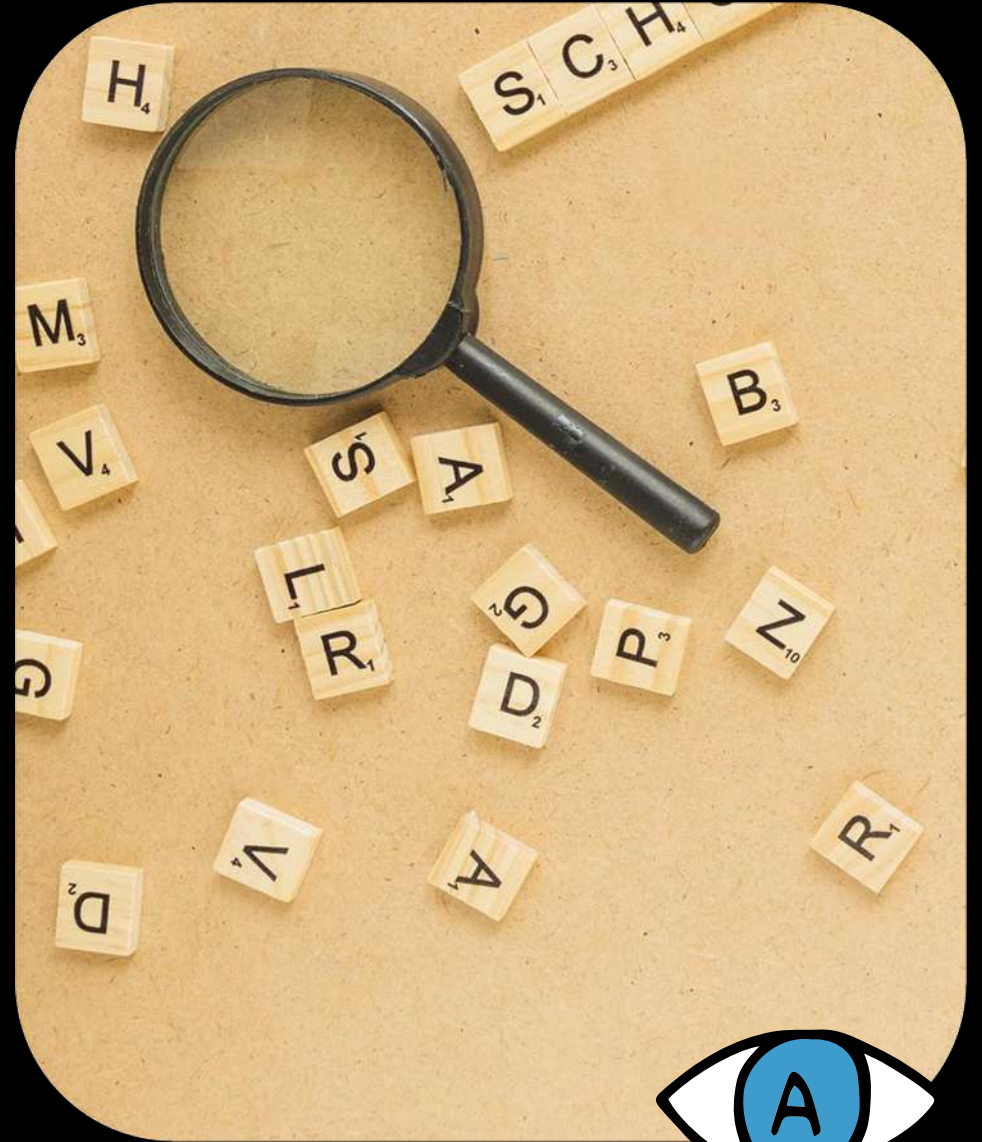
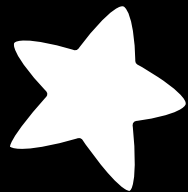




Unit -7

Physical Education



Course on

**Fundamentals of Anatomy
and Physiology in Sports...!!**



UNIT CONTENTS :



7.1

Definition and Importance of Anatomy and Physiology in exercise and sports

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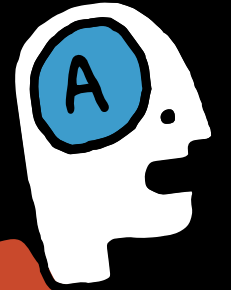
Function of Skeleton System, Classification of Bones & Types of Joints

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7.1 Definition and Importance of Anatomy and Physiology in Exercise and Sports

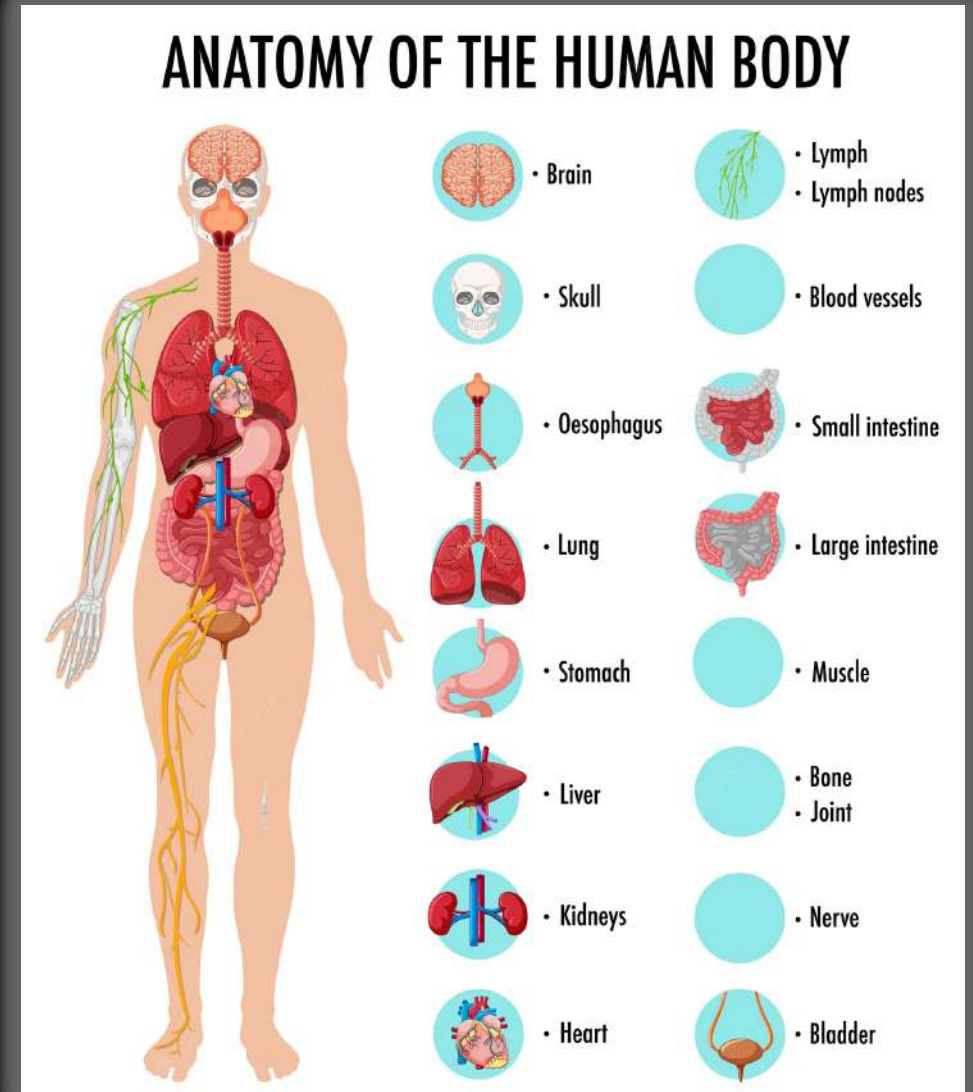
Anatomy :

It is a **branch of biology** that deals with the study of body structure of organism which includes then systems, organs and tissues.

The word 'Anatomy' is derived from a Greek word 'anatomye' which means 'to dissect' or 'to cut apart'.

According to its meaning, anatomy is a branch of biology which deals with the **identification and description** of internal body structure of an organism or living being.

In other words, it is a dissection or a **detailed analysis of the structure**, shape, size, weight and location of all organs of a human body.



Physiology :

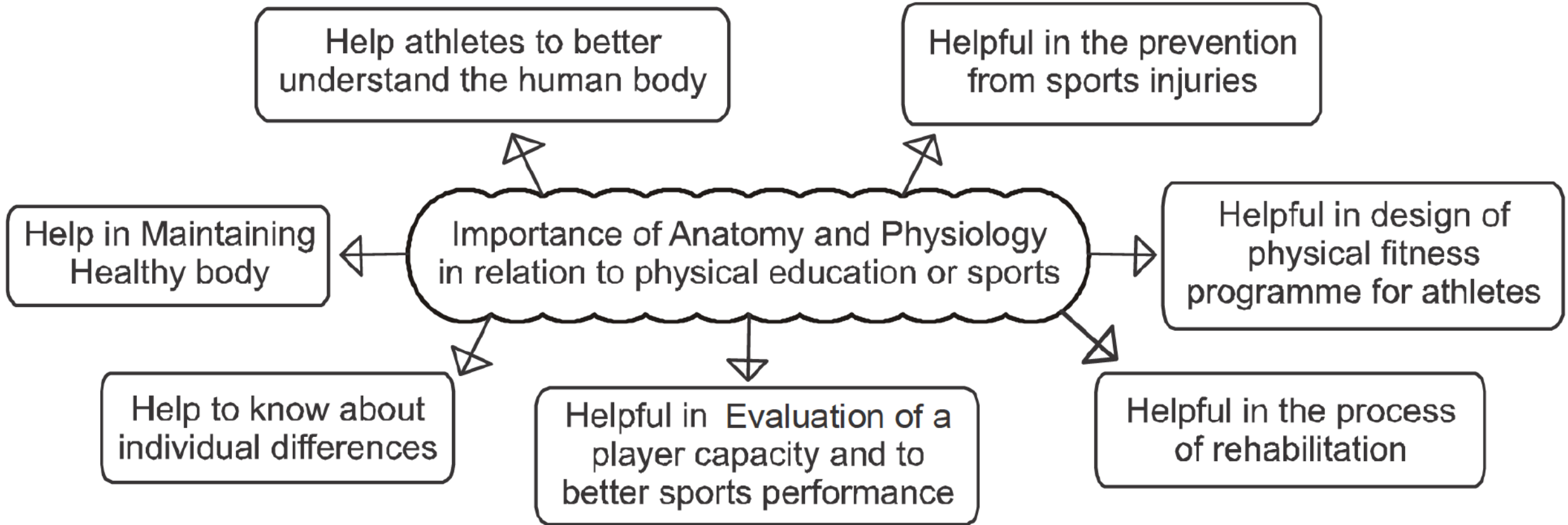
The word 'Physiology' consists of two words 'physio' which means 'nature' and 'logy' meaning 'study'.

Thus, physiology can be defined as a **branch of biology** which deals with the functions and activities of all the systems of the human body and **their mutual relationships**.

In fact, it is the study of **all mechanical, physical and biochemical processes** that support the human body and its functioning. In this field, one studies the functions of the various organ systems, organs, cells and the biomolecules that allow a living organism to survive, grow, and develop.

Human Physiology





There are mainly 9 organ systems in a human body. They are :

1. **Skeletal system**
2. Glandular system
3. Muscular system
4. Excretory system
5. **Circulatory system**
6. Reproductive system
7. **Respiratory system**
8. Digestive system
9. Nervous system



7.2 Function of Skeleton System, Classification of Bones & Types of Joints :

Skeleton System :

This is the bony frame work of body consisting of numbers of bones. Total bones in human body are 206.

Functions of skeleton system

Provides Support

Provides Protection

Give Shape to the body

Movement

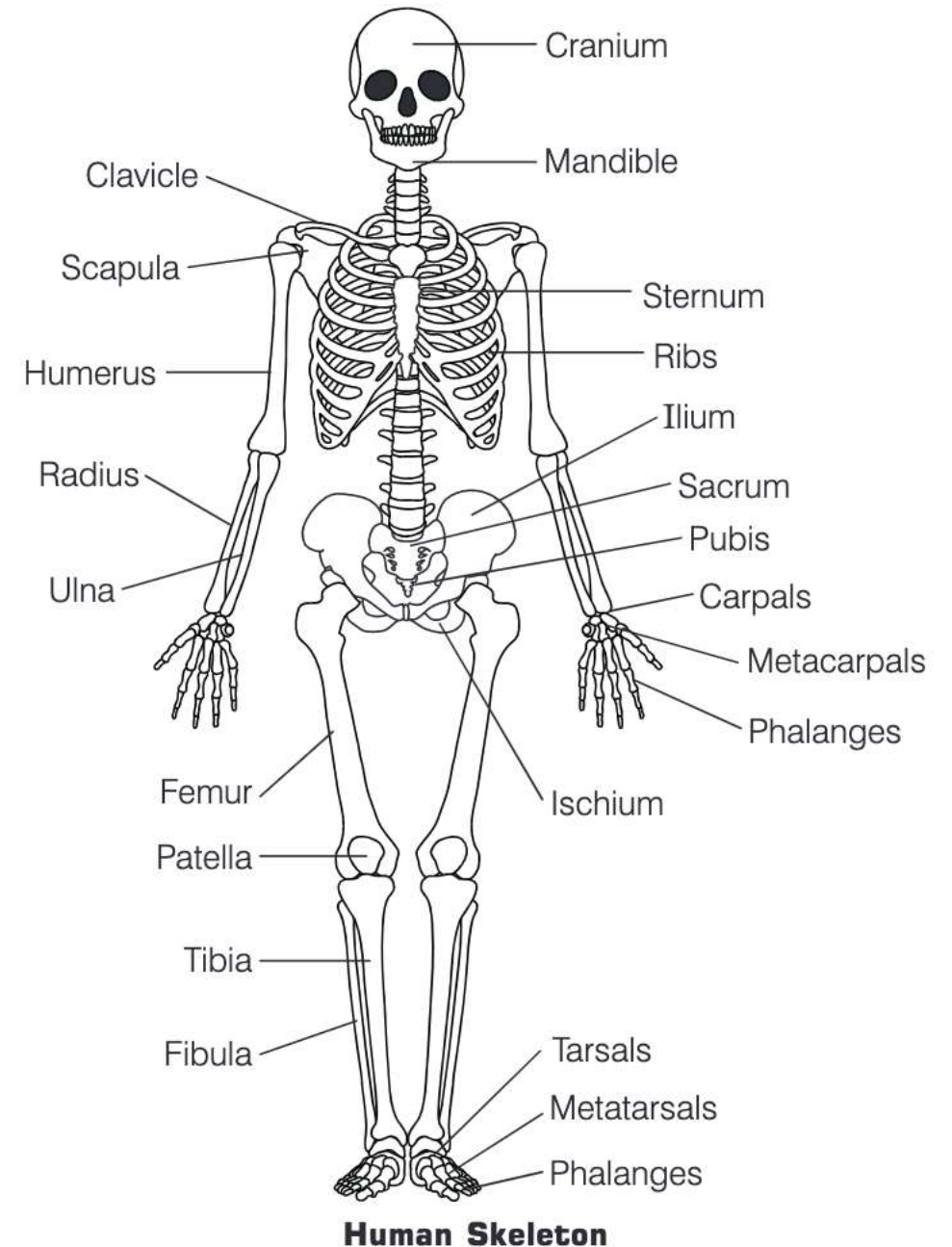
Provides Storage

Blood Cell Production

The skeletal system can be mainly classified into two categories which are as follows -

1. Axial Skeleton : It Consists of the bones such as Skull(28), Sternum (1), Ribs (24), Hyoid bone (1) and Vertebral column (26).

2. Appendicular Skeleton : It Consists of bones in the upper limbs (64) and lower limbs (62).



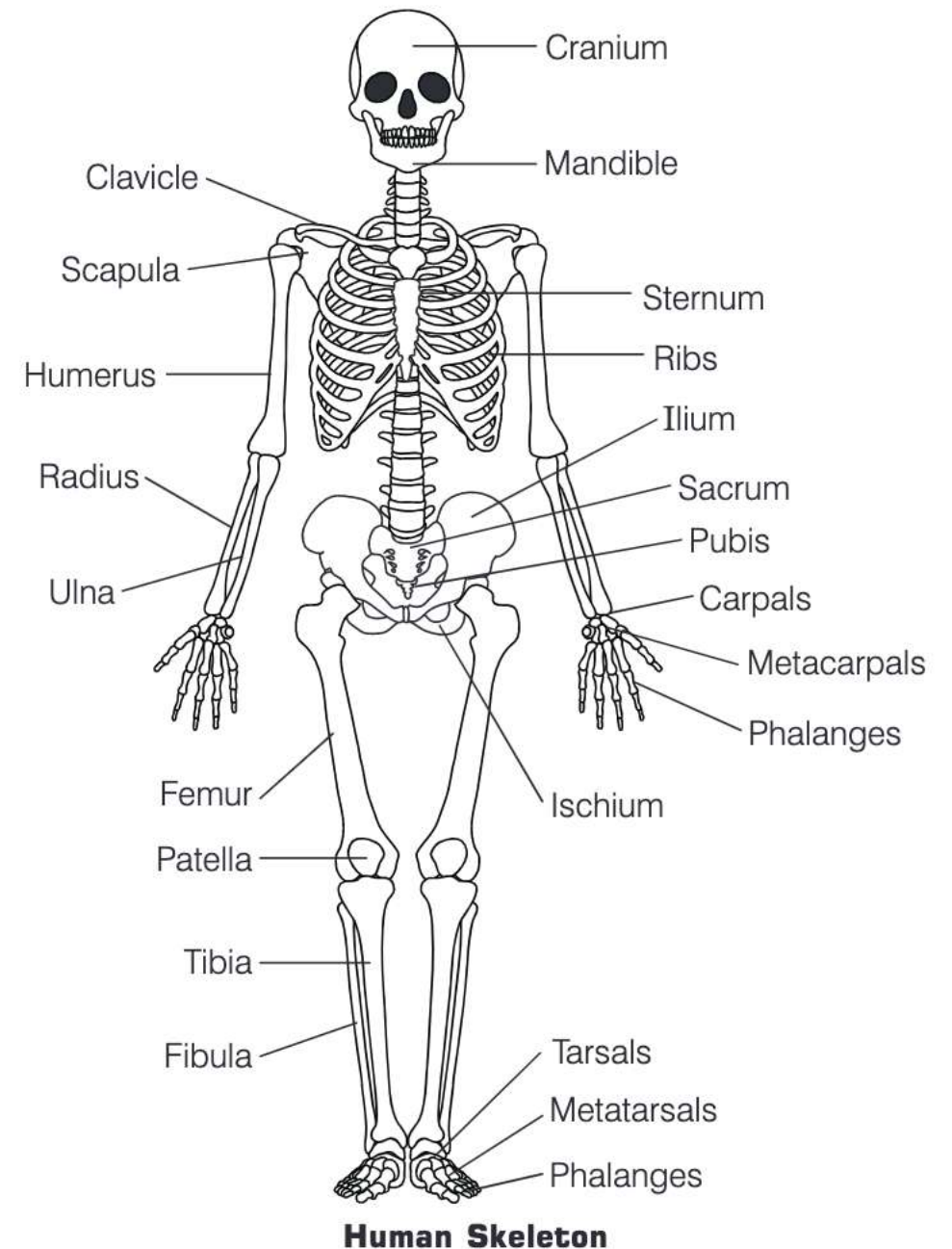
Classification of Bones : On the basis of their shapes and formation, bones are classified into the following types

1. Long Bones : These bones are found mainly in the upper and lower limbs, and act as a lever in our body which helps in making movements possible.

They are primarily compact and have a large amount of a spongy material at the end. Long bones such as **humerus and femur** consists of a shaft and two extremities each.

Some long bones present in our body are the Femur, Tibia, Fibula, etc.

2.Short Bones : A short bone is one that is **cube-like in shape**, being approximately equal in length, width and thickness. Short bones provide **stability and support** as well as some amount of motion. The only short bones in the human skeleton are in the carpals of the wrists and the tarsals of the ankles.



3. Flat Bones :

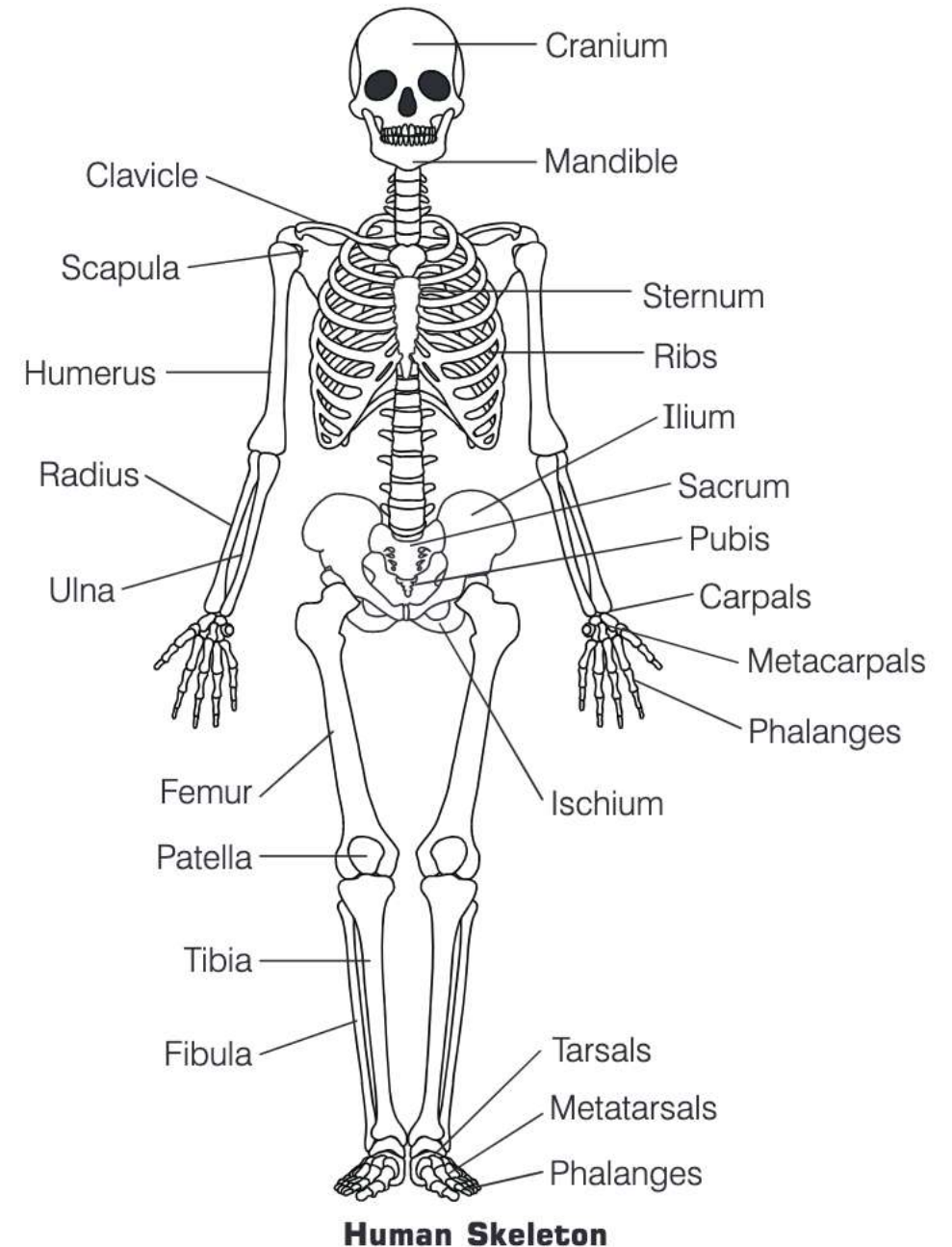
Flat bones are **thin, flattened and usually curved**. They provide a large surface for muscle attachments and protect internal organs.

Examples includes bones of the skull, the pelvis, the sternum and the scapulae.

4. Irregular Bones :

Irregular bones have **complicated shapes**. They are primarily spongy bones that are covered with a thin layer of compact bone.

The vertebrae and some of the bones in the skull are irregular bones.



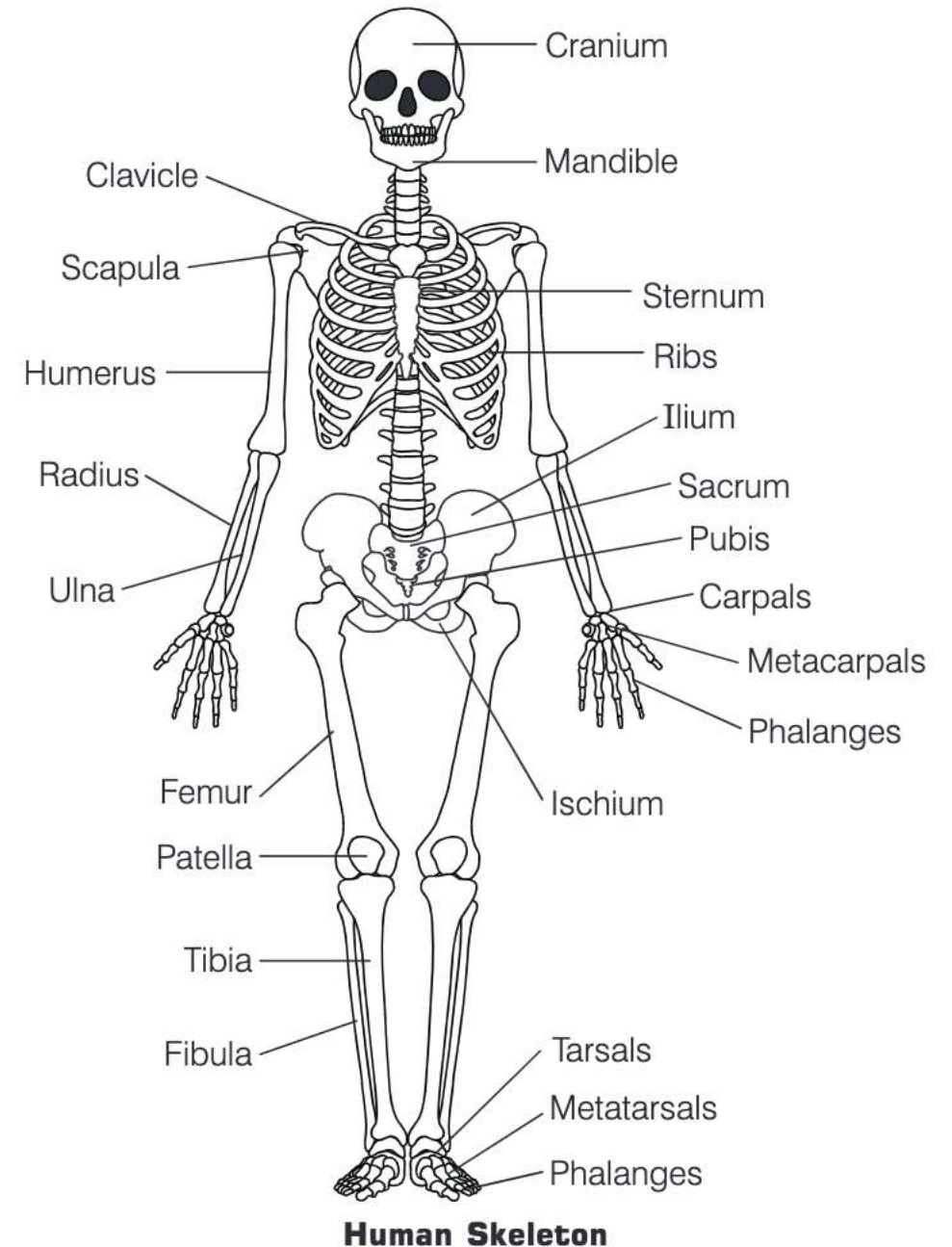
5. Sesamoid Bones :

These are **small, round bones shaped** like a sesame seed. These bones are found in tendons where a great deal of pressure is generated in a joint. The **sesamoid bones protect tendons by helping them overcome compressive forces.**

They vary in number and placement from person to person, but are typically found in tendons associated with the feet, hands and knees.

6. Sutural Bones :

These are **very small bones** located within the sutural joints between the cranial bones. These are classified by their location and not by shape. The number of sutural bones varies considerably because different people have different numbers of sutural bones.



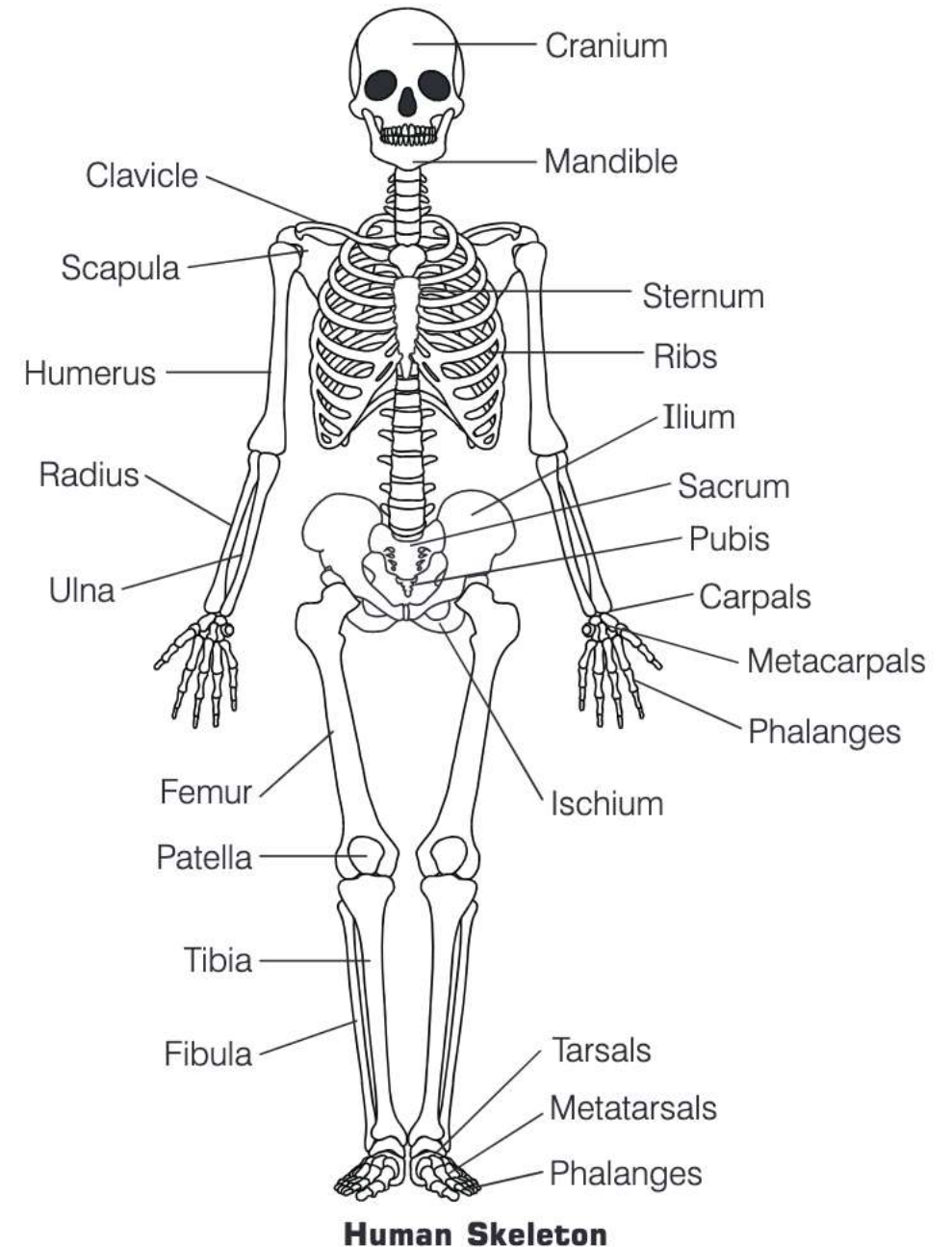
Joints :

The bones present in our body are joined by a network of **tendons, ligaments and cartilages**. The junction at which two or more bones are joined is called a joint.

It is mainly a mechanism of movements in a hard and rigid skeleton. The joints present in the human body are formed in such a way that they maintain a balance between the movement, **stability and strength** of the human skeleton.

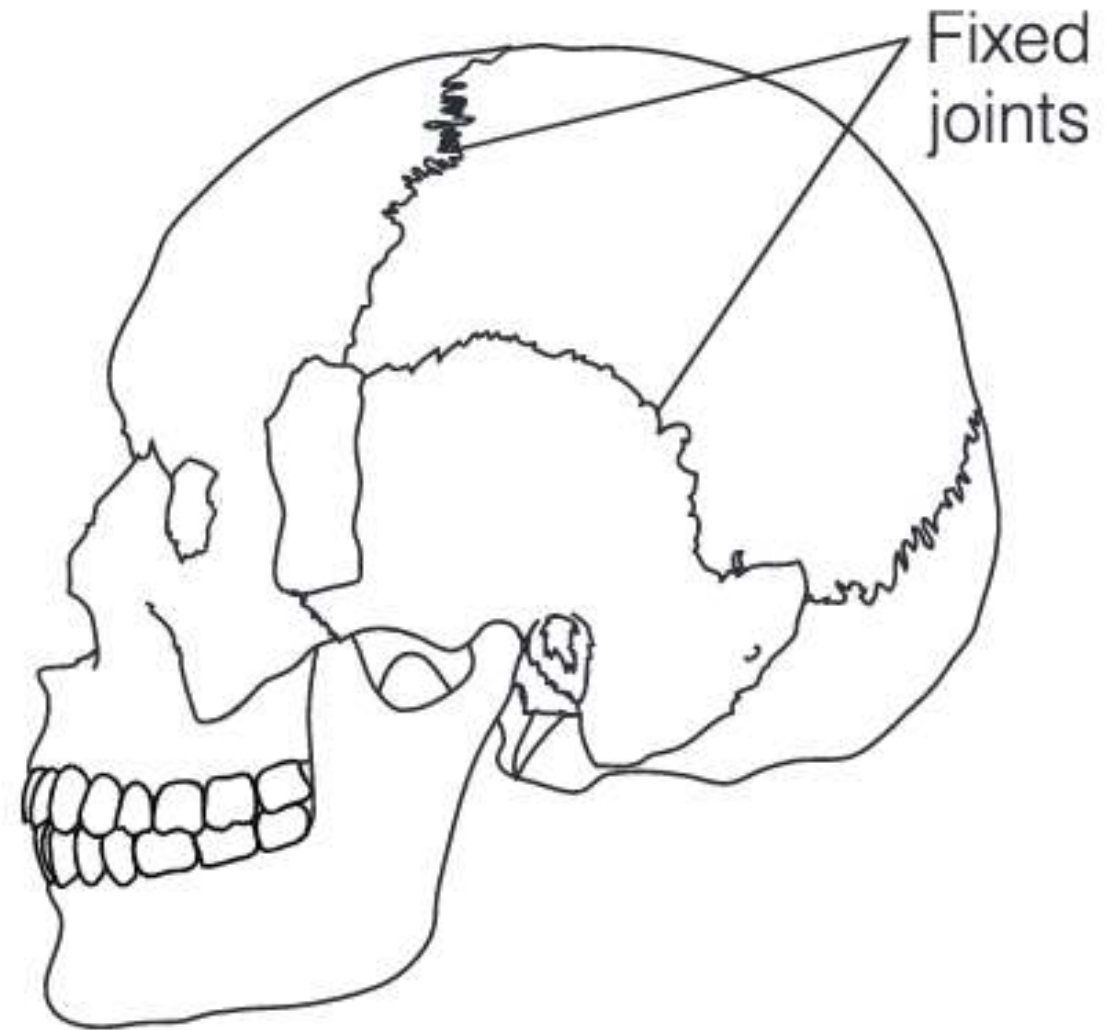
Types of Joints :

In the study of joints (also called arthrology), joints are classified into various types on the **basis of structural as well as functional basis**.



1 .Immovable Joints or Synarthrosis Joints :

In this type, the bones are held together **by means of fibrous tissue or ligaments**. So, these joints are also called fibrous joints. Due to the presence of fibrous tissue, these **joints are immovable**. These joints are found in the skull and face.



Immovable Joints

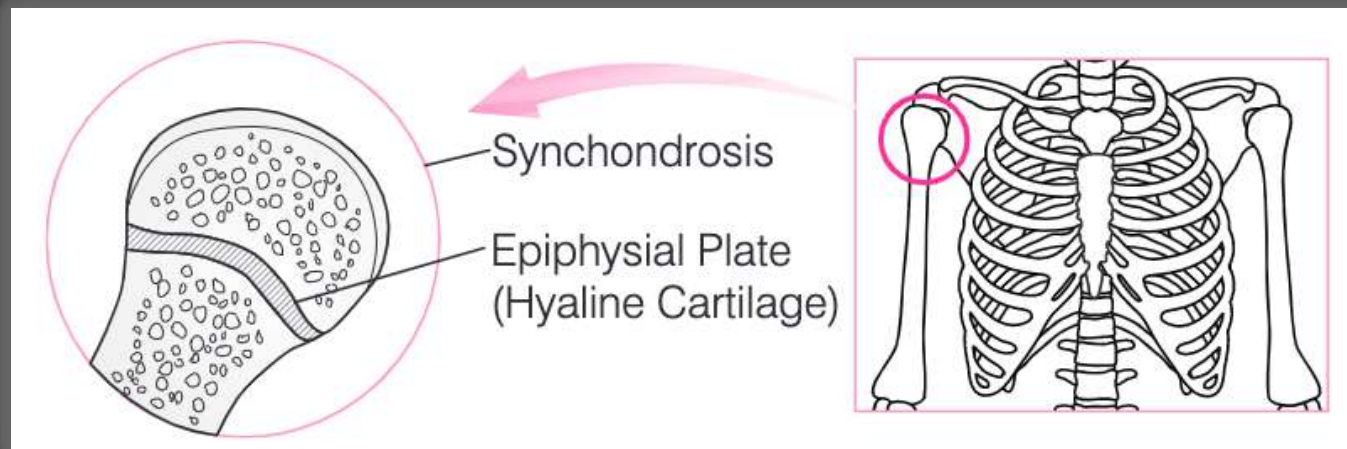
2.Slightly Movable Joints or Amphiarthrosis Joints :

These joints are slightly movable. A pad of cartilage lies between the bone surface and the fibrous capsule which holds the bone and cartilage in place.

The cartilages of such joints also act as shock absorbers. For instance, intervertebral discs between the bodies of vertebrae strengthen the cartilage by extra collagen fibres.

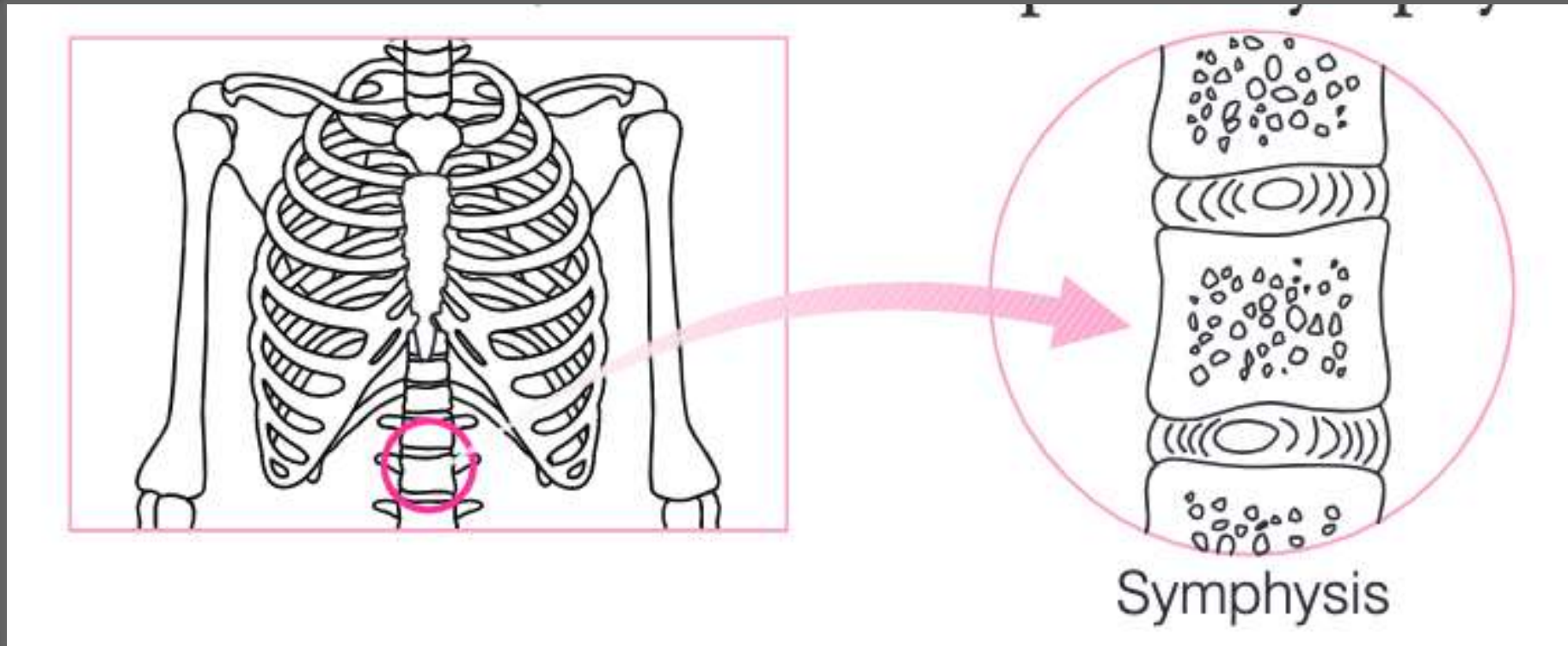
There are two types of such joints

(i) Synchondrosis : It is a temporary form of joint that exist only while the skeleton is growing. These are replaced by bones once the skeleton grows completely. An example is the joint between first pair of ribs and the sternum.



(ii) Symphysis :

The joint consists of a compressible fibro-cartilage pad that connects two bones. This type of joint allows for some movement. The hip bones, connected by the pubic symphysis, and the vertebrae connected by inter-vertebral discs, are two examples of symphysis.



3. Freely Movable Joints : These joints are also called as **synovial joints**

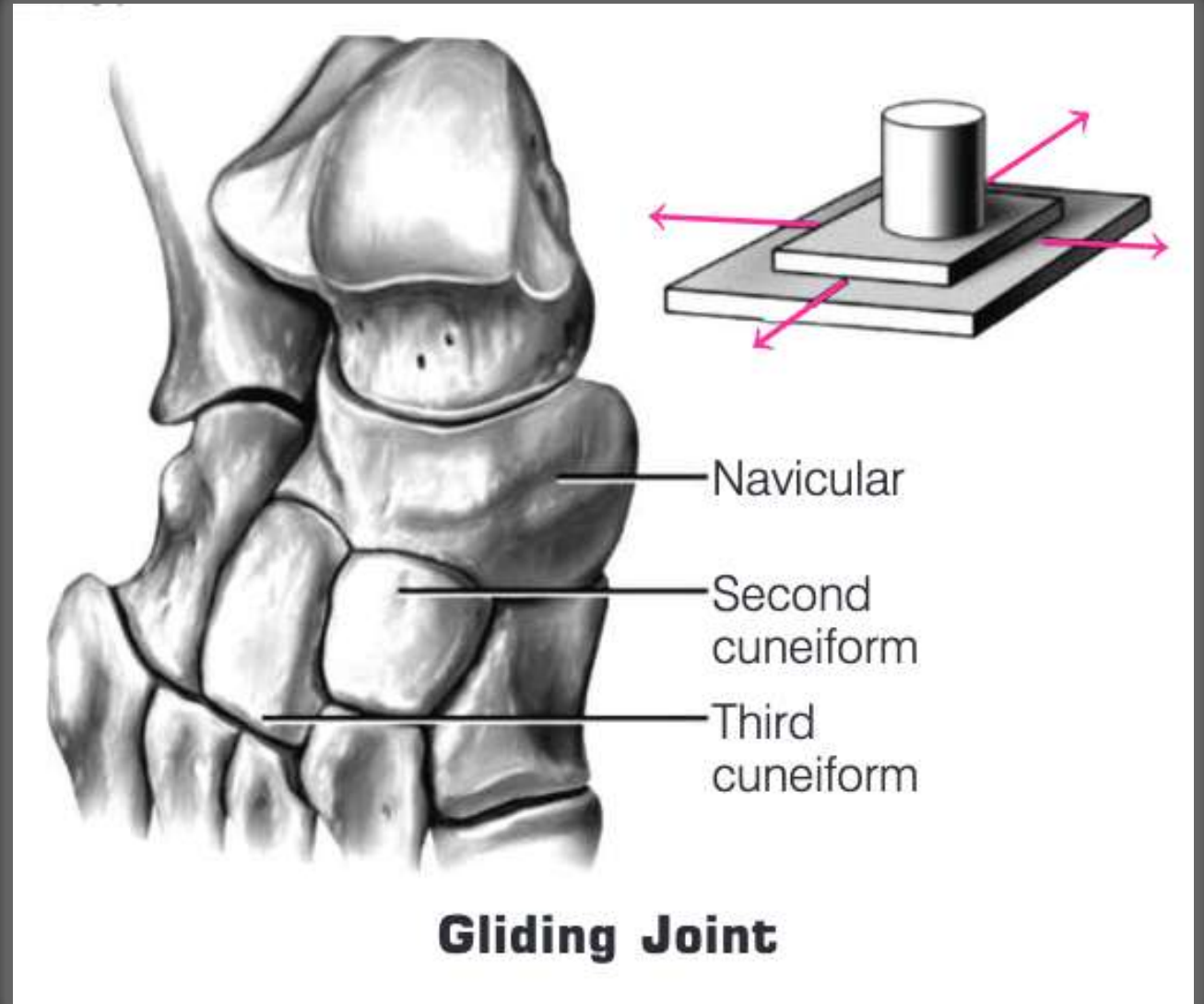
(i) Gliding Joint :

These joints move against each other or **glide on a single plane**.

The ends of one of the gliding joints are slightly concave and the other is slightly convex.

These joints provide only gliding movements.

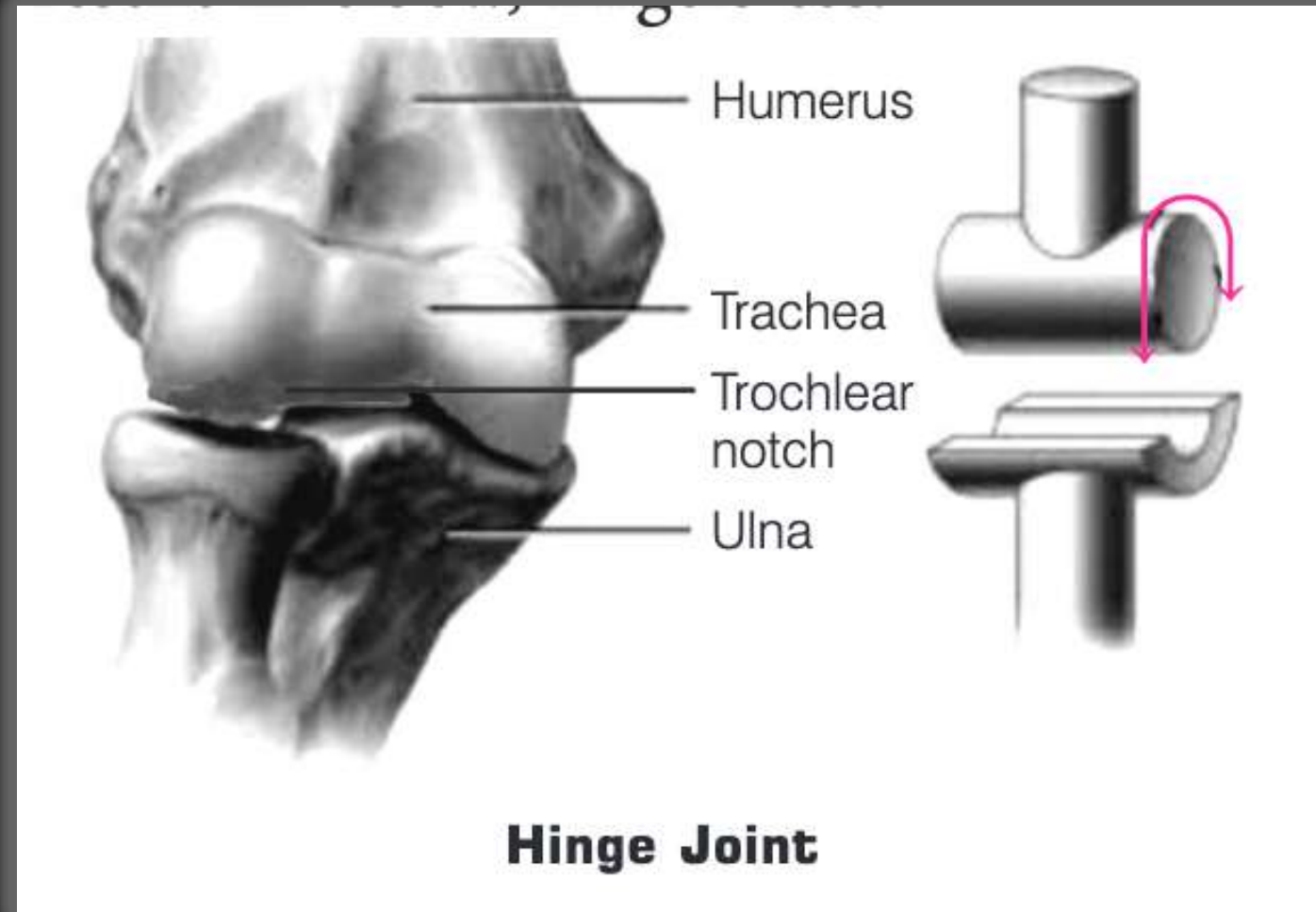
Examples of such joints are bones of **wrist and ankle**.



(ii) Hinge Joints :

In such joints, movement takes place on just one axis or direction, **like a door on its hinges**. One end of such joints has a concave shape while the other has convex, such that movement is possible only in one place.

Examples of such joints are joints present in **elbow, fingers etc.**



(iii) **Condyloid Joints :**

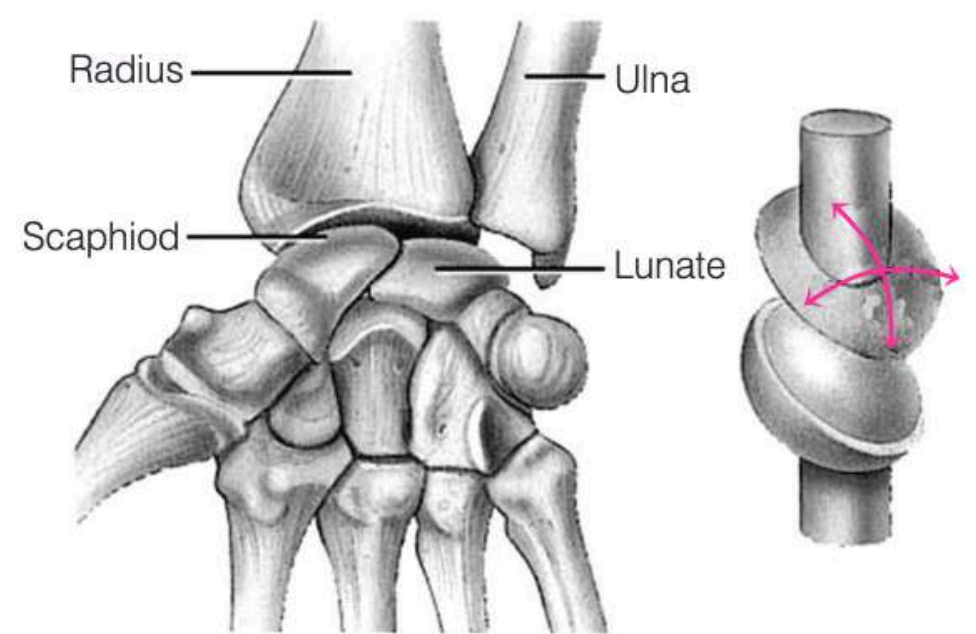
These joints are similar to hinge joints but **they allow movement over two planes.**

These joints permits flexion, extension and **circular motion** (adduction, abduction and circumduction)

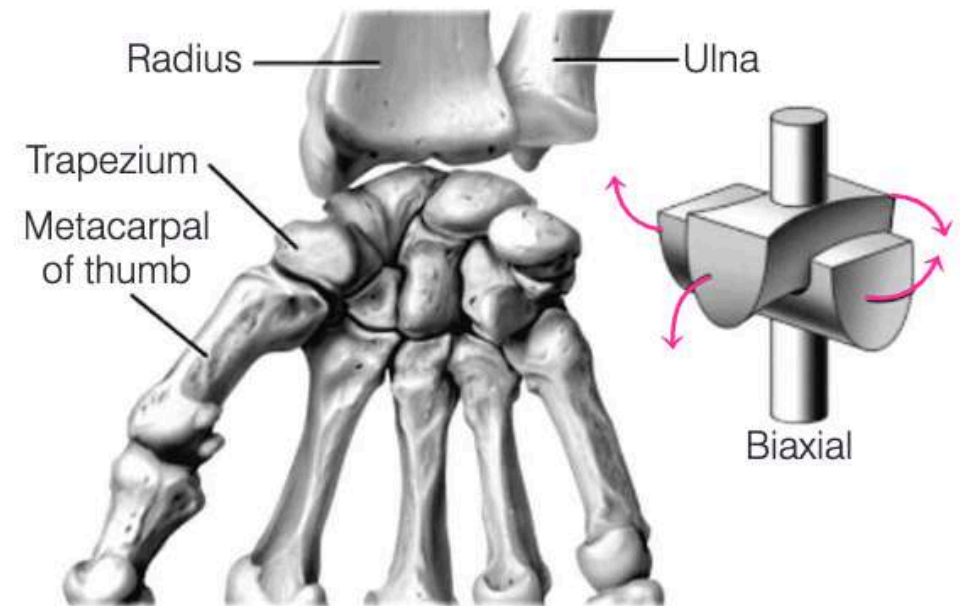
(iv) **Saddle Joints :**

These joints allow for flexion, extension and other movements, **but does not allow rotation.**

An example is the **thumb's saddle joint** (between the carpal of the hand and metacarpal of the thumb). It lets the thumb cross over the palm and oppose the fingers.



Condyloid Joint

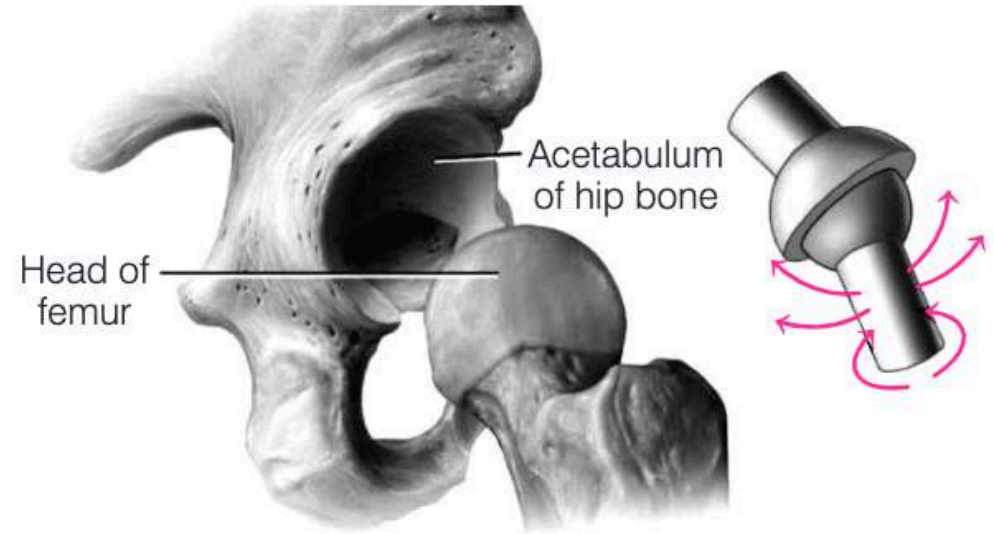


Saddle Joint

(v) Ball and Socket Joints :

These joints **move freely and can rotate on any axis**. In these joints, a rounded bone lies in a **cup-like cavity**.

The hip and shoulder joints are examples of ball and socket joints.

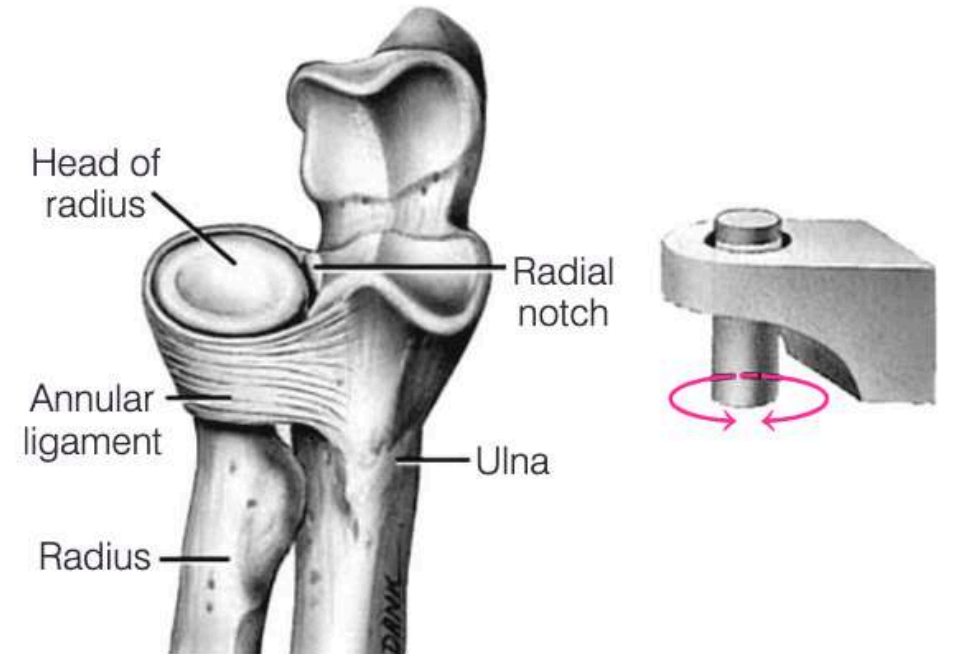


Ball and Socket Joint

(vi) Pivot Joints :

These are joints **with a rotatory movement on one axis**.

In other words, a bone of cylindrical shape moves around a pivot within a **ring made up of bone and cartilage**.



Pivot Joint



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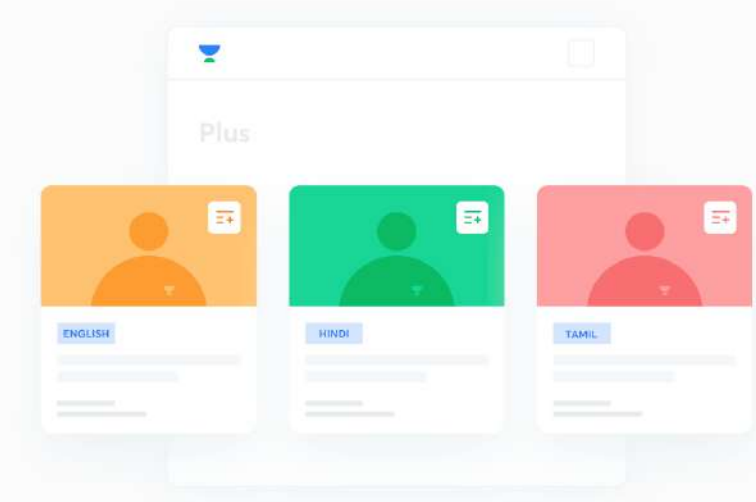
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7.3 Function and Structure of Circulatory system and heart.

Circulatory System :

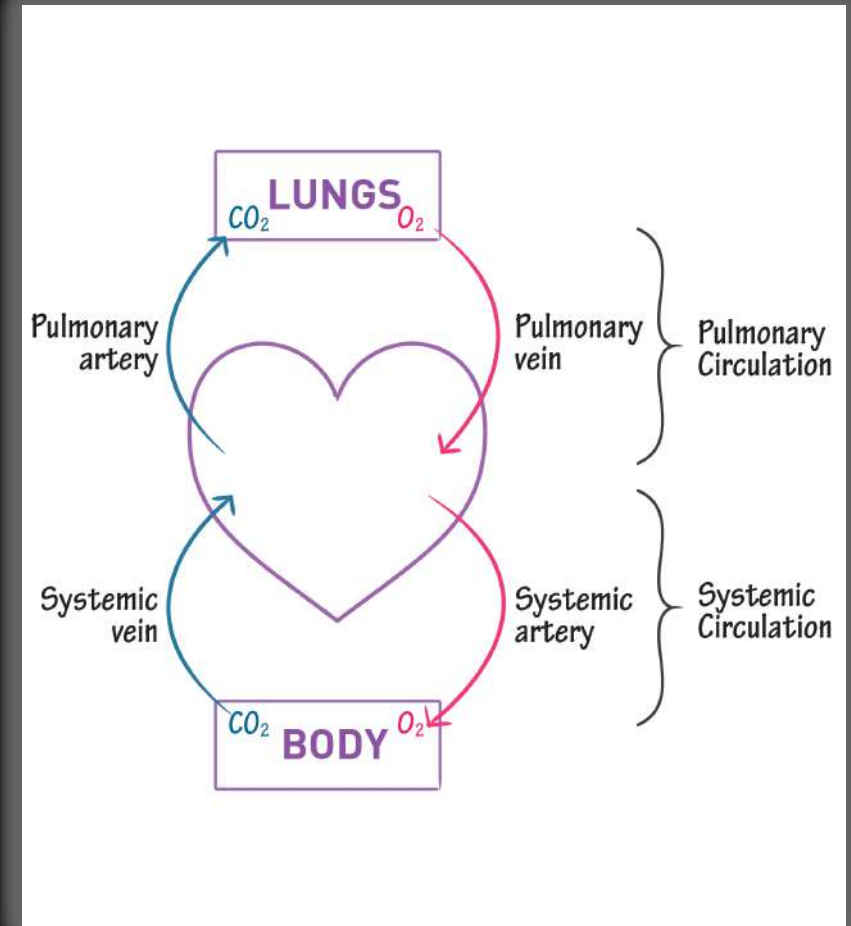
It is a group of organs that **circulates bloods and transports nutrients** such as amino acids, electrolytes, oxygen, carbon dioxide, hormones and blood cells **to and from** all the parts of the body.

It is a vast network of **organs and blood vessels** that acts both as a **delivery and waste removal system** for the body.

The circulatory system is divided into two separate loops, that are as follows

1. Pulmonary Circuit : It exchanges blood between the heart and lungs for oxygenation.

2. Systematic Circuit : It distributes blood throughout all the other systems and tissues of the body.



Structure of Circulatory System :

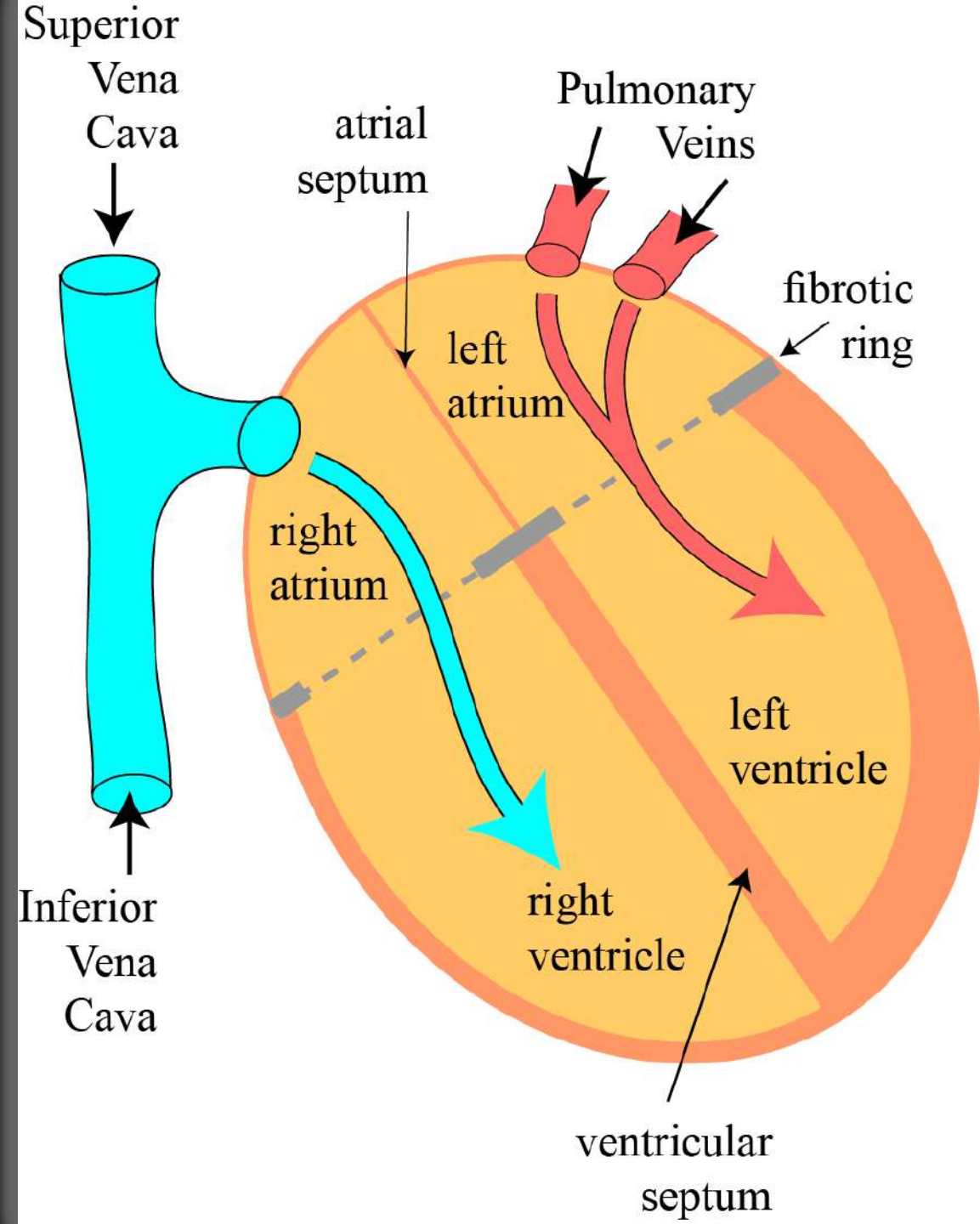
The circulatory system consists of **three main parts**, i.e. the heart, the blood vessels and blood itself.

These are described as follows :

1. Heart :

It is a **hollow, muscular cone-shaped organ** without which we cannot survive. As the only organ of the circulatory organ, the heart is responsible for **pumping blood** throughout the body.

Heart is located just under the rib cage, between the lungs, inclined towards the **left**, and is about the size of a closed fist which weighs **about 300 gms.**

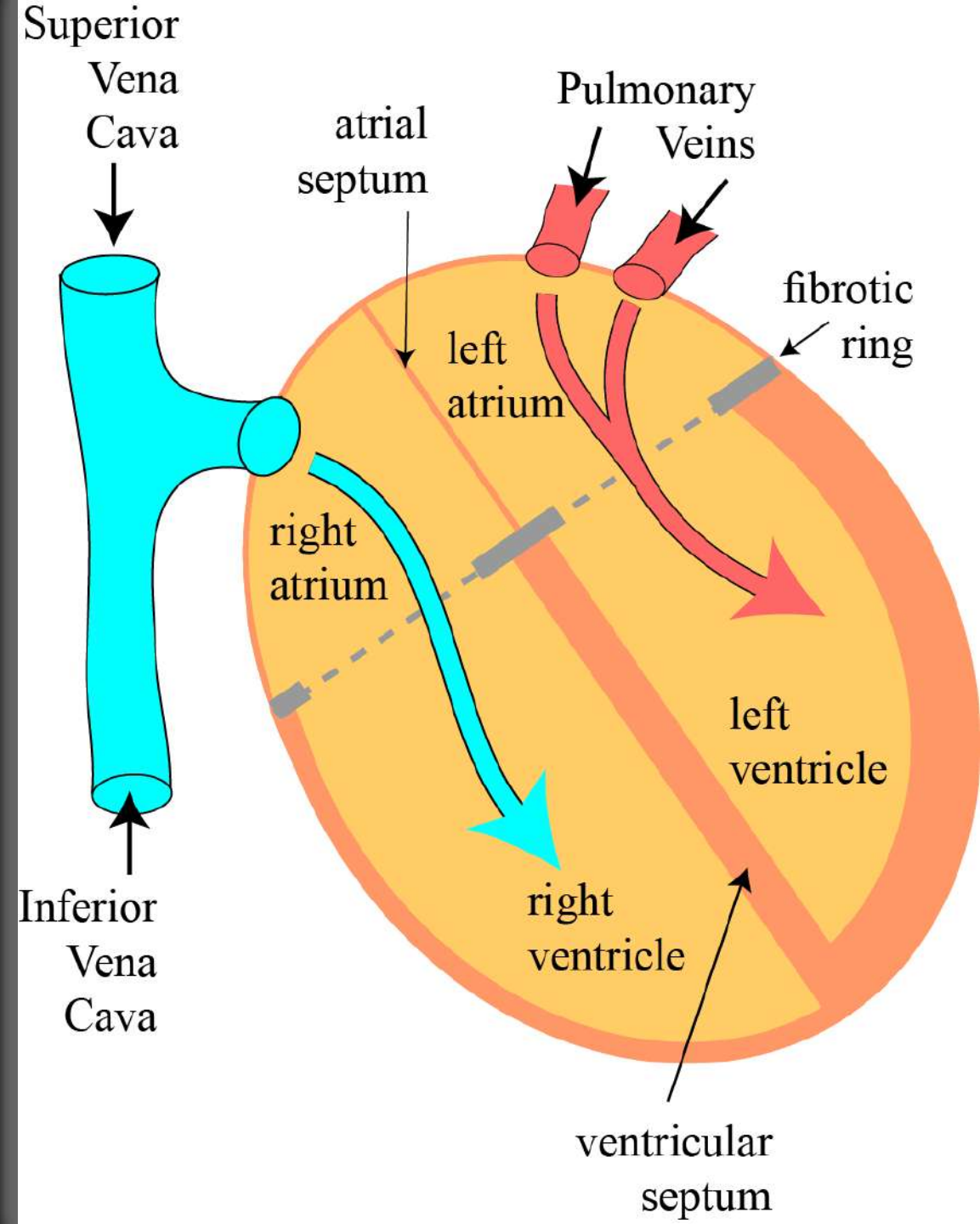


In a day, the heart beats about **15,200 times**.

Structure of the Heart :

The heart is enclosed in an **outer layer called the pericardium**. Under this layer, the **heart muscles called the 'myocardium'** is situated.

The heart is divided into two sides/parts by a **septum**. Each side is further sub-divided into **two chambers**. The **upper chambers are called atrium** or auricles and the **lower chambers are called ventricles**



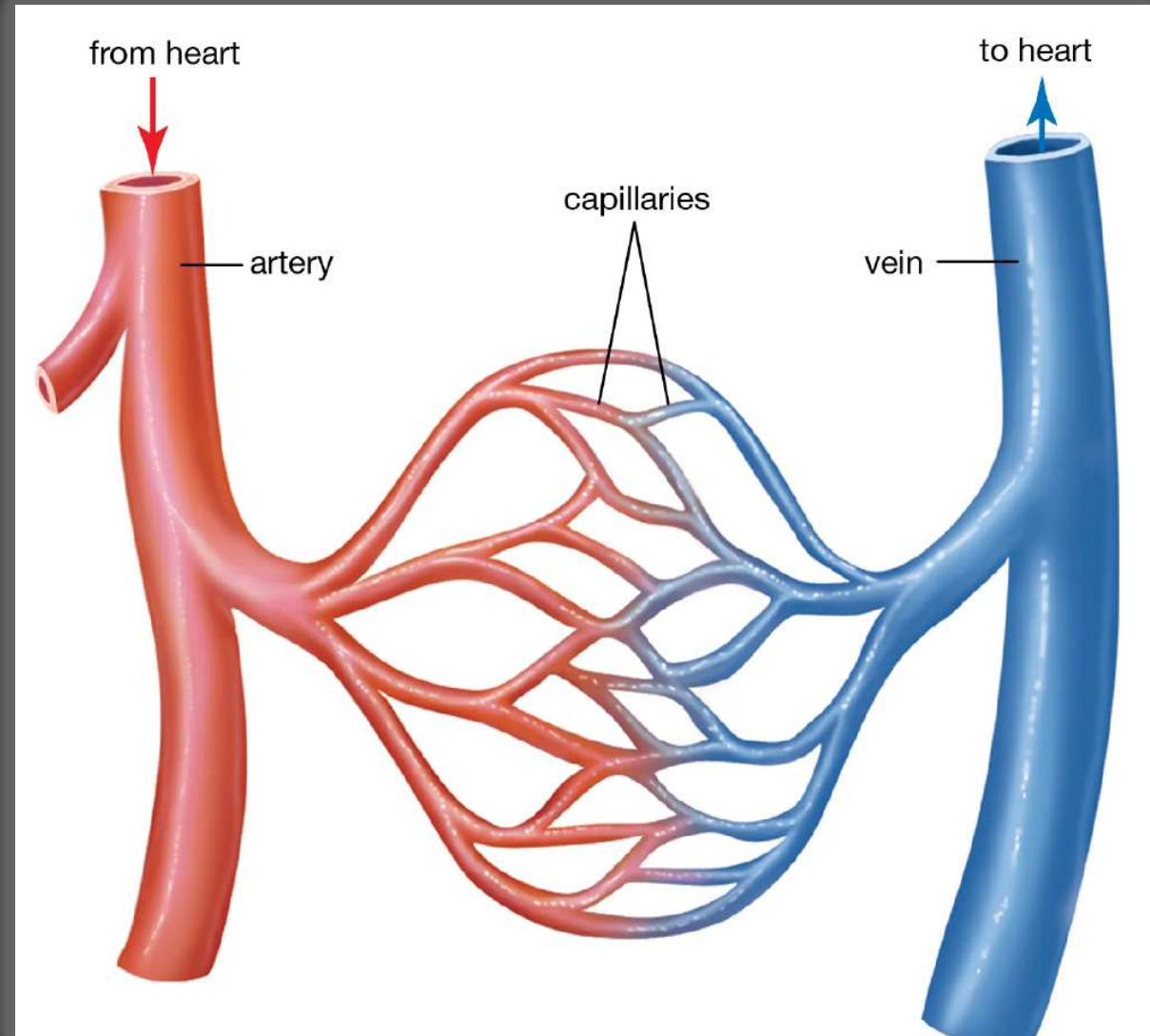
2. Blood Vessels :

These are the passages that allow blood to flow quickly from the heart to every region of the body and back again. The size of blood vessels corresponds to the **amount of blood that passes through them.**

1. Arteries :

These are blood vessels that **carry blood away from the heart.** Blood carried by arteries is **oxygenated**, except pulmonary artery that carries deoxygenated blood.

The walls of the arteries are thicker, elastic, and more **muscular** than other vessels to withstand this pressure.



2. Veins :

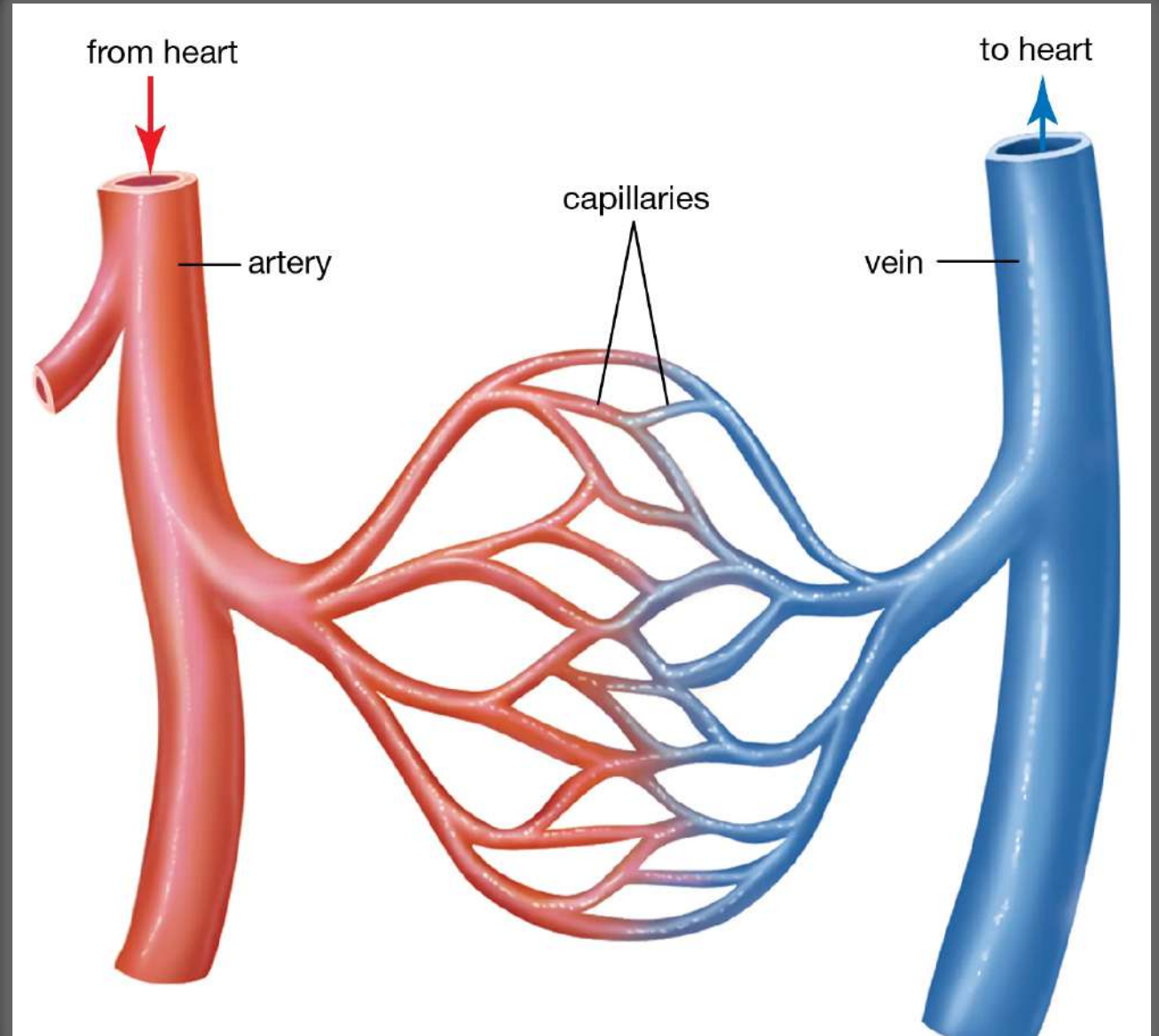
These are the blood vessels that carry blood **from various body parts towards the heart**.

Very similar to arteries, veins are much thinner, less elastic and less muscular than the arteries.

3. Capillaries :

These are the **smallest, thinnest** and most common type of blood vessels in the body.

They carry blood **very close to the cells of the tissues of the body** in order to exchange gases, nutrients and waste products.

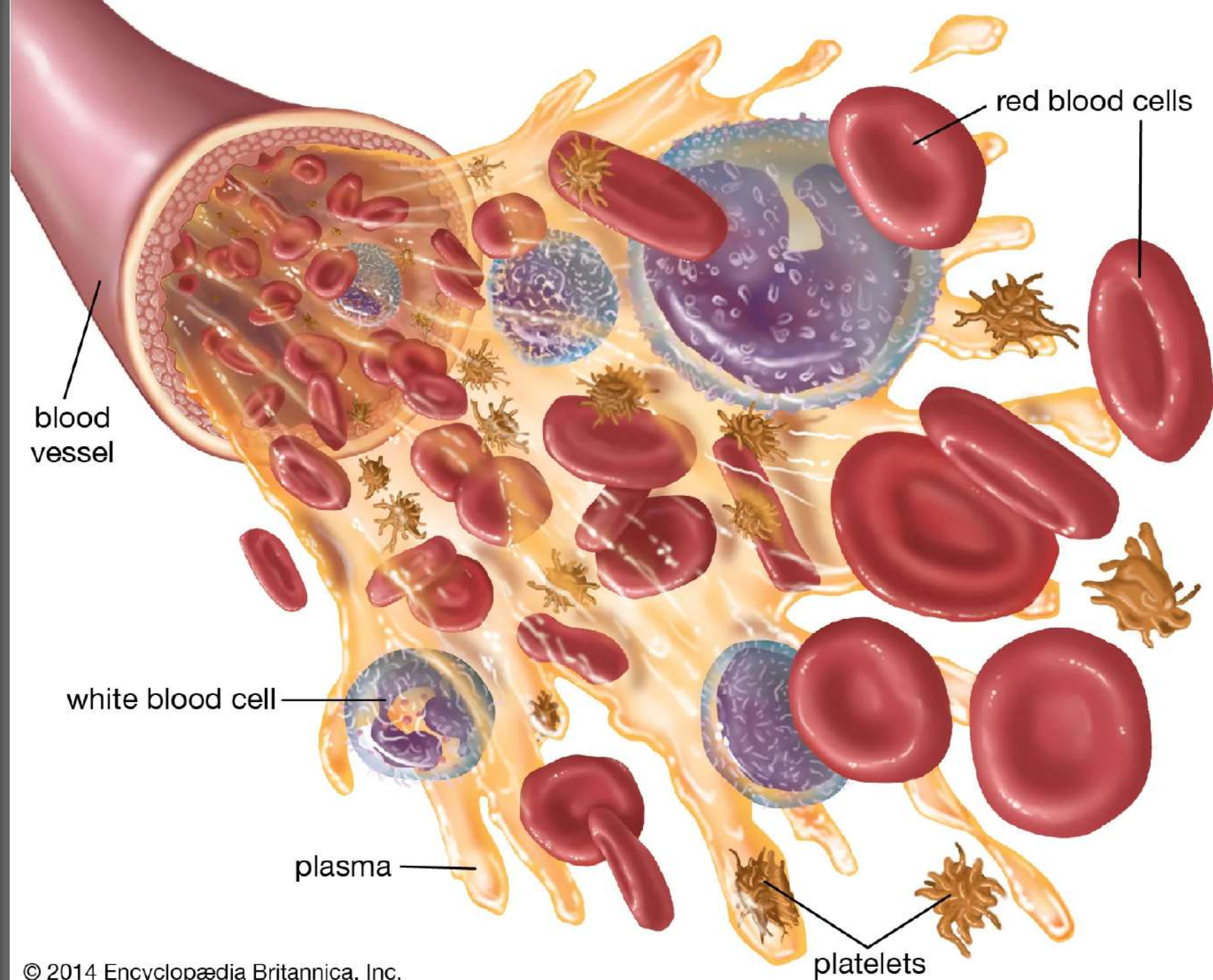


3. Blood :

It is a specialized body fluid that actually performs the **function of the circulatory system.**

It delivers the necessary **nutrients and oxygen** to the tissues and organs of the body.

It is also responsible for carrying the **waste products for excretion.**



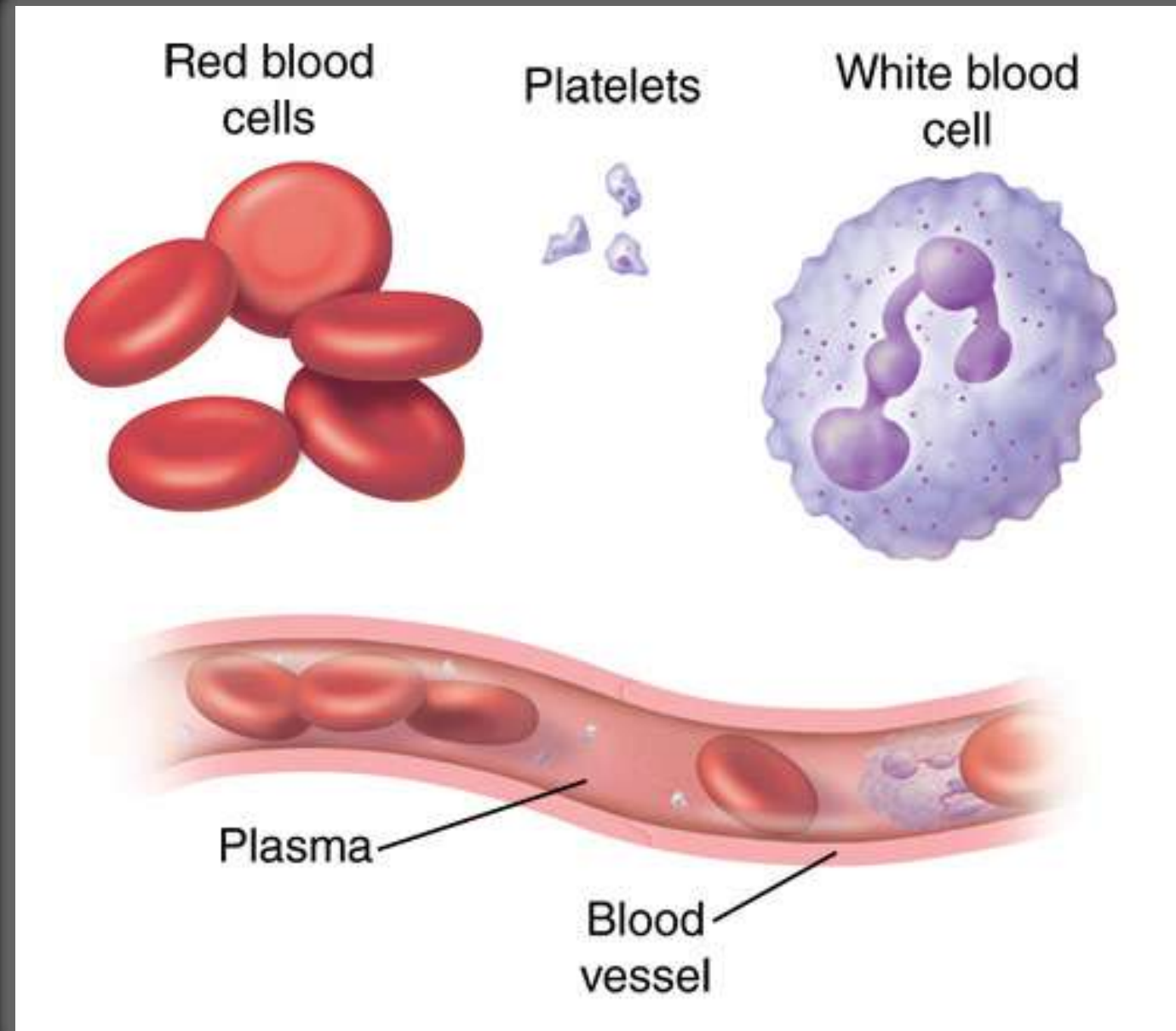
There are four components of blood. They are as follows :

1. **Red Blood Cells (RBCs)** which carries oxygen to the tissues.

2. **White Blood Cells (WBCs)** which fights all infections and diseases.

3. **Platelets** which helps the blood to clot in case of wounds and injuries.

4. **Plasma** carries the blood cells, nutrients and waste products.



Functions of Circulatory System :

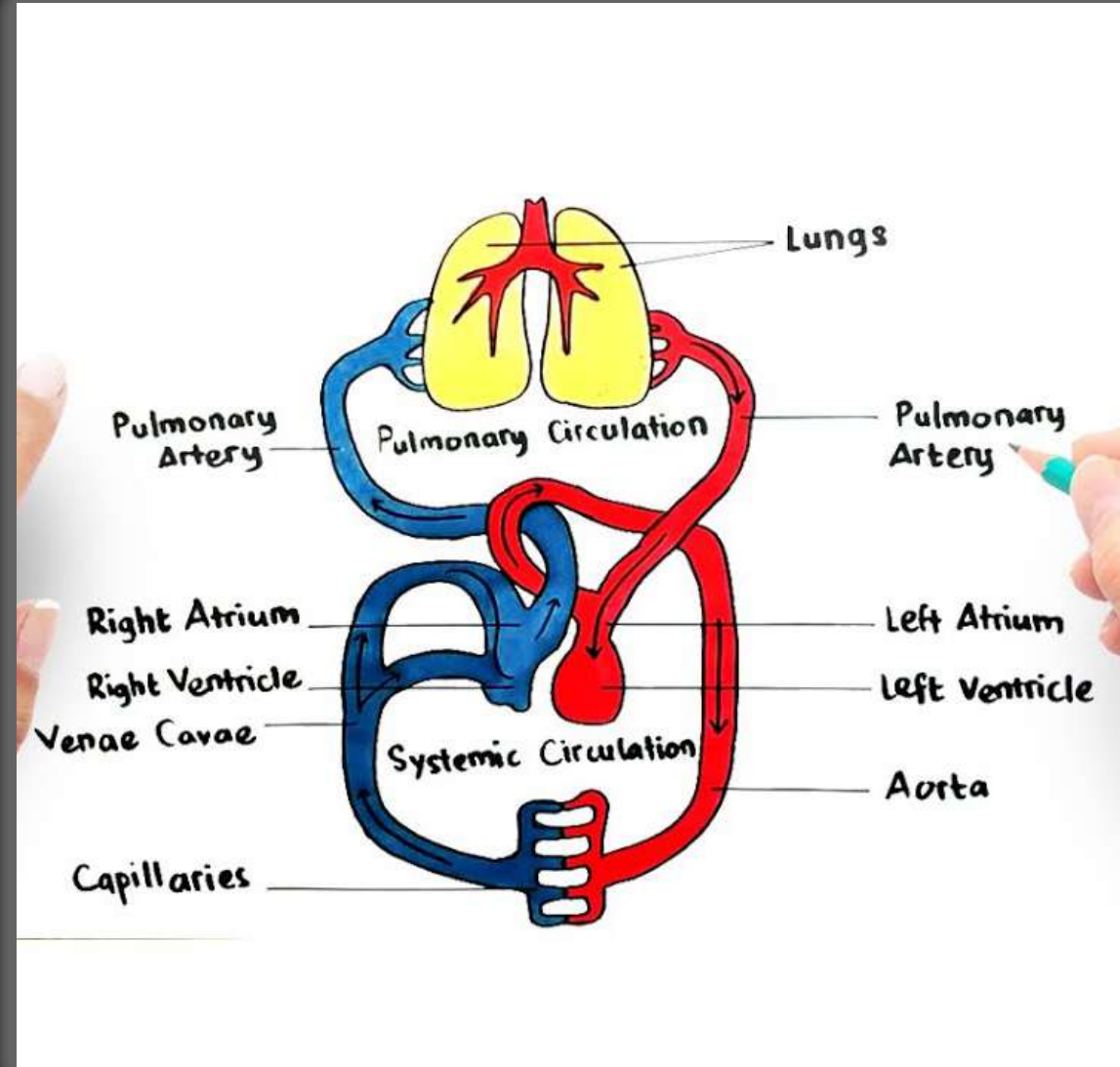
The circulatory system is responsible for performing various functions. They are as follows

1. Transportation :

It transports **blood to almost all of the body's tissues**. The blood delivers essential nutrients and oxygen into the cells of the body. It **removes wastes and carbon dioxide** from the body.

2. Protection :

It protects the body from various **diseases**. The WBCs clean up cellular debris and **fight pathogens** that have entered the body.



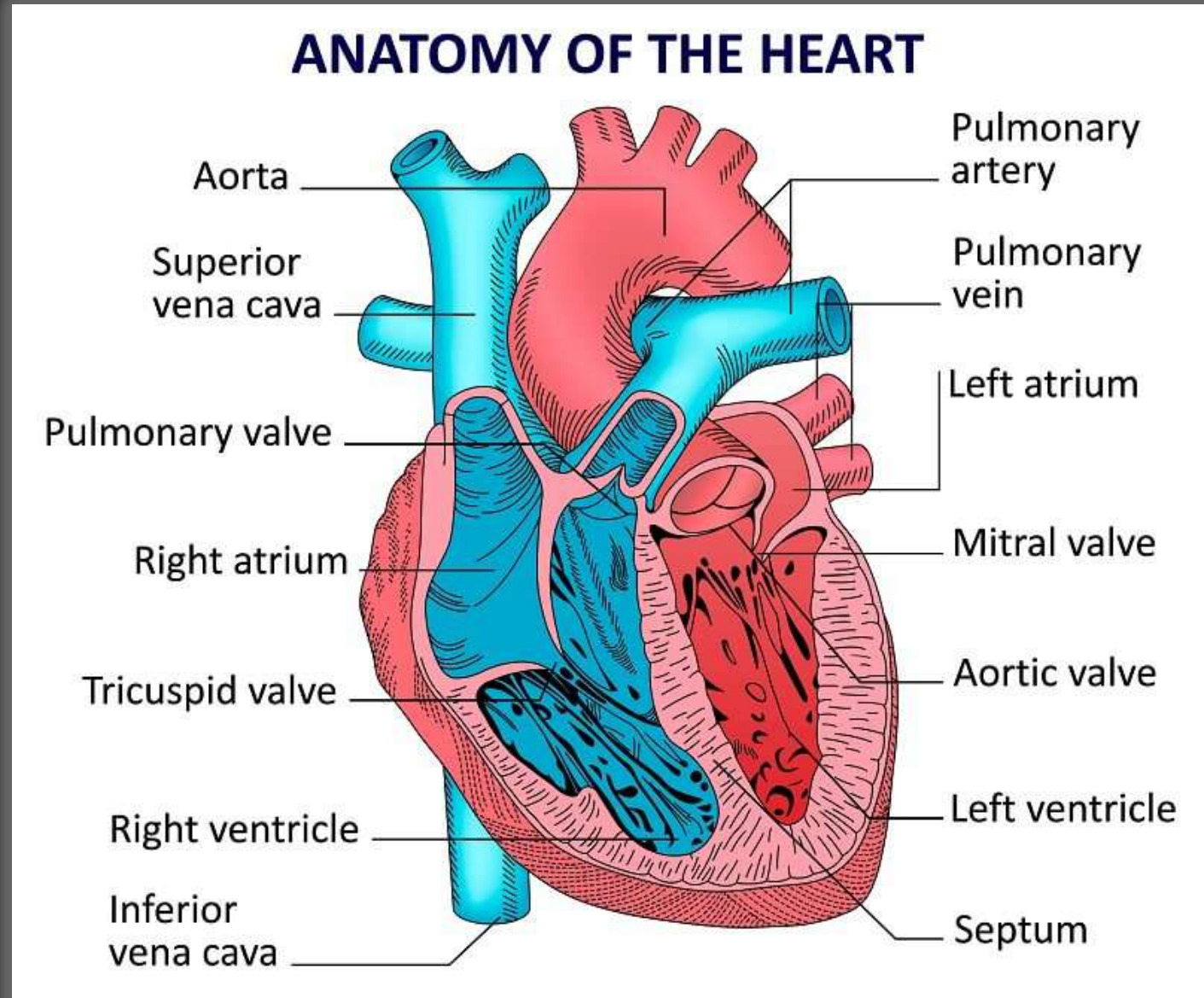
3. Regulation :

It is an instrument in the body to maintain homeostatic control of several internal conditions.

Blood vessels help maintain a stable body temperature by controlling the blood flow to the surface of the skin.

4. Nutrition :

The circulatory system carries the nutrients and essential vitamins, minerals, amino acids as well as glucose to all parts of the body.

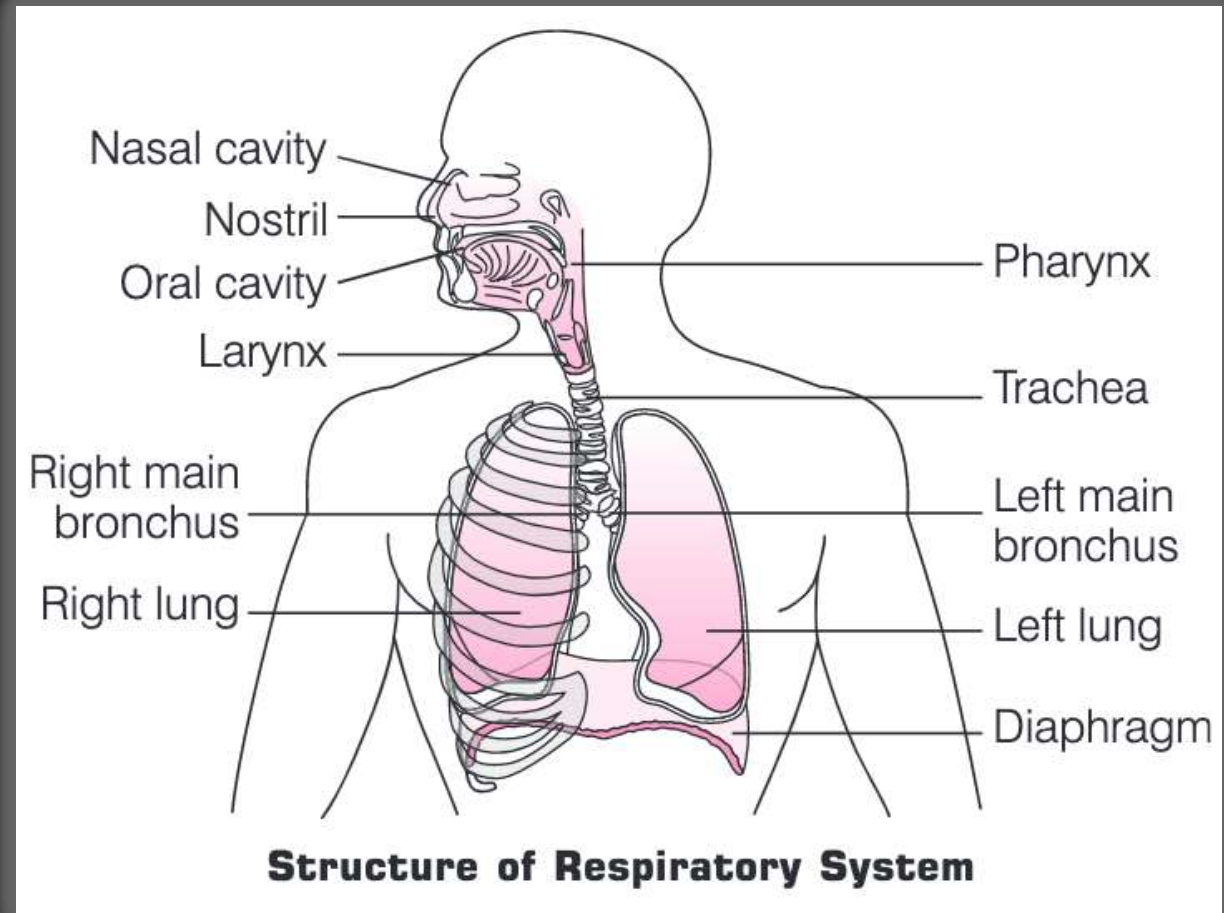


7.4 Function and Structure of Respiratory system.

Respiratory System :

The respiratory system is the body of organs that are **involved in the process of breathing**, commonly known as respiration.

In the process of respiration, we **take Oxygen (O₂) from the environment and give out Carbon Dioxide (CO₂)**, a waste product, that is produced as a result of chemical changes within the cells of our body.

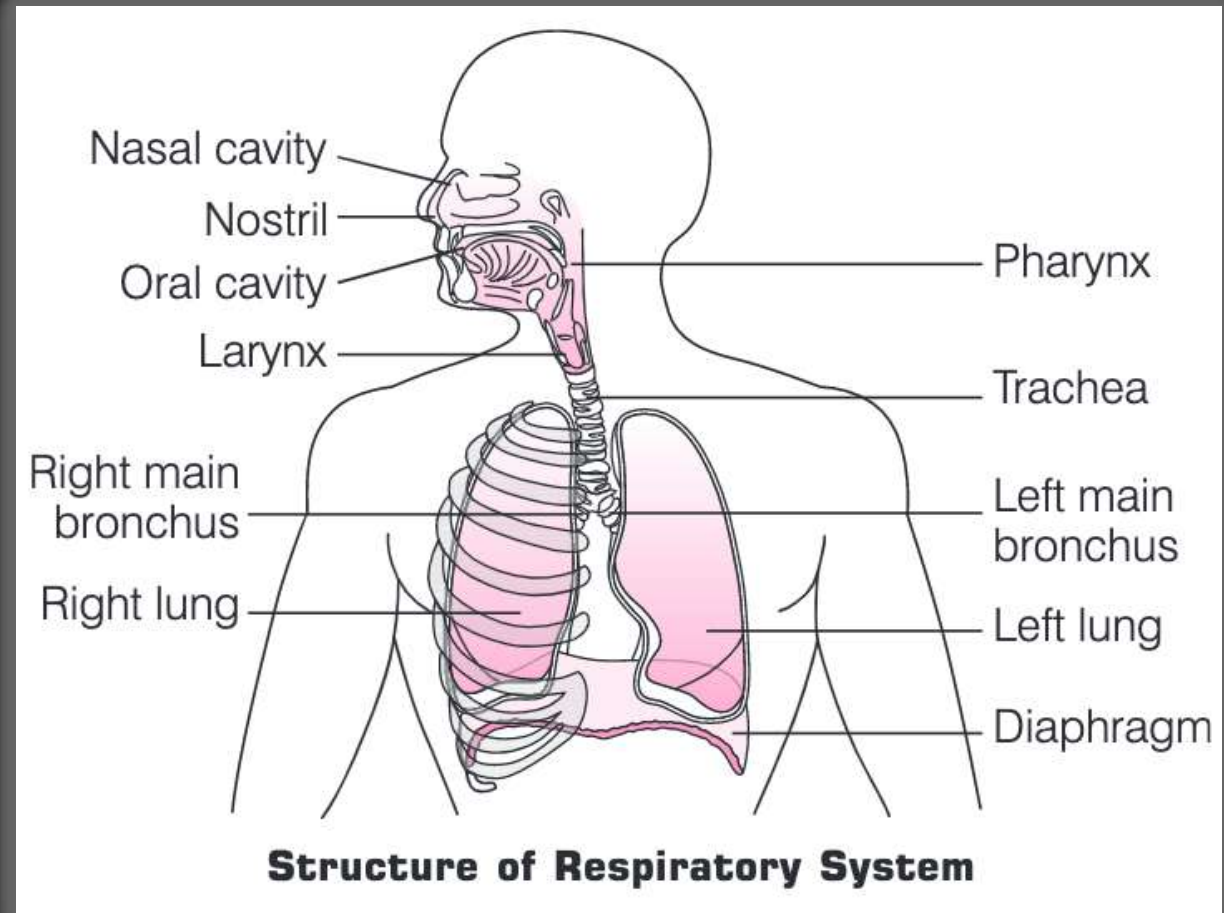


Structure of Respiratory System :

There are **three major parts** of the respiratory system which play a vital role in respiration.

These are :

1. **The airways** (nose, mouth, pharynx, larynx etc.) allow air to enter the body and into the lungs.
2. **The lungs** work to pass oxygen into the body and remove carbon dioxide from the body.
3. **The muscles** of respiration, such as the diaphragm, work to pump air in and out of the lungs while breathing.



Functions of Respiratory System :

The primary function of the respiratory system is the exchange of gases, i.e. **O₂ and CO₂ at both**, internal and external levels.

The exchange of gases takes place through two process, namely inspiration or **inhalation** and expiration or **exhalation** of air.

Oxygenation of the Blood : With inhalation, oxygen enters the lungs which supplies it to the organs of the body for usage.

Excretion of the Carbon dioxide (CO₂) : CO₂ is a waste product for our body which is produced by the metabolic breakdown of carbohydrates.

