SNS COLLEGE OF TECHNOLOGY
(AN AUTONOMOUS INSTITUTION)
Approved by AICTE & Affiliated to Anna University
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Recognized by UGC saravanampatti (post), Coimbatore-641035.

Department of Biomedical Engineering

Course Name: 19GET277 – Biology for Engineers

IV Year : VII Semester

UNIT II – Biodiversity

Topic : Digestive and Respiratory System

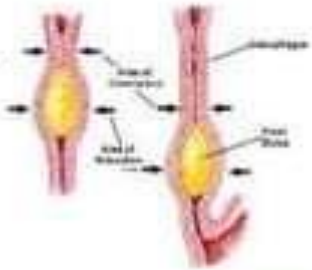
Instructions:

1. *Write down the following definitions on your notebook*
2. *Listen to the word.*
3. *Match it with the corresponding definition.*

Enzyme that starts protein digestion in the stomach. ***pepsin***

Initial section of the small intestine. ***duodenum***

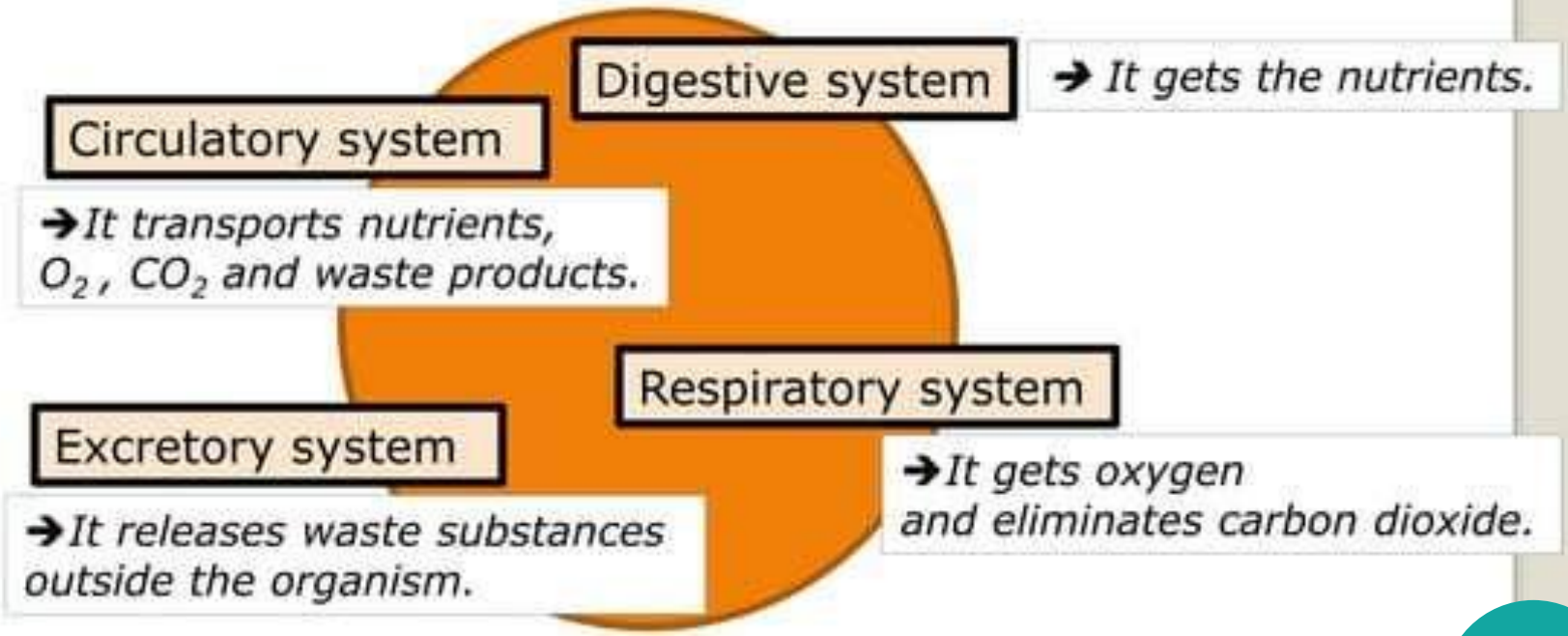
Movement produced by the contraction of the muscles found in the digestive tract. ***peristaltic movements***



Tooth used to tear. ***canine***

Bag-like organ which stores bile. ***gallbladder***

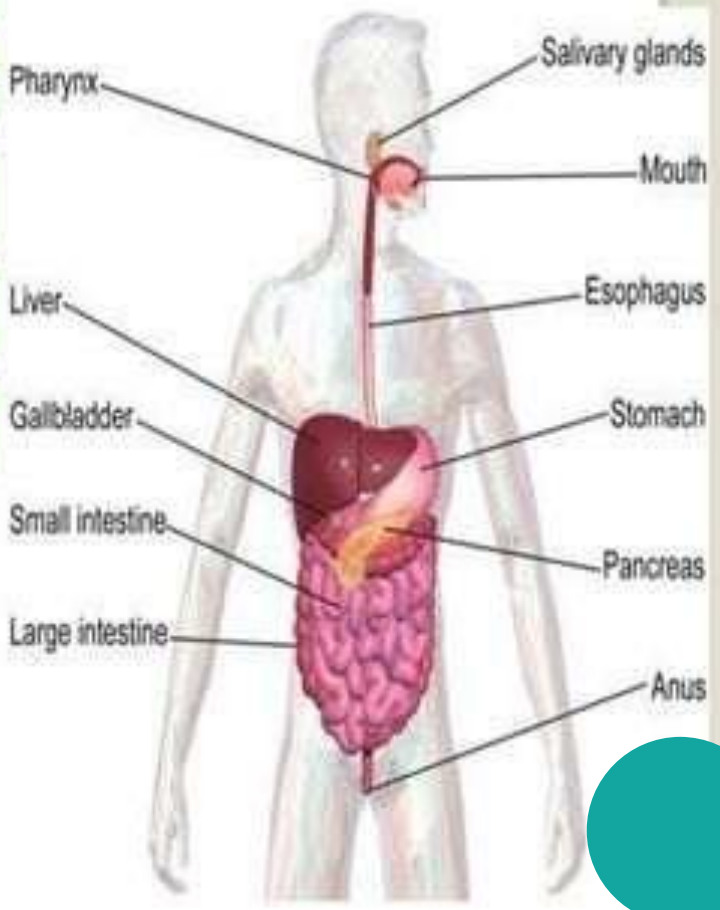
1. Systems involved in nutrition



2. Digestive System

Parts of the digestive system

- Gastrointestinal tract
  - Mouth
  - Pharynx
  - Esophagus
  - Stomach
  - Small intestine
  - Large intestine
- Accessory glands
  - Salivary glands
  - Liver
  - Pancreas



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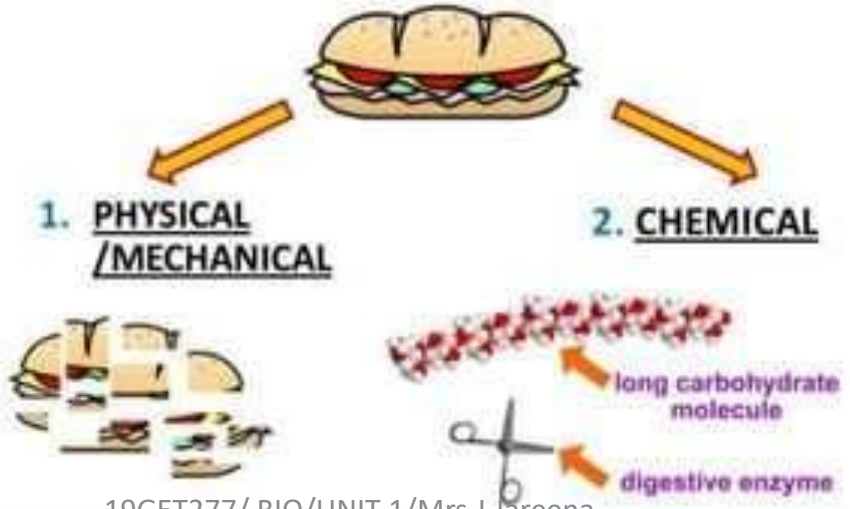
3. Digestion

It is the process by which foods are transformed into nutrients.

Types of processes

- **Mechanical processes**
  - Chewing
  - Muscular contractions
- **Chemical processes**
  - Performed by digestive enzymes found in digestive juices

Food is broken down by two actions:

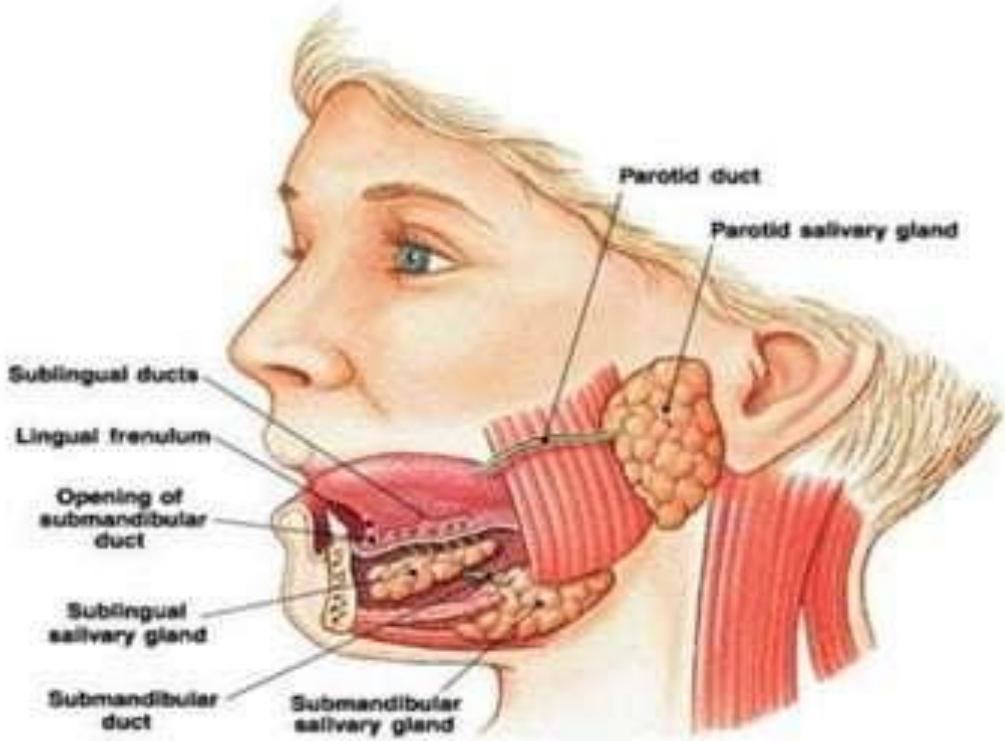


3.1 The digestive process in the mouth

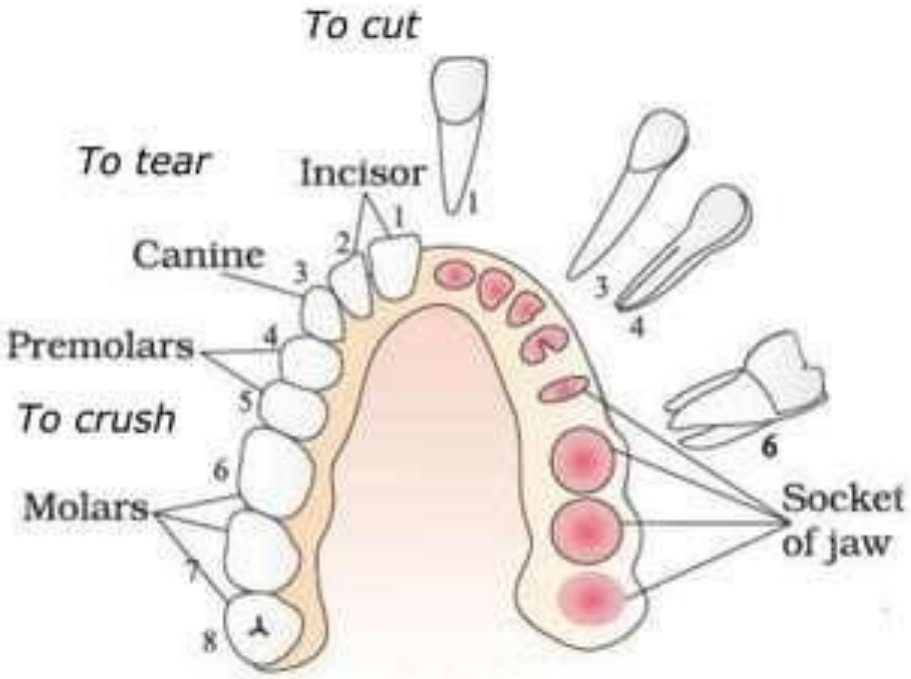
3.1.1 Salivation

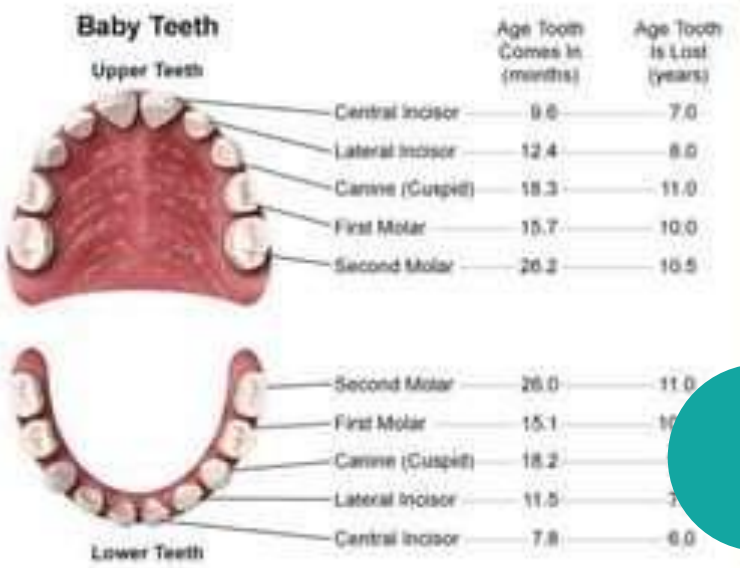
Functions of saliva

- It starts the digestion of starch molecules (*amylase*)
- It destroys some bacteria (*lysozyme*)
- It lubricates the bolus (*mucin*)

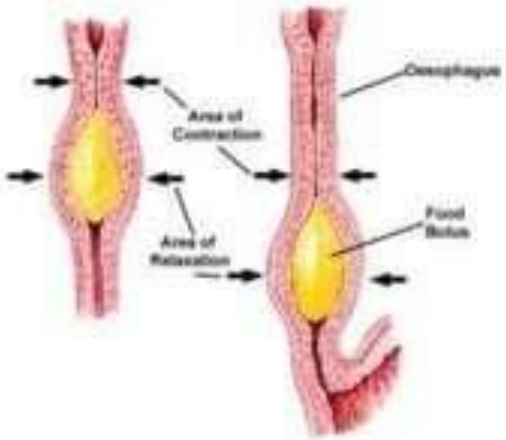


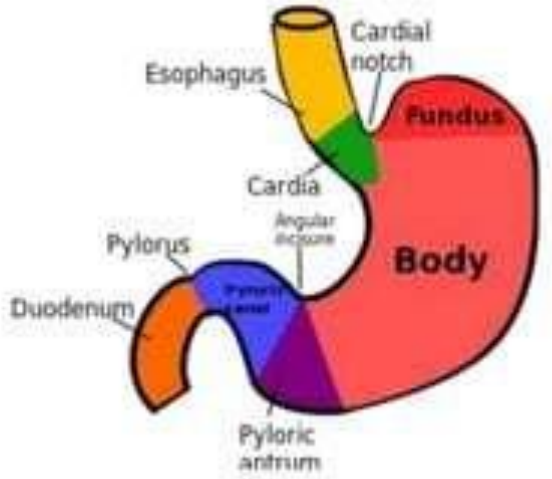
3.1.2 Chewing *(Mechanical processes)*



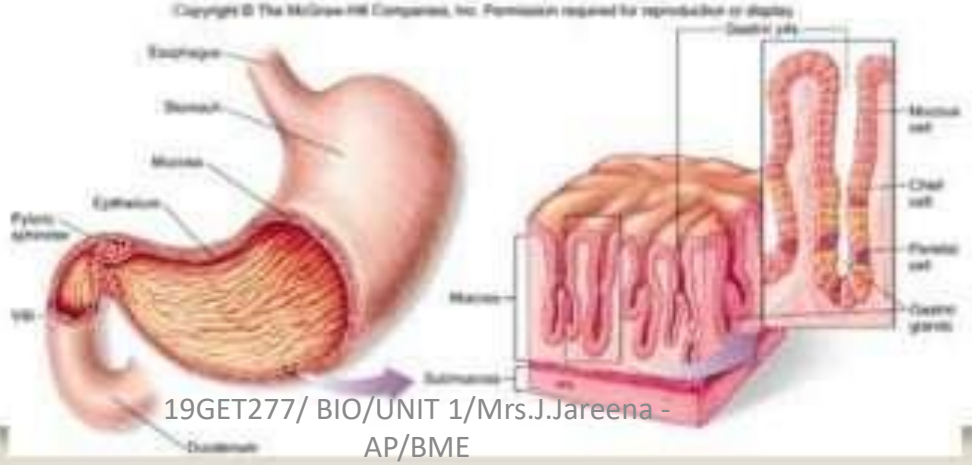


3.2 The digestive process in the stomach





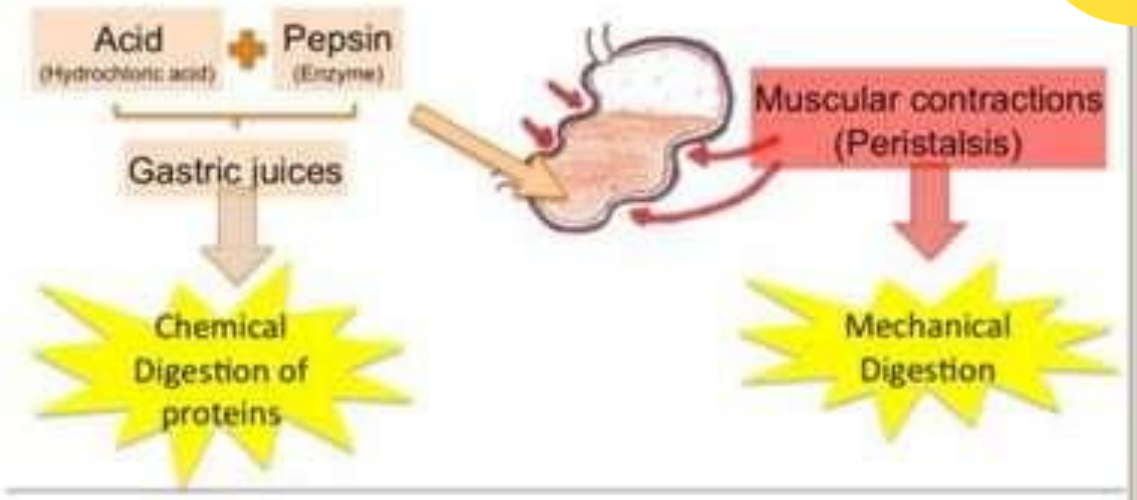
Cardia: valve which separates the esophagus from the stomach
Pylorus: valve which separates the stomach from the duodenum

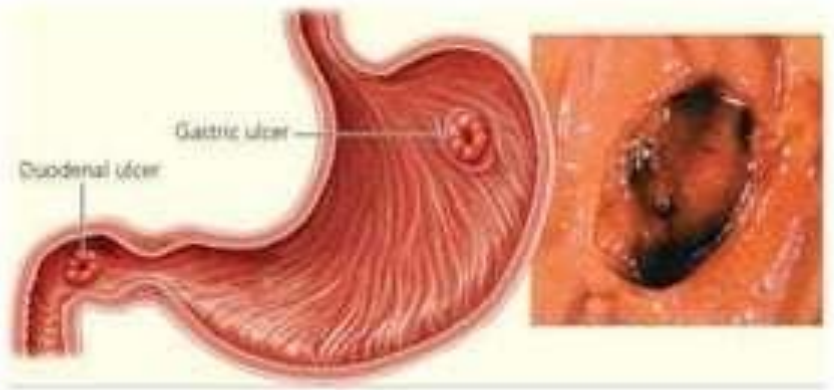


Gastric juices contain:

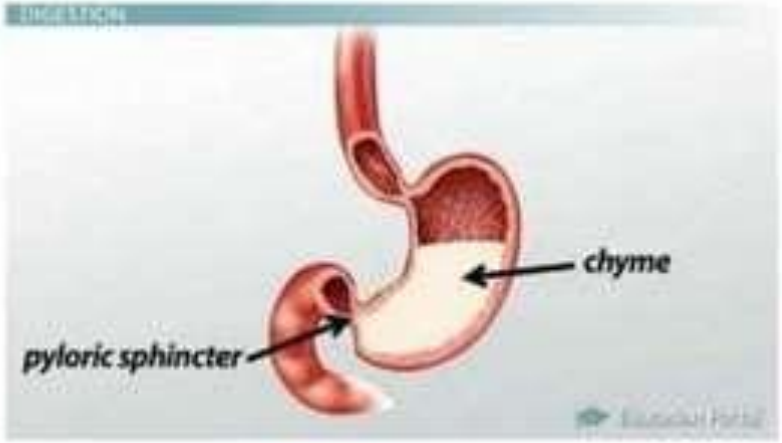
Pepsin:
enzyme that starts protein digestion

Hydrochloric acid (HCl):
- It activates and helps pepsin.
- It destroys bacteria.





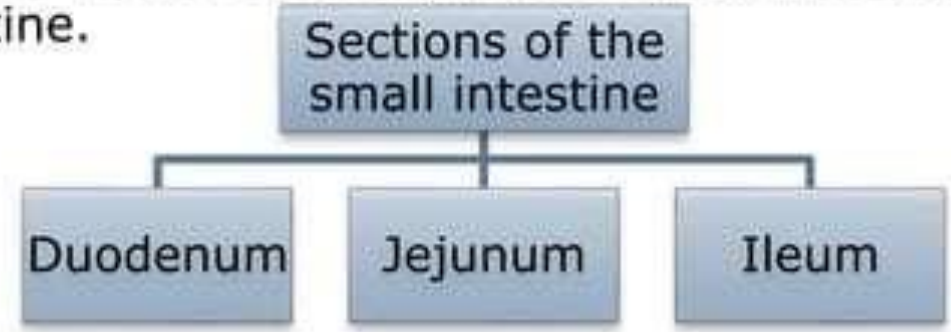
Bolus ➔ chyme

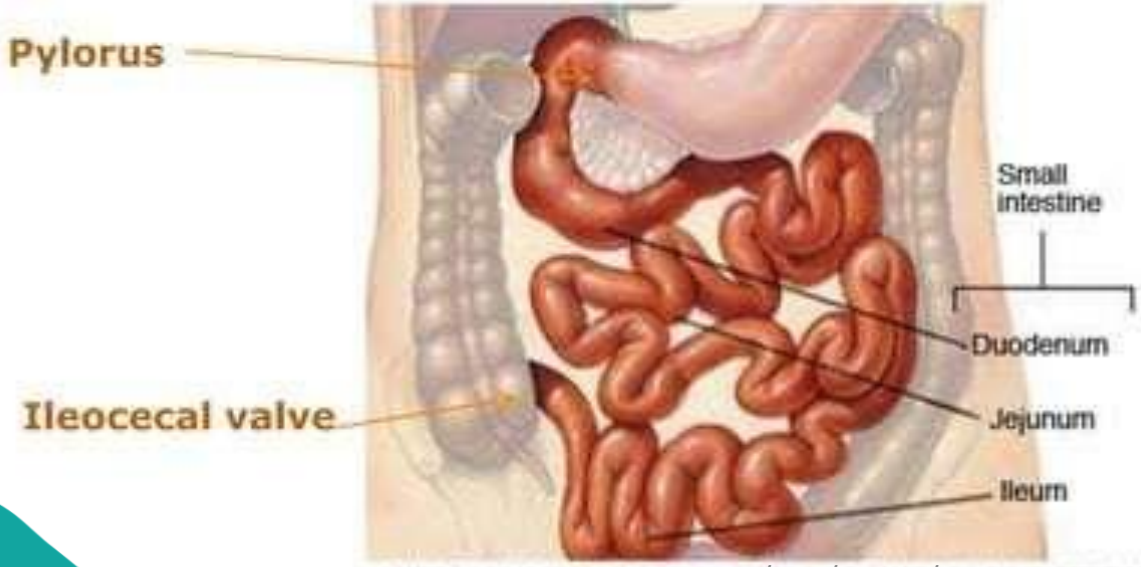


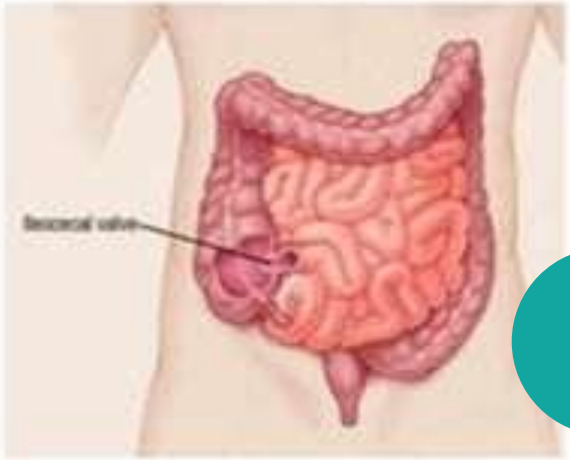
Food is transformed in the stomach into a fluid substance called **chyme**

3.3 The digestive process in the small intestine

Pylorus: valve which separates the stomach from the duodenum.
Ileocecal valve: valve which separates small intestine from the large intestine.





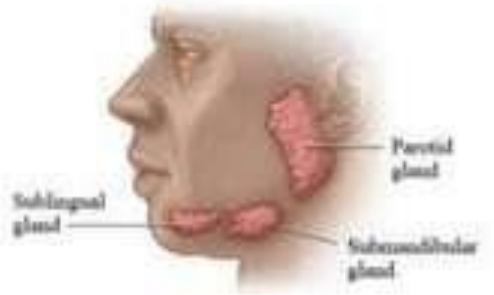


The chyme mixes with the bile and the pancreatic and intestinal juices and it is transformed into **chyle.**

From the liver *From the pancreas* *From the walls of the intestine*

Food → Bolus → Chyme → Chyle

Saliva



Gastric juices

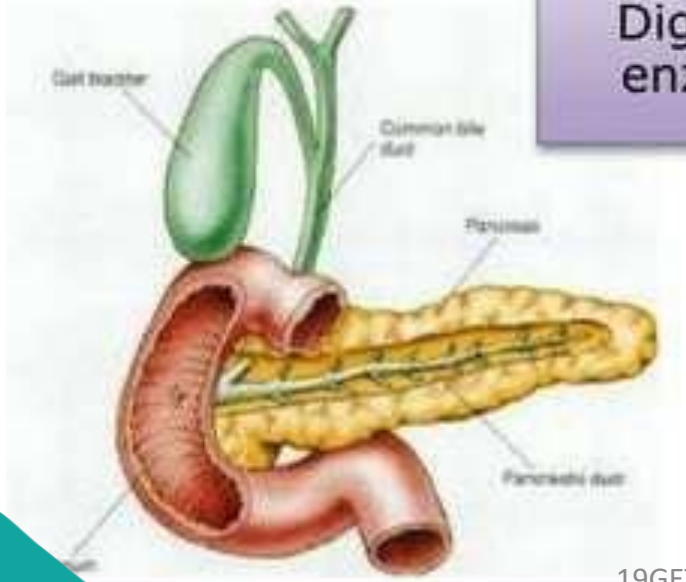
Pancreatic juice
Bile
Intestinal juice

Functions of the pancreas

Endocrine function: it produces insulin and glucagon (hormones)

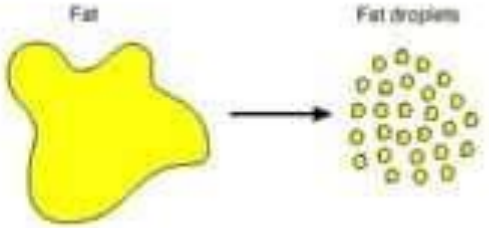
Digestive function: it secretes **pancreatic juice**

- Digestive enzymes
- Sodium bicarbonate
  - It neutralises the chyme's acidity



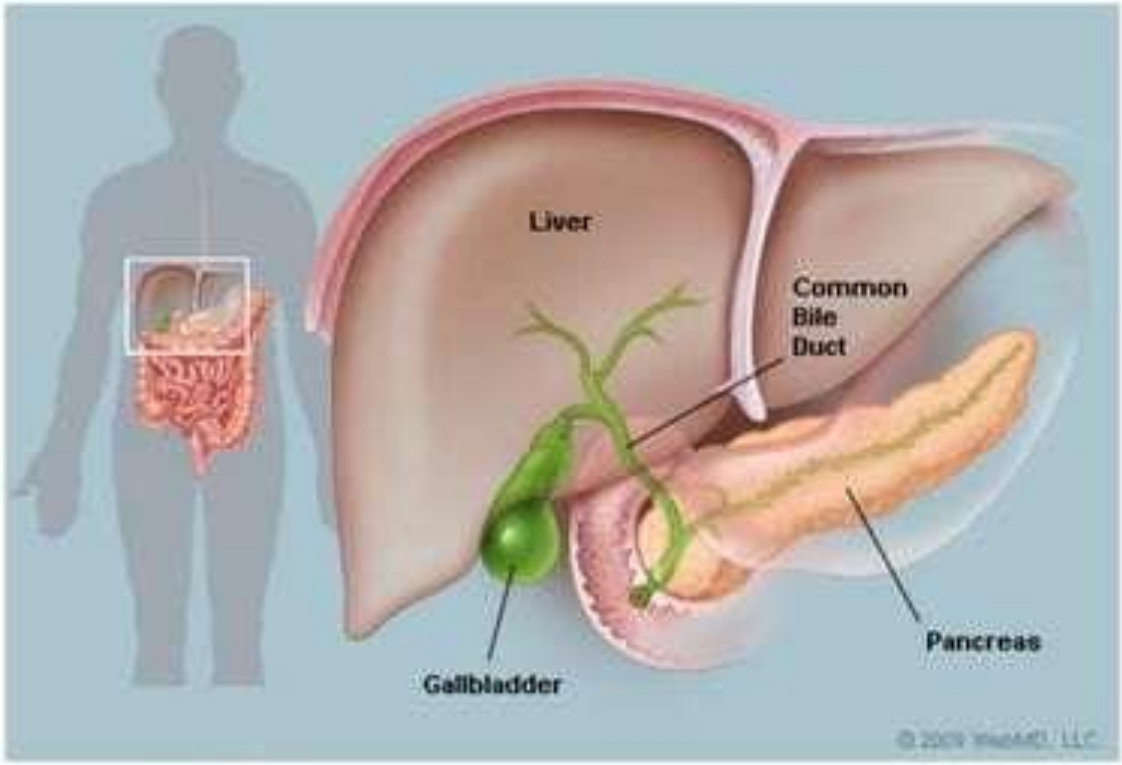
Functions of the liver

- To destroy toxic molecules
- **Digestive function:** it secretes **bile,** which contains **bile salts**
  - Emulsification of fats



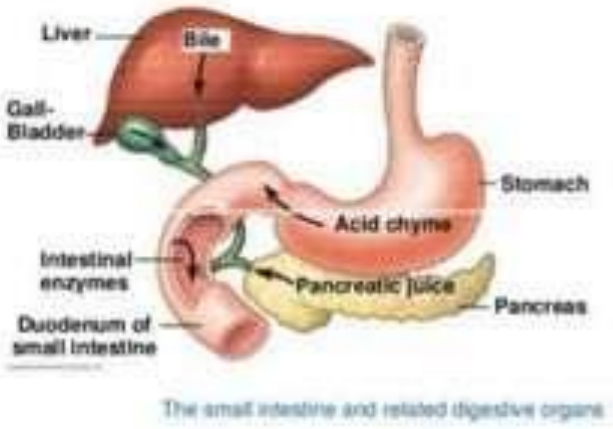
Bile is stored in the gallbladder and it is only released when food enters the intestine.

Gallbladder stones

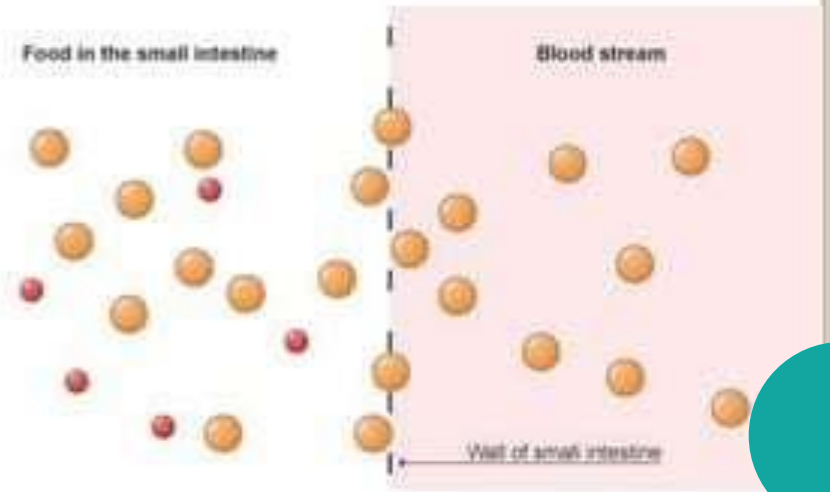


The **digestive process** in the small intestine

- digestion
- absorption



The small intestine and related digestive organs

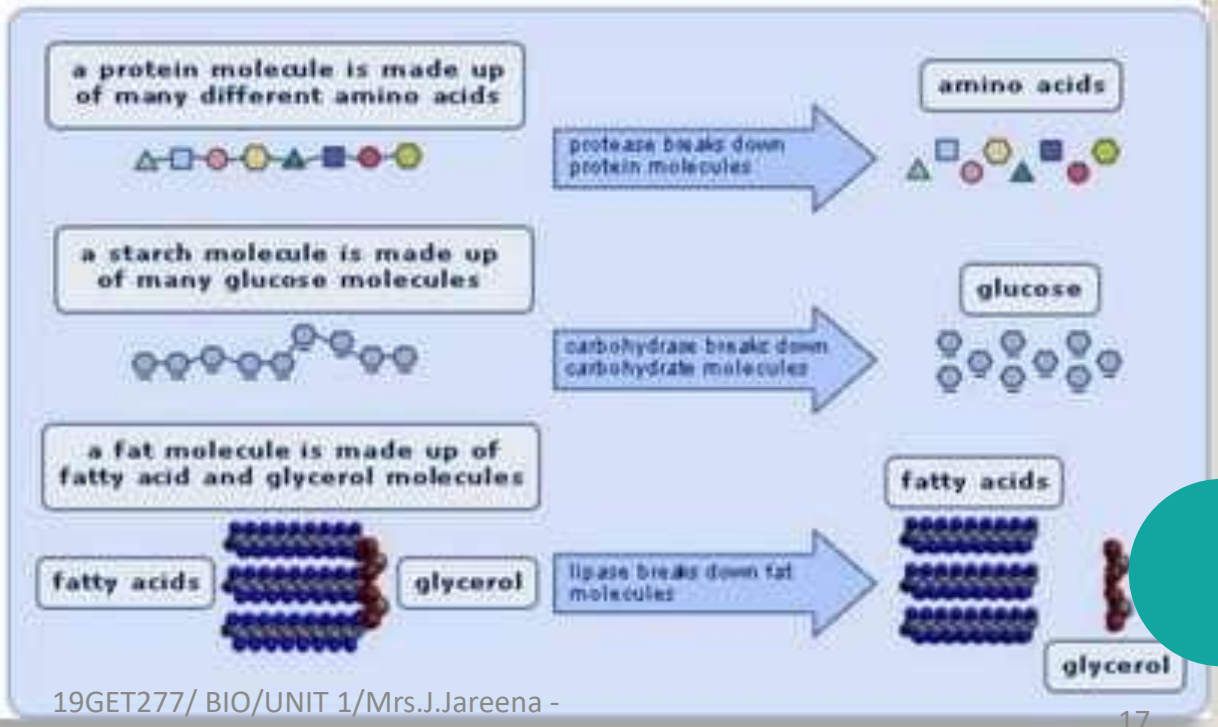


(Large molecules) ➔ (small molecules)

Starch ➔ glucose
Sucrose ➔ glucose
Fats ➔ fatty acids + glycerol
Proteins ➔ amino acids

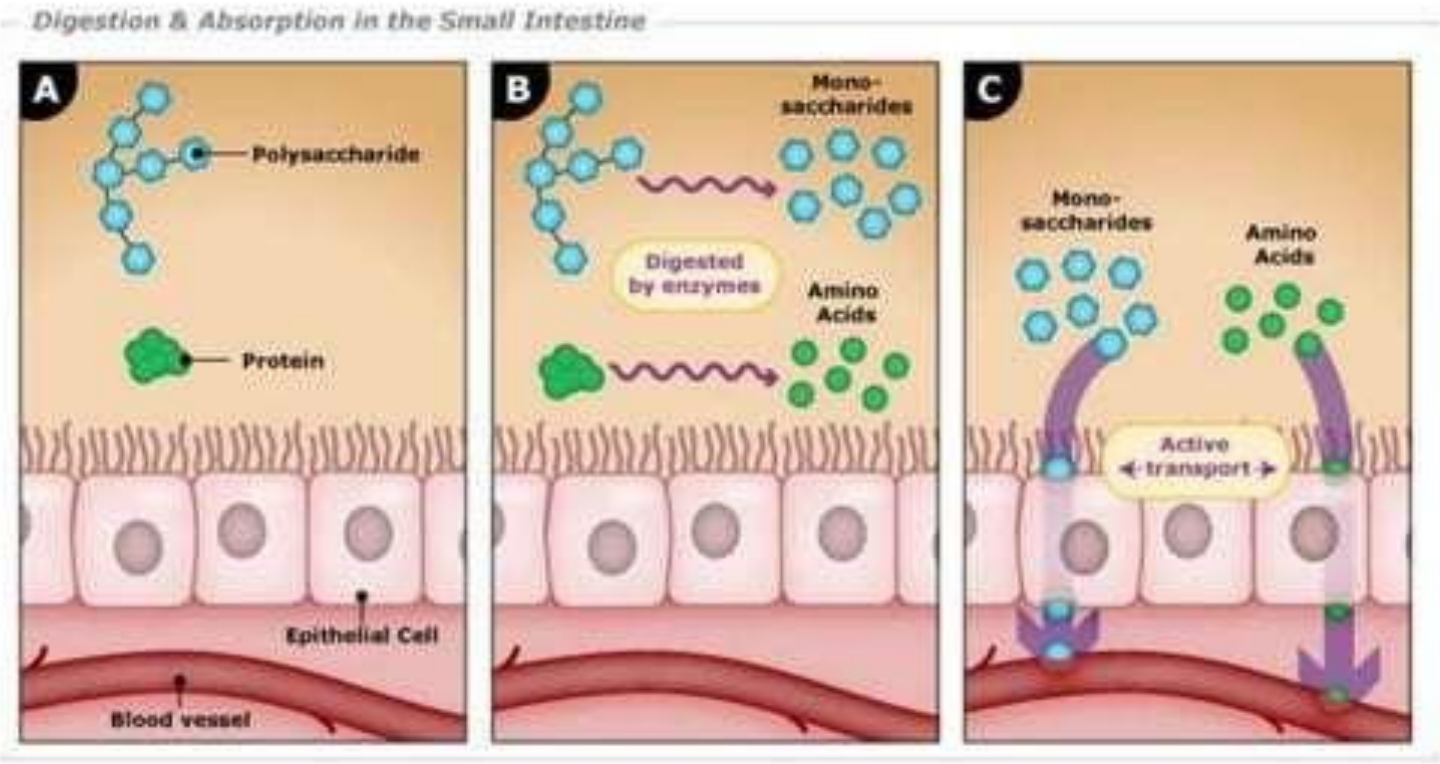
digestion

Digestive enzymes

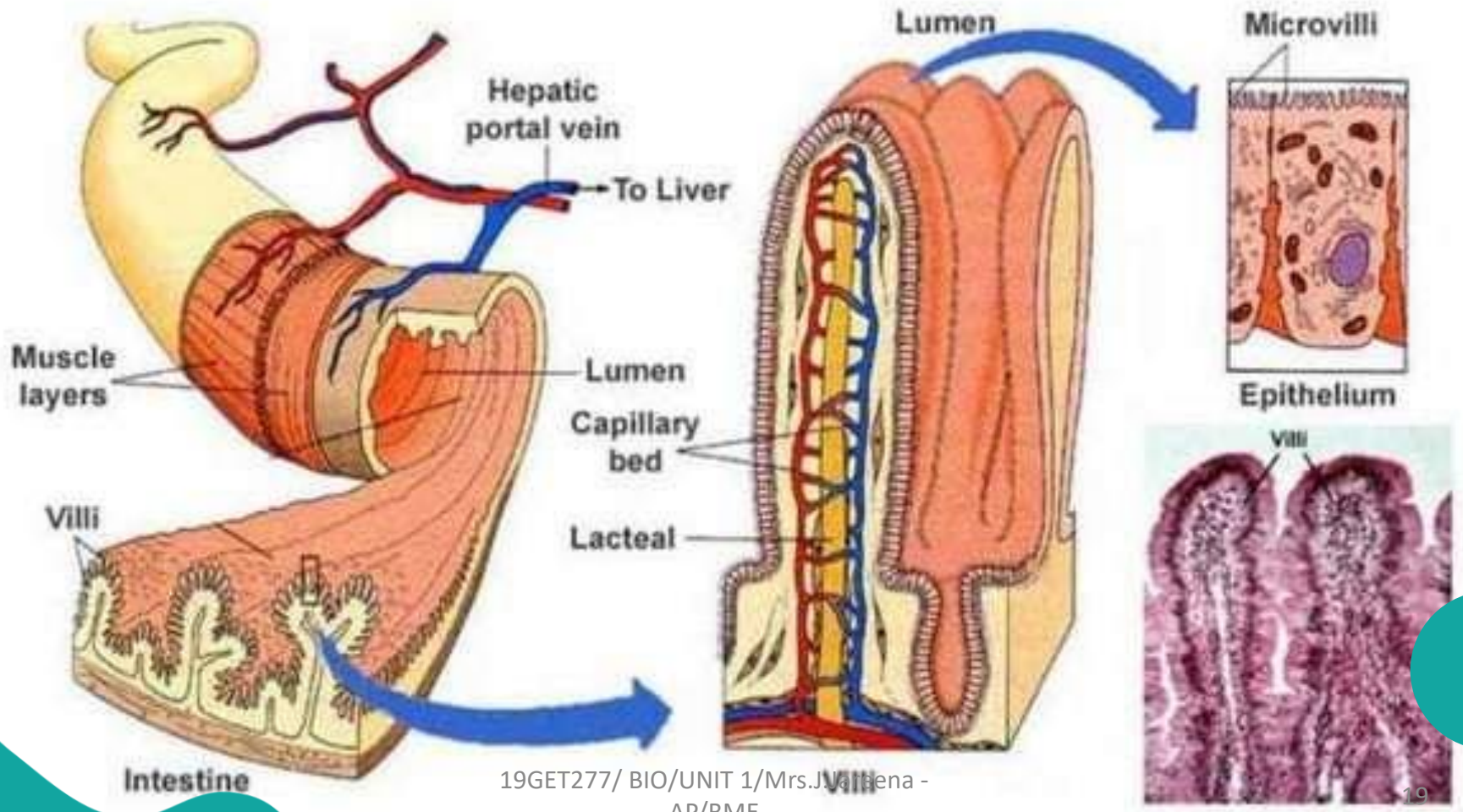


absorption

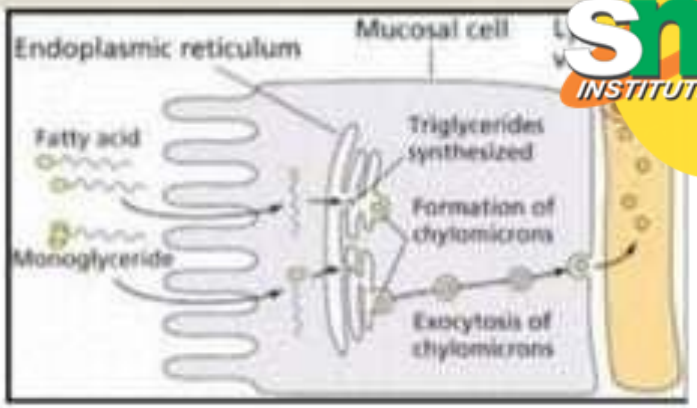
Absorption is the passage of nutrients to our blood.

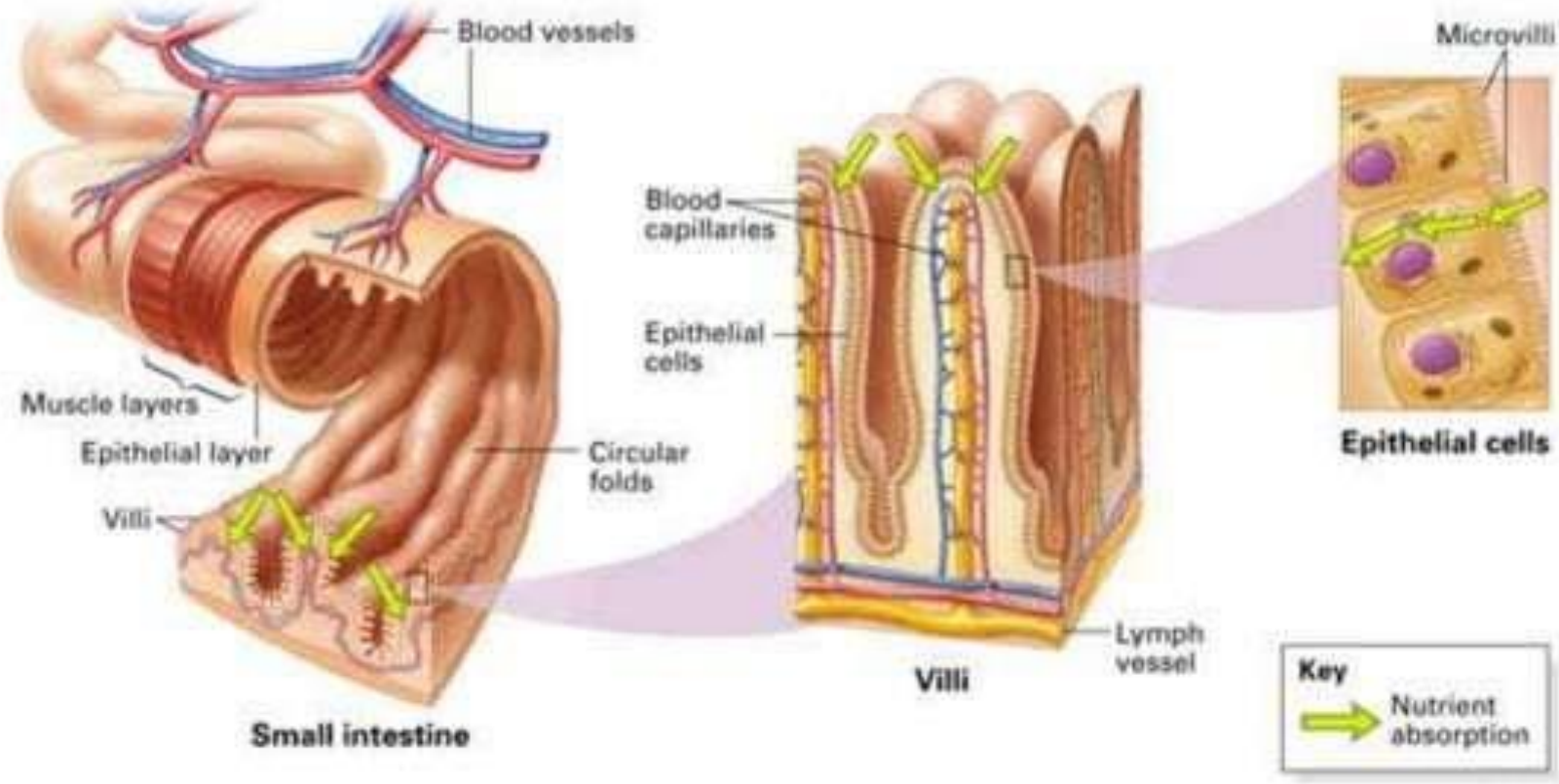


To increase the surface of absorption, the walls of the intestine:
- Are folded
- Have villi
- the epithelial cells have microvilli



Nutrients pass to the blood vessels, except digested lipids, which pass to the **lymphatic system**.





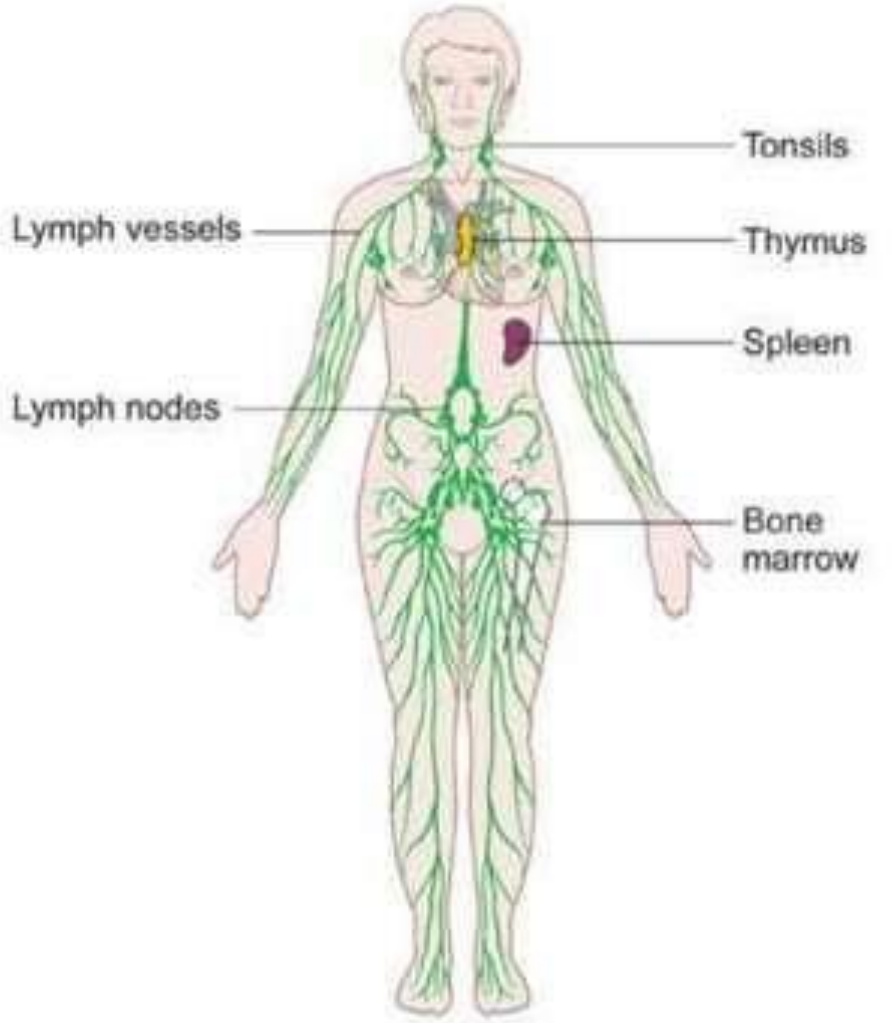


Diagram of the lymphatic system
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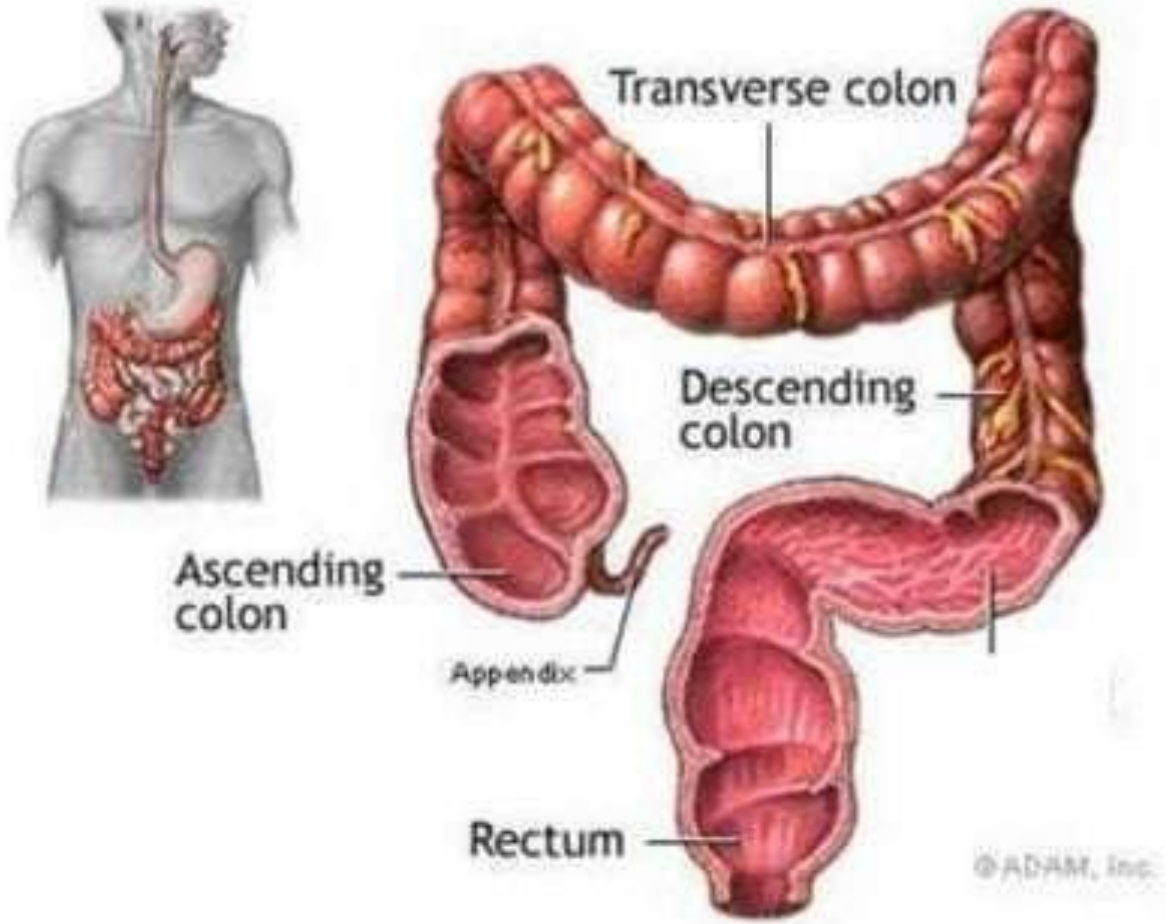
3.4 The digestive process in the large intestine

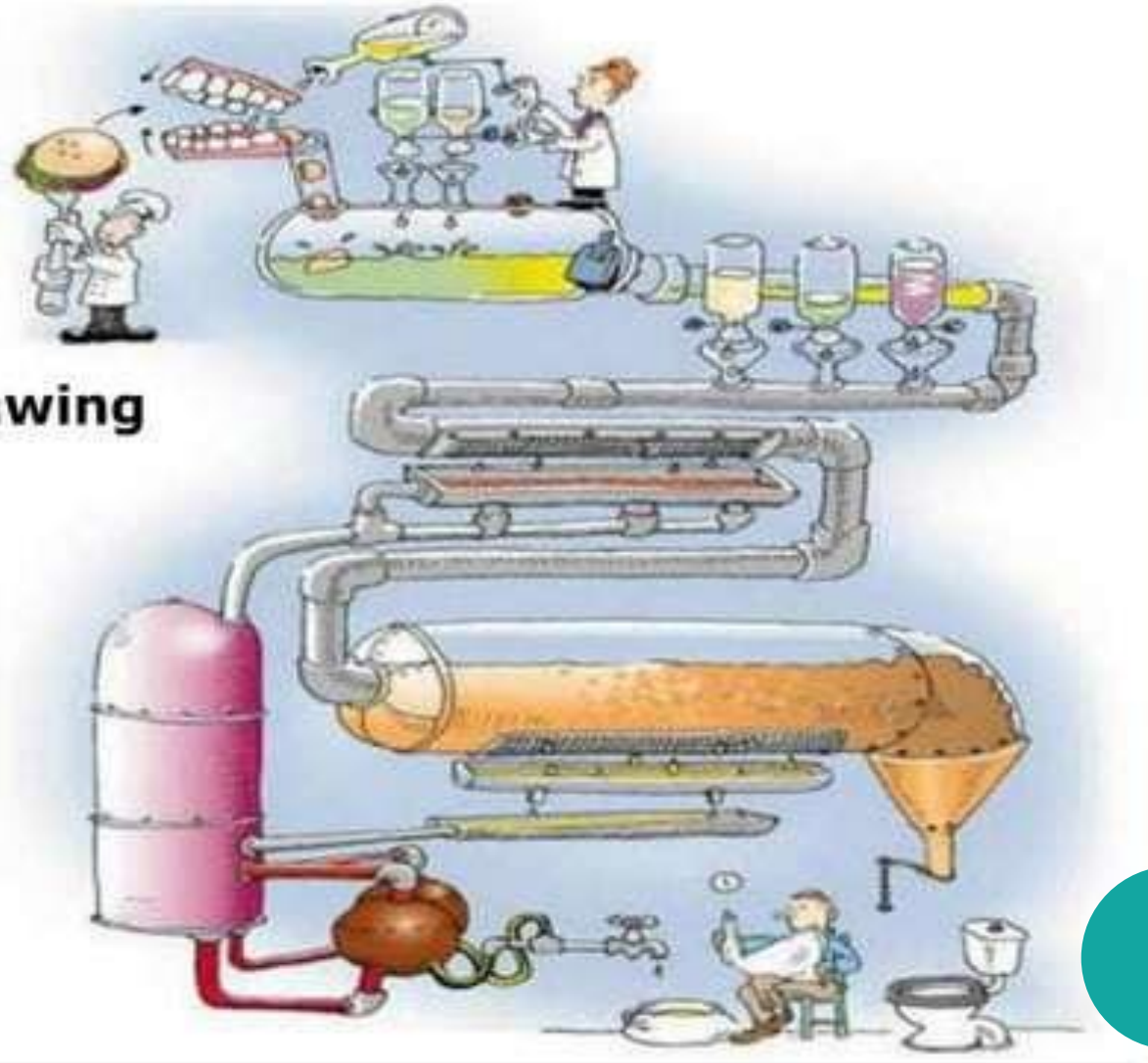


Funtions of the large intestine

- To absorb most of the water and minerals from the faeces
- To host symbiotic bacteria of the intestinal flora
  - They help digestion
  - They produce vitamine K and vitamine B_{12}

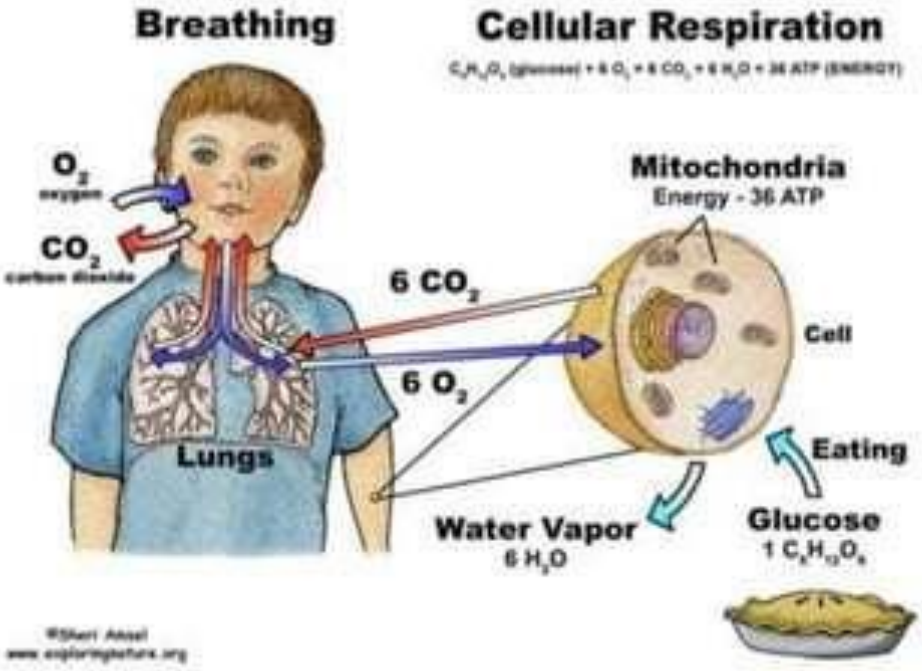
IN PAIRS

What does each part of the drawing represent?



4. The Respiratory System

REMEMBER!! The final goal of getting O_2 is **cellular respiration**: All cells need the oxygen to burn glucose in the mitochondrion and obtain ENERGY.

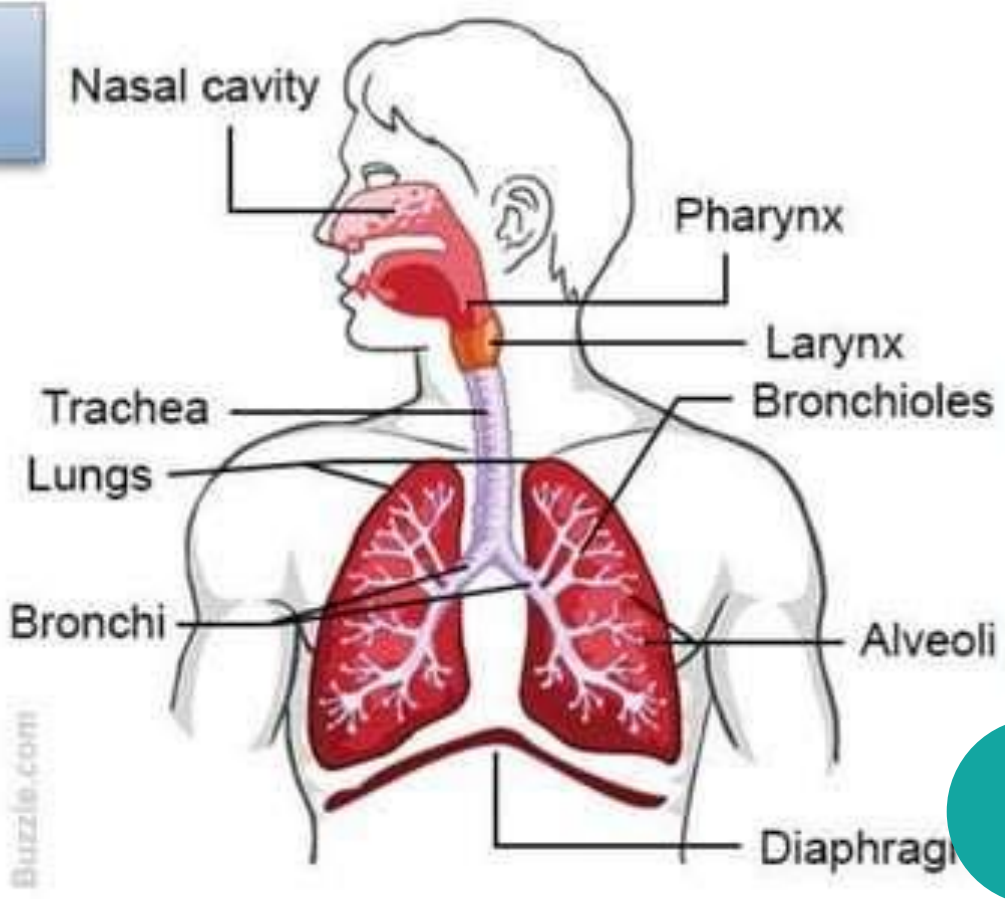


CO_2 is formed in this process as a waste product and it needs to be released out of the body.

4.1 Anatomy of the respiratory system

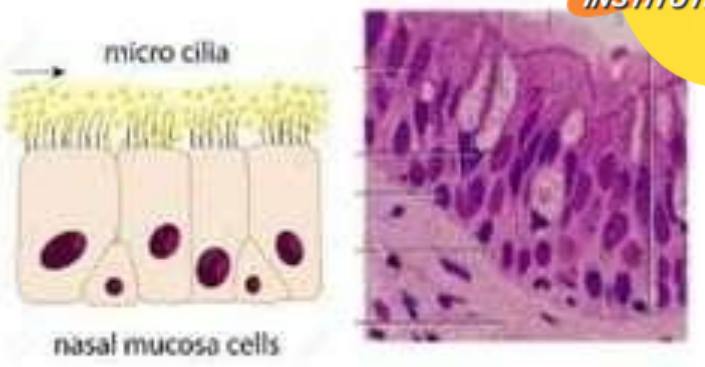
Respiratory system

- Respiratory tract
  - Nasal cavity
  - Pharynx
  - Larynx
  - Trachea
  - Bronchi and bronchioles
- Lungs

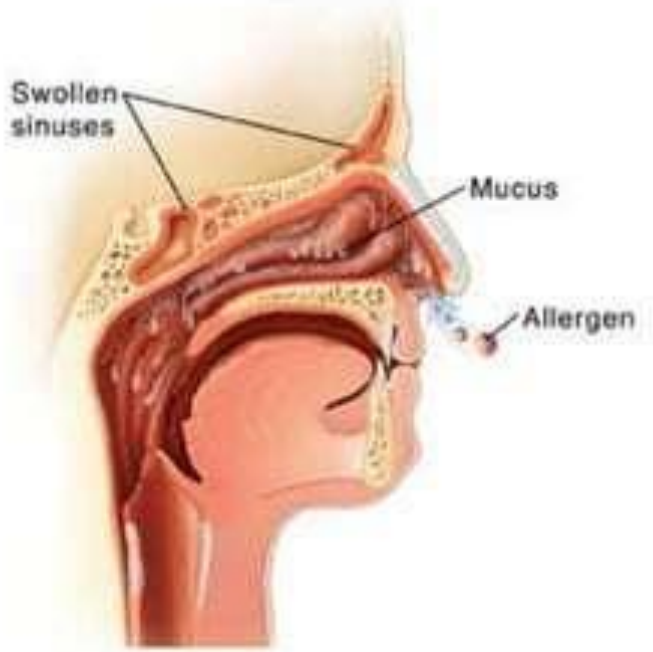


Nasal cavity

The respiratory tract is covered by a mucosa which purifies and humidifies the air.



Some illnesses

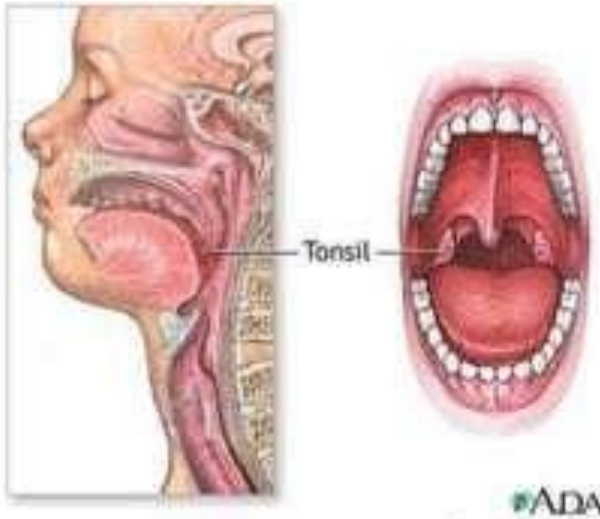


Allergic rhinitis

Sinusitis

Pharynx

It is common to the digestive tract.

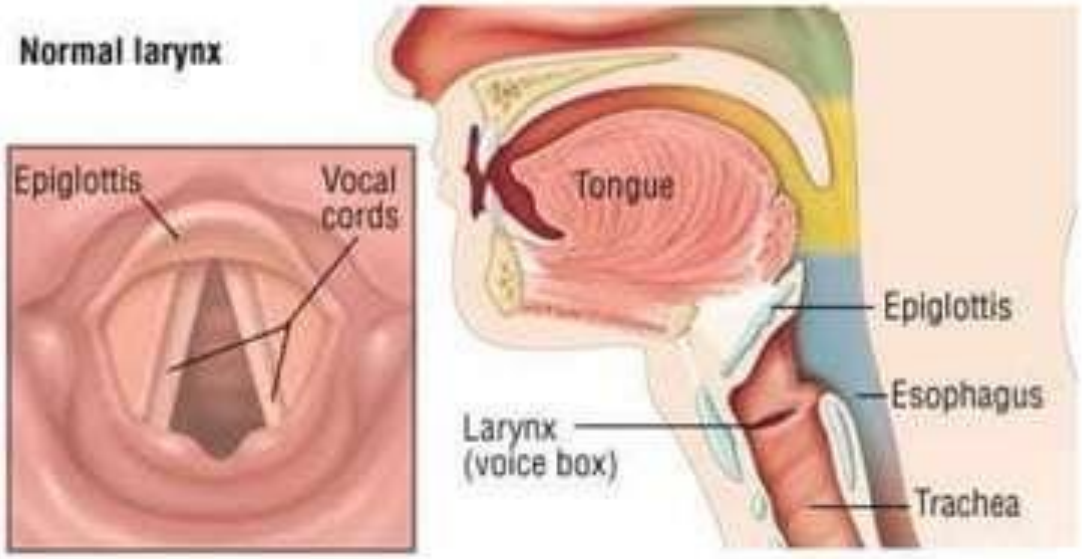


(amigdalas)

The function of the **tonsils** is to produce white blood cells.

Viral and Bacterial Pharyngitis

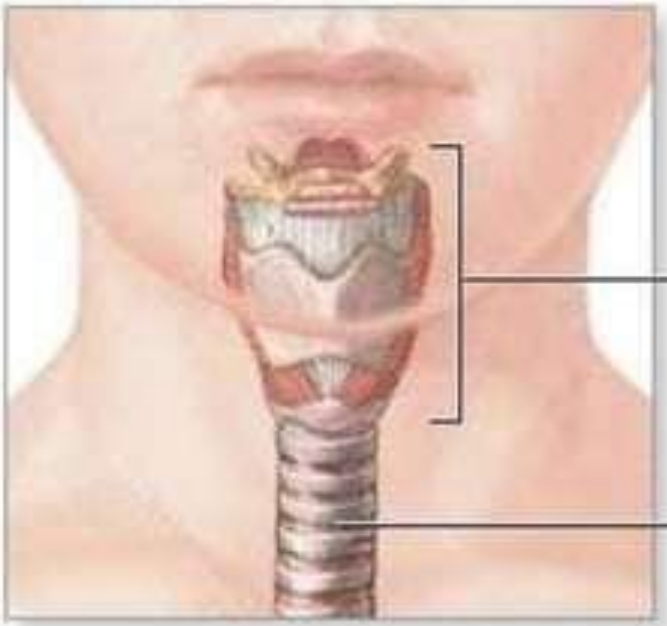
Larynx



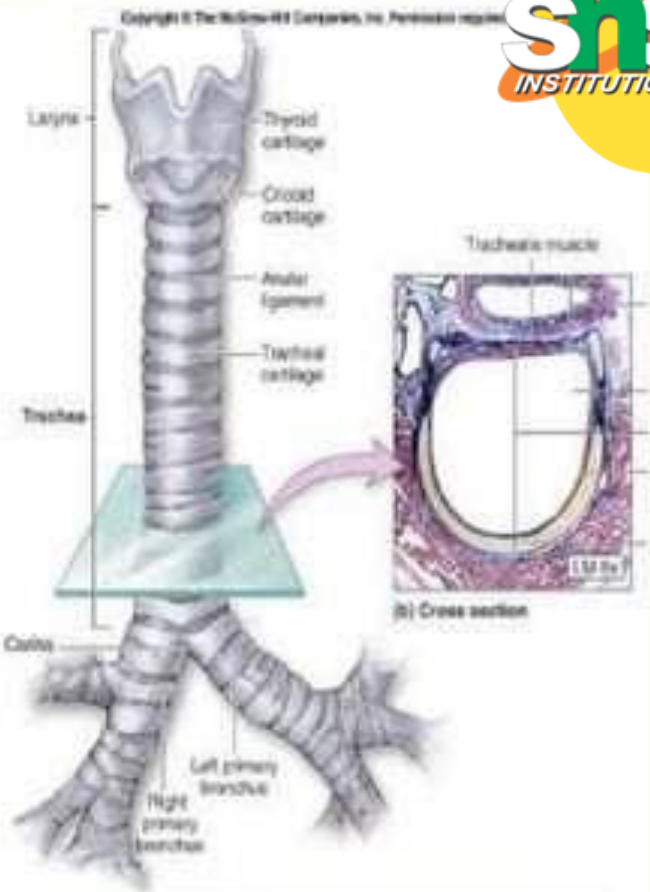
Vocal cords create sounds when the passage of air makes them vibrate.

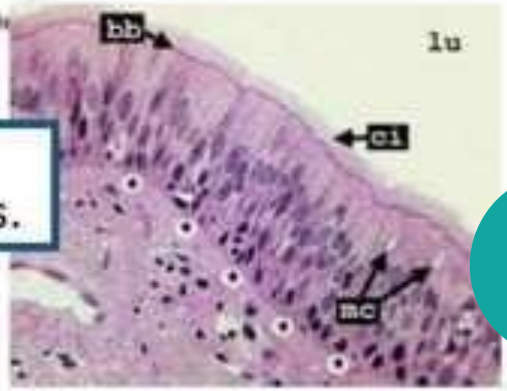
The **epiglottis** is a fold of tissue that crosses out the trachea to avoid food entering it.

Trachea



ADAM.





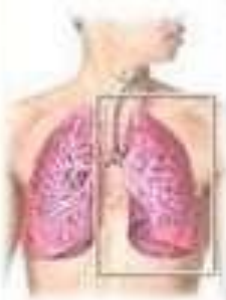
It has open cartilage rings at its back to keep it open. There are mucous and cells with cilia covering its walls.

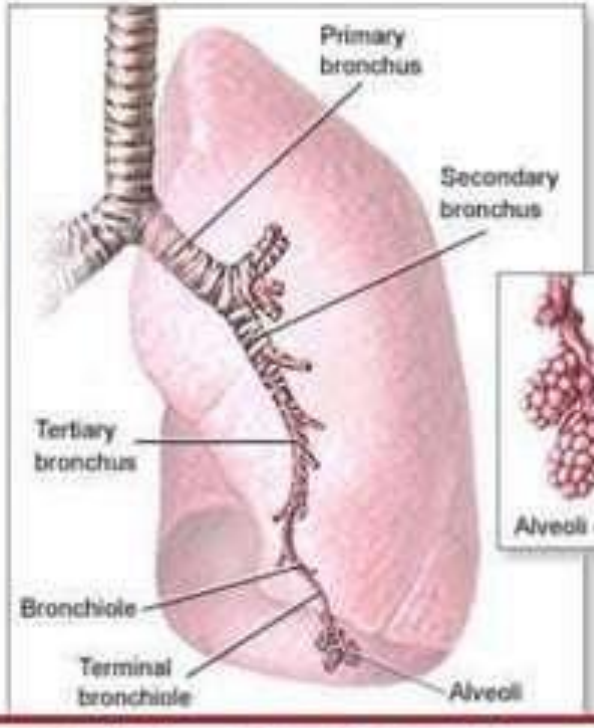
Bronchi, bronchioles and pulmonary alveoli

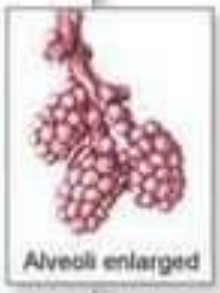
(Bronchus/bronchi)

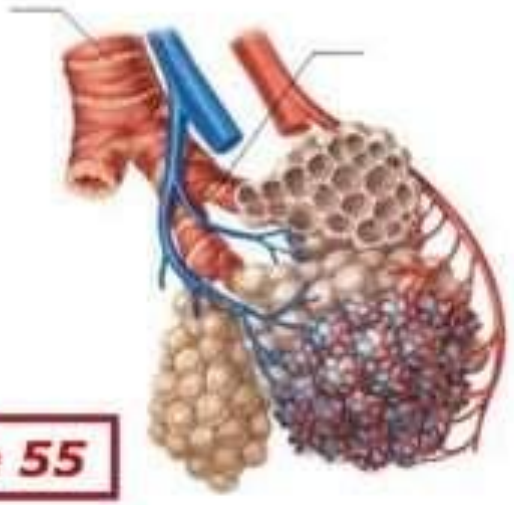
The trachea is divided into **two bronchi.**

Bronchioles are progressively smaller ducts inside the lungs. They do not have cartilage rings.







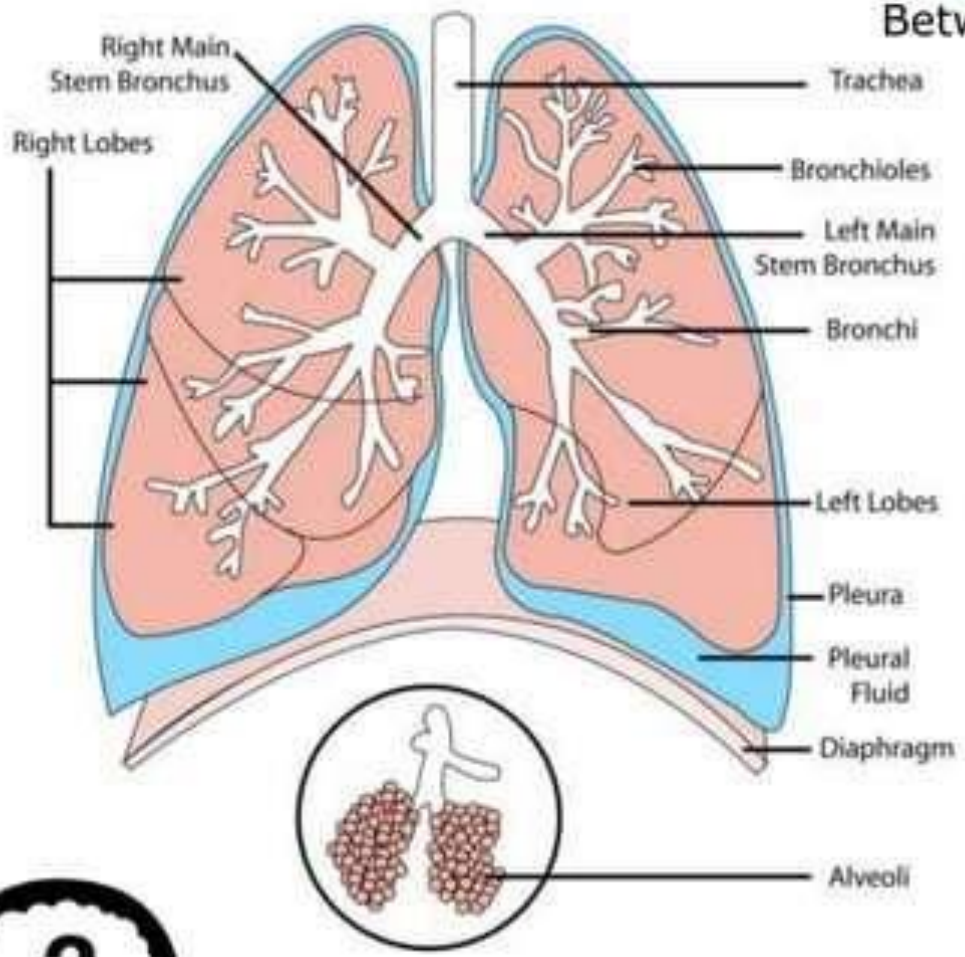


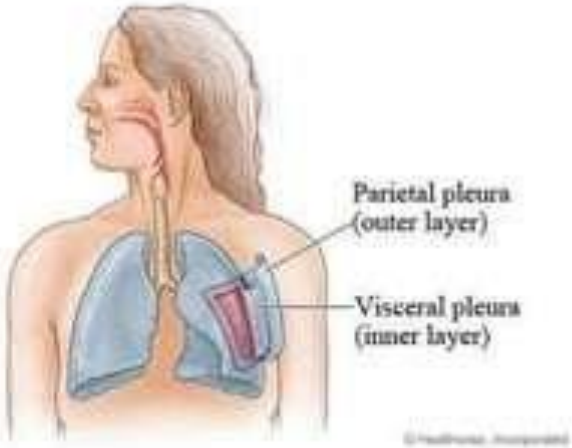
Activities 32, 34, 35 and 36 page 55

Pulmonary alveoli are tiny sacs where gas exchange takes place. Their surface is humid to facilitate the diffusion of the gases.

Diagram of the Human Lungs

The **pleura** has got two membran
Between them there is a liquid.



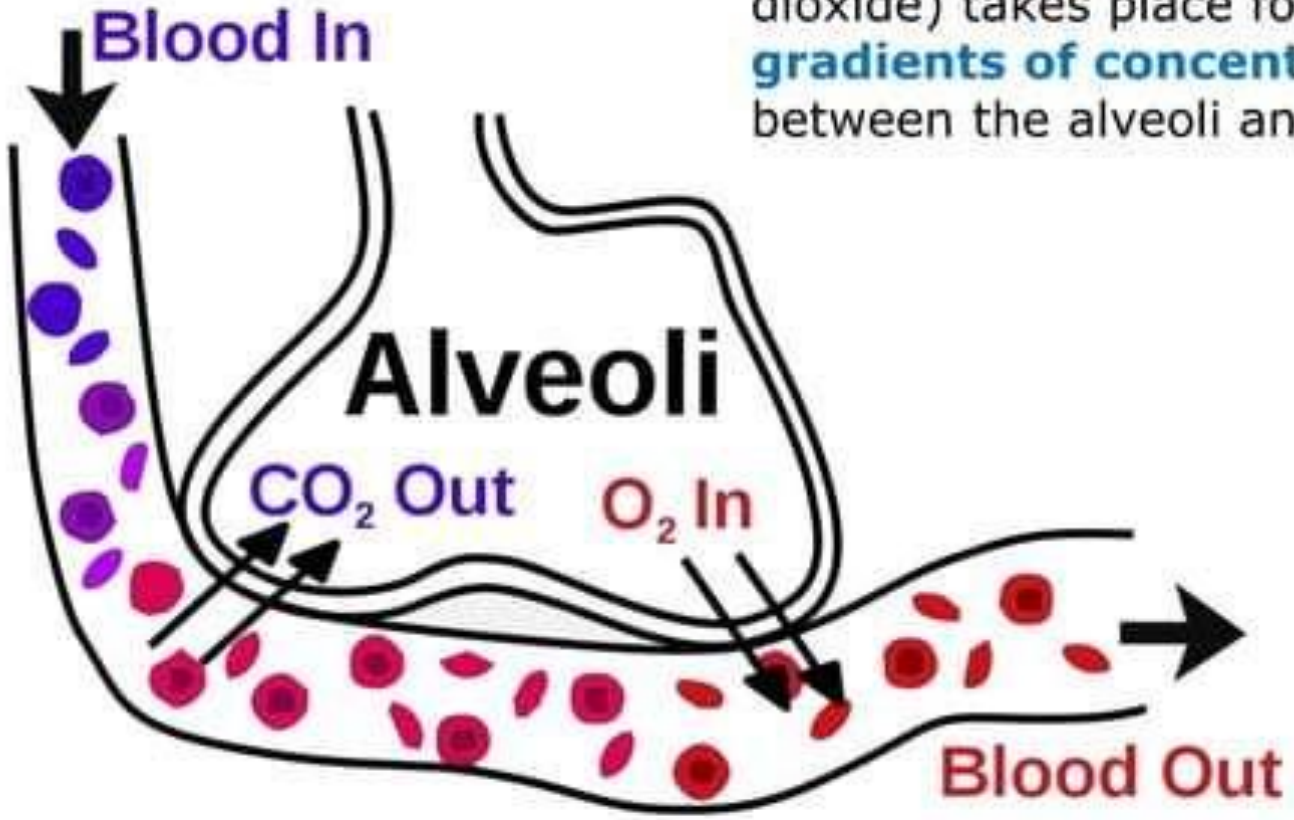


Why does the left lung only have two lobes, whereas the right lung has got three lobes?

4.2 Gas Exchange

DIFFUSION

Gas exchange (oxygen and carbon dioxide) takes place following the **gradients of concentration** between the alveoli and the blood.



nimation about gas exchange:
://www.curriculumenlineamineduc.cl/605/articles-
recurso_swf.swf

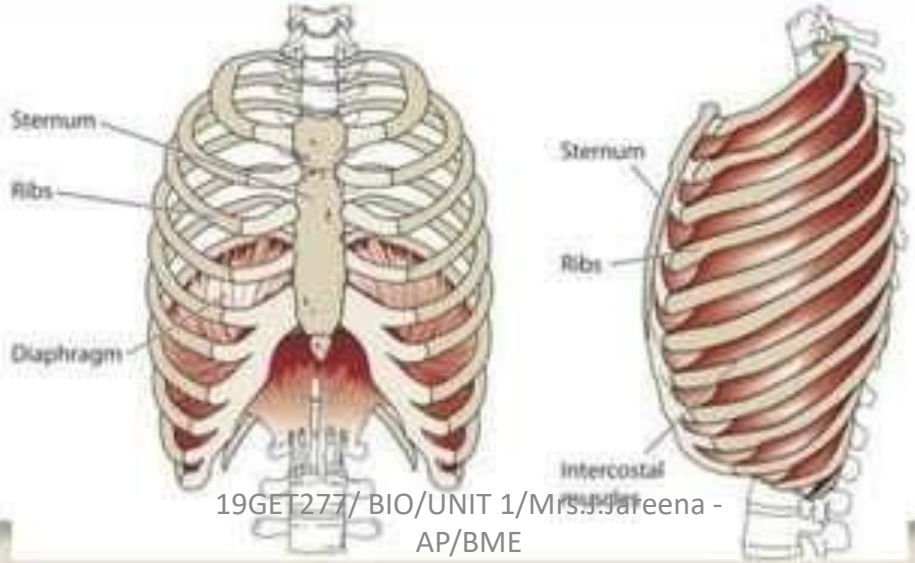
Activity 37 page 56

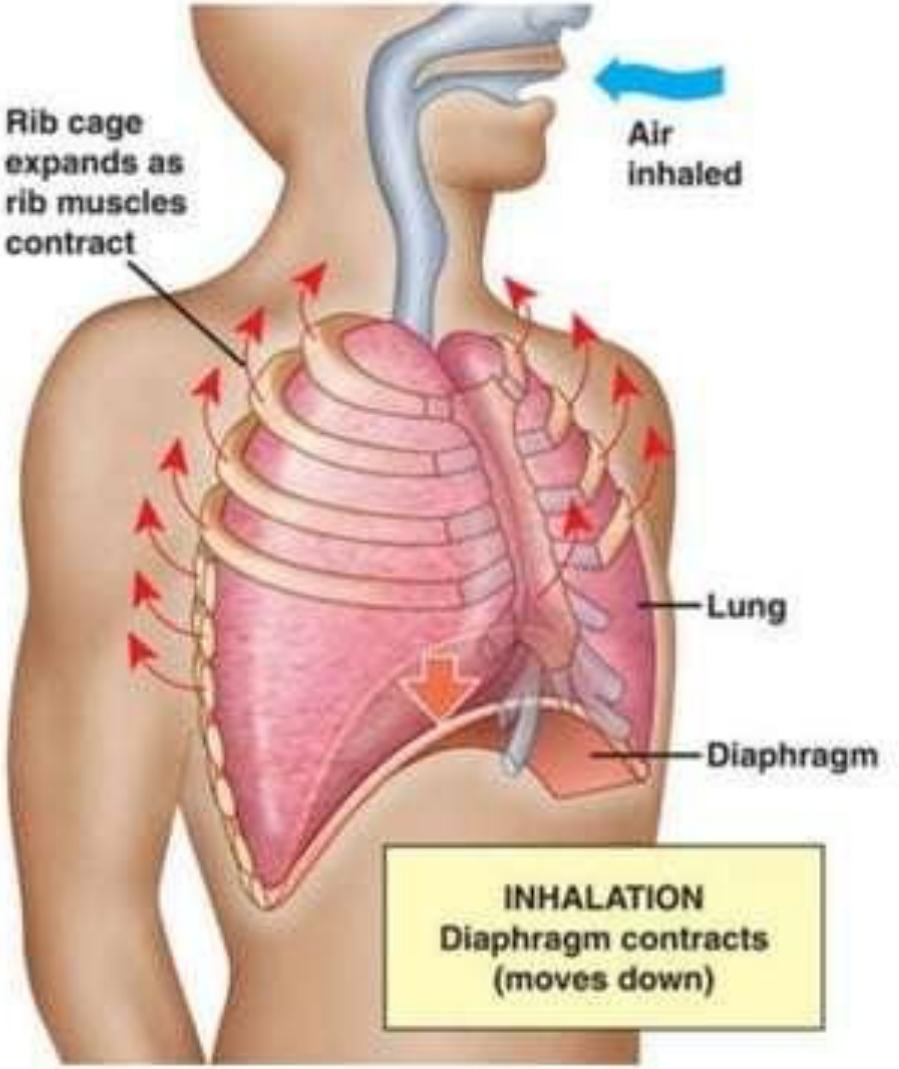
4.3 Pulmonary ventilation

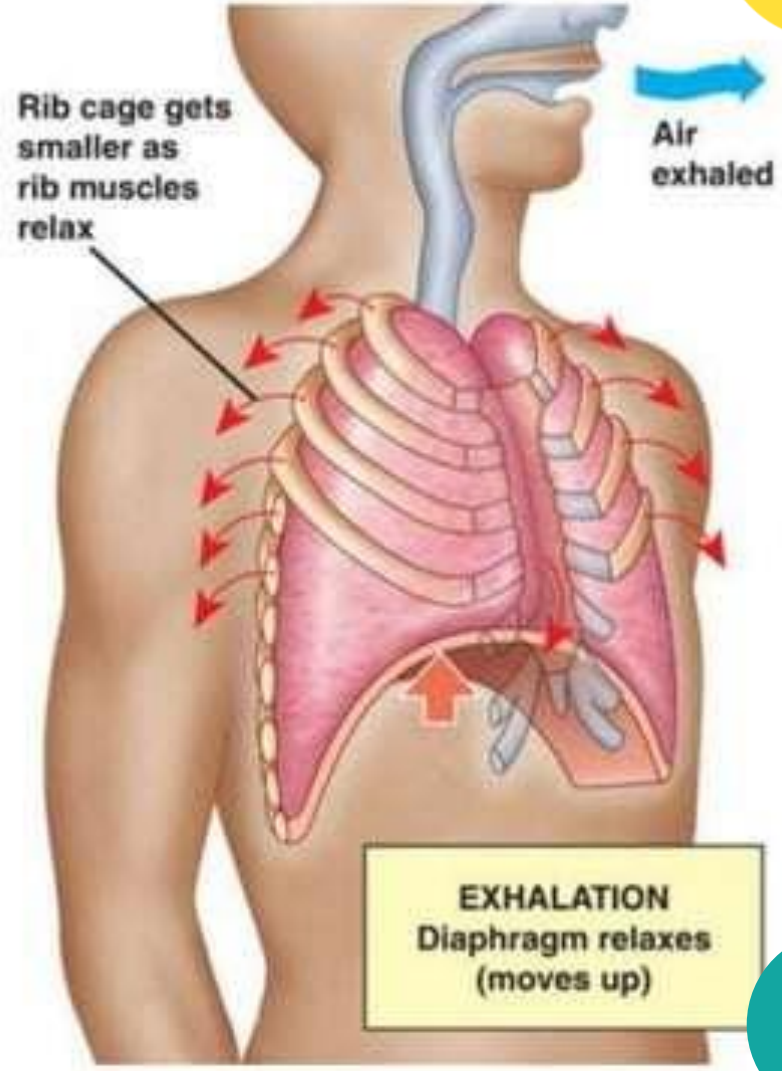
Stages

- **Inhalation** (breathing in) — **inspiración**
- **Exhalation** (breathing out) — **espiración**

The **intercostal muscles** and the **diaphragm** are responsible for pulmonary ventilation.

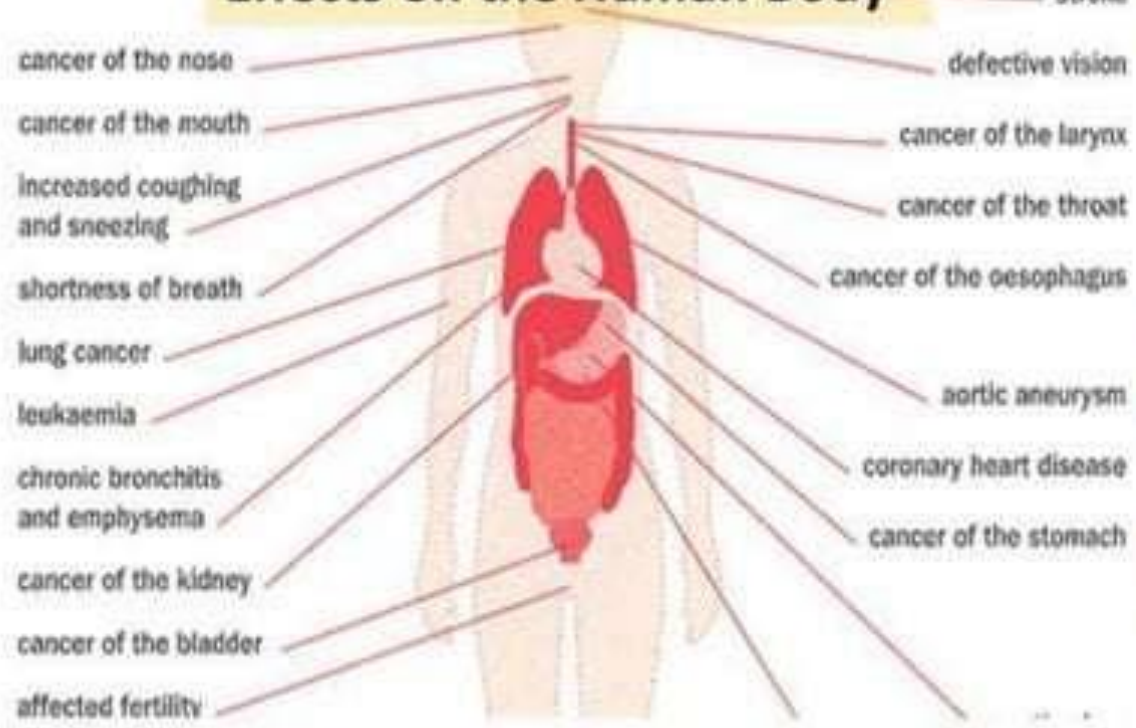



Rib cage expands as rib muscles contract
Air inhaled
Lung
Diaphragm
INHALATION
Diaphragm contracts (moves down)

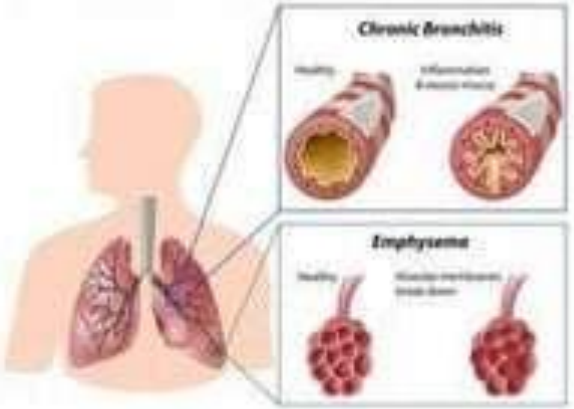

Rib cage gets smaller as rib muscles relax
Air exhaled
EXHALATION
Diaphragm relaxes (moves up)

The Impact of Tobacco

Effects on the Human Body



Effects on the Lungs



Second Hand Smoke

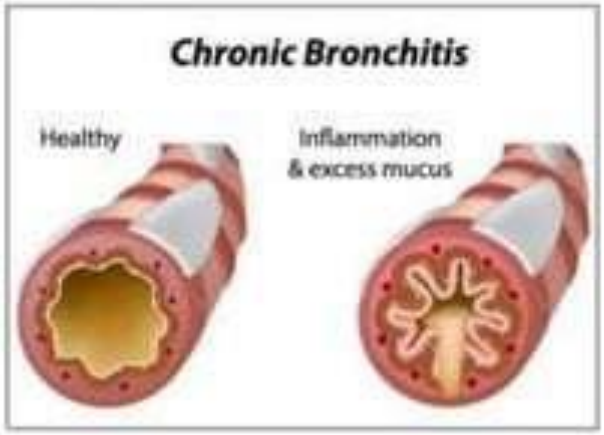
Nicotine Addiction

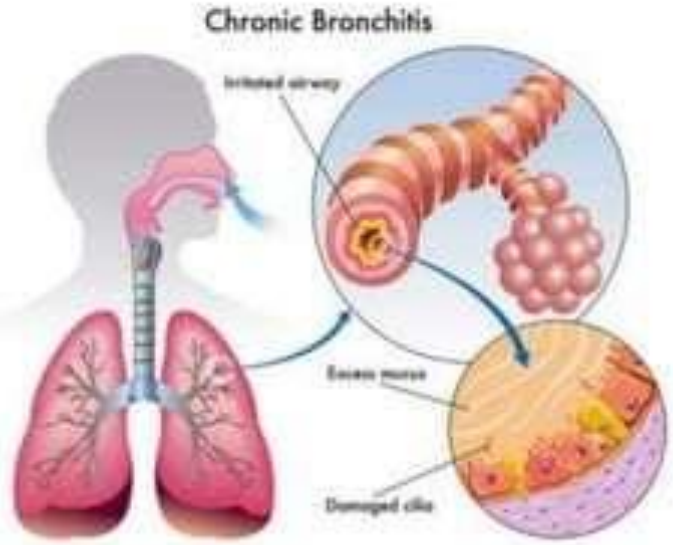
Money Spent

Chewing Tobacco

hronic bronchitis

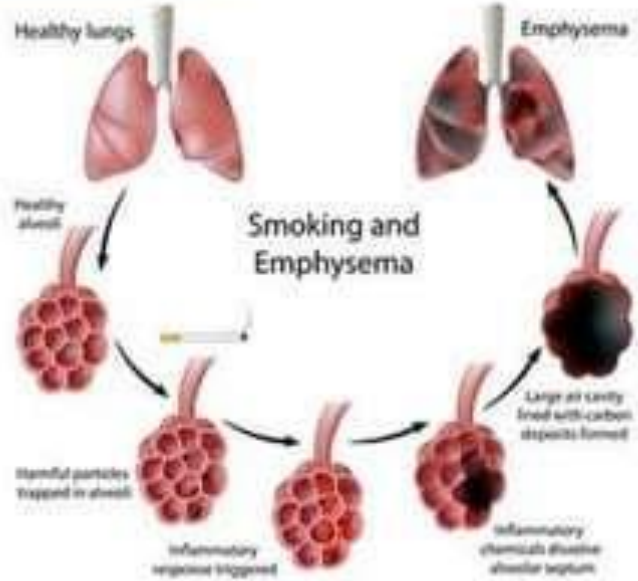
-Frequent coughing
-Chest pain
-Asthma





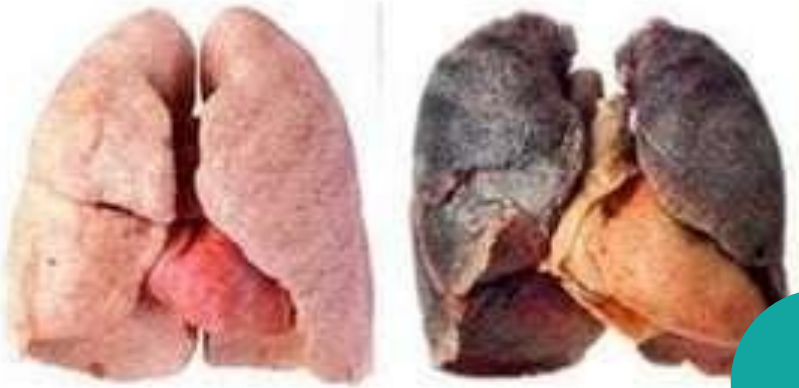
Emphysema

-Alveoli break



Emphysema

Lung cancer



✓Choose three of the healthy habits on page 58 and 60 that you **already do**.

✓Choose one that you **will include** in your life style.

WRITE THEM DOWN ON YOUR NOTEBOOK

Things which I already do

....

....

....

New habits which I will adquire

....

Discuss the following activities with your partner

IN PAIRS

4 minutes

Activities 40, 41, 42, 43 pages 58 and 59

HW: Activities 48, 54, 61 and READ AND UNDERSTAND SCIENCE