

BIOLOGY

SHORT STUDY NOTES

**RESPIRATORY
SYSTEM**

CLASS 11

BY LEARNINGMANTRAS.COM

Digestive System

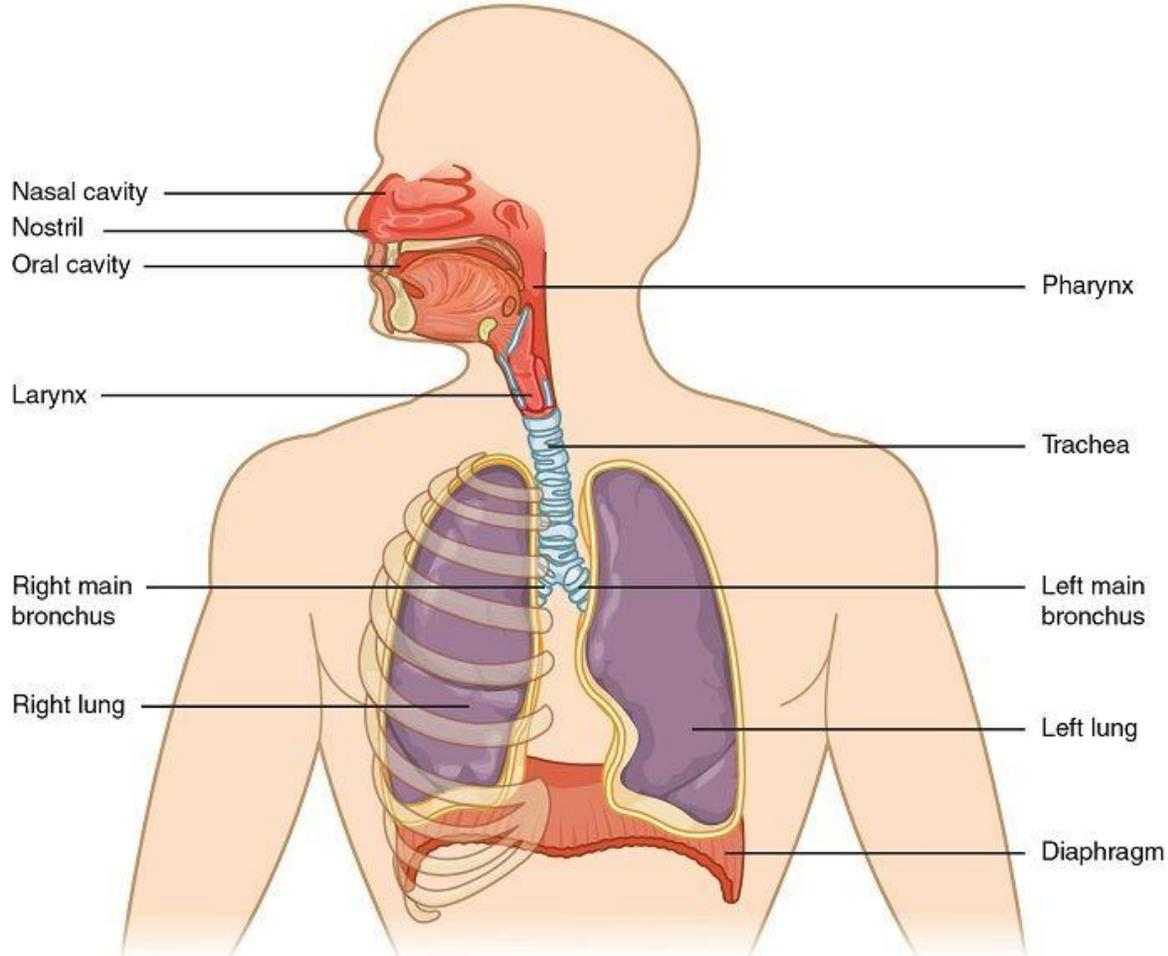
The respiratory system is the network of organs and tissues that help you breathe. It includes your airways, lungs and blood vessels. The muscles that power your lungs are also part of the respiratory system. These parts work together to move oxygen throughout the body and clean out waste gases like carbon dioxide.

- Respiration is also called 'internal respiration' as it is an internal process of breaking down complex organic compounds into carbon dioxide and water while releasing energy.
- Respiration takes place in the mitochondria of all the cells throughout the body.
- Respiration is a metabolic process where glucose is oxidized in the presence of oxygen to form carbon dioxide and water.
- Respiration can occur either in the presence of oxygen or in its absence.
- Respiration in the presence of oxygen is aerobic respiration,
- Respiration in the absence of oxygen is anaerobic.
- The reactions involved in cellular respiration are catabolic reactions which break down complex compounds into simple ones.
- The process of respiration is dependent on various enzymes that catalyze different steps in the metabolic pathway. These enzymes regulate the rate and direction of these reactions.
- Cellular respiration occurs through a number of cycles like glycolysis, Krebs's cycle and electron transport chain. All of these reactions together result in a large amount of energy and oxidation of organic compounds.
- The nutrients that are commonly used by organisms during respiration are carbohydrates, amino acids and fatty acids.

Functions of Respiratory System

- Inhalation and Exhalation.
- Exchange of Gases between Bloodstream and Body Tissues.
- The Vibration of the Vocal Cords.
- Allows you to smell.
- Warms air to match your body temperature and moisturizes it to the humidity level your body needs.
- Delivers oxygen to the cells in your body.
- Removes waste gases, including carbon dioxide, from the body when you exhale.
- Protects your airways from harmful substances and irritants.

Parts of Respiratory System



- **Nose and Nasal cavity:**

- Humans have exterior nostrils, which are divided by a framework of cartilaginous structure called the septum.
- This is the structure that separates the right nostril from the left nostril.
- Tiny hair follicles that cover the interior lining of nostrils act as the body's first line of defence against foreign pathogens.
- Furthermore, they provide additional humidity for inhaled air.

- **Sinuses:**

- The sinuses are a connected system of hollow cavities in the skull. The largest sinus cavities are about an inch across. Others are much smaller.
- Your cheekbones hold your maxillary sinuses (the largest).
- The low-center of your forehead is where your frontal sinuses are located.
- Between your eyes are your ethmoid sinuses.
- In bones behind your nose are your sphenoid sinuses.

- **Throat (pharynx):**

- The nasal chambers open up into a wide hollow space called the pharynx.

- It is a common passage for air as well as food.
- It functions by preventing the entry of food particles into the windpipe.
- The epiglottis is an elastic cartilage, which serves as a switch between the larynx and the oesophagus by allowing the passage of air into the lungs, and food in the gastrointestinal tract.
- **Larynx (Voice Box):**
 - Two cartilaginous chords lay the framework for the larynx.
 - It is found in front of the neck and is responsible for vocals as well as aiding respiration.
 - It is also informally called the voice box.
 - When food is swallowed, a flap called the epiglottis folds over the top of the windpipe and prevents food from entering into the larynx.
- **Windpipe (trachea):**
 - The trachea or the windpipe rises below the larynx and moves down to the neck.
 - The walls of the trachea comprise C-shaped cartilaginous rings which give hardness to the trachea and maintain it by completely expanding.
 - The trachea extends further down into the breastbone and splits into two bronchi, one for each lung.
- **Diaphragm:**
 - The diaphragm is a thin skeletal muscle that sits at the base of the chest and separates the abdomen from the chest.
 - It contracts and flattens when you inhale.
 - This creates a vacuum effect that pulls air into the lungs.
 - When you exhale, the diaphragm relaxes and the air is pushed out of the lungs.
 - It also has some non-respiratory functions as well.
 - The diaphragm increases abdominal pressure to help the body get rid of vomit, urine, and feces. It also places pressure on the esophagus to prevent acid reflux.
- **Lungs:**
 - Lungs are the primary organs of respiration in humans and other vertebrates.
 - They are located on either side of the heart, in the thoracic cavity of the chest.
 - Anatomically, the lungs are spongy organs with an estimated total surface area between 50 to 75 sq meters.
 - The primary function of the lungs is to facilitate the exchange of gases between the blood and the air.
 - Interestingly, the right lung is quite bigger and heavier than the left lung.
- **Bronchial tubes/Bronchi:**
 - The trachea splits into two tubes called the bronchi, which enter each lung individually.
 - The bronchi divides into secondary and tertiary bronchioles, and it further branches out into small air-sacs called the alveoli.
 - The alveoli are single-celled sacs of air with thin walls.
 - It facilitates the exchange of oxygen and carbon dioxide molecules into or away from the bloodstream.
- **Bronchioles:**
 - Bronchioles are air passages inside the lungs that branch off like tree limbs from the bronchi—the two main air passages into which air flows from the trachea (windpipe) after being inhaled through the nose or mouth.
 - The bronchioles deliver air to tiny sacs called alveoli where oxygen and carbon dioxide are exchanged.

- They are vulnerable to conditions like asthma, bronchiolitis, cystic fibrosis, and emphysema that can cause constriction and/or obstruction of the airways.
- **Air sacs (alveoli):**
 - Alveoli are tiny air sacs in your lungs that take up the oxygen you breathe in and keep your body going.
 - There are about 480 million alveoli, located at the end of bronchial tubes.
 - When you breathe in, the alveoli expand to take in oxygen.
 - When you breathe out, the alveoli shrink to expel carbon dioxide.
 - It helps move air in and out of your lungs (ventilation).
 - It helps in exchange of oxygen and carbon dioxide (diffusion).
 - It helps in pumping blood through your lungs (perfusion).
- **Capillaries:**
 - Capillaries are very tiny blood vessels — so small that a single red blood cell can barely fit through them.
 - They help to connect your arteries and veins in addition to facilitating the exchange of certain elements between your blood and tissues.

How Does the Respiratory System Clean the Air?

Hairs in your nose help filter out large particles. Tiny hairs, called cilia, along your air passages move in a sweeping motion to keep the passages clean. But if you breathe in harmful things like cigarette smoke, the cilia can stop working. This can lead to health problems like bronchitis. Cells in your trachea and bronchial tubes make mucus that keeps air passages moist and helps keep things like dust, bacteria and viruses, and allergy-causing things out of your lungs.

Diseases of Respiratory System

- **Asthma:** Your airways narrow and make too much mucus.
- **Bronchiectasis:** Inflammation and infection make your bronchial walls thicker.
- **Chronic obstructive pulmonary disease (COPD):** This long-term condition gets worse over time. It includes bronchitis and emphysema.
- **Pneumonia:** An infection causes inflammation in your alveoli. They might fill up with fluid or pus.
- **Tuberculosis:** A bacterium causes this dangerous infection. It usually affects your lungs but might also involve your kidney, spine, or brain.
- **Lung cancer:** Cells in your lung change and grow into a tumor. This often happens because of smoking or other chemicals you've breathed in.
- **Cystic fibrosis:** This disease is caused by a problem in your genes and gets worse over time. It causes lung infections that don't go away.
- **Pleural effusion:** Too much fluid builds up between the tissues that line your lungs and chest.
- **Idiopathic pulmonary fibrosis:** Your lung tissue becomes scarred and can't work the way it should.
- **Sarcoidosis:** Tiny clumps of inflammatory cells called granulomas form, often in your lungs and lymph nodes.

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