11. Human Body and Organ System

- **Cellular Respiration**
  - It is the process in which food is broken down in the cell to release energy.
  - It occurs in the cells of all living organisms.

- **Two types of Respiration**
  - **Aerobic respiration –** It is the process of breakdown of food in the presence of oxygen.
  - It occurs in all organisms.
  - It leads to production of carbon dioxide, water, and energy.

$$\text{Glucose} \xrightarrow{\text{Oxygen}} CO_2 + \text{Water} + \text{Energy}$$

  - **Anaerobic respiration –** It is the process of breakdown of food in the absence of oxygen.
  - Yeast, bacteria, human muscle cells, etc. respire anaerobically.
  - In yeast cells, anaerobic respiration leads to production of alcohol and carbon dioxide.

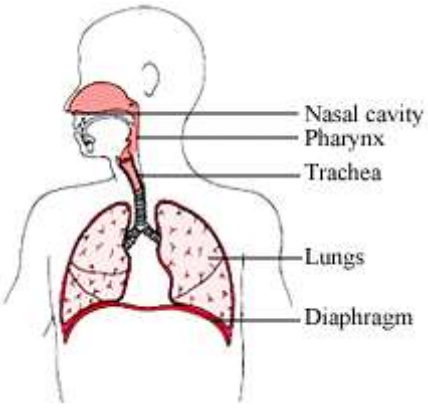
$$\text{Glucose} \xrightarrow[\text{Oxygen}]{\text{without}} \text{Alcohol} + \text{Energy} + CO_2$$

  - During heavy exercise, our muscles respire anaerobically to provide energy to muscle cells. This leads to accumulation of lactic acid that causes muscle cramps and thus, pain in body.

$$\text{Glucose} \xrightarrow[\text{Oxygen}]{\text{without}} \text{Lactic acid}$$

Human respiration

Includes the nose, pharynx, trachea, bronchi, bronchioles and alveoli

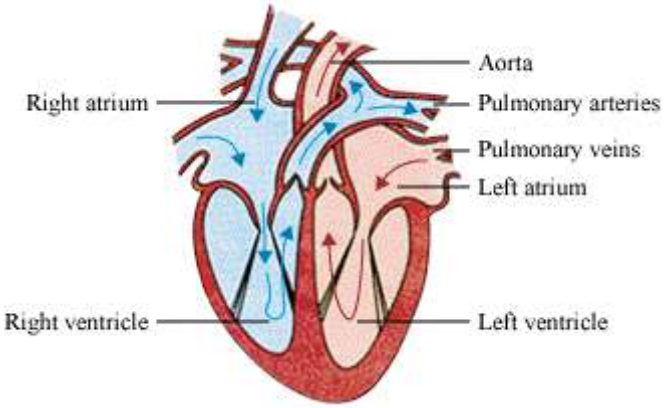


- Bronchioles divide to form many alveoli
- Alveoli are sites of gas exchange
- O_2 present in alveolar blood vessels transported to body cells
- Haemoglobin is the respiratory pigment present in blood is mainly responsible for the transport of carbon dioxide and oxygen.

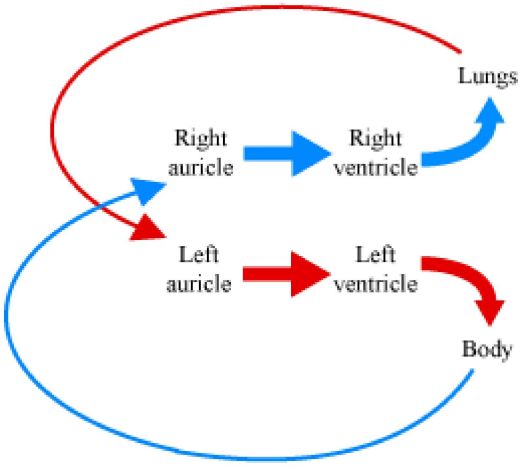
- All multicellular organisms have a specialized system to transport nutrients and other necessary materials to the cell and the wastes away from the cell.
- Circulatory system is the transportation system of human body.
- It is composed of three major parts − blood, blood vessel, and heart.

Heart

- It is the main pumping organ of our body that beats continuously.
- It pumps oxygen-rich blood to all parts of the body and carbon dioxide-rich blood to the lungs. .
- Human heart is four chambered as shown in the figure below, and located in the chest cavity



- The upper two chambers are called atria while lower two chambers are called ventricles.
- A muscular wall between the chambers prevents the mixing up of blood rich in oxygen and blood rich in carbon dioxide.



- The rhythmic contraction and expansion of heart is the heart beat.
- Doctors use stethoscope for listening to the heart sounds.
- The human heart beats about 70 to 80 times per minute in an adult.

Blood vessels

- Arteries carry oxygen-rich blood from the heart to various organs of the body.
    1. Pulmonary artery is the only artery that carries CO_2-rich blood from heart to lungs.

    2. The walls of arteries are thick and elastic in order to tolerate high pressure of the blood.

3. Pulse is the rhythmic contraction and expansion of arteries with each beat of heart. The number of beats per minute is the pulse rate.

4. A resting person usually has a pulse rate between 72 to 80 beats per minute.

- Veins carry CO_2-rich blood from various organs towards the heart.

1. They are thin-walled, non-elastic vessels that possess valves.

2. Pulmonary veins carry oxygen-rich blood from lungs to heart.

- Capillaries are thin-walled blood vessels. They connect arteries with veins.

All multicellular organisms have a specialized system to transport nutrients and other necessary materials to the cell and the wastes away from the cell. This system is known as circulatory system.

Circulatory system is the transportation system of human body. It has three major parts − Blood, Blood vessel, and Heart.

Blood- It is a fluid connective tissue that is pumped throughout the body by heart.

Functions of Blood-

- It transports oxygen and nutrients to various parts of the body.
- It also transports wastes for removal from the body.

Composition of Blood-It contains plasma, red blood cells, white blood cells, and platelets.

- Plasma is the fluid part of blood.
- Red blood cell contains a pigment called **haemoglobin**. It carries oxygen and transports it to all parts of the body.
- White blood cell protects body against infections. These are also known as leucocytes.
- Platelets help in clotting of blood.

Lymph

Lymph is a watery clear fluid. It is blood minus RBC. This fluid distributes immune cells and other factors throughout the body. It also interacts with the blood circulatory system to drain fluid from cells and tissues. The lymphatic system contains immune cells called **lymphocytes**, which protect the body against foreign antigens (viruses, bacteria, etc.) that invade the body.