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General Science

By Kinshuk Sir

Human Body

Circulatory System

Respiratory System

Digestive System

Nervous System

Excretory System

Some Facts about Human Body

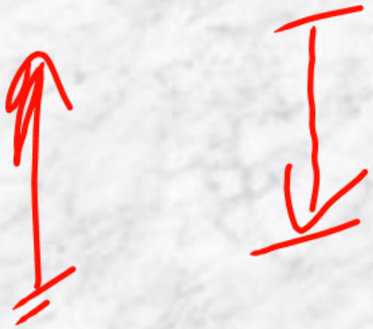
- Blood is a fluid connective tissue that has a significant role in the transportation of nutrients, respiratory gases, hormones, in maintaining and regulation of body temperature, pH, and other thermo-regulation processes. It is 6 times thicker than water and each drop of blood contains about 250 million cells.
- Cornea that is the transparent front part of the eye is the only part in Human body with no blood supply and it gets oxygen directly from the air.

Some Facts about Human Body

- Skin is the human body's largest organ
- A large amount of the dust in your home is actually dead skin. Humans shed about 600,000 particles of skin every hour.
- The smallest bone found in the human body is located in the middle ear. The staples (or stirrup) bone is only 2.8 millimetres long.
- The femur (thigh bone) is the longest bone in the human body.

Some Facts about Human Body

- Goose bumps evolved to make our ancestors' hair stand up, making them appear more threatening to predators.
- Between birth and death, the human body goes from having 300 bones, to just 206.
- Our brain is programmed to erect the inverted image formed on our retina by the convex eye lens. A newborn baby sees the world upside down till its brain starts erecting it.
- In camera terms, the human eye is about 576 megapixels.



Circulatory System

Human circulatory system consists of

(i) Centrally located muscular pump called heart, and

(ii) Blood vessels, which are tube-like structures, connected to the heart.

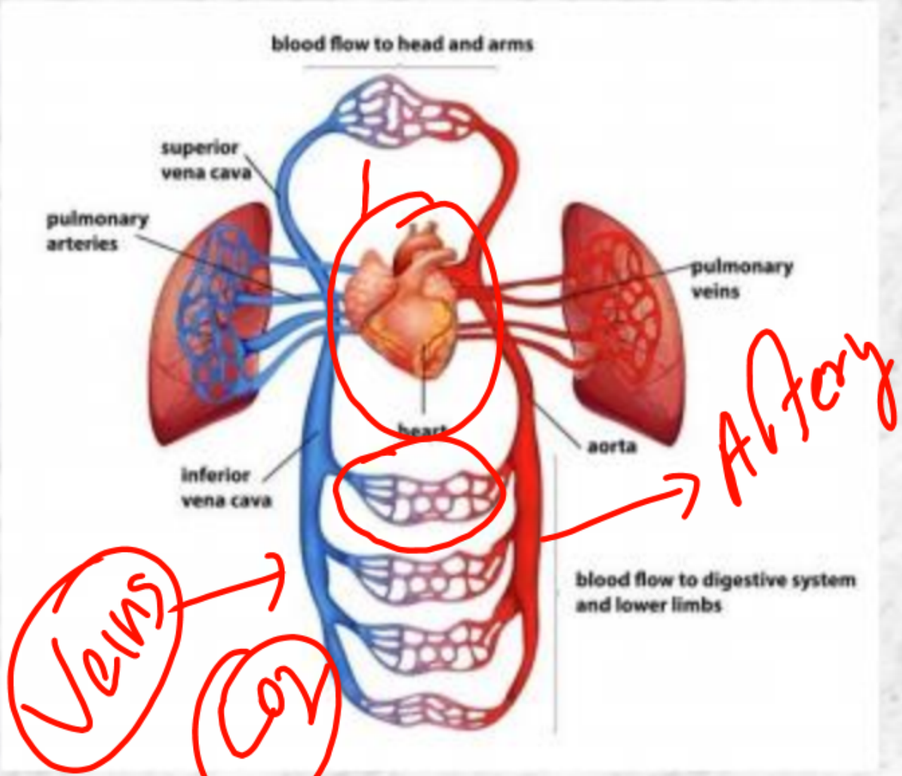
Blood vessels are of three kinds:

Arteries: Carry blood from heart to various parts of body.

Veins: Bring blood from various parts of body to the heart.

Capillaries: Thin vessels between the artery and the vein. The capillaries allow the exchange of materials between blood and tissues.

(iii) Circulating fluid—blood, tissue fluid and lymph



Functions

→ Temp

→ pH

→ Immune response

(I) Heart

(II) Blood vessels

(III) Blood

Transport

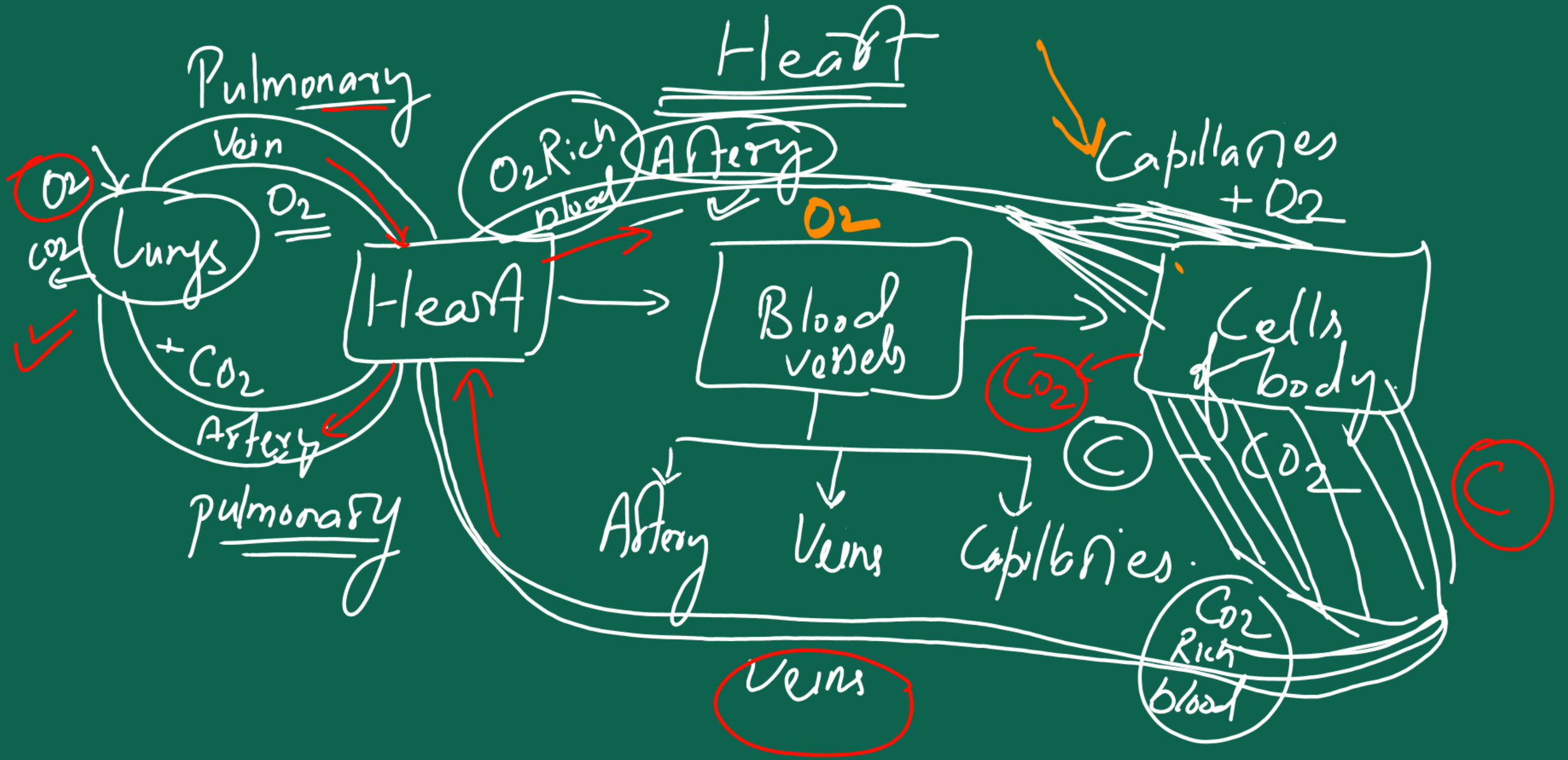
24x7

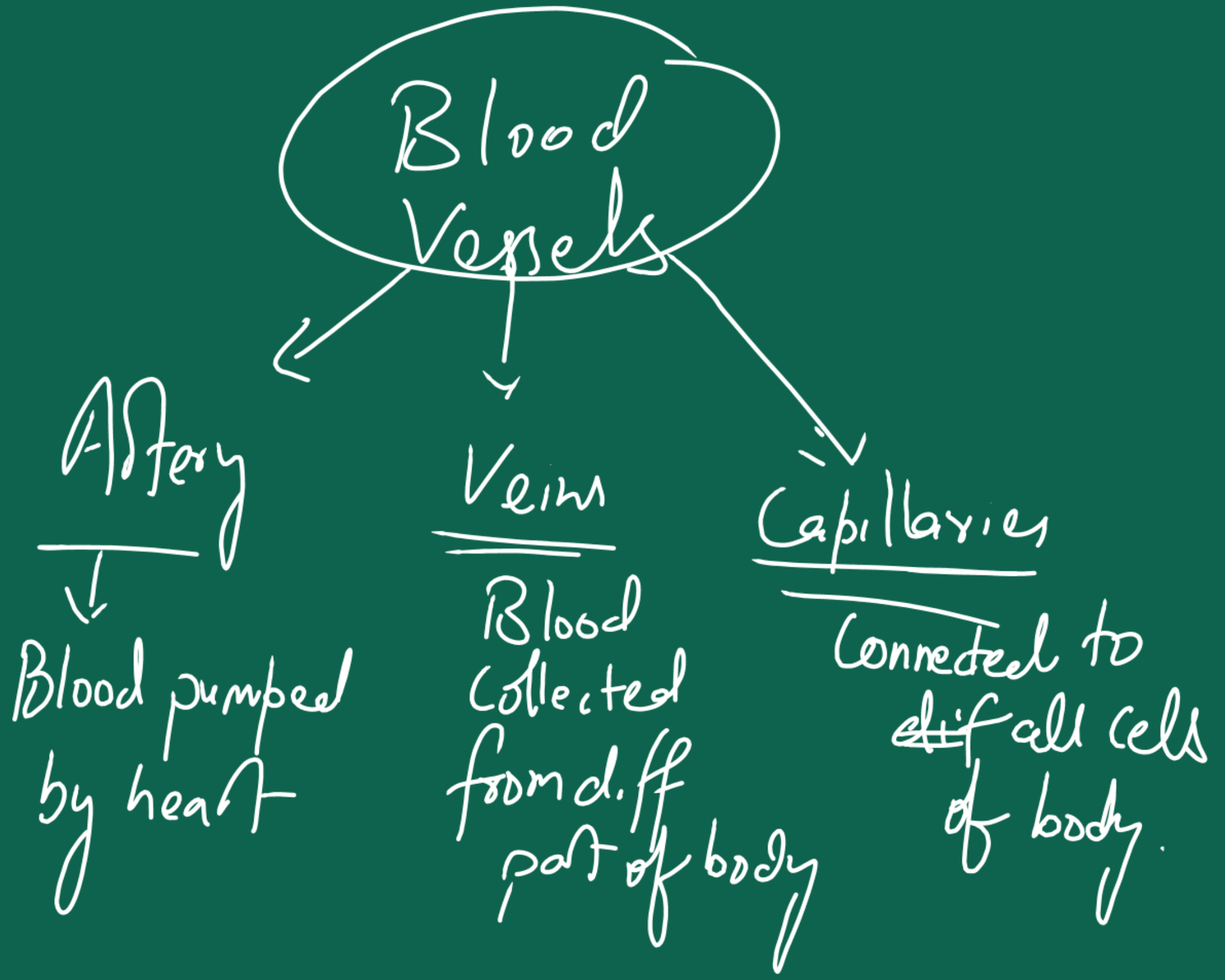
→ nutrients

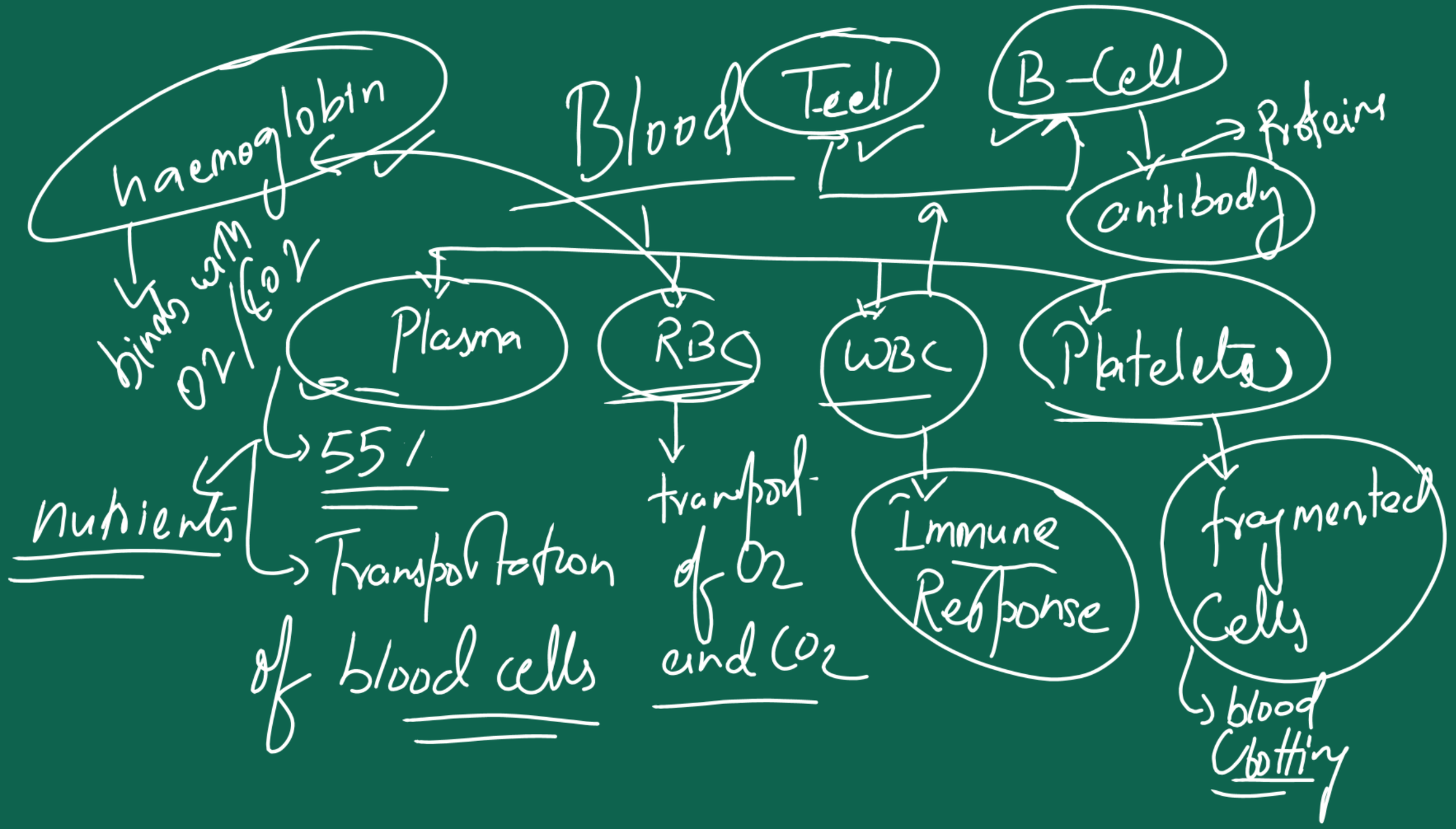
→ Oxygen

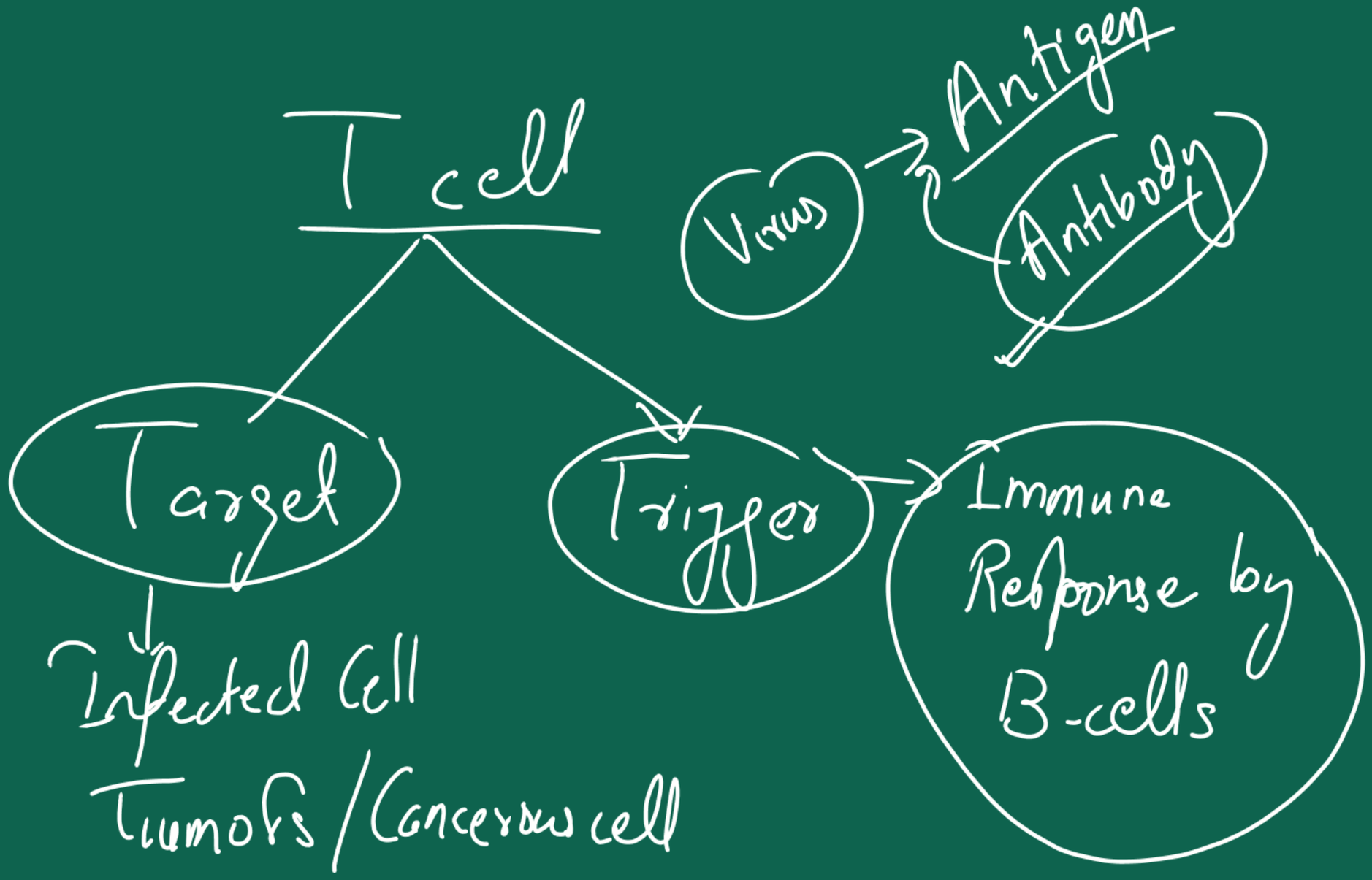
→ CO_2

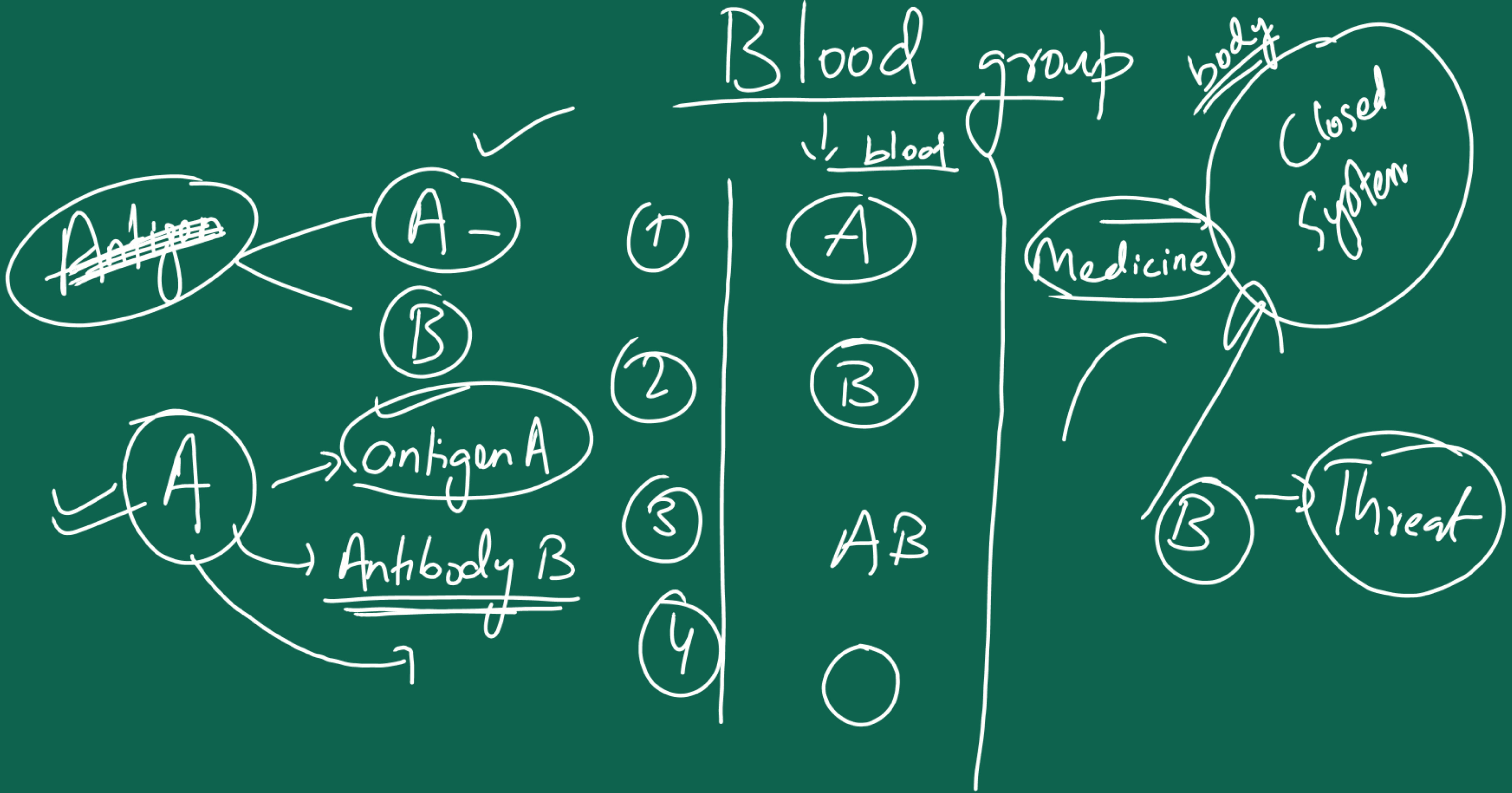
→ medicine

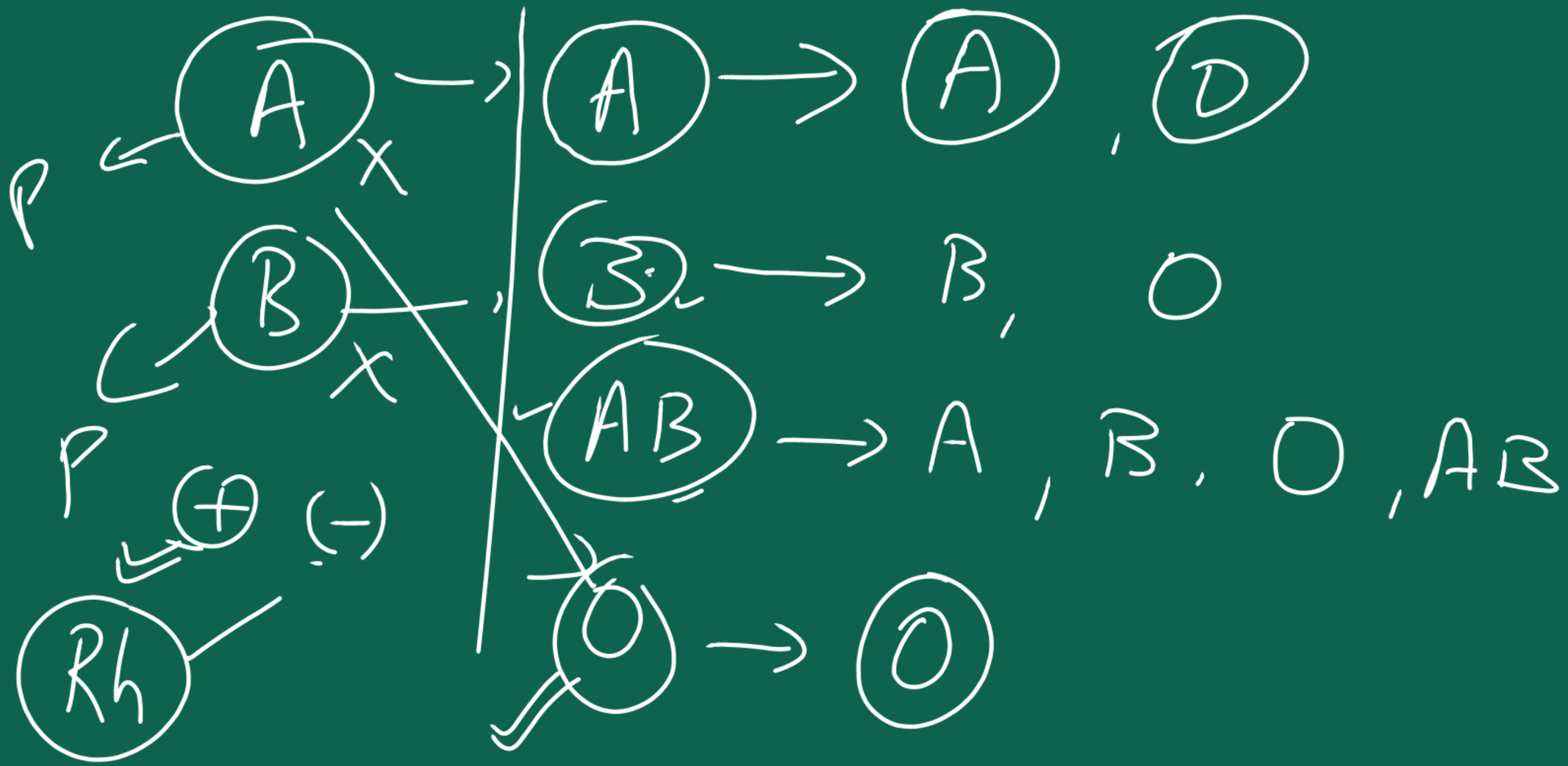

Heart
Pulmonary
Vein
O2
Lungs
CO2
O2
+CO2
Artery
Pulmonary
O2 Rich blood
Artery
Heart
Blood vessels
Artery
Veins
Capillaries.
Capillaries + O2
Cells of body.
CO2
CO2
Rich blood
Veins


Blood Vessels
Artery
Blood pumped by heart
Veins
Blood collected from diff part of body
Capillaries
Connected to all cells of body.


Blood
Haemoglobin
binds with O2/CO2
T-cell
B-Cell
Protein
antibody
Plasma
RBC
WBC
Platelets
55%
Nutrients
Transportation of blood cells
transport of O2 and CO2
Immune Response
fragmented cells
blood Clotting


T cell
Virus
Antigen
Antibody
Target
Trigger
Immune Response by B-cells
Infected Cell
Tumors / Cancerous cell


Blood group
blood
Antigen
A –
B
A
antigen A
Antibody B
1
2
3
4
A
B
AB
O
body
Closed System
Medicine
B
Threat


A
P
X
B
P
X
P
+
(-)
Rh
A
A
A
D
B
B
O
AB
A
B
O
AB
O
O

Rh

A^+	A^+, O^+, A^-, O^-
A^-	A^-, O^-
B^+	B^+, O^+, O^-, B^-
B^-	B^-, O^-
O^+	O^+, O^-
O^-	O^-
AB^+	$A^+, B^+, O^+, AB^+, A^-, B^-, AB^-, O^-$
AB^-	A^-, B^-, O^-, AB^-

A

B

Rh

Circulatory System

- **Blood is a specialized body fluid. It has four main components: plasma, red blood cells, white blood cells, and platelets. Blood has many different functions, including:**
- **transporting oxygen and nutrients to the lungs and tissues**
- **forming blood clots to prevent excess blood loss**
- **carrying cells and antibodies that fight infection**
- **bringing waste products to the kidneys and liver, which filter and clean the blood**
- **regulating body temperature**

Circulatory System

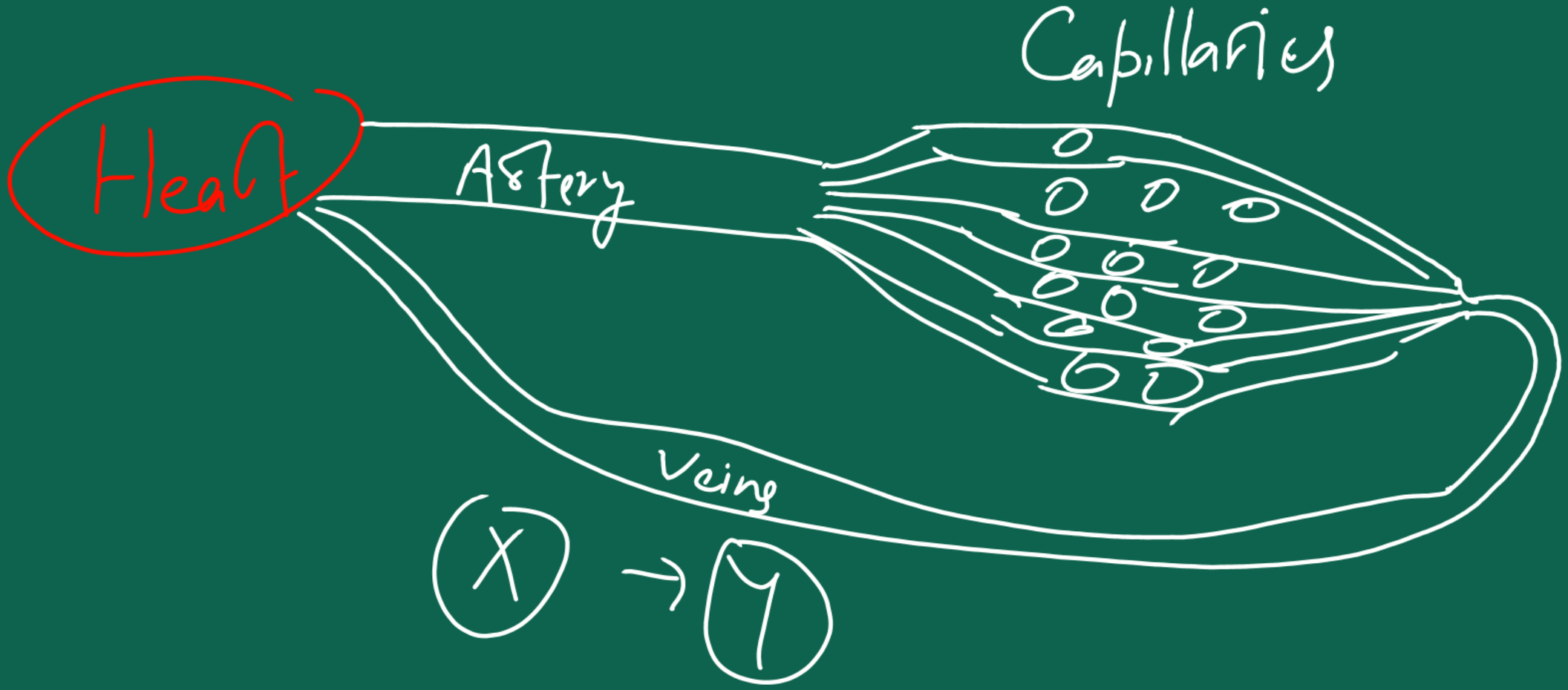
- **The blood that runs through the veins, arteries, and capillaries is known as whole blood, a mixture of about 55 percent plasma and 45 percent blood cells. About 7 to 8 percent of your total body weight is blood. An average-sized man has about 12 pints of blood in his body, and an average-sized woman has about nine pints.**

Circulatory System

- **Plasma**
- **The liquid component of blood is called plasma, a mixture of water, sugar, fat, protein, and salts. The main job of the plasma is to transport blood cells throughout your body along with nutrients, waste products, antibodies, clotting proteins, chemical messengers such as hormones, and proteins that help maintain the body's fluid balance.**

Circulatory System

- **Red Blood Cells (also called erythrocytes or RBCs)**
- **Known for their bright red color, red cells are the most abundant cell in the blood, accounting for about 40 to 45 percent of its volume. Red cells contain a special protein called haemoglobin, which helps carry oxygen from the lungs to the rest of the body and then returns carbon dioxide from the body to the lungs so it can be exhaled. Blood appears red because of the large number of red blood cells, which get their color from the hemoglobin.**


Capillaries
Heart
Artery
Veins
X
Y

Circulatory System

- **The other major type of white blood cell is a lymphocyte. There are two main populations of these cells. T lymphocytes help regulate the function of other immune cells and directly attack various infected cells and tumors. B lymphocytes make antibodies, which are proteins that specifically target bacteria, viruses, and other foreign materials.**

Circulatory System

- Platelets (also called thrombocytes)
- Unlike red and white blood cells, platelets are not actually cells but rather small fragments of cells. Platelets help the blood clotting process (or coagulation) by gathering at the site of an injury, sticking to the lining of the injured blood vessel, and forming a platform on which blood coagulation can occur. This results in the formation of a fibrin clot, which covers the wound and prevents blood from leaking out. Fibrin also forms the initial scaffolding upon which new tissue forms, thus promoting healing.
- A higher than normal number of platelets can cause unnecessary clotting, which can lead to strokes and heart attacks

Circulatory System

- **Blood groups**
- **There are 4 main blood groups (types of blood) – A, B, AB and O. Your blood group is determined by the genes you inherit from your parents.**
- **The blood group is identified by antibodies and antigens in the blood.**
- **Antibodies are proteins found in plasma. They're part of your body's natural defences. They recognise foreign substances, such as germs, and alert your immune system, which destroys them.**
- **Antigens are protein molecules found on the surface of red blood cells.**

Circulatory System

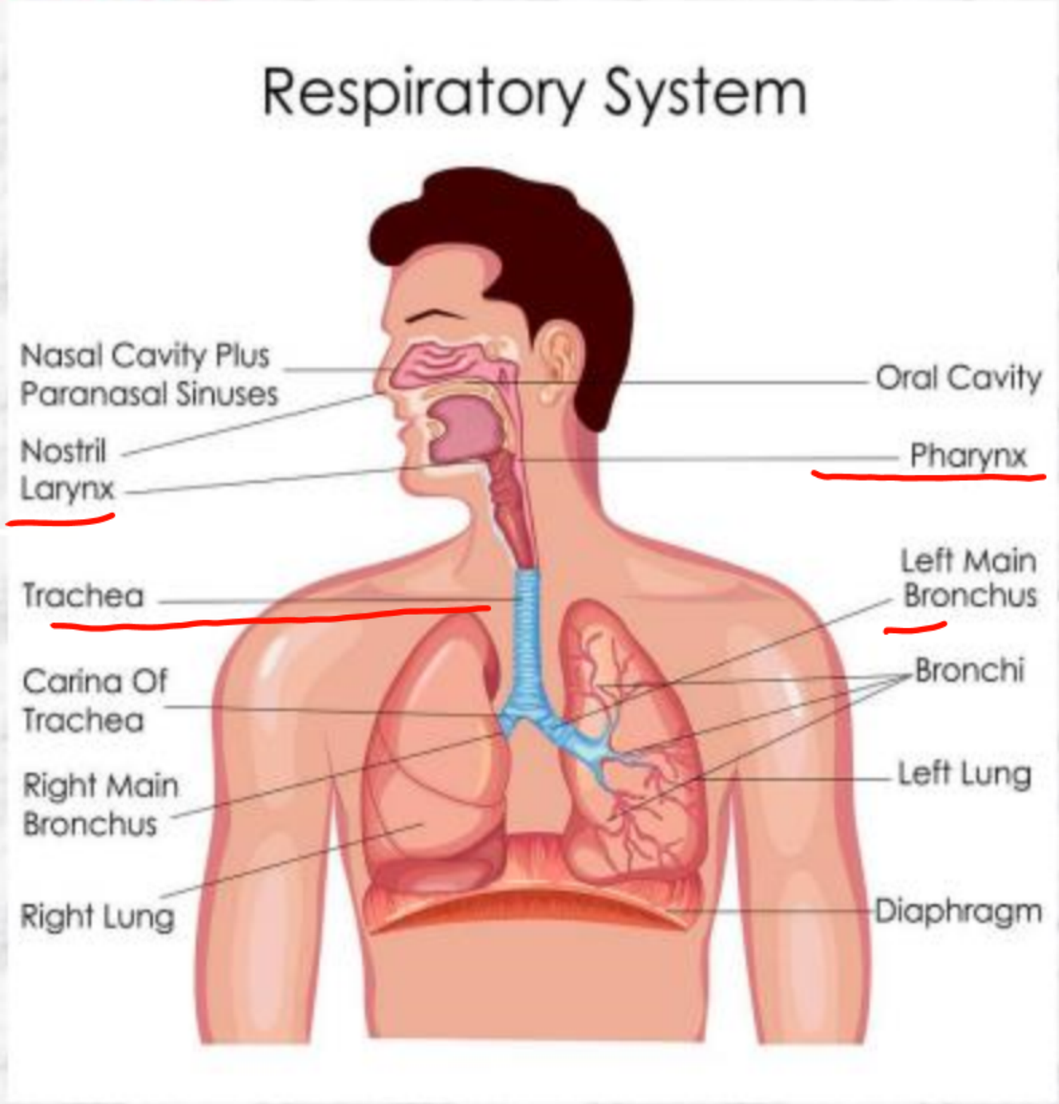
- The ABO system
- There are 4 main blood groups defined by the ABO system:
- blood group A – has A antigens on the red blood cells with anti-B antibodies in the plasma
- blood group B – has B antigens with anti-A antibodies in the plasma
- blood group O – has no antigens, but both anti-A and anti-B antibodies in the plasma
- blood group AB – has both A and B antigens, but no antibodies

Circulatory System

- Blood group O is the most common blood group.
- The Rh system
- Red blood cells sometimes have another antigen, a protein known as the RhD antigen. If this is present, then blood group is RhD positive. If it's absent, then blood group is RhD negative.
- This means there are 8 blood groups:
- A RhD positive (A+)
- A RhD negative (A-)
- B RhD positive (B+)
- B RhD negative (B-)
- O RhD positive (O+)
- O RhD negative (O-)
- AB RhD positive (AB+)
- AB RhD negative (AB-)
- In most cases, O RhD negative blood (O-) can safely be given to anyone. It's often used in medical emergencies when the blood type is not immediately known.
- It's safe for most recipients because it does not have any A, B or RhD antigens on the surface of the cells, and is compatible with every other ABO and RhD blood group

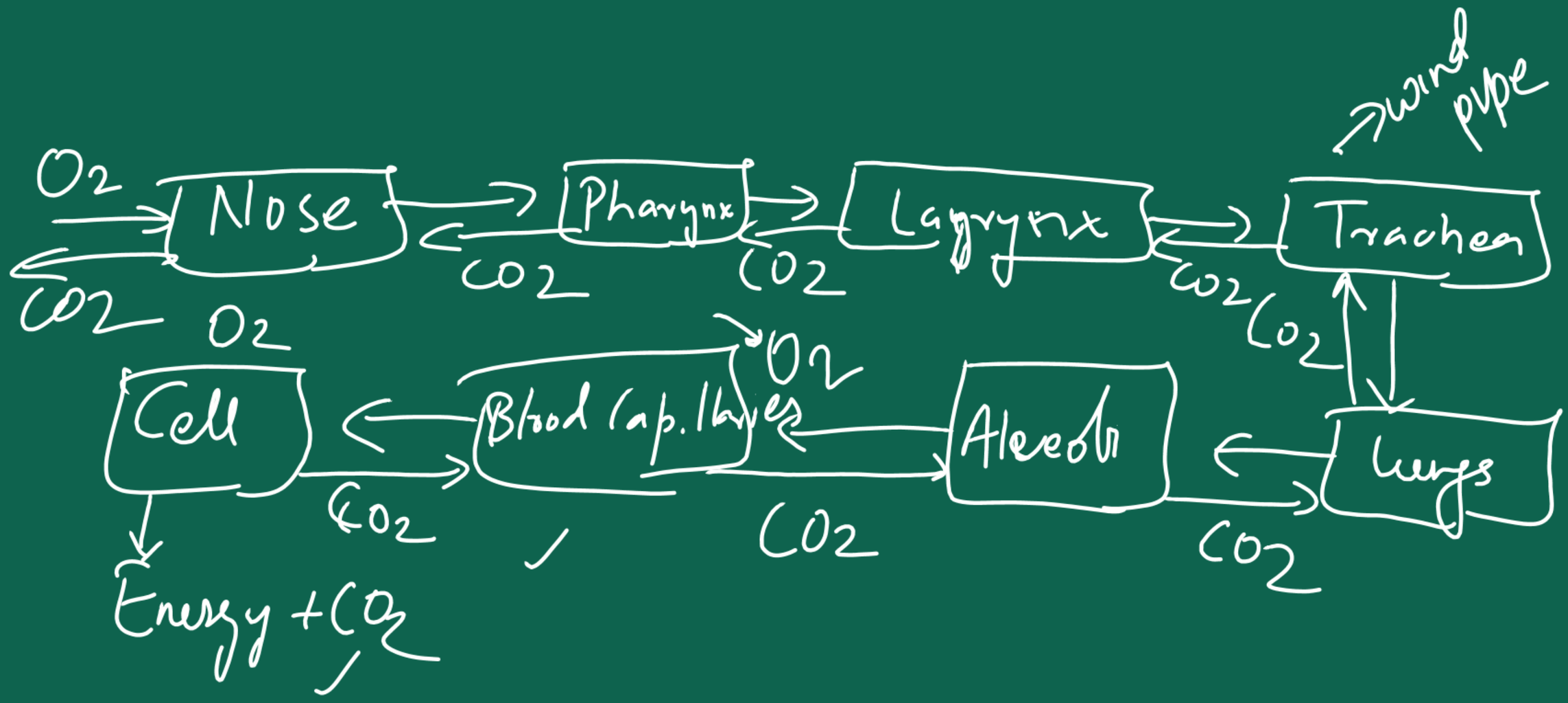
Respiratory System

- The respiratory system is the network of organs and tissues that helps to breathe. It includes airways, lungs and blood vessels. The muscles that powers lungs are also part of the respiratory system. These parts work together to move oxygen throughout the body and clean out waste gases like carbon dioxide.
- What does the respiratory system do?
- The respiratory system has many functions. Besides helping you inhale (breathe in) and exhale (breathe out), it:
- Allows you to talk and to smell.
- Warms air to match your body temperature and moisturizes it to the humidity level your body needs.
- Delivers oxygen to the cells in your body.
- Removes waste gases, including carbon dioxide, from the body when you exhale.
- Protects your airways from harmful substances and irritants.

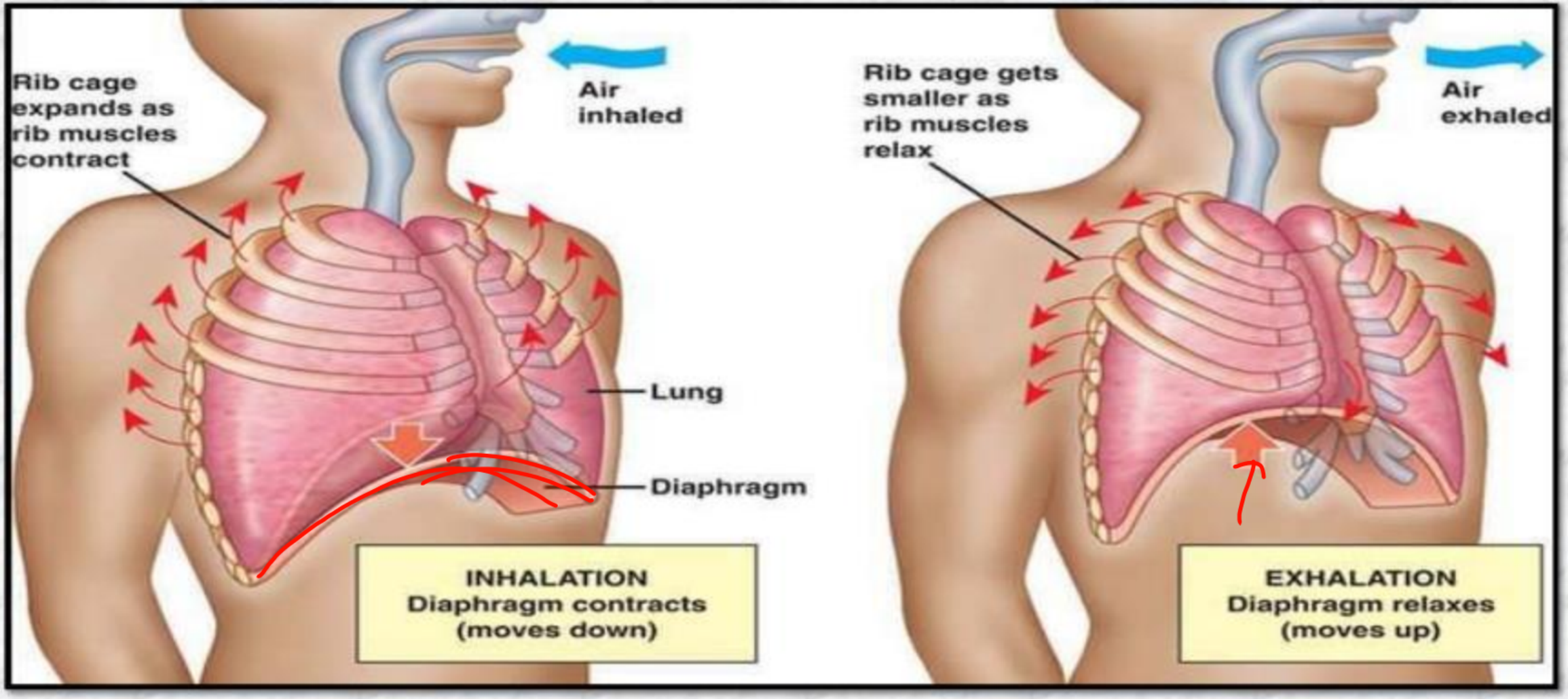


Respiratory

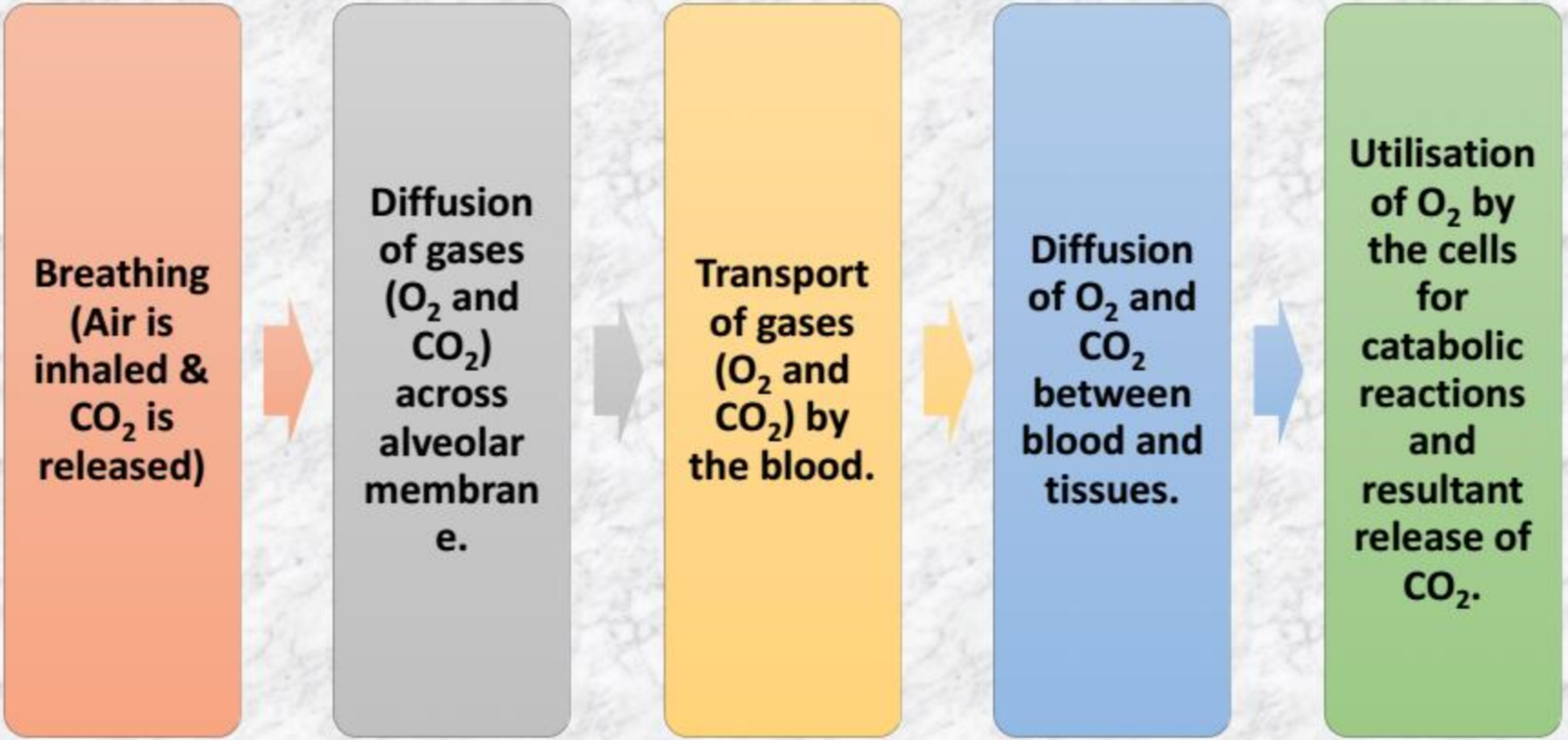
- Inhaling of O_2
- Transport of O_2 to cells
- Energy formation
- Release of CO_2
- Exhaling


O2
Nose
Pharynx
Lagryinx
Trachea
wind pipe
CO2
CO2
CO2
CO2
O2
O2
Cell
Blood cap. layer
Alveoli
Lungs
CO2
CO2
CO2
Energy + CO2

Respiratory Mechanism



Respiratory Mechanism



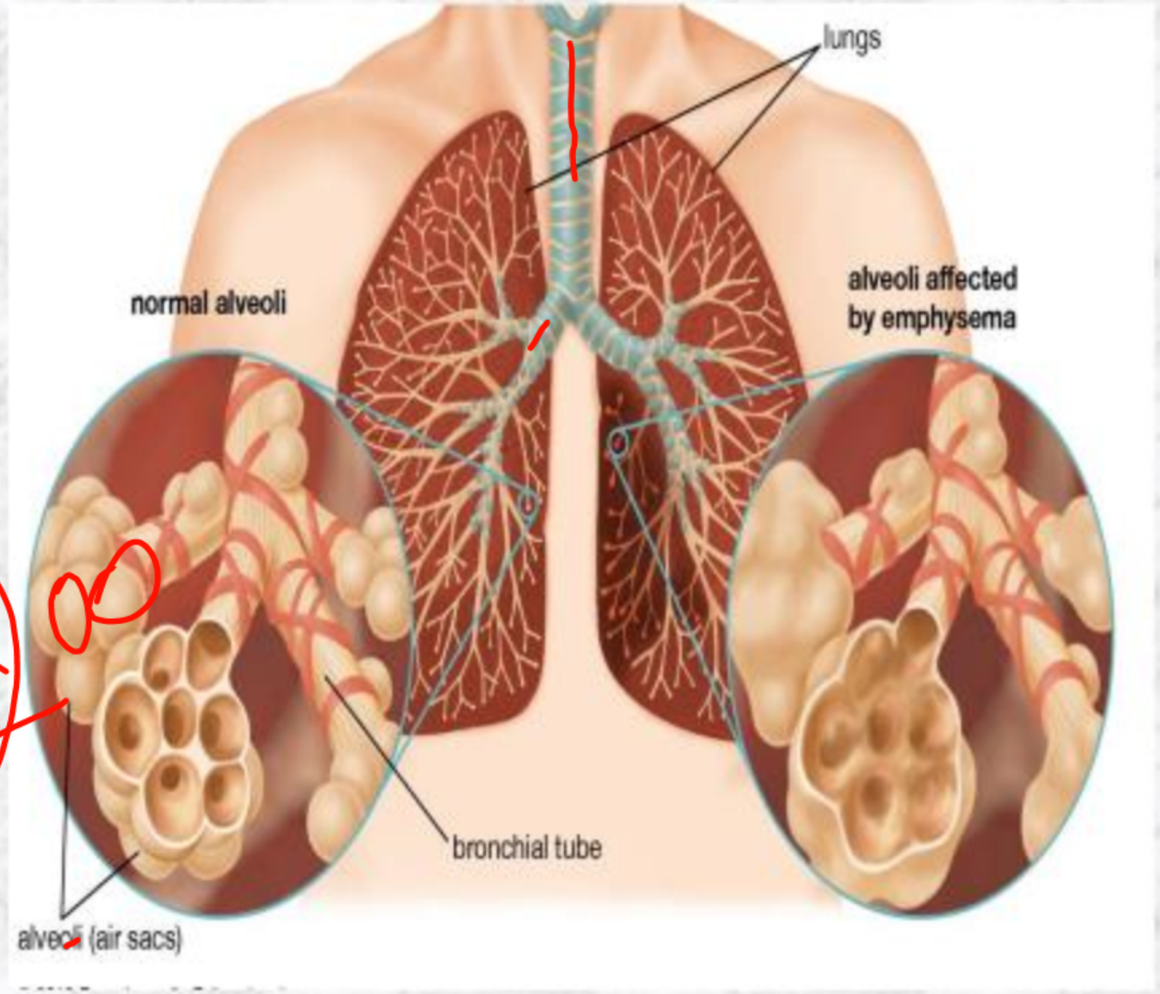
Respiratory System

- **Parts of Respiratory System:**
- **Mouth and nose: Openings that pull air from outside your body into your respiratory system.**
- **Sinuses: Hollow areas between the bones in your head that help regulate the temperature and humidity of the air you inhale.**
- **Pharynx (throat): Tube that delivers air from your mouth and nose to the trachea (windpipe).**
- **Trachea: Passage connecting your throat and lungs.**
- **Bronchial tubes: Tubes at the bottom of your windpipe that connect into each lung.**
- **Lungs: Two organs that remove oxygen from the air and pass it into your blood.**

Respiratory Mechanism

Alveoli are the primary sites of exchange of gases.

Exchange of gases also occur between blood and tissues. O_2 and CO_2 are exchanged in alveoli by diffusion based on pressure & concentration gradient.



Respiratory Mechanism

External Respiration

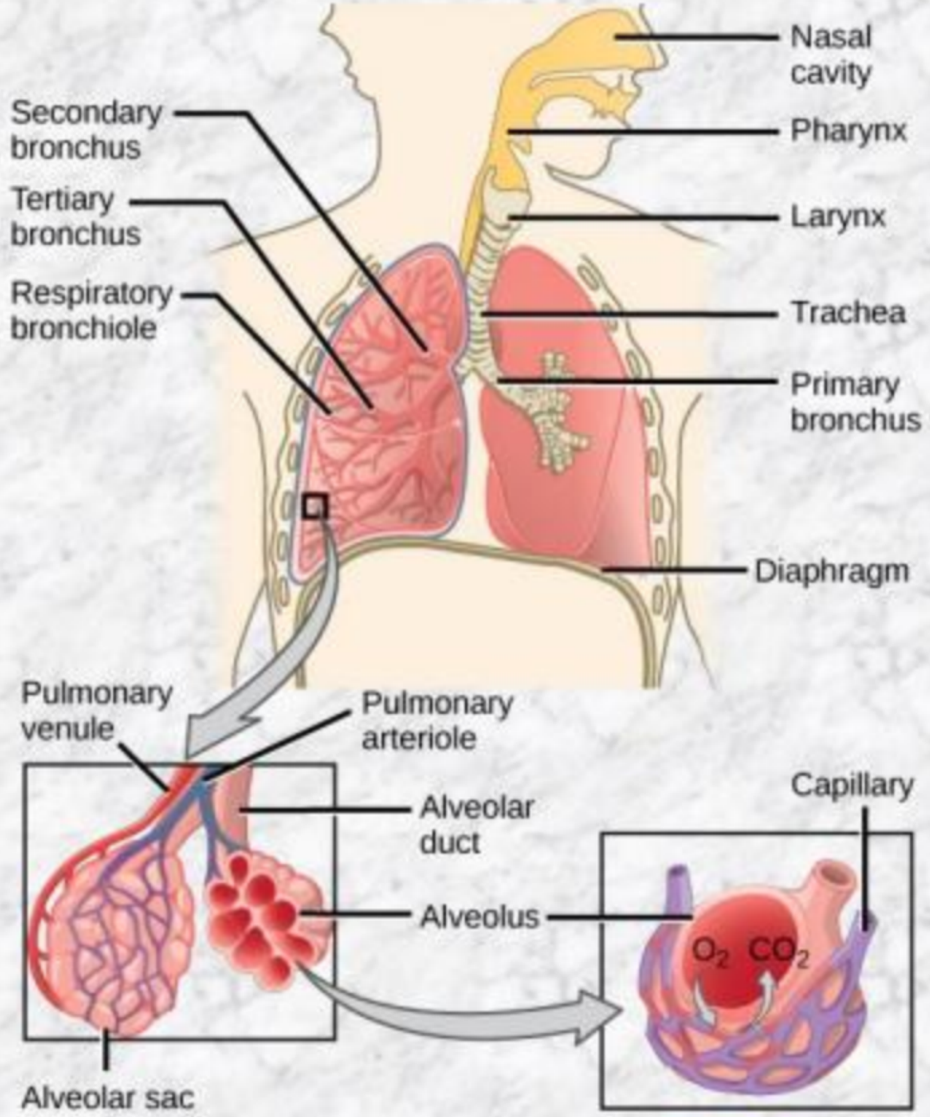
- Inhale
- Exhale

Internal Respiration

- oxygen and carbon dioxide are exchanged between the cells and blood vessels.

Cellular Respiration

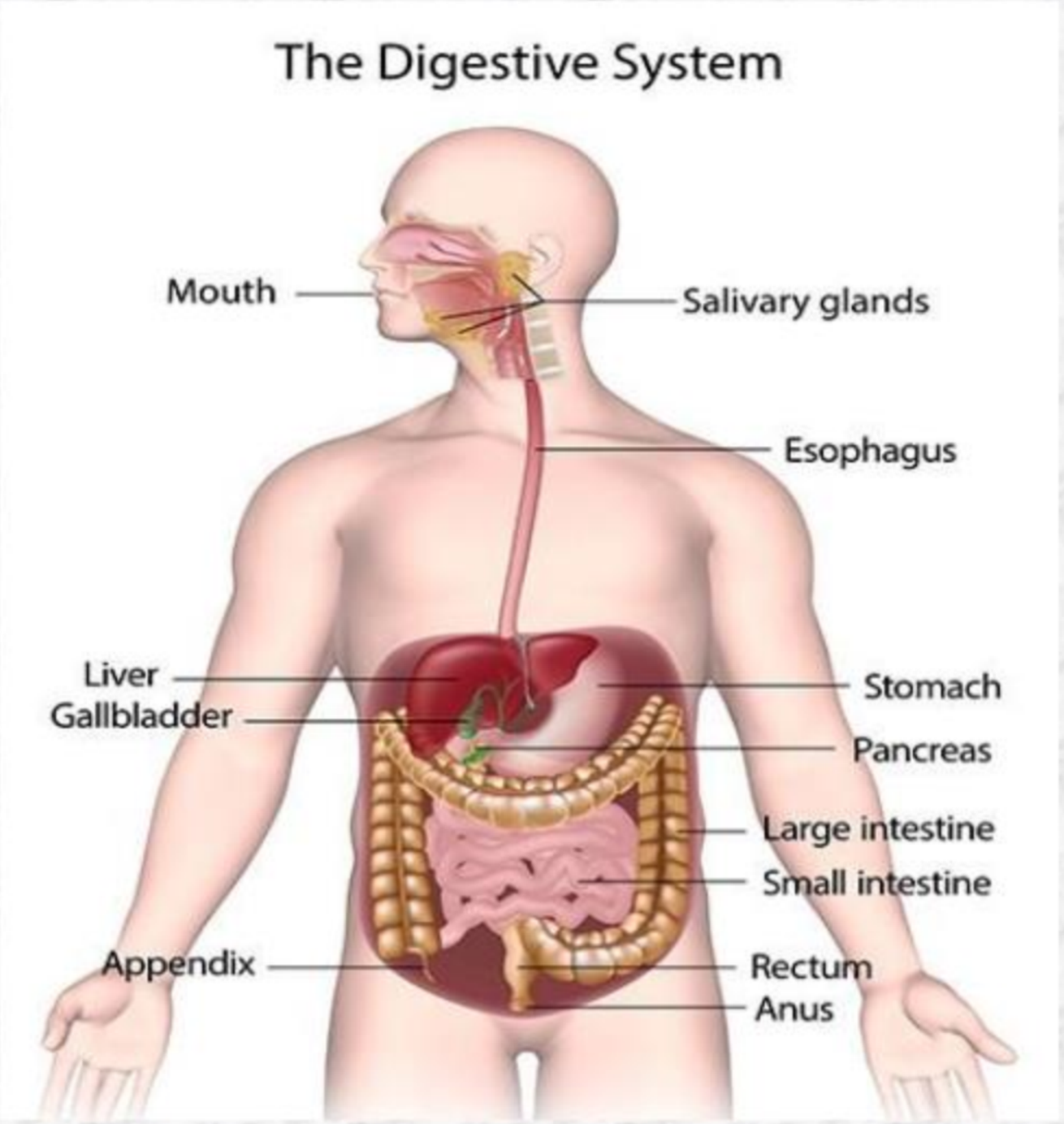
- cellular respiration process is one in which carbohydrates are converted into energy.



Human Digestive System

The human digestive system consists of the gastrointestinal tract plus the accessory organs of digestion.

Digestion involves the breakdown of food into smaller and smaller components, until they can be absorbed and assimilated into the body.



Digestive System

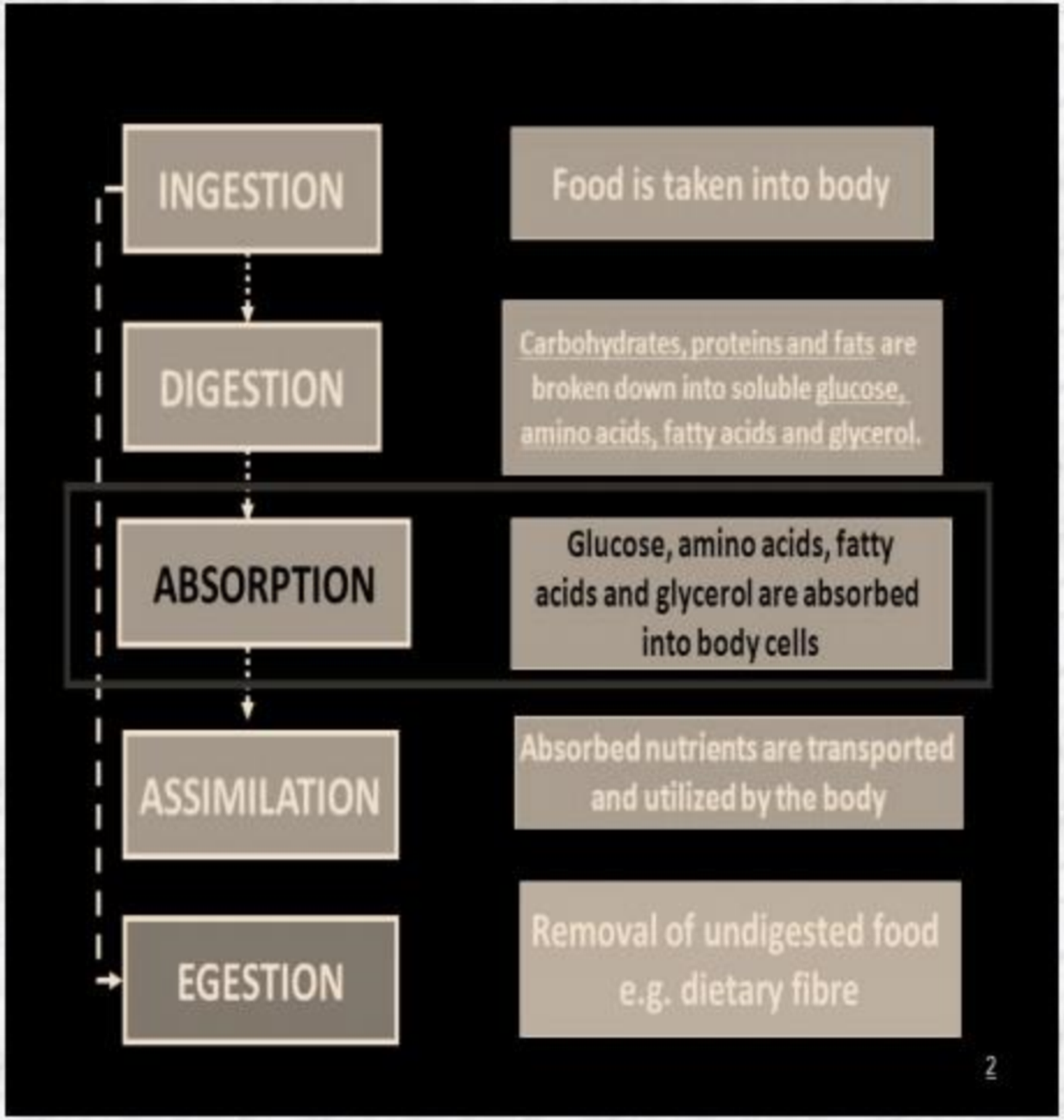
Ingestion

Digestion

Absorption

Assimilation

Egestion



Digestive System

Mouth & Buccal Cavity

Ingestion happens through the mouth.
The mouth leads to the buccal cavity or oral cavity where digestion starts.

Mouth has the salivary glands which secrete saliva.

The saliva breaks down the starch into sugars.

The saliva secreted into the oral cavity contains electrolytes and enzymes.

Salivary Amylase:

The chemical process of digestion is initiated in the oral cavity by the hydrolytic action of the carbohydrate-splitting enzyme, salivary amylase.

Lysozyme is also present in saliva and acts as an antibacterial agent that prevents infections.

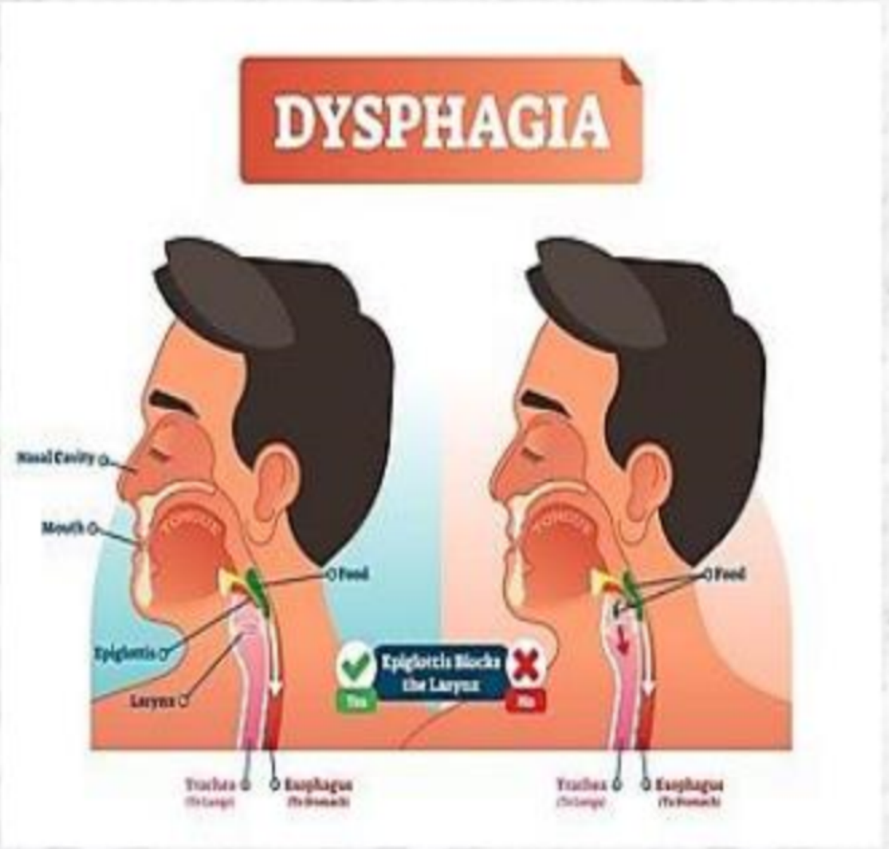
Mouth & Buccal Cavity

The oral cavity leads into a short pharynx which serves as a common passage for food and air.

The Oesophagus and the trachea (wind pipe) open into the pharynx.

Epiglottis prevents the entry of food into the glottis(opening of the wind pipe).

The swallowed food passes into the foodpipe or oesophagus then enter stomach.



Esophagus

The esophagus is a muscular tube that connects the pharynx (throat) to the stomach.

The esophagus contracts as it moves food into the stomach.

A “valve” called the lower oesophagal sphincter (LES) is located just before the opening to the stomach.

This valve opens to let food pass into the stomach from the esophagus and it prevents food from moving back up into the esophagus from the stomach.

Stomach

The inner lining of the stomach secretes mucous, hydrochloric acid and digestive juices. The mucous protects the lining of the stomach.

Why Stomach have an acidic pH?

The acidic nature of the stomach kills many bacteria that enter along with the food.

The digestive juices break down the proteins into simpler substances.

Small Intestine

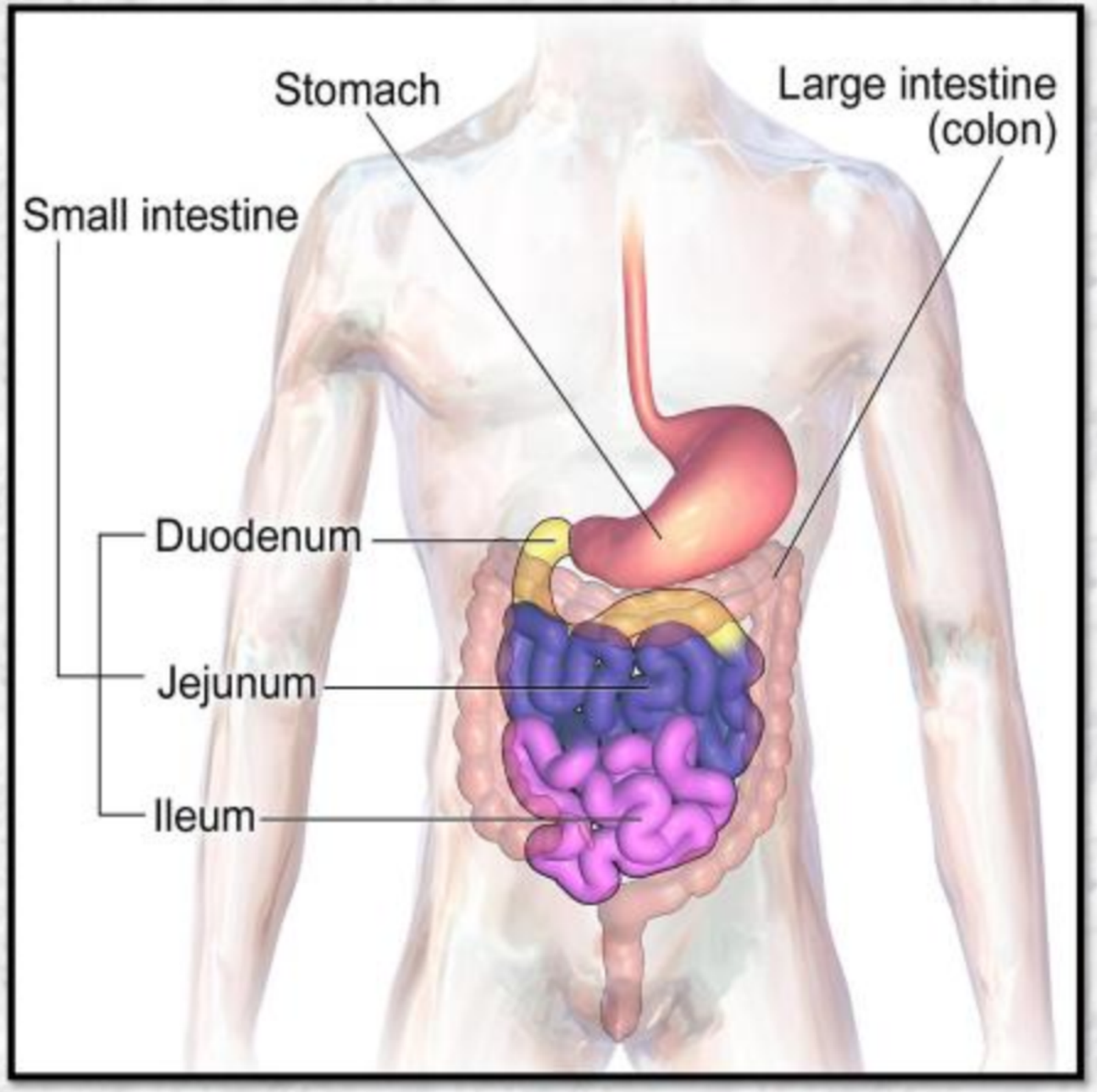
Small intestine is distinguishable into three regions

1. **Duodenum**
2. **Jejunum**
3. **Ileum**

The small intestine is highly coiled and is about 5-6 meters long.

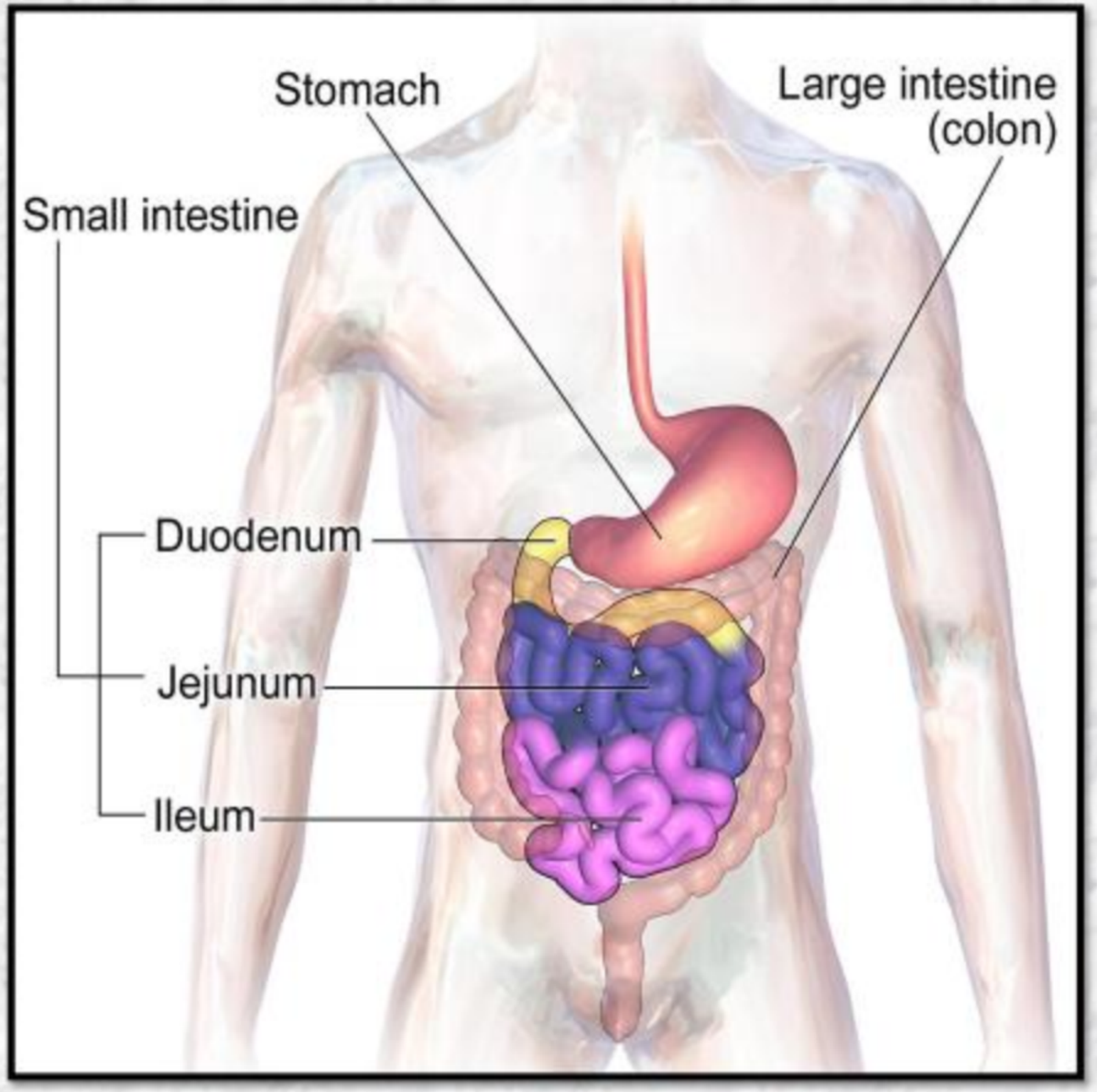
It also receives secretions from the liver and the pancreas.

Besides, its wall also secretes juices.



Small Intestine

1. **Duodenum** : Initial portion of the small intestine and where absorption actually begins. It receives, Pancreatic enzymes and breaks down the chyme. It also receives bile from Gall which allows for the breakdown and absorption of lipids from food products.
2. **Jejunum**: Primary function of the jejunum is to absorb sugars, amino acids, and fatty acids.
3. **Ileum**: The ileum absorbs any remaining nutrients that did not get absorbed by the duodenum or jejunum, in particular vitamin B12, as well as bile acids that will go on to be recycled.
4. **Duodenum < Jejunum < Ileum (In length 0.25m < 2.5m < 3m)**



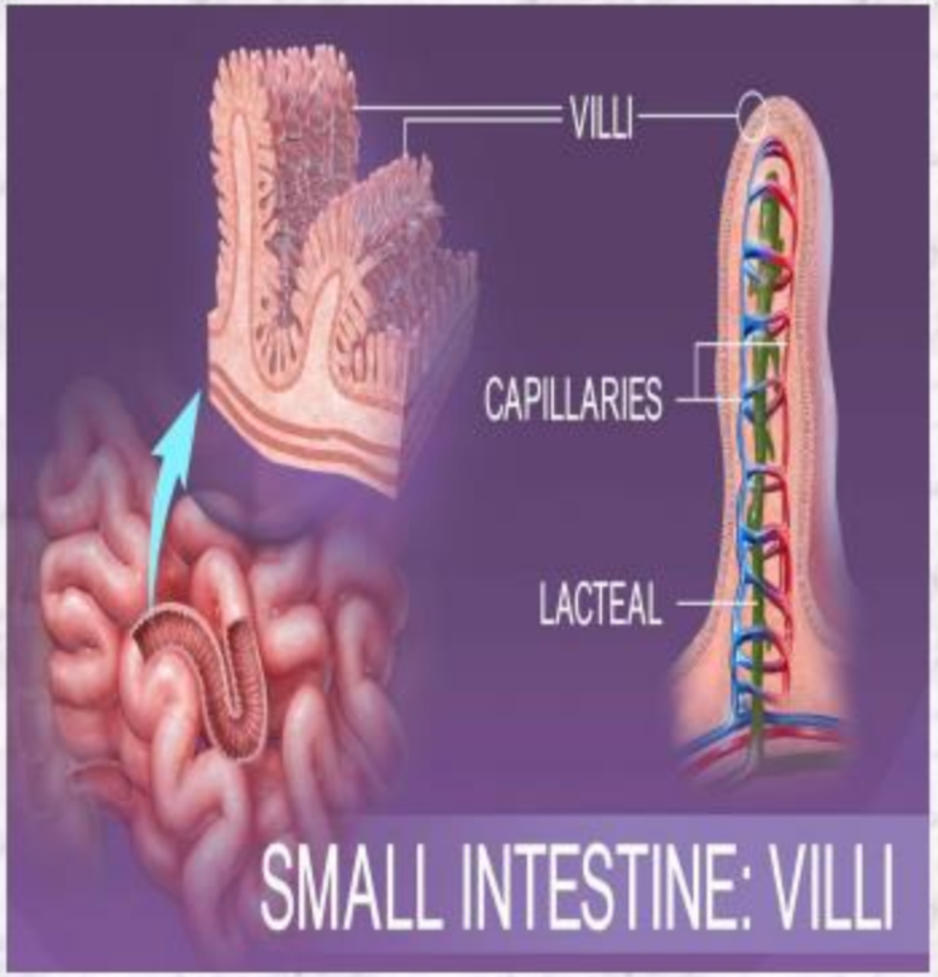
Small Intestine

The digested food passes into the blood vessels in the wall of the intestine. This process is called absorption.

The inner walls of the small intestine have thousands of finger-like outgrowths. These are called villi.

Villi increase the surface area for absorption of the digested food.

The absorbed substances are transported via the blood vessels to different organs of the body where they are used to build complex substances such as the proteins required by the body. This is called assimilation.



Small Intestine

Small intestine receives the secretions of two glands: Liver and pancreas.

Liver secretes bile.

Bile is a greenish yellow liquid made in the liver which is normally stored in the gall bladder.

Bile is alkaline and contains salts which help to emulsify or break the fats or lipids present in the food. It makes the acidic food alkaline which comes from stomach.

Alkaline medium makes it easy for the enzymes to act and digest them.

Pancreas is a large leaf like gland which lies parallel to and beneath the stomach.

Pancreas secretes pancreatic juice which contains digestive enzymes like pancreatic amylase, trypsin and lipase.

The walls of small intestine contain glands which secrete intestinal juice. The intestinal juice contains a number of enzymes which complete the digestion of complex carbohydrates in to glucose, proteins in to amino acids and fats in to fatty acids and Glucose.

Large Intestine

The large intestine is wider and shorter than small intestine. It is about 1.5 metre in length.

Large intestine's function is to absorb water and some salts from the undigested food material.

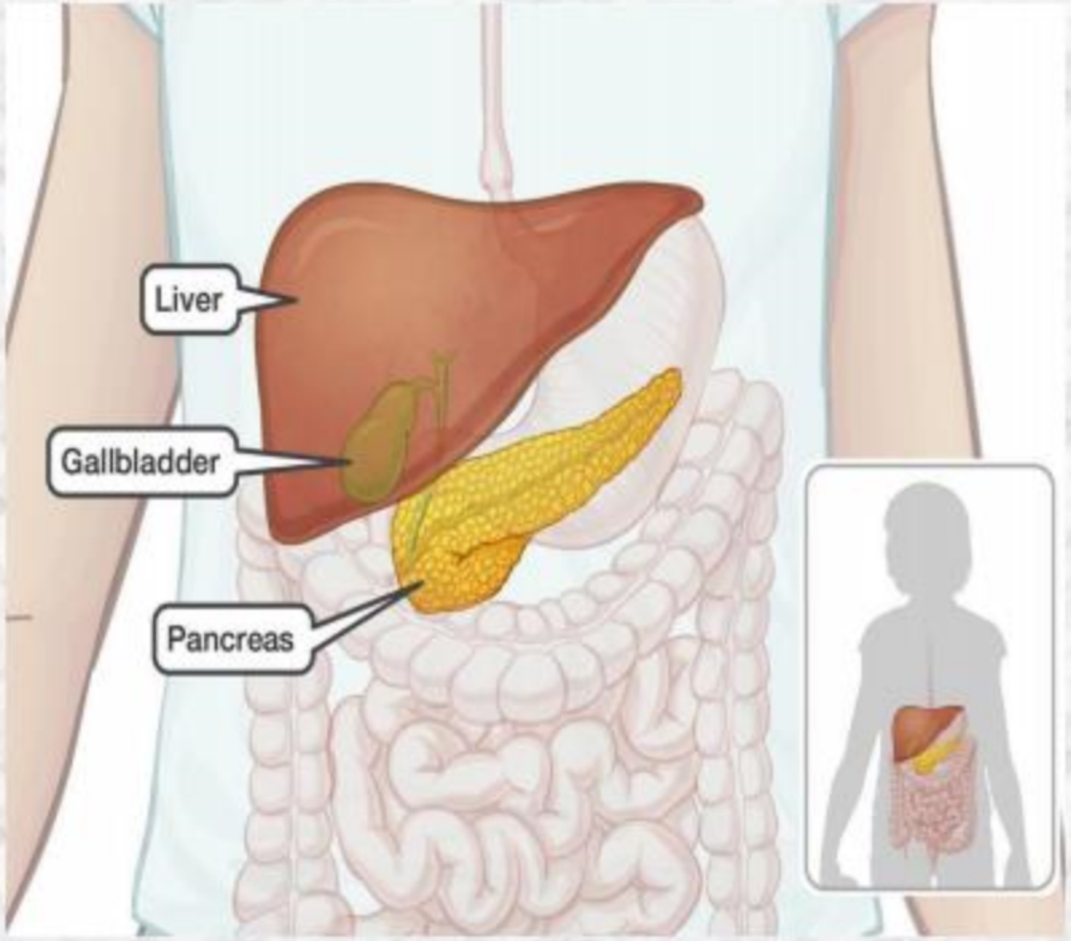
Rectum: An 8-inch chamber that connects the colon to the anus. The rectum receives stool from the colon, sends signals to the brain if there is stool to be evacuated, and holds stool until evacuation can happen.

Anus: The last part of the digestive tract, the anus, consists of pelvic floor muscles and two anal sphincters (internal and external). Together their jobs are to detect rectal contents, whether they are liquid, gas or solid, and then control when stool should and shouldn't be excreted from your body.

Liver, Pancreas & Gall Bladder

Liver

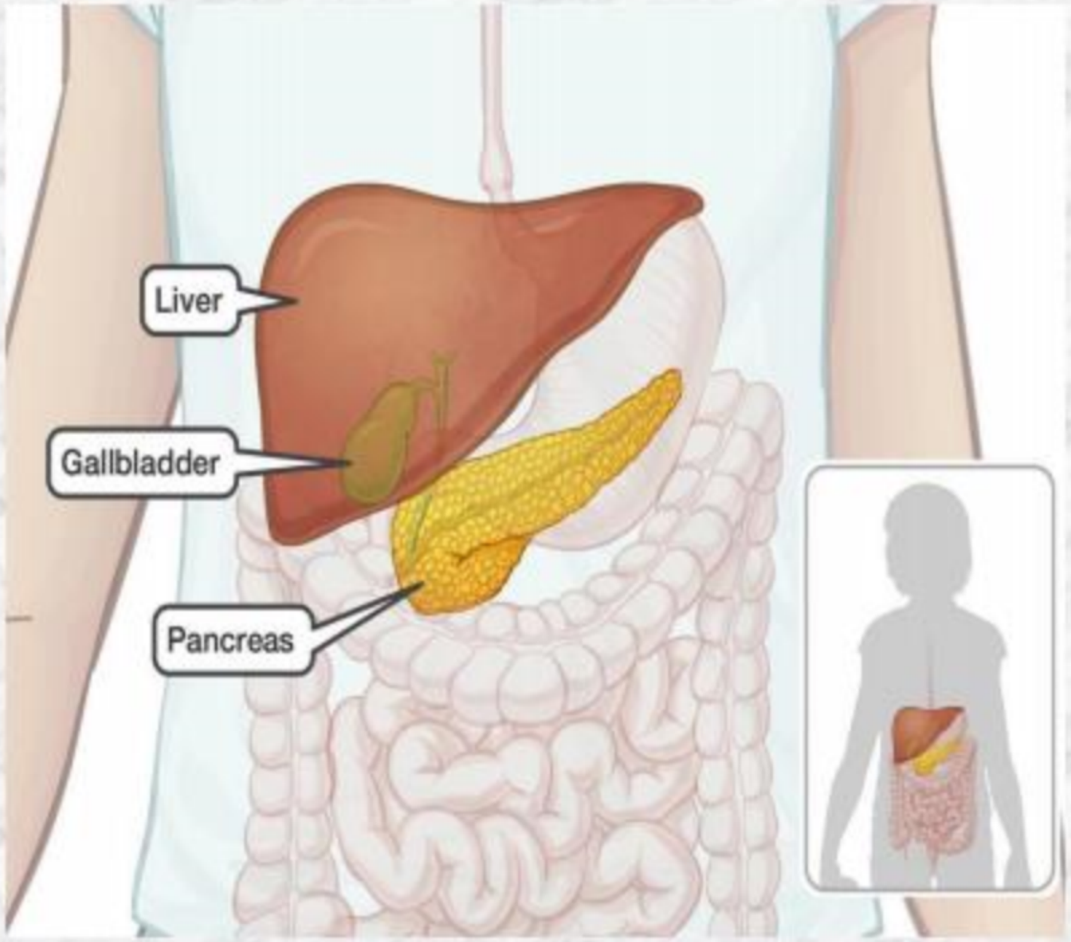
- **The liver is the largest gland in the body, weighing about 1.5 kg (3.3 lb) in an adult.**
- **The liver has many roles in the digestive system.**
- **It produces a yellow-green fluid called bile, which breaks down fats and removes wastes and toxins from the body**
- **Bile is alkaline and contains salts which help to emulsify or break the fats or lipids present in the food.**
- **Bile also helps carry waste from the liver that cannot go through the kidneys.**



Liver, Pancreas & Gall Bladder

Pancreas

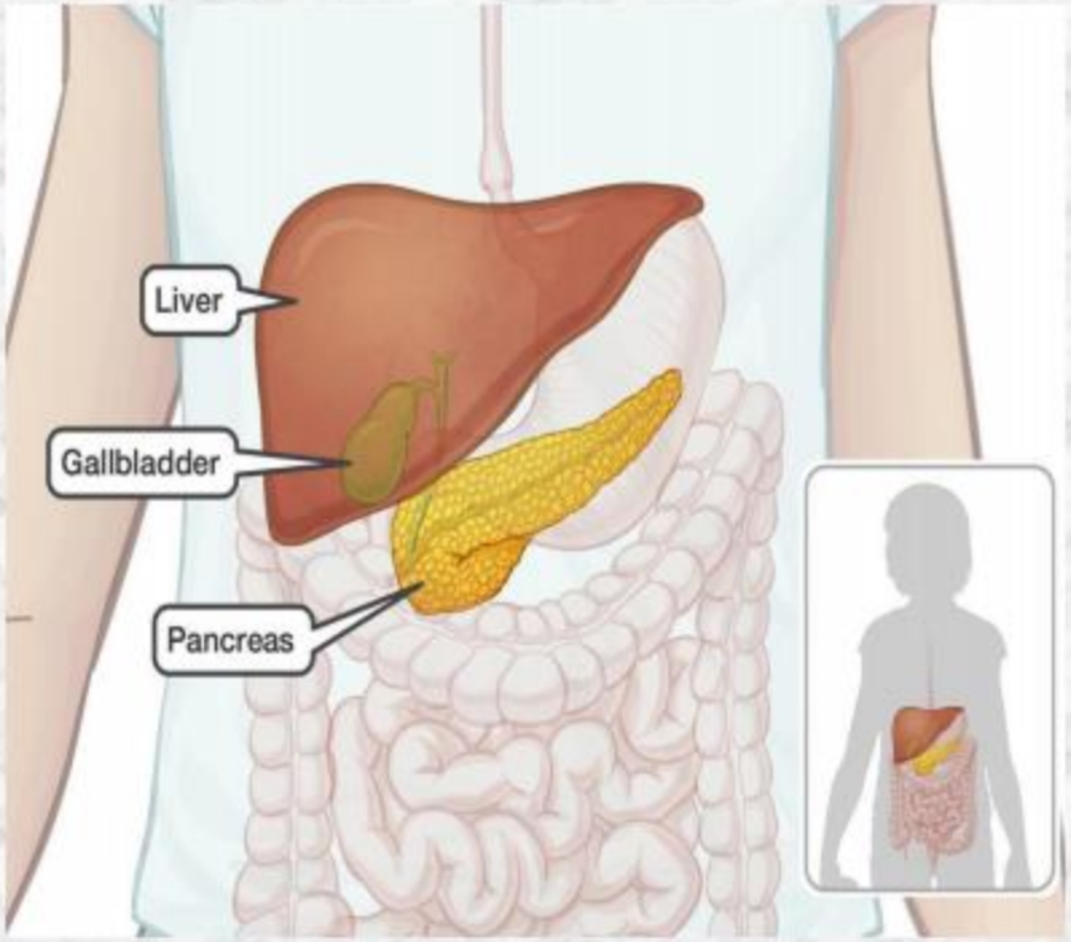
- **The pancreas is located below the stomach.**
- **It produces a mix of enzymes that together are called pancreatic juice.**
- **The pancreas secretes pancreatic juice which contains digestive enzymes like pancreatic amylase, trypsin and lipase.**
- **This juice helps neutralize the very acidic chyme when it enters the small intestine.**
- **Pancreatic juice also helps us to digest proteins, fats and carbohydrates.**
- **Amylase breaks down the starch, trypsin digests the proteins and lipase breaks down the emulsified fats.**



Liver, Pancreas & Gall Bladder

Gall bladder

- **The gall bladder is a pouch-shaped organ that stores the bile produced by the liver.**
- **The gall bladder shares a vessel, called the common bile duct, with the liver.**
- **When bile is needed, it moves through the common bile duct into the first part of the small intestine, the duodenum.**
- **It is here that the bile breaks down fat.**



Nervous System

We see people, identify them, listen to their thoughts and speak our thoughts etc. All these co-ordinating activities are done by our brain and nerves which is called nervous system

1. brain

2. Spinal cord

3. nerves

4. sensory organs

Nervous System

brain - human brain is a soft and delicate part. It is around 3 to 5 kg kilograms in an adult. This part is safe in skull.

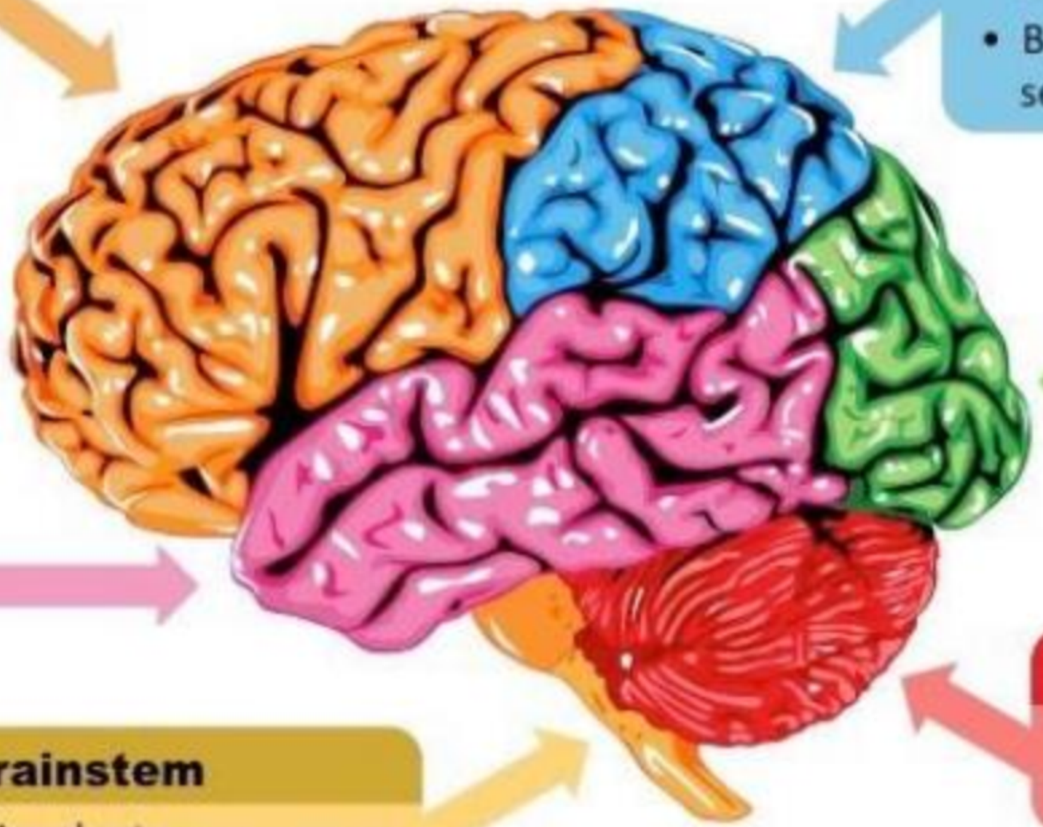
Human brain is the biggest size in all living organisms. It has the only secret of how humans can do all other works that other organisms cannot do.

Parts of brain:

Fore brain: this is the biggest part of brain. Its main function is to think and remember. This part is related to will power, intelligence and consciousness. It also gives us other areas related to knowledge centre like speaking, seeing, taste and smell.

Mid brain: this is a small part found below fore brain and back side of skull. Its function is to control various muscles.

Medulla oblongata - this is also known as pillar of brain. Its function is to control involuntary activities like heart rate and exhale breathing



Frontal Lobe
- Motor control (premotor cortex)
- Problem solving (prefrontal area)
- Speech production (Broca's area)

Parietal Lobe
- Touch perception (somatosensory cortex)
- Body orientation and sensory discrimination

Temporal Lobe
- Auditory processing (hearing)
- Language comprehension (Wernicke's area)
- Memory / information retrieval

Occipital Lobe
- Sight (visual cortex)
- Visual reception and visual interpretation

Brainstem
- Involuntary responses

Cerebellum
- Balance and coordination

Nervous System

2. Spinal cord - this is a pipe like structure starting from brain and going to backbone internally in body. All message sent from brain to body reach by this pipe. This also helps in giving fast reaction like if a thorn pricks than we take our hand back internally.

3. Nerves- Nerves carry electrical signals from brain that help you feel sensations and move your muscles. Nerves also control body functions like digesting food and maintaining your heart rate. Nerves are one of the foundational parts of your nervous system.

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THANKS FOR WATCHING