Human Organ Systems

Organ systems are groups of organs that have related functions; e.g., the circulatory system contains the heart, blood, and blood vessels that enable oxygen to travel throughout the body.

Organ System	Major Organs and Components	Major Function
Digestive	Mouth, esophagus, stomach, gall bladder, intestines, liver, pancreas, rectum	**Ingestion, digestion, absorption of nutrients, elimination of solid wastes,**
Circulatory	heart, blood vessels (arteries, veins, capillaries)	**transportation of nutrients, gases, wastes, and hormones within the body**
Respiratory	nose, mouth, trachea, lungs, bronchi, bronchioles, alveoli, blood vessels, diaphragm	**gas exchange**
Nervous	brain, spinal cord, eyes, ears, nose, tongue, peripheral nerves	**response to environment; control of body activities**
Reproductive	testes, vas deferens, ovaries, uterus, fallopian tubes, glands, penis, vagina	**sexual reproduction**
Excretory	kidneys, bladder, ureter, urethra, liver	**removal of wastes**
Muscular	bones, muscles, tendons, ligaments	**movement of body and body parts**
Lymphatic	thymus, spleen, lymph nodes, lymph vessels	**protects from disease, circulates lymph fluid, absorbs and transports fats**
Endocrine	pancreas, pituitary gland, adrenal glands, ovaries, testes	**coordination and chemical regulation of body activities e.g. growth, metabolism**
Integumentary	skin, glands, hair, nails	**covers and protects body; glands help control body temperature**
Skeletal	bones, cartilage	**allows movement, protects and supports the body**

Respiratory System

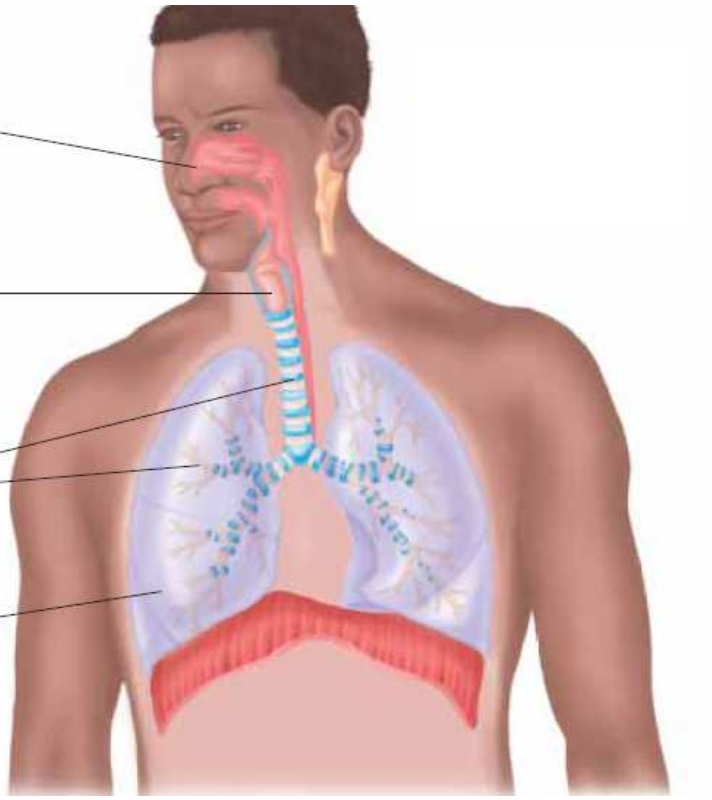
You need oxygen to live; it is used to break down food in order to produce energy to grow, move, and reproduce. Respiration is a complex chemical process that your cells use to get energy in order to live. As cells respire, they consume oxygen and produce carbon dioxide and water. The process of taking in oxygen and releasing carbon dioxide is called **gas exchange.**

Each time you breathe in, the respiratory system takes in the oxygen that your cells require to carry out cellular respiration. Your body gets rid of carbon dioxide every time you breathe out.

Inhalation: take in air through your mouth and nose. Mucus and cilia traps and eliminates dirt.

Air passes down the trachea into the bronchus to the bronchioles.

Bronchioles empty into alveoli - site of gas exchange. Oxygen in, carbon dioxide out.



Gas Exchange Takes Place in the Alveoli

Diffusion: The movement of atoms or molecules from an area of higher concentration to an area of lower concentration.

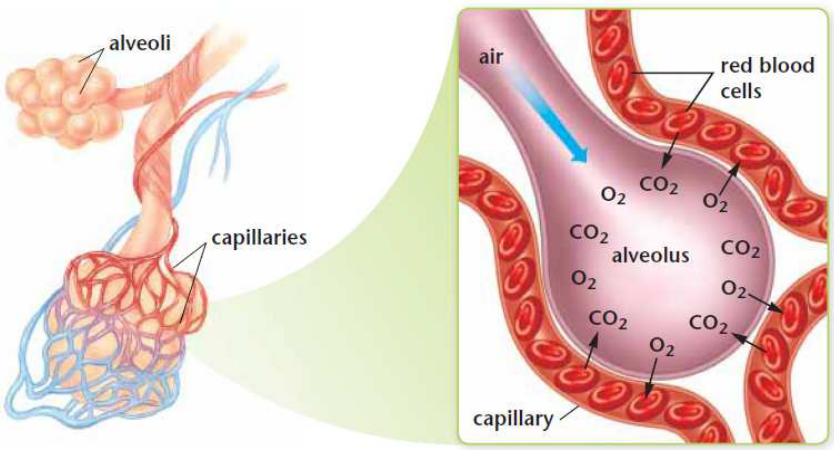
Once air reaches the lungs, the actual exchange of gases occurs between the blood and the alveoli.

Alveoli are clusters of tiny air sacs in the lungs. The wall of each alveolus is a single layer of cells. Alveoli are surrounded by a network of tiny blood vessels called capillaries.

The wall of each capillary also is a single layer of cells. The ultra-thin walls of both the alveoli and the capillaries allow the exchange of gases between the air and the blood. Once the air enters the capillaries, oxygen from the air is taken up by the **red blood cells**.

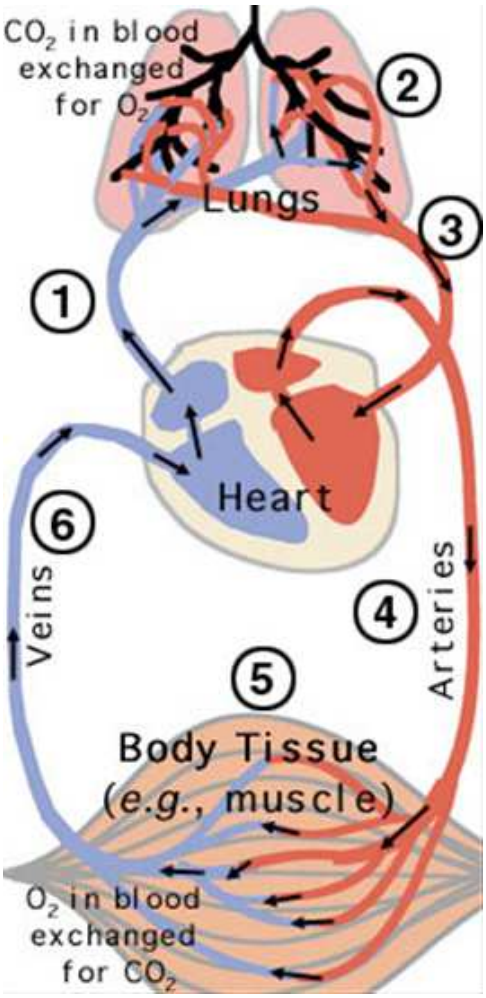
The red blood cells are responsible for transporting gases in the bloodstream.

Oxygen diffuses through the walls of the alveoli, through the capillary walls, and into the red blood cells. The blood also releases carbon dioxide into the lungs. The path that carbon dioxide follows is the reverse of the path that oxygen follows. Carbon dioxide diffuses from the blood through the capillary walls, through the walls of the alveoli, and into the alveoli. Once in the lungs, the carbon dioxide is exhaled with the next breath.



Circulatory System:

The circulatory system in the human circulates blood around the body so that it can be oxygenated (receive oxygen), and so wastes can be disposed.



This circulation then serves to bring newly oxygenated blood to the tissues of the body, and allows other chemicals to diffuse out of the blood cells and into the fluid surrounding the cells of the body's tissues. Waste products diffuse into the blood cells to be carried away. The blood then circulates through organs such as the liver and kidneys where wastes are removed, and then moves back to the lungs where carbon dioxide is exchanged for a fresh dose of oxygen. The process then repeats itself. This process of circulation is necessary for the continued life of cells, tissues, and even of the entire organism.

1. Blood rich in carbon dioxide is pumped from the heart into the lungs through the pulmonary arteries. Arteries are blood vessels carrying blood away from the heart; veins are blood vessels carrying blood to the heart.

2. In the lungs, CO_2 in the blood is exchanged for O_2.

3. The oxygen-rich blood is carried back to the heart through the pulmonary veins.

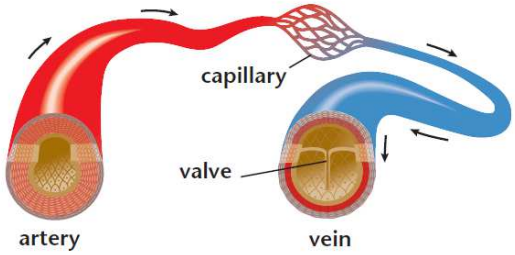
4. This oxygen-rich blood is then pumped from the heart to the many tissues and organs of the body, through the systemic arteries. In the tissues, the arteries narrow to tiny capillaries. Here, O_2 in the blood is exchanged for CO_2.

5. The capillaries widen into the systemic veins, which carry the carbon dioxide-rich blood back to the heart.

Blood Vessels: The Branches of the Circulatory System

As blood vessels move toward the cells (arteries), they branch out and grow smaller and smaller. This allows them to bring blood to all the cells in the body. As they move away from the cells (veins), they combine and grow larger again.

Capillaries: The capillaries are the smallest blood vessels. All the work of the circulatory system related to gas exchange takes place in the capillaries. They are one-cell thick. Oxygen and nutrients, plus carbon dioxide and other wastes, diffuse easily through the thin capillary walls.



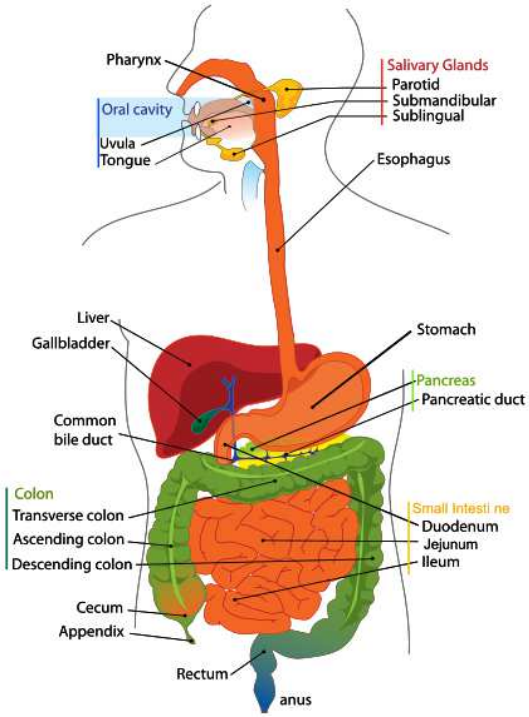
Arteries: Arteries are thick-walled, elastic blood vessels that carry blood away from the heart. The arteries get narrower the farther they are from the heart.

Veins: Veins are thin-walled, inelastic blood vessels. They have valves that keep blood from backing up as it is carried toward the heart.

Processes Carried Out by the Digestive System

The digestive system completes the following four tasks in the body:

• Ingestion: Food is taken into the body.
• Digestion: Food is broken down into nutrients physically (through dissolving and breaking it into smaller bits) and chemically (through chemical reactions).
• Absorption: During absorption, nutrients diffuse or are moved into the blood. Energy from these nutrients is made available to cells through cellular respiration.
• Elimination: Solid waste passes from the digestive system out of the body.



Digestion System

Digestion begins in the mouth where food is chewed and swallowed.

During this mechanical breakdown of food, enzymes are released from the **salivary glands** that speed up the chemical **breakdown** of **starch and other sugars** into simpler components.

After food is swallowed it travels down the esophagus to the stomach by **peristalsis (wave like contractions)**.

The stomach has three functions.
It stores the swallowed food/liquid, it mixes up the food and digestive juices for further breakdown, and finally it empties the contents into the small intestine.

In the stomach the acidic juices kill bacteria in the food and further breakdown of the food occurs. Damage to the stomach wall by acidic gastric juice is prevented by mucus lining the stomach walls.

The **liver produces bile**. This **bile juice dissolves fat** into the watery contents of the intestine, similar to the breakdown of grease in a frying pan with soapy water. After fat is dissolved, it is digested by enzymes from the pancreas and the lining of the intestine.

Once inside the intestines, organs like the pancreas produce juice that contains a wide array of enzymes to break down the carbohydrates, fats, and proteins in food. Other enzymes that are active in the process come from glands in the wall of the intestine.

Finally, the digested **nutrients are absorbed through the intestinal walls by specialized cells called villi** that allow absorbed materials to cross into the blood, where they are carried off in the bloodstream and transported by capillaries throughout the body.

This is where the two organ systems connect. The digestive system breakdowns the food we eat and the circulatory system transports these tiny nutrient packages produced by the digestive system to trillions of hungry cells in the human body.

The waste products of this process include undigested parts of the food, known as fibre, and older cells that have been shed from the mucosa. These materials are pushed into the **colon, where water and some nutrients are reabsorbed.** Feces are stored in the rectum and eliminated through the anus by a bowel movement.