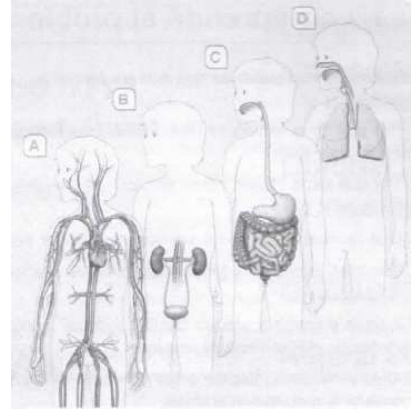


Nutrition

Nutrition helps us obtain **energy** and useful **materials** for our body. Nutrition involves four systems: digestive, respiratory, circulatory and excretory. All these systems must work together in a coordinate way.



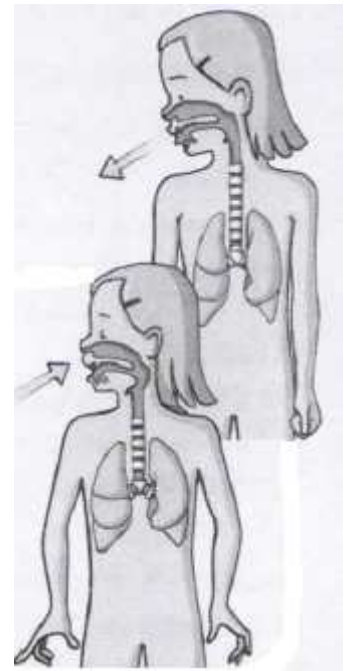
Nutrition step by step

The function of nutrition involves some systems from our body. Look at the following pictures to help understand the whole process.



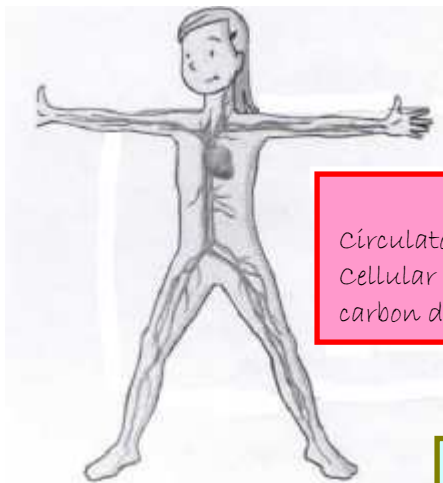
Digestive process

Sara eats an apple and the digestive system starts the digestive process. From the apple Sara obtains some nutrients and those nutrients go to the blood



Respiration

Sara continuously breathes. Oxygen (O_2) from air goes into the respiratory system and then into blood. The respiratory system also expels Carbon dioxide (CO_2) from cells.

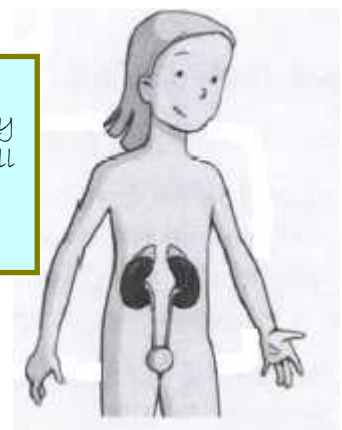


Circulation

Circulatory system transports nutrients and oxygen (O_2) to all the body parts. Cellular respiration takes place within the cell. It produces waste products such as carbon dioxide (CO_2)

Excretion

When blood goes through the excretory system, waste products are filtered and will be eliminated through the urine

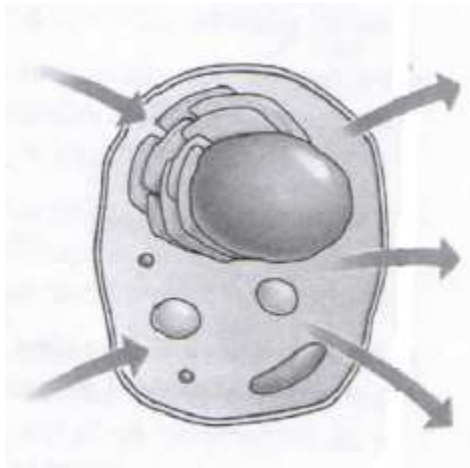


Digestive System

To work correctly, our body needs:

- **Energy:** we use it to do our daily activities such as eating, studying, doing sport...
- **Materials:** they are useful to make us grow and replace those parts of our body that are not necessary any more, such as our skin.

Nutrition consists of those processes through which we obtain energy and useful materials to work correctly.



We obtain energy and nutrients from food. Food contains a lot of nutrients. **Cellular respiration** is the responsible to obtain energy from nutrients. Cells make chemical reactions to obtain nutrients from food. After chemical reactions, cells produce some waste products, such as Carbon Dioxide (CO_2) that have to be excreted.

Nutrients

We classify nutrients into:

- **Carbohydrates:** We need carbohydrates to get energy quickly. We obtain carbohydrates from bread, pasta, cereals, legumes, potatoes...
- **Fats:** We need fats to get energy but slower than carbohydrates. We obtain fats from butter, oil, cakes...
- **Proteins:** We need proteins to grow and repair the body. We obtain proteins from legumes, meat, fish, eggs, milk...
- **Vitamins:** We need vitamins to work correctly. We obtain vitamins from fruit and vegetables.
- **Water and minerals:** We get water by drinking it and from food. We obtain some minerals such as salt or calcium from water, fruit, vegetables...



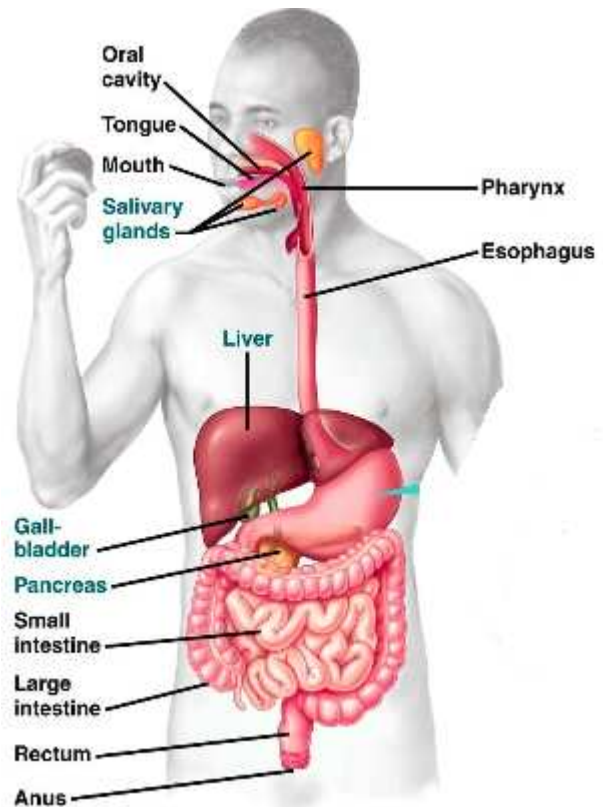
The process of digestion and organs

- Process

Digestion is a process through which we obtain nutrients from food. Many organs work together to make digestion possible. Digestion starts in the **mouth** where **teeth** cut, tear and grind food. **Salivary glands** expel saliva and our **tongue** mixes them. This mixture is called **bolus**. We swallow the bolus into the **pharynx**, goes down through the **oesophagus** and finally to the **stomach**.

The stomach expels gastric acids to decompose the bolus. After that, all the bolus is a liquid called **chyme**. Chyme goes into the **small intestine** and the **liver** expels bile from the gallbladder and the **pancreas** expels pancreatic juices to help us obtain nutrients.

Now, chyme becomes **chyle**. Nutrients are absorbed in the **small intestine** and goes to the blood. The rest goes into the **large intestine** where we absorb water. All the body does not need is expelled through the **anus**.



FOOD → BOLUS → CHYME → CHYLE → SOLID WASTE PRODUCTS

- Organs and functions

Organs	Functions
1.- Teeth	cut, tear and grind food
2.- Tongue	mixes the food with saliva
3.- Salivary glands	produce saliva to lubricate food
4.- Pharynx	swallows the bolus
5.- Oesophagus	swallows the bolus
6.- Stomach	decomposed the bolus and produces gastric juices
7.- Liver	produces bile
8.- Pancreas	produces pancreatic juices
9.- Small intestine	absorb nutrients
10.- Large intestine	absorb nutrients and water
11.- Anus	expels solid waste product

Respiratory System

Without energy we cannot live and our cells need oxygen (O_2) to obtain it. Oxygen comes from the air we breathe.

Respiration is the process to obtain oxygen from the air

Respiration takes place in the respiratory system, which consists of the respiratory airways and the lungs.

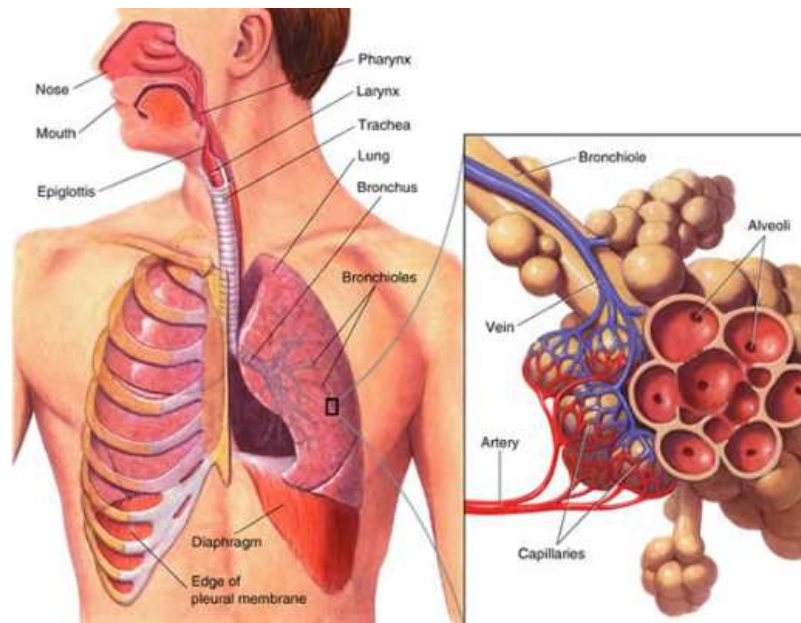
1.- Respiratory airways consist of **mouth**, **nostrils**, **pharynx**, **larynx**, **trachea**, **bronchi**, and **bronchioles**.

Air enters into the body through the **mouth** or **nostrils** and then goes into the **pharynx**, **larynx** and **trachea**. The trachea is divided into two **bronchi** and each one enters in the **lungs**. Within the lungs, bronchi are also divided into **bronchioles**, which are even smaller and thinner.

Language tip!!

- Foreign plural
trachea → tracheae
bronchus → bronchi
alveolus → alveoli

2.- Lungs are two organs located in the **thorax**. The left lung is smaller because we need enough space for the heart. Each lung is divided into **lobes**. The inner part of lungs is composed by lots of bronchioles and there is an **alveolus** in the end of each bronchiole. **Alveoli** are tiny bags covered by blood capillaries. The exchange of gases is produced in the alveoli.



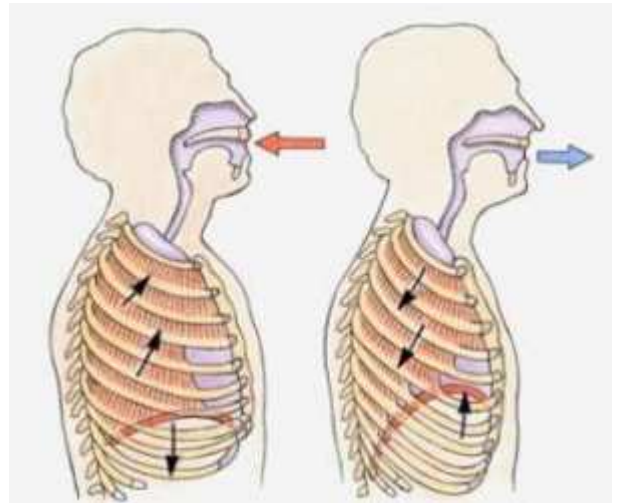
Respiratory movements

To breathe is necessary that air goes in and out the lungs. This is thanks to the respiratory movements: **inhalation** and **exhalation**.

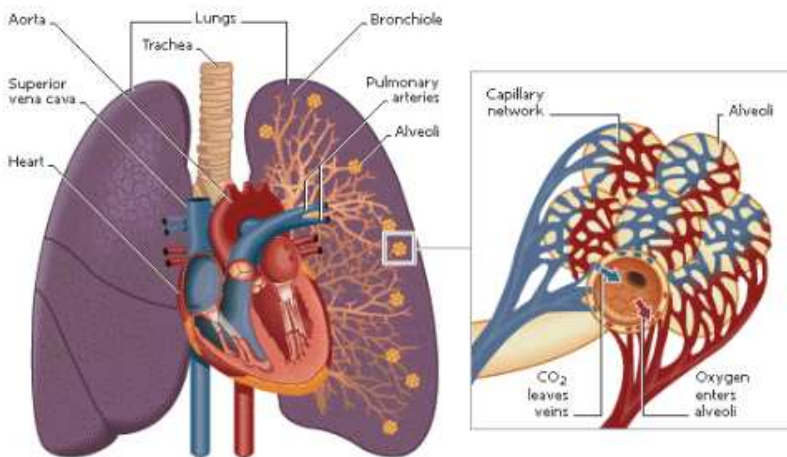
a. **Inhalation** is the process through which air enters into the lungs

b. **Exhalation** is process through which air goes out from the lungs.

During inhalation and exhalation some muscles work to make possible. They are the **diaphragm**, the **intercostal** and **abdominal** muscles.

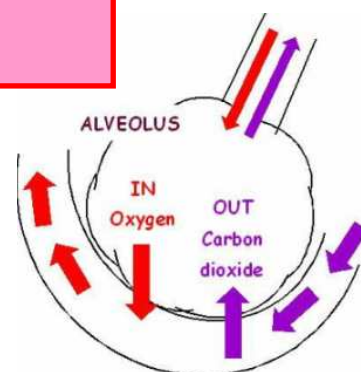


The exchange of gases



In each **inhalation**, air goes into the respiratory airways until it reaches alveoli. Within alveoli, the exchange of gases takes place. **Oxygen** (O_2) from the air goes into the blood and **carbon dioxide** (CO_2) from the blood is expelled with the **exhalation**. After this process, blood exchanges **carbon dioxide** (CO_2) by **oxygen** (O_2) and **oxygen** (O_2) can be delivered to all the parts of the body.

- . **Inhalation**: getting Oxygen (O_2)
- **Exhalation**: expelling Carbon Dioxide (CO_2)



Circulatory System

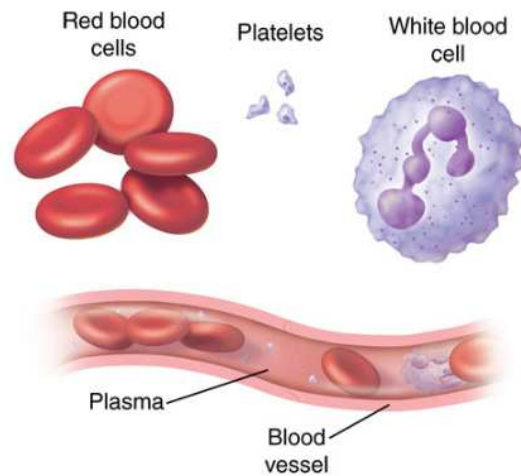
The **circulatory system** is responsible for the transport of nutrients, gases (oxygen and carbon dioxide) and waste products to all the parts of our body.

Circulatory system consists of the blood, blood vessels and the heart

Blood

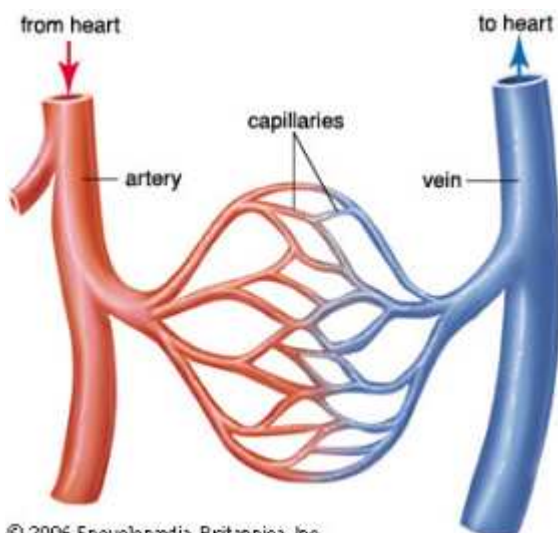
An adult human body has got around 5 litres of blood circulating around our body thanks to the heart. Blood is composed of:

- **Plasma** which it is a liquid composed mainly of water. Within plasma, we can find nutrients, waste products and gases (oxygen and carbon dioxide).
- **Blood cells** that are classified in to:
 - o **Red blood cells:** they give a red colour to blood because of haemoglobin. They transport gases.
 - o **White blood cells:** they are cells that help our body be safe against infections.
 - o **Platelets:** they are fragments of cells that help close a wound when bleeding.



Blood vessels

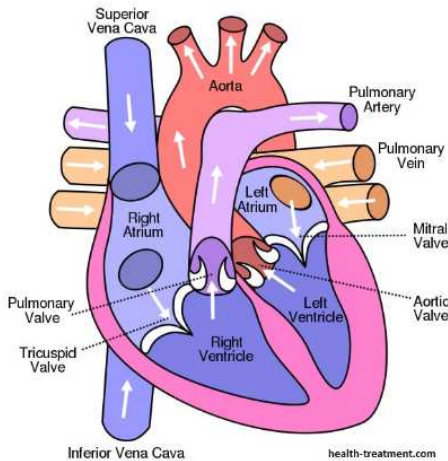
Blood vessels are those conducts through which blood circulates. They are classified into three different types:



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- **Arteries:** they carry blood from the heart to the rest of the body
- **Veins:** they carry blood from the body to the heart
- **Capillaries:** they carry blood to the inner parts of organs. Arteries and veins become thinner until they form capillaries

The Heart



The **heart** is a hollow muscled organ that pumps blood to all the parts of the body. It is located in the thorax, between the lungs. The heart is divided into four chambers. The upper part is called **atrium** and the lower part is called **ventricle**. We have two **atria** (right and left) and two **ventricles** (right and left) separated by **valves**.

Language tip!

- Foreign plural
atrium → atria

Atria receive blood from **veins**
Ventricles receive blood from **arteries**

The heart beats continuously, pumping blood. It has got two movements, a contraction and a relaxation movement. When the heart contracts the movement is called **systemole** and when the heart relaxes the movement is called **diastole**.

Circulation can be classified into:

- Pulmonary circulation
- Systemic circulation



a. Pulmonary circulation

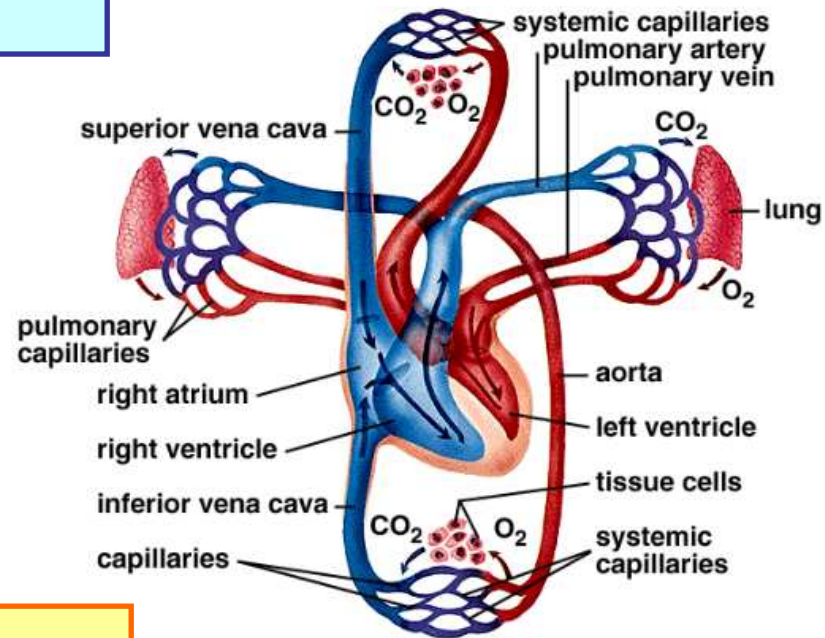
Pulmonary circulation is the circuit that blood follows from the heart and the lungs. During this circulation, we do the gases exchange in the lungs. Blood expels carbon dioxide and absorbs oxygen.

b. Systemic circulation

Systemic circulation is the circuit that blood follows through all the parts of the body except from the lungs. During this circulation, blood carries oxygen to all the cells and takes from them carbon dioxide and waste products.

PULMONARY CIRCULATION

1. Blood with carbon dioxide (CO_2) from all the parts of the body arrives at the right atrium from the cava vein



2. Blood goes from the right atrium to the right ventricle and get out of the heart from the pulmonary arteries to the lungs

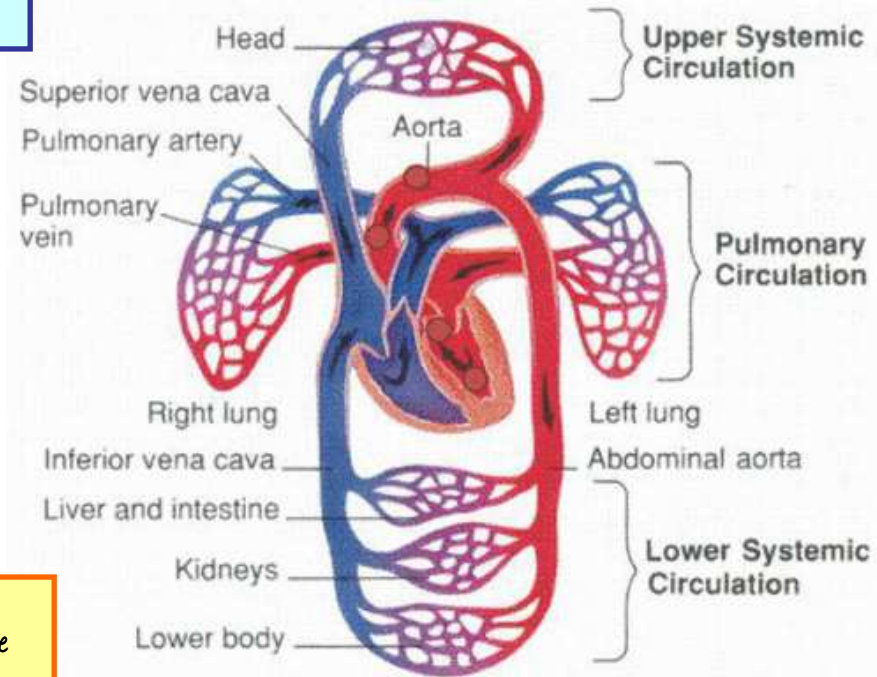
3. The exchange of gases is produced in the alveoli. That way, blood gives carbon dioxide (CO_2) and takes oxygen (O_2)

4. Blood with oxygen (O_2) returns to the heart from the pulmonary veins and reaches the left atrium. Later, it goes to the left ventricle and get out the heart from the aorta

SYSTEMIC CIRCULATION

1. The left ventricle contracts and pumps blood with oxygen (O_2) out of the heart through Aorta artery

3. In the capillaries, blood gives oxygen (O_2) and nutrients and takes carbon dioxide (CO_2) and waste products from the cells



2. From the Aorta, blood is delivered to the rest of the body becoming thinner and reached capillaries inside the organs

4. Veins collect blood and they return to the heart through the Cava veins to start pulmonary circulation and expel carbon dioxide (CO_2) and take oxygen (O_2) again.

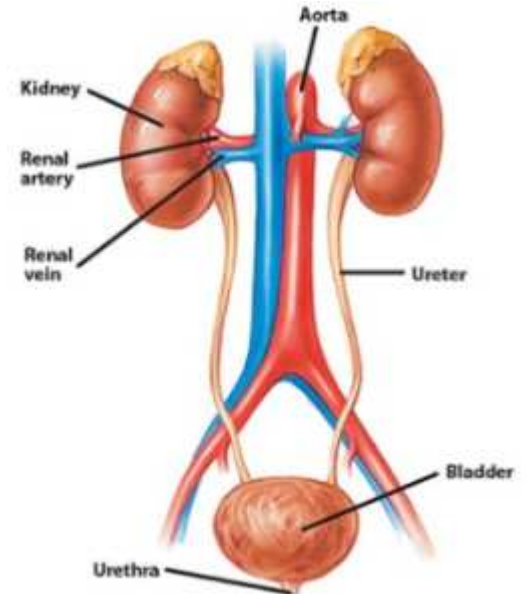
Excretory System

Our cells produce waste products and they go to blood. These substances are toxic and our body needs to eliminate them. The **excretory system** is the responsible for this task.

Excretion is produced by the **excretory system**, in the **sweat glands** and in the **lungs**.

The organs of the excretory system are:

Organs	Functions
1.- Kidneys	filter blood
2.- Ureters	Connect kidneys to the bladder
3.- Bladder	contains urine
4.- Urethra	allows urine to be eliminated



Excretory System

The **excretory system** consists of the kidneys, the ureters, bladder and urethra.

- The **kidneys** are the main organs of the excretory system. They are located in the back part of the abdomen. Their function is to filter blood and form **urine**, composed of the rest of water the body does not need and waste product such as salt, hormones and harmful substances.
- **ureters** are two conducts that connect kidneys to the bladder.
- **Bladder** is the organ where urine is accumulated until it is eliminated. It is like an elastic bag.
- **urethra** is the tube through which urine is eliminated.

Sweat Glands

Sweat glands produce **sweat**, a transparent liquid composed mainly of water. However, it also contains other substances such as salt and waste products. Sweat glands are located around all the body in our skin. Each gland contains a long tangled tube forming a balloon. It is connected to the outer part of the body by a **pore**, through which sweat goes out.

