variation, In contrast, exhalation (breathing out) is usually a passive process. The gas exchange takes place between the air in the alveoli and the blood in the pulmonary capillaries.

The process of breathing does not fill the alveoli with atmospheric air during each inhalation (about 350 ml per breath), but the inhaled air is carefully diluted and thoroughly mixed with a large volume of gas (about 2.5 liters in adult humans) known as the functional residual capacity which remains in the lungs after each exhalation.

Parts and Specific Function of Respiratory:

The respiratory system provides oxygen to the body's cells while removing carbon dioxide, a waste product that can be lethal if allowed to accumulate. The airway, which includes the nose, mouth, pharynx, larynx, trachea, bronchi, and bronchioles,

carries air between the lungs and the body's exterior. The following are the five key functions of the respiratory system.



1. Inhalation and Exhalation Are Pulmonary Ventilation.

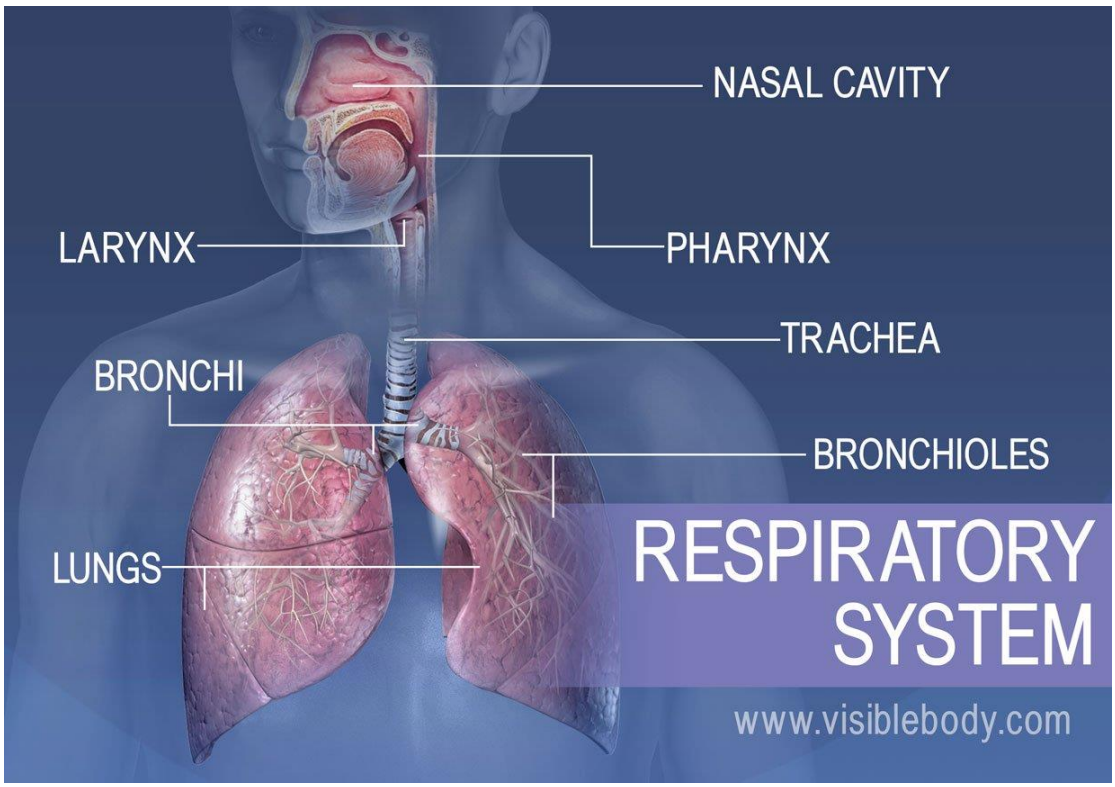
During inhalation, the diaphragm moves down and the ribs move upwards and outwards, thereby increasing the space in the chest cavity. During exhalation, the diaphragm moves to its former position and the ribs move downwards and inwards, thereby reducing the size of the chest cavity. This leads to the movement of air out of the lungs.

2- External Respiration:

Exchanges Gases between the Lungs and the blood. Inside the lungs, oxygen is exchanged the carbon dioxide waste through the process called external respiration. This respiratory process takes place through hundreds of millions of microscopic sacs called alveoli .Oxygen binds to hemoglobin molecules in red blood cells, and pumped through the bloodstream. Meanwhile, carbon dioxide is expelled through exhalation.

3- Internal Respiration.

Exchanges Gases between the Bloodstream and Body Tissues. The bloodstream delivers oxygen to cells and removes waste carbon dioxide through internal respiration. In this respiratory process, red blood cells carry oxygen absorbed from the lungs around the body, through the vasculature. It diffuses through the capillary walls into body tissues. Meanwhile, carbon dioxide diffuses from the tissues into red blood cells and plasma.



4- Air Vibrating the Vocal Cords Creates Sound.

During exhalation, air passes from the lungs through the larynx, or “voice box.” When we speak, muscles in the larynx move the arytenoid cartilages, which push the vocal cords, or vocal folds, together. When the cords are pushed together, air passing between them makes them vibrate, creating sound.

5- **Olfaction, or Smelling, Is a Chemical Sensation.**

The process of olfaction begins with olfactory fibers that line the nasal cavities inside the nose. As air enters the cavities, some chemicals in the air bind to and activate nervous system receptors on the cilia. This stimulus sends a signal to the brain: neurons take the signal from the nasal cavities through openings in the ethmoid bone, and then to the olfactory bulbs, which travels along cranial nerve 1, to the olfactory area of the cerebral cortex.

Mechanical and Control of Ventilation:

Control of ventilation refers to the control of breathing, Ventilation facilitates respiration which utilization of oxygen and removal of carbon dioxide. Under most conditions, the partial pressure of carbon dioxide (PCO2), controls the respiratory rate. The peripheral chemoreceptors that detect changes in the levels of oxygen and carbon dioxide are located in the arterial aortic bodies.

Central chemoreceptors are primarily sensitive to changes in the pH in the blood, they are located on the medulla oblongata near to the medullar respiratory groups of the respiratory center. There are four respir atory groups, two in the medulla and two in the pons. The two groups in the pons are known as the pontine respiratory group.

Gas Blood Transport:

Oxygen is transported in the blood in two ways: A small amount of O_2 (1.5 percent) is carried in the plasma as a dissolved **gas**. Most oxygen (98.5 percent) carried in the **blood** is bound to the protein hemoglobin in red **blood** cells. A fully saturated oxyhemoglobin (HbO_2) has four O_2 molecules attached.

Once the oxygen diffuses across the alveoli, it enters the bloodstream and is **transported** to the tissues where it is unloaded, and carbon dioxide diffuses out of the blood and into the alveoli to be expelled from the body.

Carbon dioxide can be transported through the blood via three methods. It is dissolved directly in the blood, bound to plasma proteins or hemoglobin, or converted into bicarbonate. The majority of **carbon dioxide** is **transported** as part of the bicarbonate system. **Carbon dioxide** diffuses into red blood cells.

Internal Respiration:

Cellular respiration is a set of metabolic reactions and processes that take place in the cells of organisms to convert biochemical energy from nutrients into adenosine triphosphate, and then release waste products

Internal respiration occurs in the metabolizing tissues, where oxygen diffuses out of the blood and carbon dioxide diffuses out of the cells.

Internal Respiration is exchanging Gases between the Bloodstream and Body Tissues. The bloodstream delivers oxygen to cells and removes waste carbon dioxide through **internal respiration**; it is another key **function** of the respiratory system.

Factor affecting of Internal respiration:

The body digests the food and sends nutrients, particularly **glucose**, a simple sugar, through the bloodstream. Cells take up the glucose and break it apart, releasing energy in the process. This process is called **cellular respiration**, where cells break down glucose and capture energy as **ATP**, or adenosine triphosphate. There are some factors affect how quickly this process happens, and in turn how much energy your cells can make.

The eight environmental factors effecting the rate of respiration are: (1) Oxygen Content of the Atmosphere (2) Effect of Temperature (3) Effect of Light (4) Effect of Water Contents (5) Effect of Respirable Material (6) Effect of **Carbon Dioxide** Concentration (7) Protoplasmic Conditions and (8) Other Factors. Problems with this process, which is called **cellular respiration**, have been linked to a number of morbid conditions, from unusual genetic **diseases** to diabetes, cancer and Parkinson's, as well as to the normal ageing process.