

UNIT 3. DIGESTIVE AND RESPIRATORY SYSTEMS

1. NUTRITION

The process of **nutrition** allows living organisms to obtain the matter and energy they need for making their own matter and for carrying out their vital functions. In human beings, it means that a series of **substances enter** the organism (**air, water, food**), and **others are expelled** (**air, urine, faeces**).

1.2 The systems involved in nutrition

The process of nutrition is carried out by **four** organ systems in our body:

- the digestive system**
- the respiratory system**
- the circulatory system**
- the excretory system**

All of them are controlled by the **nervous system**.

* **Digestive system:** Involved in the processing of foods in order to obtain water, proteins, fats and sugars.

* **Respiratory system:** Involved in the exchange of gases in the alveoli, where the blood takes oxygen and releases carbon dioxide.

* **Circulatory system:** This circulates the blood throughout the body. Food substances, water and oxygen are transported from the digestive system to the cells. Carbon dioxide and waste substances produced by the cells are collected and expelled.

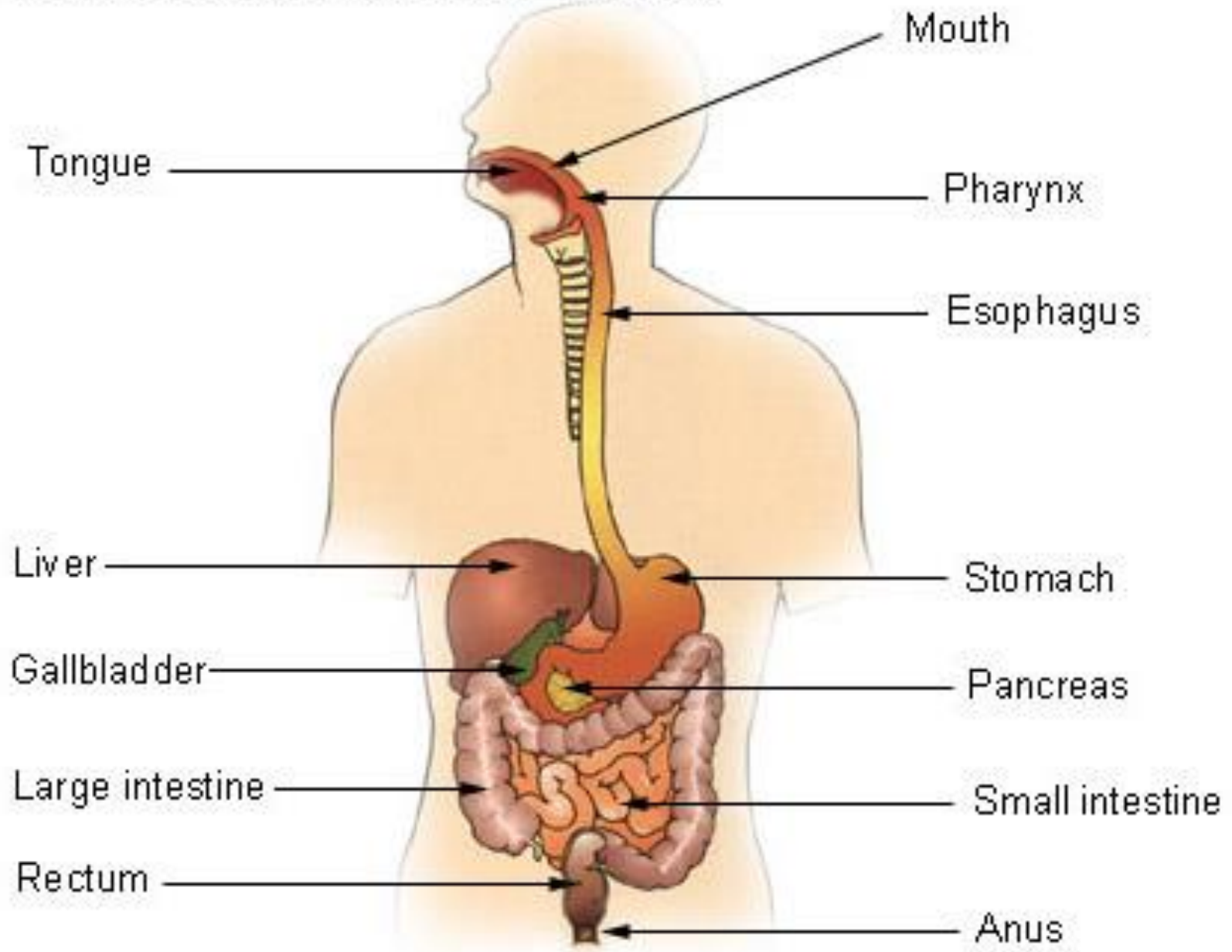
* **Excretory system:** Eliminates waste substances transported in the blood.

2.1 THE DIGESTIVE SYSTEM: the digestive tube

Transforms food into simpler substances, that are transported by blood to the cells and expels waste substances.

It is made up of **DIGESTIVE TUBE AND ASSOCIATED GLANDS**

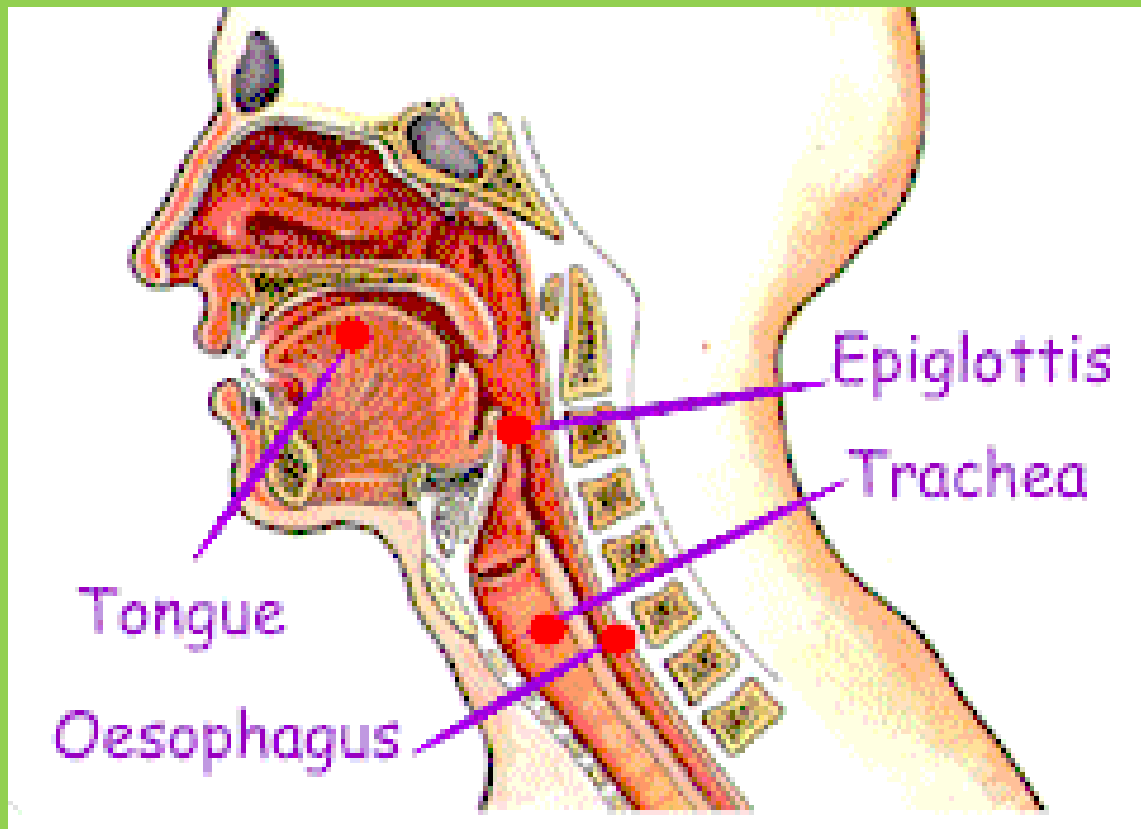
Organs of the Digestive System



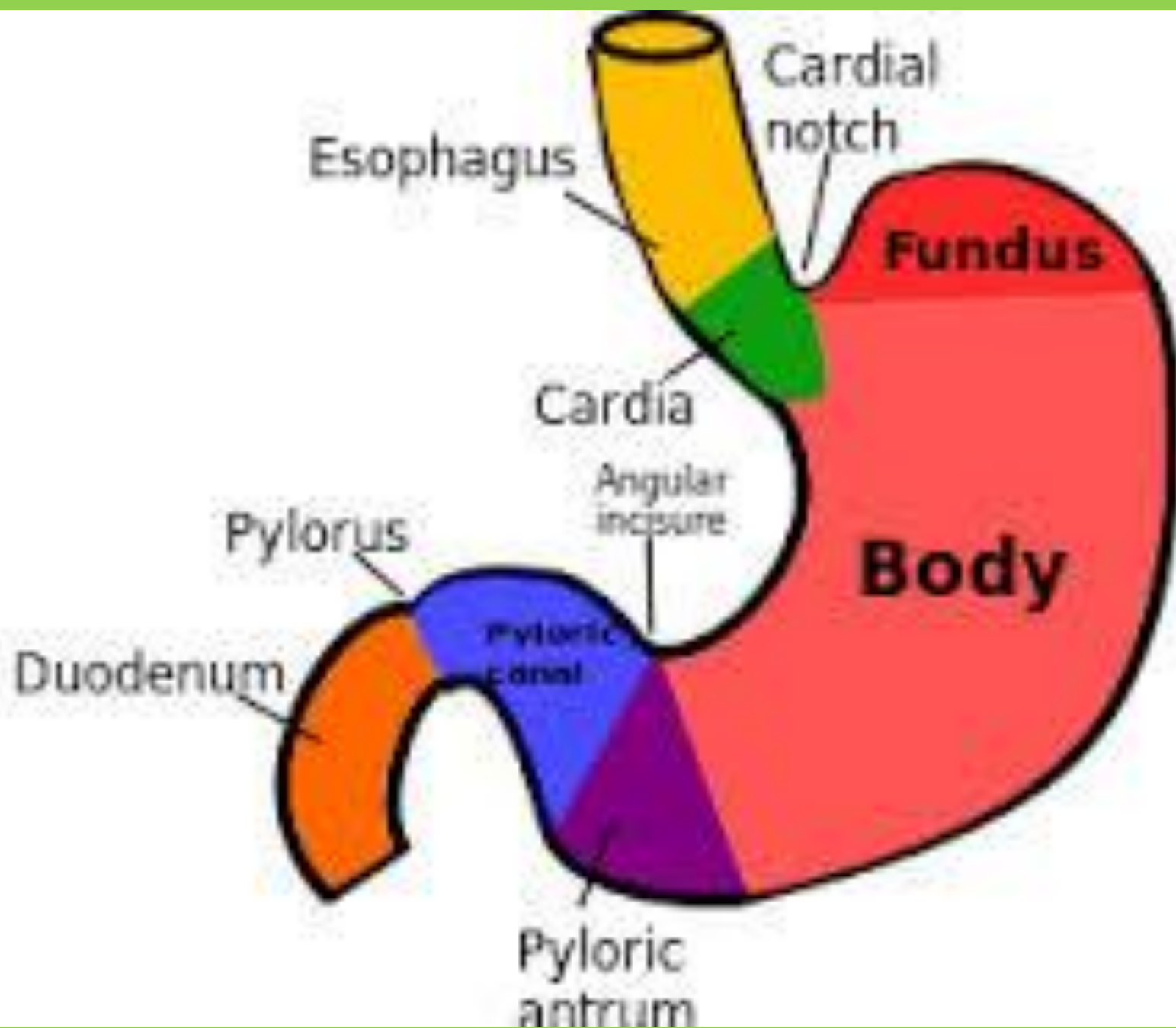
2.1 The anatomy of digestive system

- **Mouth:** the first part of the digestive system, where food enters the body. Chewing and salivary enzymes in the mouth are the beginning of the digestive process (breaking down the food).
- **Pharynx:** the common channel for deglutition and respiration, and the food and air pathways cross each other in the pharynx.

The **epiglottis** is one of nine cartilaginous structures that make up the larynx (voice box). When we are eating it closes to keep food from going into your lungs!!!).



- **Oesophagus:** the long tube between the mouth and the stomach. It uses rhythmic muscle movements (called **peristaltic movement**) to force food from the throat into the stomach.
- **Estomach:** muscular organ located between the oesophagus and the small intestine. It secretes strong acids that mix with food. The estomach communicates with the esophagus through the **cardia** and with the small intestine through the **pylorus**.



* **Small intestine:** tubular structure where much of the digestion and absorption of food takes place. It secretes **intestinal juices** that mix with **bile** produced by the liver and with **pancreatic juice** from the pancreas. Once broken down, the nutrients are absorbed by the inner walls of the small intestine into the blood stream. The internal walls are filled with **intestinal hairs with many blood vessels.**

- * **Large intestine:** Is a thicker tube.
- **Anus:** the opening at the end of the digestive system from which faeces (waste) exits the body.

2.1 THE DIGESTIVE SYSTEM: the associated glands

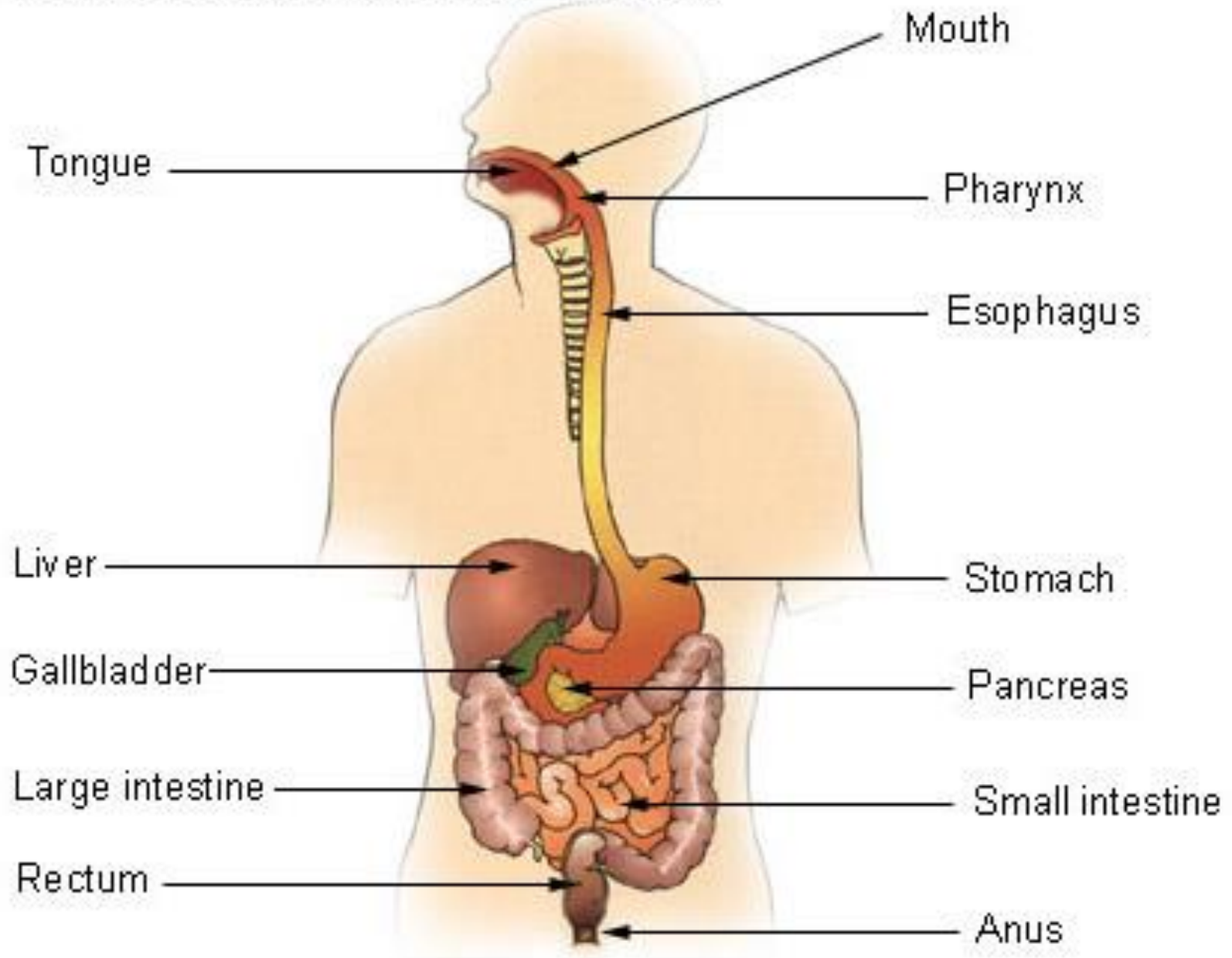
There are three accessory glands of the digestive system: the **salivary glands**, the **pancreas** and the **liver**.

(1) THE SALIVARY GLANDS: They are six **exocrine** glands that flow **saliva** into the mouth.

(2) THE PANCREAS: Is both an **endocrine** gland (producing several important hormones, including insulin and glucagon), as well as an **exocrine** gland, secreting **pancreatic juice** that pass to the small intestine.

(3) THE LIVER: Is the largest organ in the human body. It plays a major role in metabolism and has a number of functions in the body (glycogen storage, decomposition of red blood cells, plasma protein synthesis, and detoxification). It **produces bile**, an alkaline compound which aids in digestion, via the emulsification of lipids. The bile is stored in the **gallbladder**.

Organs of the Digestive System



2.2 THE DIGESTIVE PROCESS

There are three phases in food processing: **digestion, absorption, and the expulsion of waste.**

(1) DIGESTION

According to the changes in the food, digestion can be **mechanical** or **chemical**.

- **MECHANICAL DIGESTION**: Consists of several processes which aid in reducing the size of food particles and in moving them through the digestive system.

We distinguish **three stages: mastication, salivation and swallowing.**

- **Mastication** cuts and crushes the food. It is carried out by teeth and the lower jaw.
- **Food is mixed with saliva** thanks to the movements of the tongue.

BOLUS is then produced

- **Swallowing:** the bolus passes through the pharynx and the oesophagus to the stomach with the help of the peristaltic movements.

* **CHEMICAL DIGESTION**: Is done through the action of various substances which attack the foods and bring about **chemical changes** in them, breaking them down into smaller substances. It occurs in different parts of the digestive tract.

- **In the mouth:** Saliva contains substances which act chemically on the foods and glucids are broken down into smaller substances (look at page 53 spanish book).
- **In the estomach:** The foods reach the estomach where **gastric digestion** begins. The foods move and are softened thanks o the movement of the walls of the stomach and they are mixed with **gastric juices**. As a result, **CHYME** is produced.

- **In the small intestine:** There, chyme is mixed with **intestinal juices**, with **bile** (produced by the liver) and with **pancreatic juices** (from the pancreas). The result is a fluid known as **CHYLE**, which contains water, from digestion and other non-digested products.

(2) ABSORPTION: Consists of the useful substances in the food crossing through the intestinal walls (which are filled with intestinal hairs and many blood vessels) and into the blood vessels. The blood takes the substances to all the cells in the body.

(2) ELIMINATION OF WASTE: The remains of the chyle which cannot be used pass into the large intestine. There, water is absorbed and the non-digested products become into **faeces**, which pass on to the rectum ready to be expelled via the anus.

3. THE RESPIRATORY SYSTEM

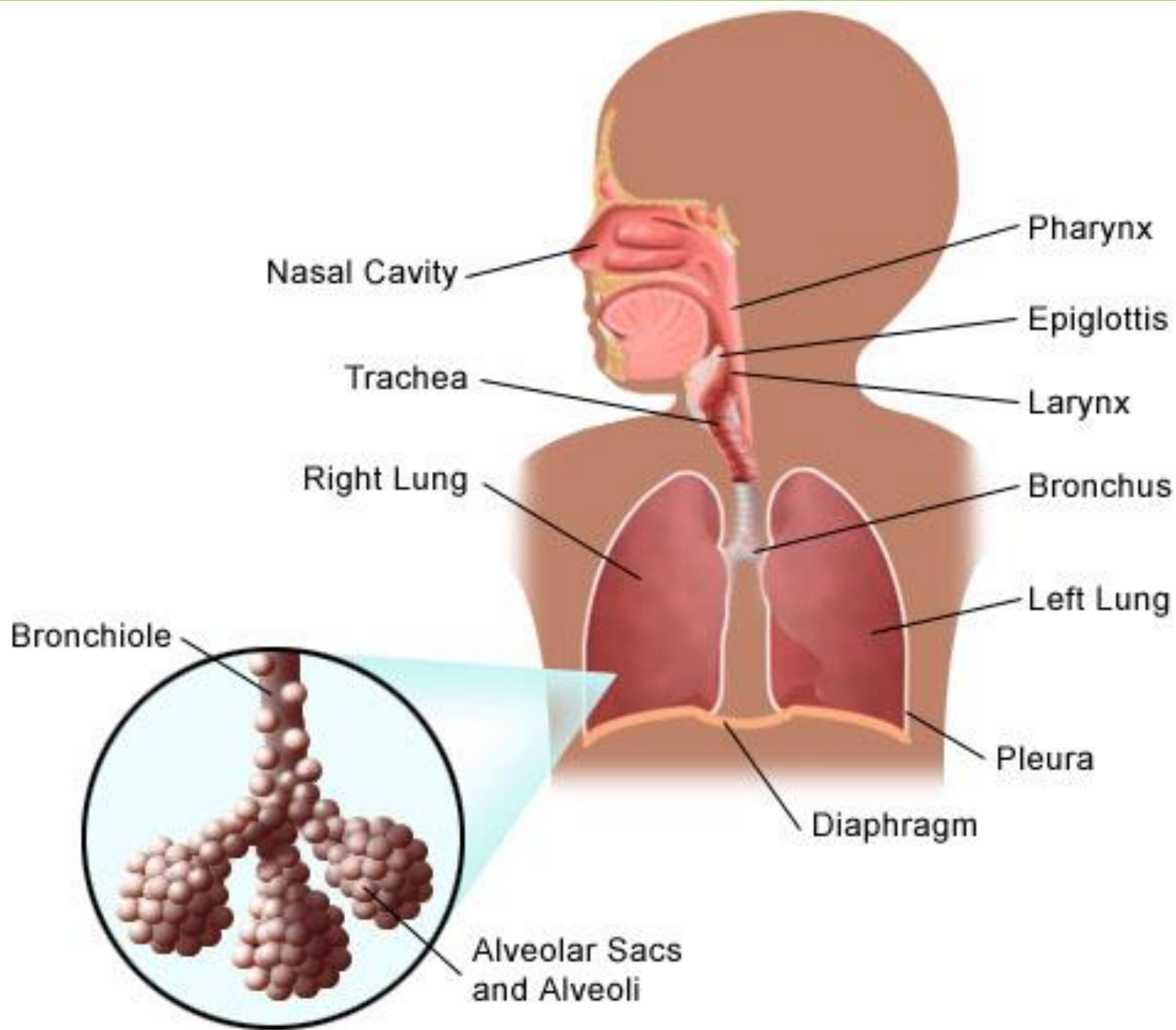
FUNCTION: 1) Takes air from the exterior to capture the oxygen, 2) passes the oxygen to the blood, 3) recover the carbon dioxide from cells, 4) expels air rich in carbon dioxide to the exterior.

The **circulatory system** carries the oxygen to all the cells and collects the carbon dioxide from cells.

Both systems work together under the control of the **nervous system**.

3. 1 THE ANATOMY OF THE RESPIRATORY SYSTEM

There are two parts: **the respiratory tract and the lungs.**



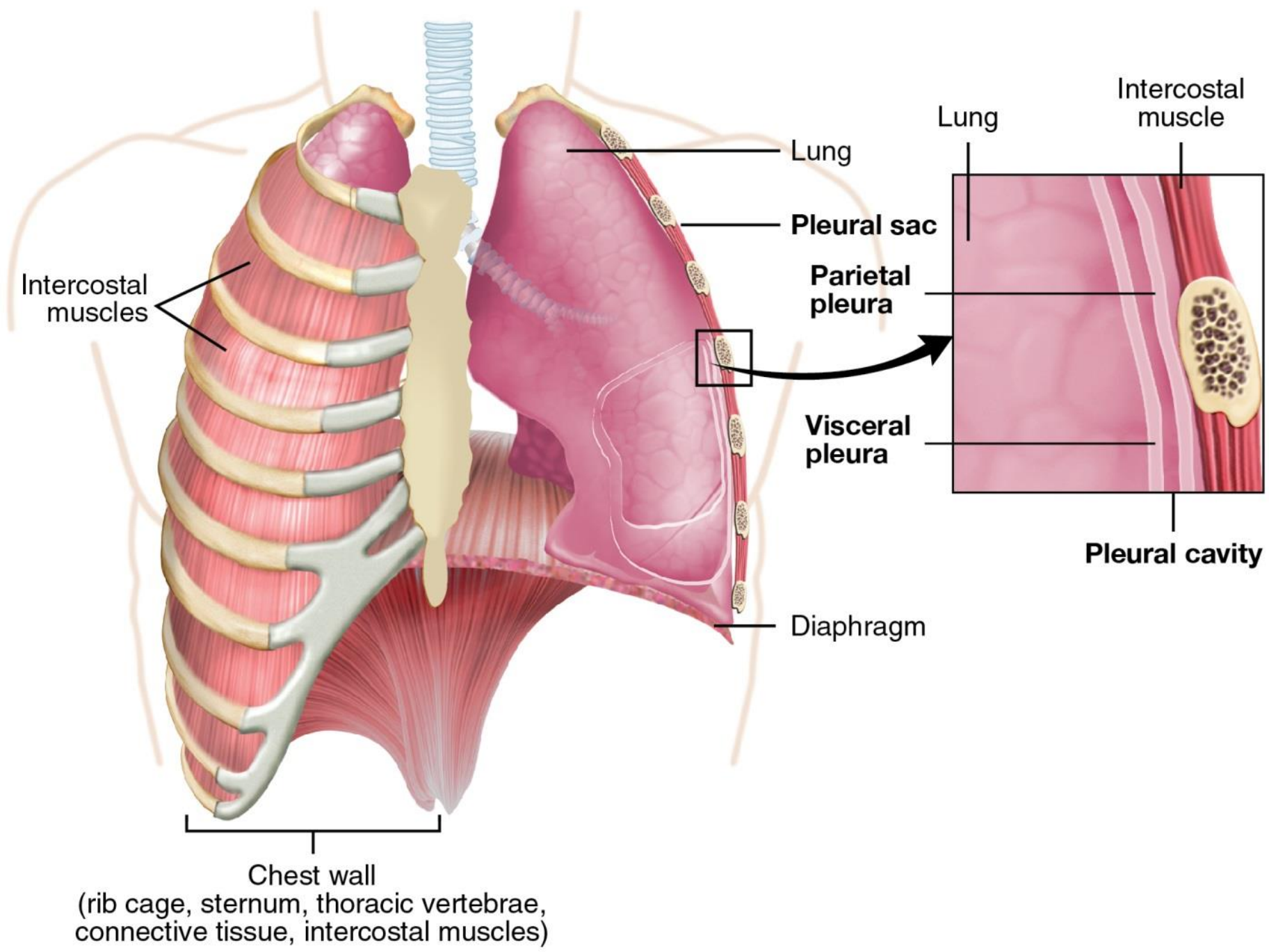
(1) RESPIRATORY TRACT: Carry the air from the exterior to the lungs and viceversa (carry the air from the cells to the lungs). The respiratory tract is made up of: **the nasal cavity, the pharynx, the larynx, the tracheal cartilage, bronchus (two) and bronchioles.**

The bronchioles are connected to the **alveoli**, which are small sacks in contact with numerous blood vessels.

(2) THE LUNGS: The lungs are two small spongy organs (have no muscles) located in your **chest**. The lung on the left side of your body is a bit smaller than the lung on the right. This extra space on the left leaves room for your heart.

The lungs are protected by the **rib cage**. Beneath the lungs is the **diaphragm** a dome-shaped muscle that works with the lungs to allow you to inhale (breathe in) and exhale (breathe out) air.

The **pleura** are double-layered membranes that surround each lung. Between the two layers is the **pleural cavity**, which creates a hollow space for the lungs to expand into during inhalation. Serous fluid secreted by the pleural membranes lubricates the inside of the pleural cavity to prevent irritation to the lungs during breathing.

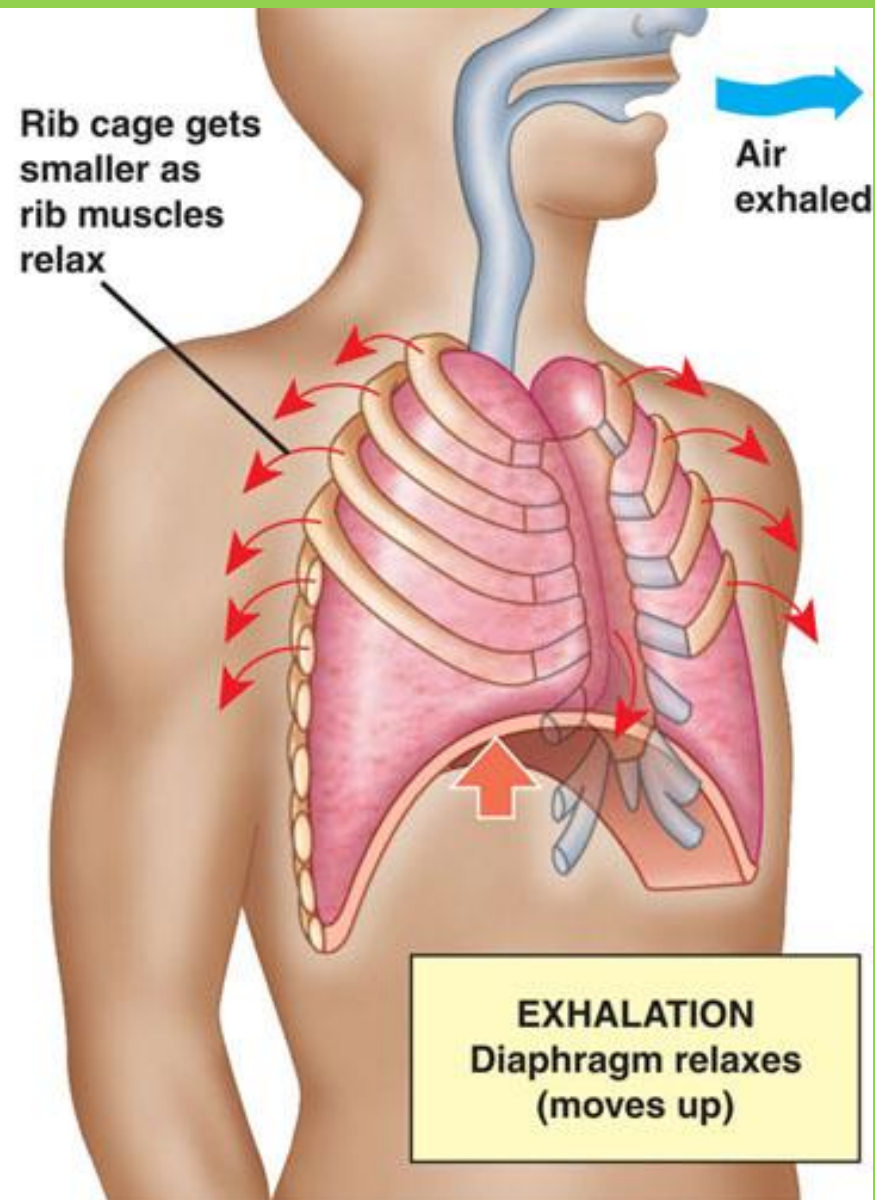
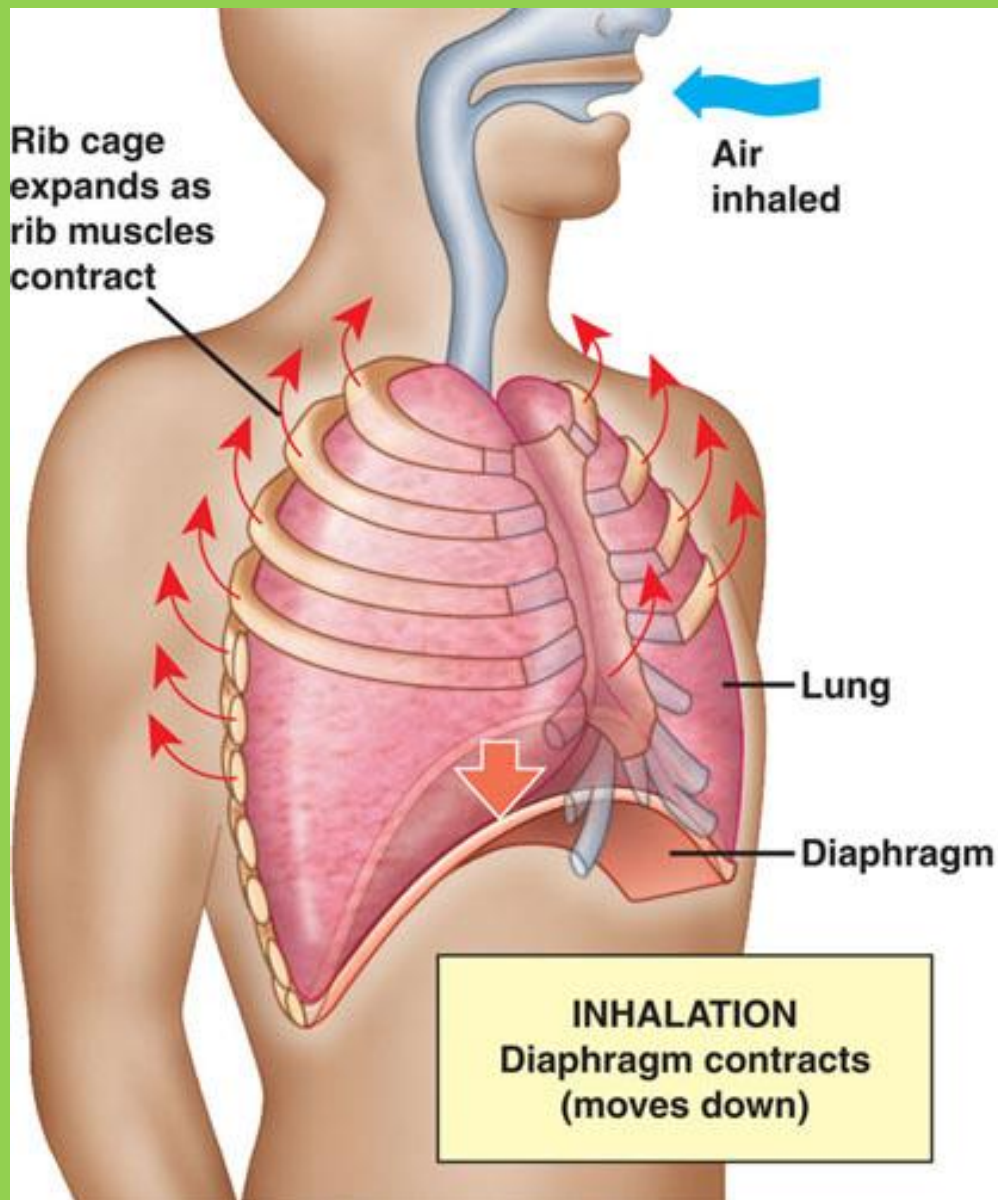




EDSCIENCE.COM

3. 2 HOW DO WE BREATHE?

1. **INHALATION**: Air enters the lungs. **The lungs swell and the diaphragm contracts and descends. Ribs lift.**
2. **EXHALATION**: Air leaves the lungs. **The lungs relax (reduce volume) and the diaphragm relaxes. Ribs are pulled back.**



EXCHANGING GASES: The exchange of gases between the air and the blood **occurs in the alveoli**. The blood that reaches the alveoli through the veins is full of carbon dioxide. There, the blood releases the carbon dioxide (which passes to the air), and takes oxygen (which reaches the rest of the body).

