

**AL MUSTAQBAL UNIVERSITY**

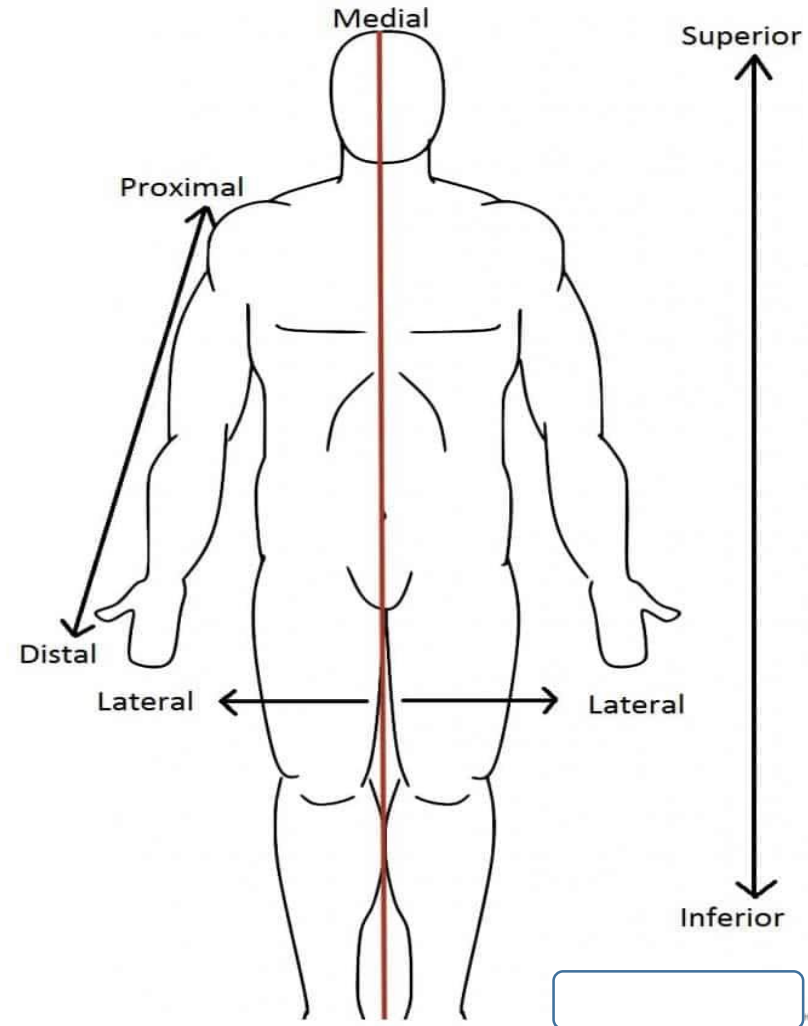
**College of Pharmacy / First Stage**



**ANATOMY**

**(L2) Skeletal System**

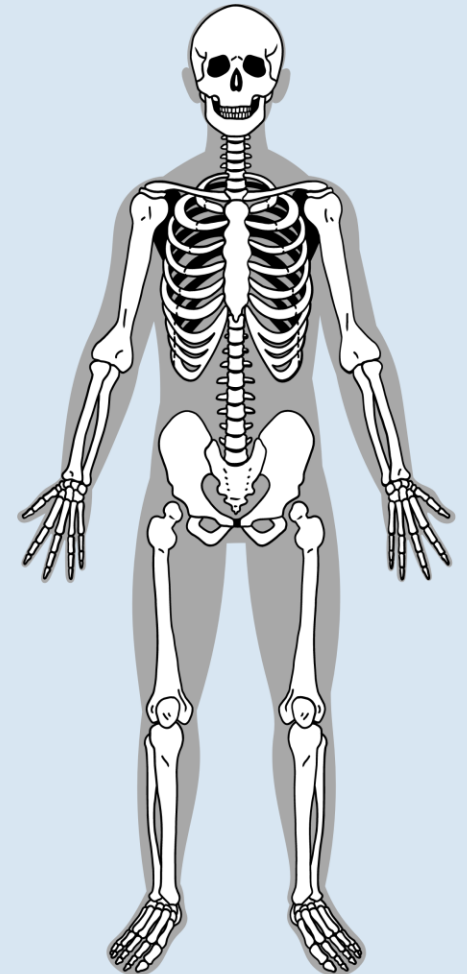
**Dr. Abdulhusein Mizhir Almaamuri**



# Skeletal System

**Has five main functions:**

- **Provides us with a basic structure/shape**
- **Allows movement**
- **Protects vital organs**
- **Produces blood cells**
- **Storage of fats and minerals**





- 206 BONES
- CARTILAGE
- LIGAMENTS



# THE HUMAN SKELETON



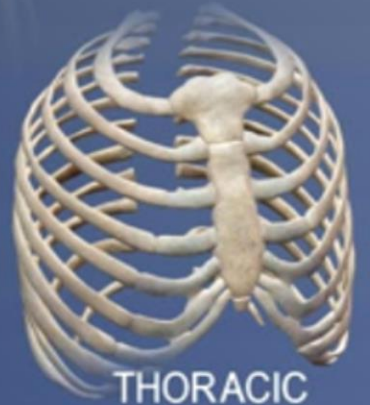
SKULL: 22



SHOULDER GIRDLE and  
UPPER LIMBS: 64



VERTEBRAL  
COLUMN: 33



THORACIC  
CAGE: 25

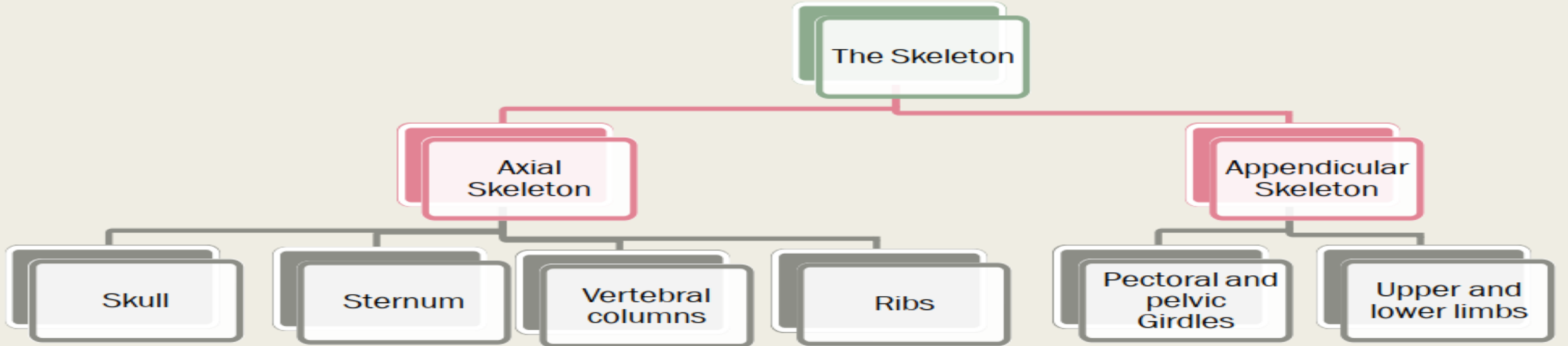


PELVIC GIRDLE and  
LOWER LIMBS: 62

206 BONES

# The Skeleton

The skeleton is formed from **206** Bones



When you look at the human skeleton the 206 bones and 32 teeth stand out. But look closer and you'll see even more structures. The human skeleton also includes **ligaments and cartilage**. Ligaments are bands of dense and fibrous connective tissue that are key to the function of joints. Cartilage is more flexible than bone but stiffer than muscle. Cartilage helps give structure to the larynx and nose. It is also found between the vertebrae and at the ends of bones like the femur.





APPENDICULAR  
SKELETON

AXIAL  
SKELETON

THE HUMAN SKELETON

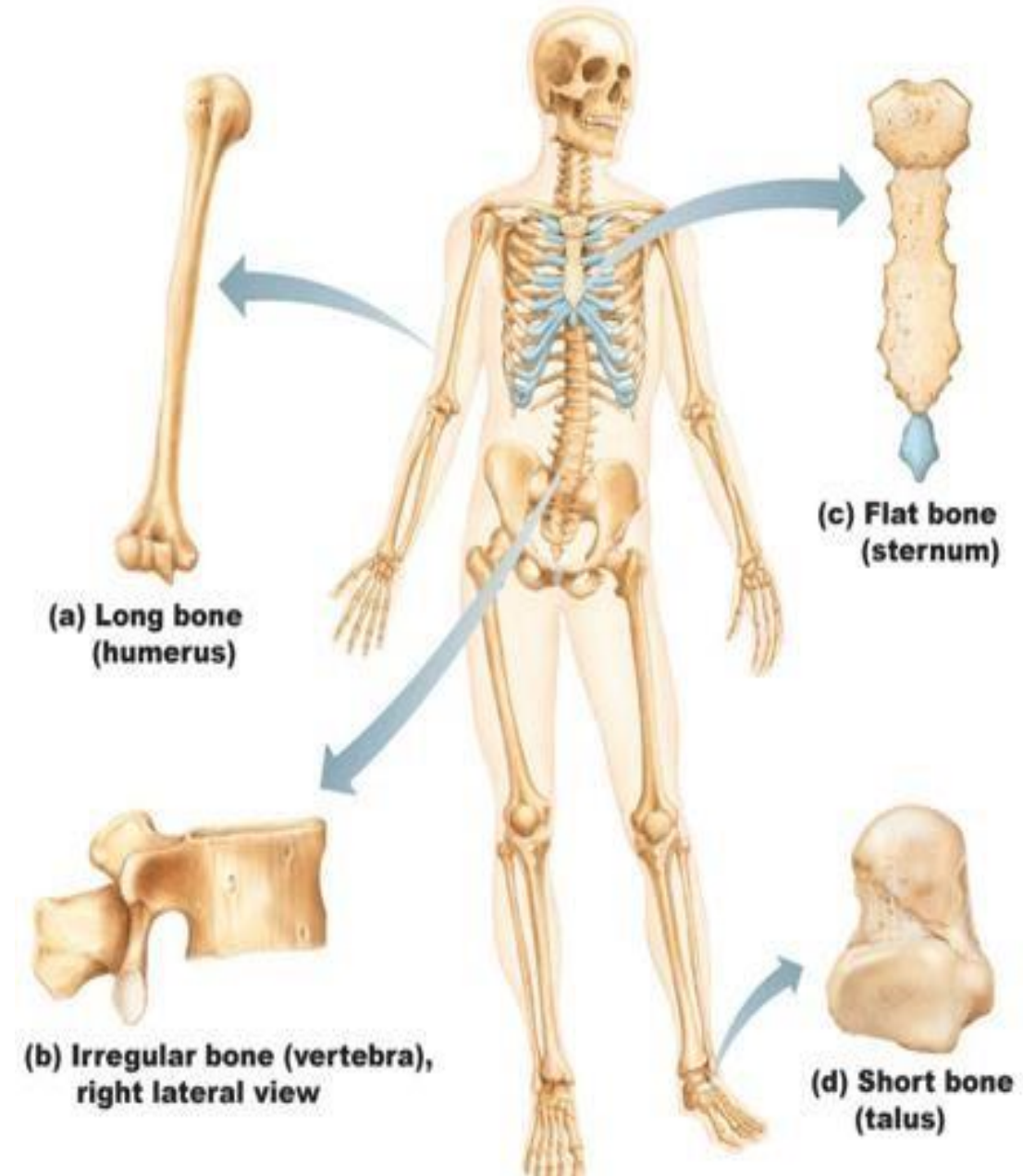
■ *Bones are classified based on three things:*

1 Shape: **Long, Short, Irregular, flat**

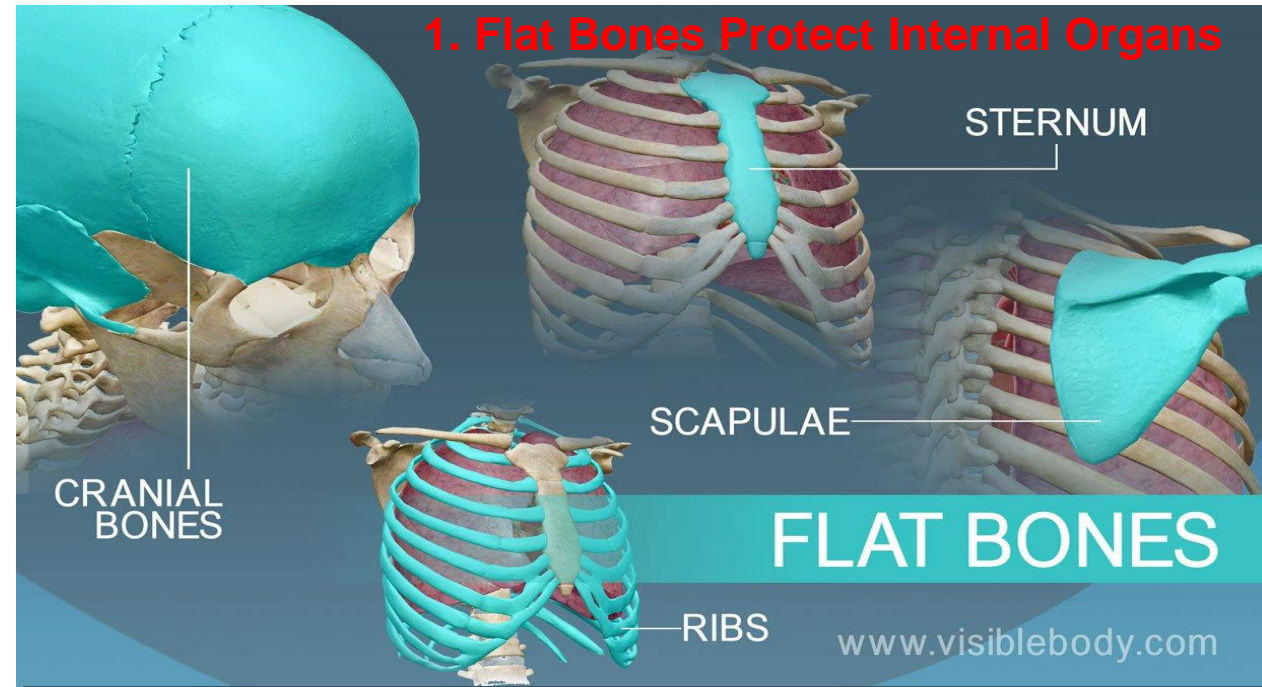
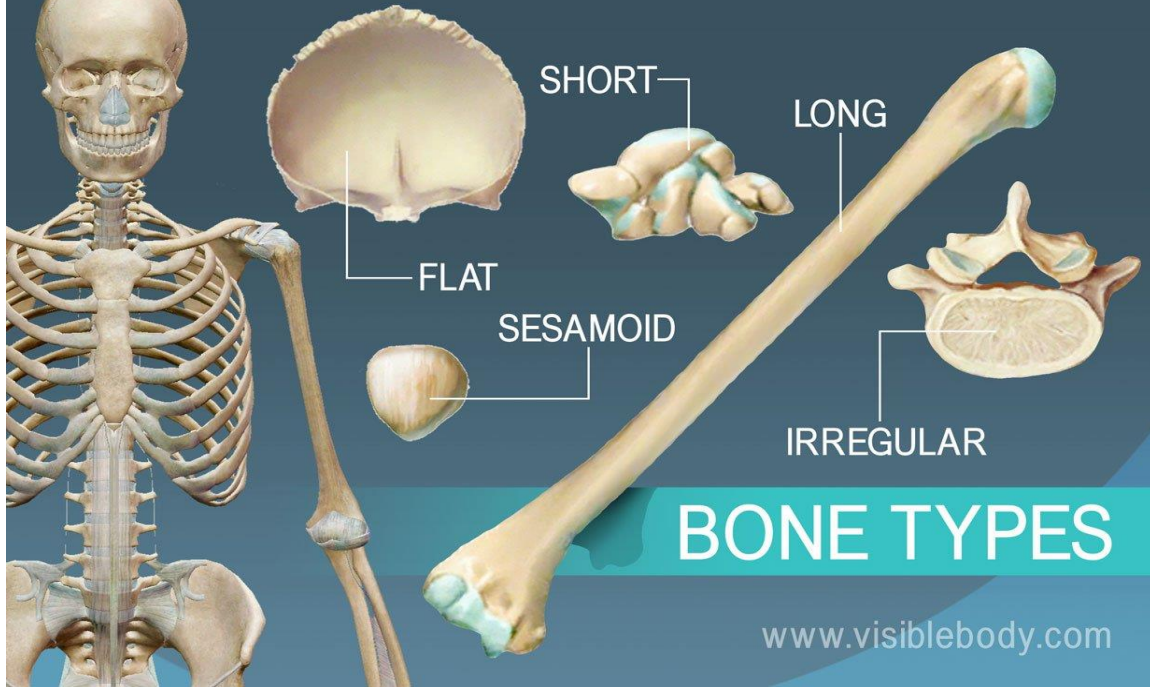
2 Structure: **Compact, Spongy**

3 Development: **Membrane, Cartilage**

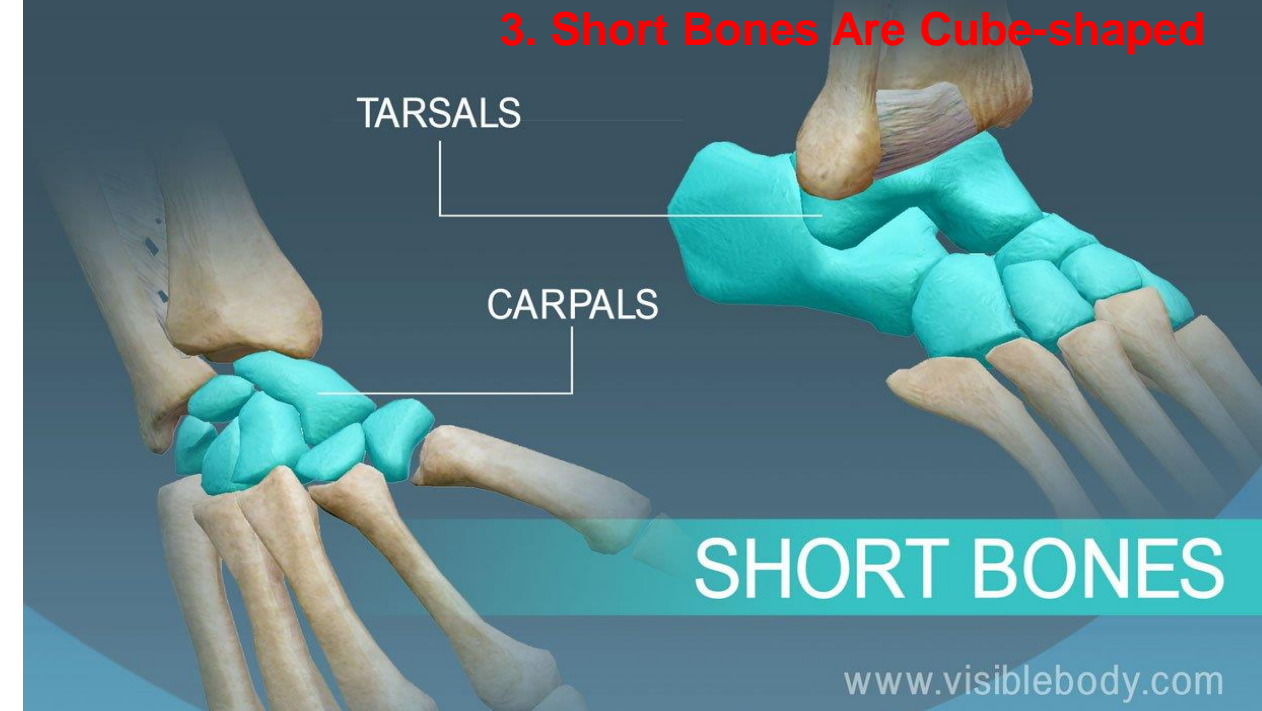
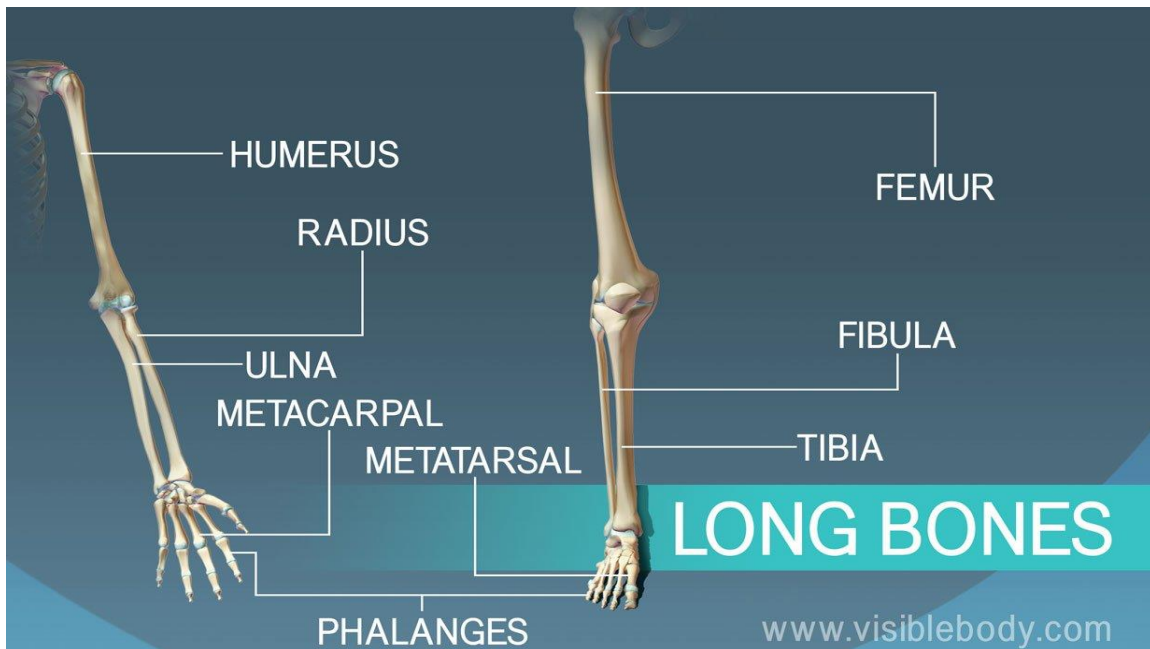
*An infant skeleton has almost a hundred more bones than the skeleton of an adult.*



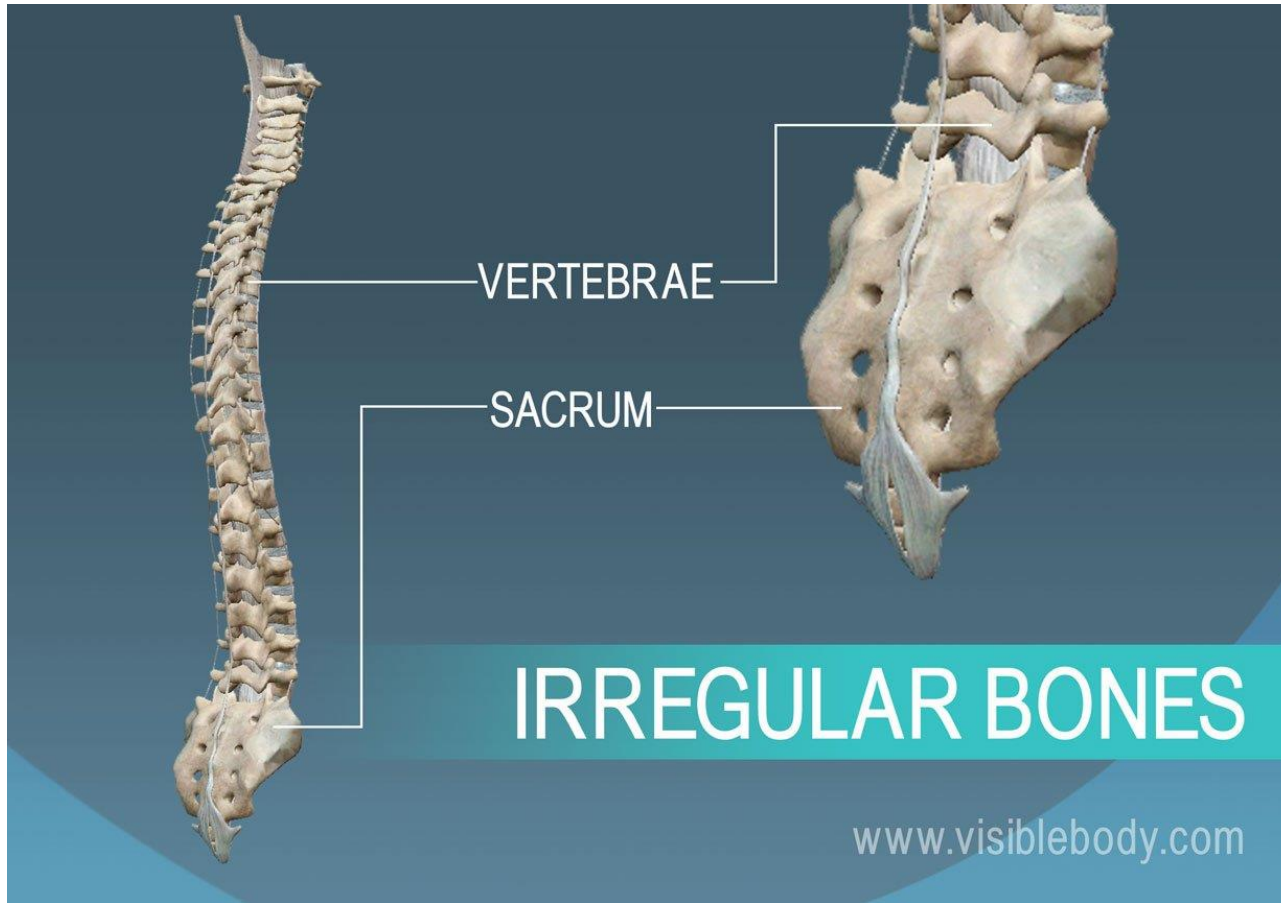




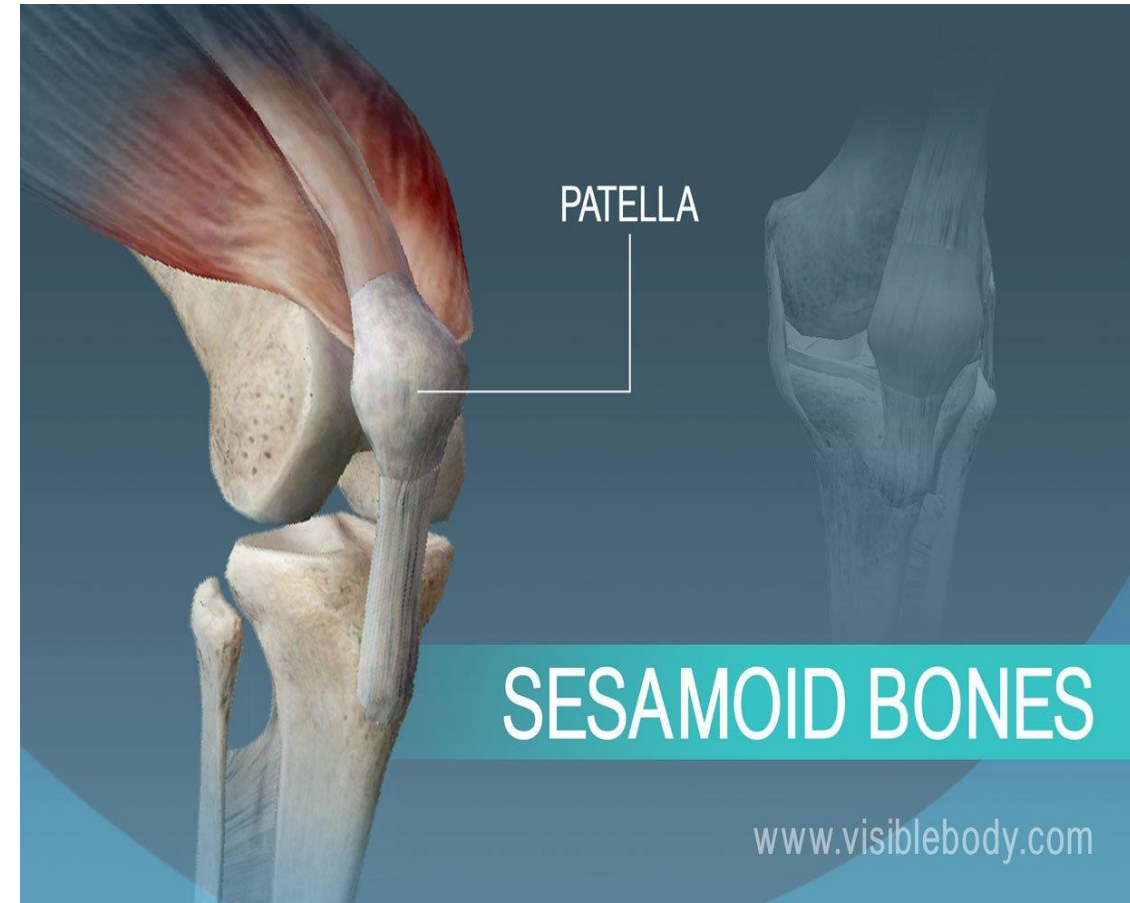
**2. Long Bones Support Weight and Facilitate Movement**



#### 4. Irregular Bones Have Complex Shapes



#### 5. Sesamoid Bones Reinforce Tendons



There are **flat bones** in the skull (occipital, parietal, frontal, nasal, lacrimal, and vomer), the thoracic cage (sternum and ribs), and the pelvis (ilium, ischium, and pubis). The function of flat bones is to protect internal organs such as the brain, heart, and pelvic organs.

**Sesamoid bones** are bones embedded in tendons. These small, round bones are commonly found in the tendons of the hands, knees, and feet. Sesamoid bones function to protect tendons from stress and wear. The patella, commonly referred to as the kneecap, is an example of a sesamoid bone.





The bones of the human skeleton are divided into two groups. The **appendicular skeleton** includes all the bones that form the upper and lower limbs, and the shoulder and pelvic girdles.

The **axial skeleton** includes all the bones along the body's long axis .

The **axial skeleton** includes the bones that form the skull, laryngeal skeleton, vertebral column, and thoracic cage. The bones of the appendicular skeleton (the limbs and girdles) “append” to the axial skeleton.

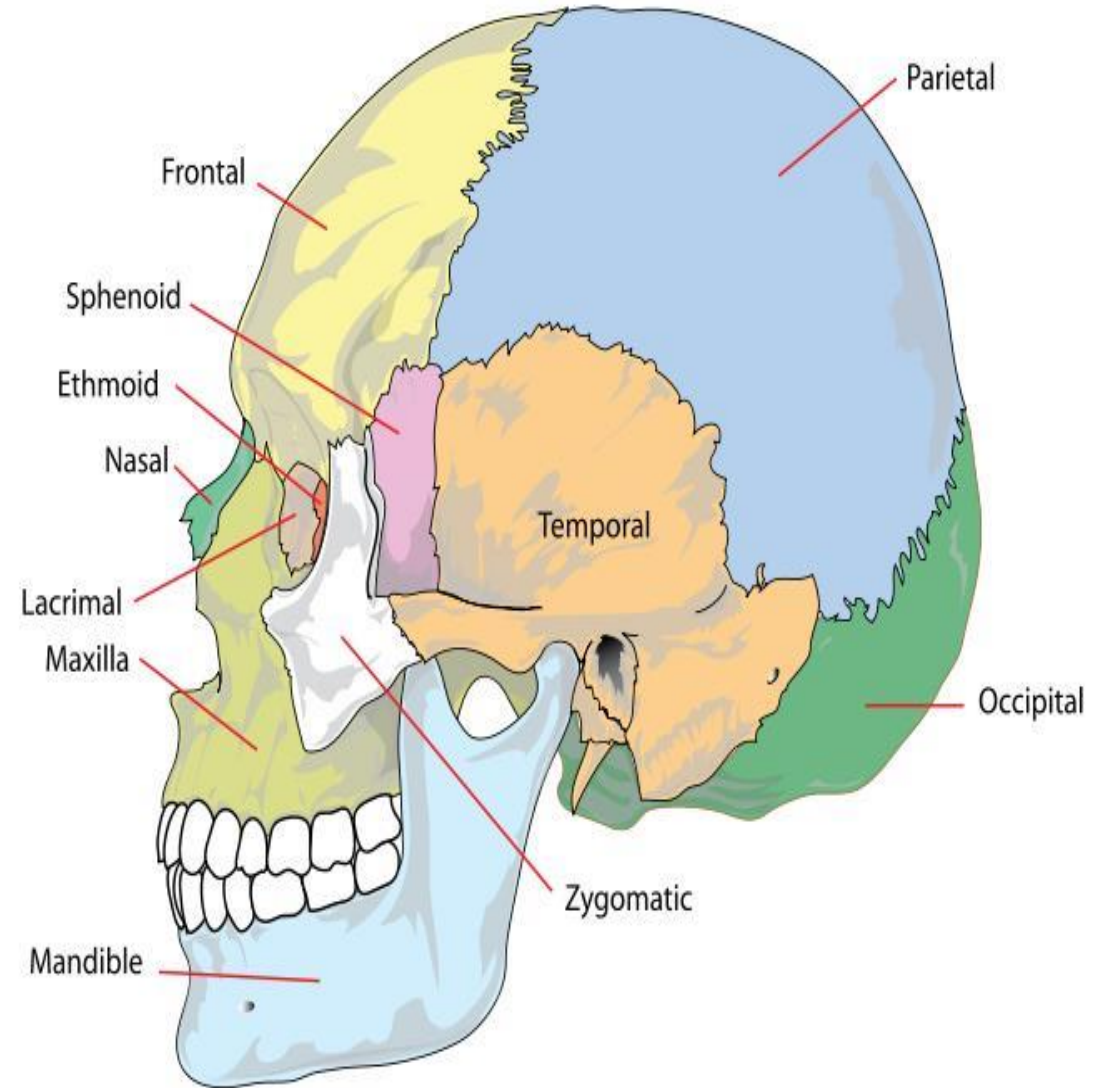
# Bones of the axial skeleton

## The Skull

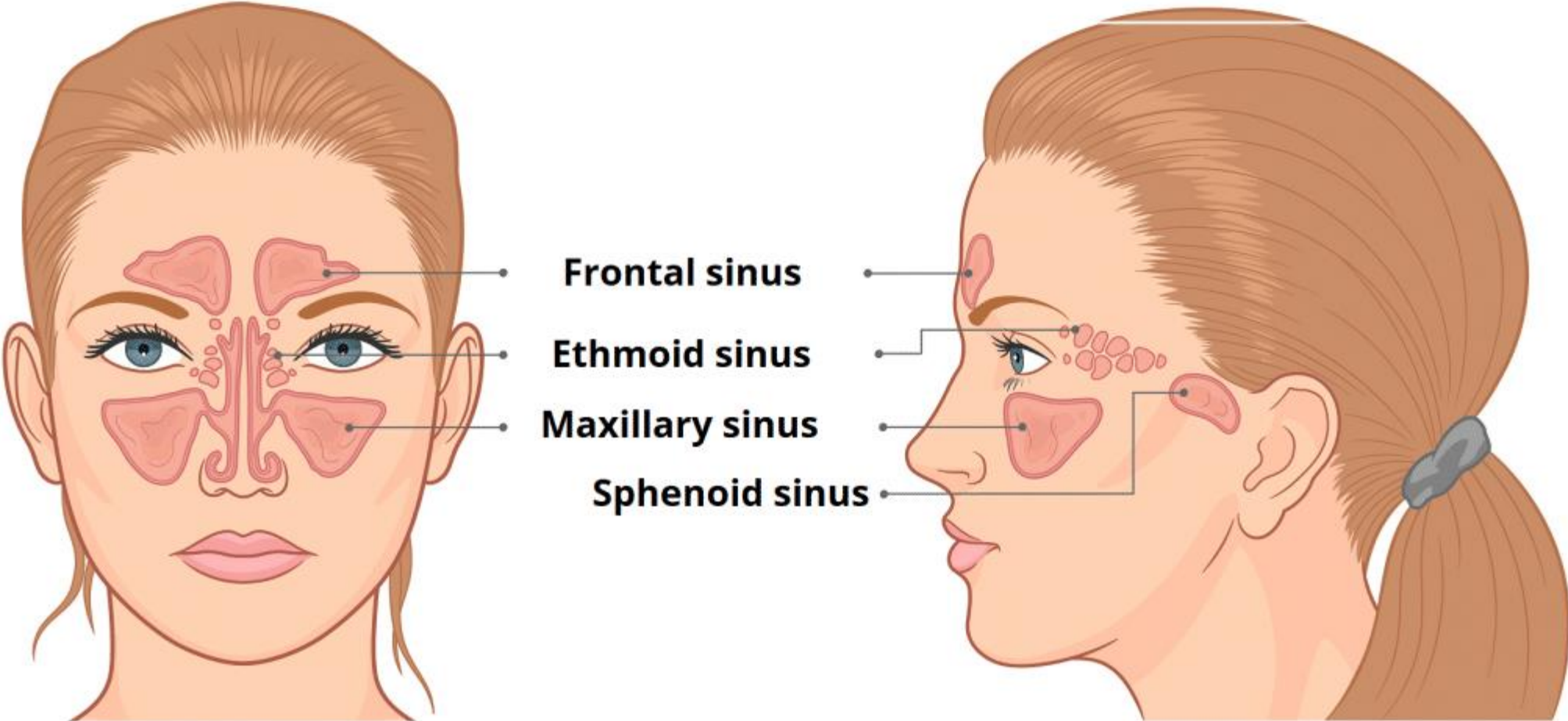
Formed from two sets of bones:

1. **Cranium**(bones enclosing and covering the brain): **Frontal, Temporal, Occipital, Parietal, Sphenoid**

2. **Facial bones** (bones that form the skeleton of the face): **Maxilla, Nasal, Zygomatic, Mandible**



The **paranasal sinuses** are air-filled extensions of the nasal cavity. There are four paired sinuses – named according to the bone in which they are located – maxillary, frontal, sphenoid and ethmoid. Each sinus is lined by a ciliated pseudostratified epithelium, interspersed with mucus-secreting goblet cells.





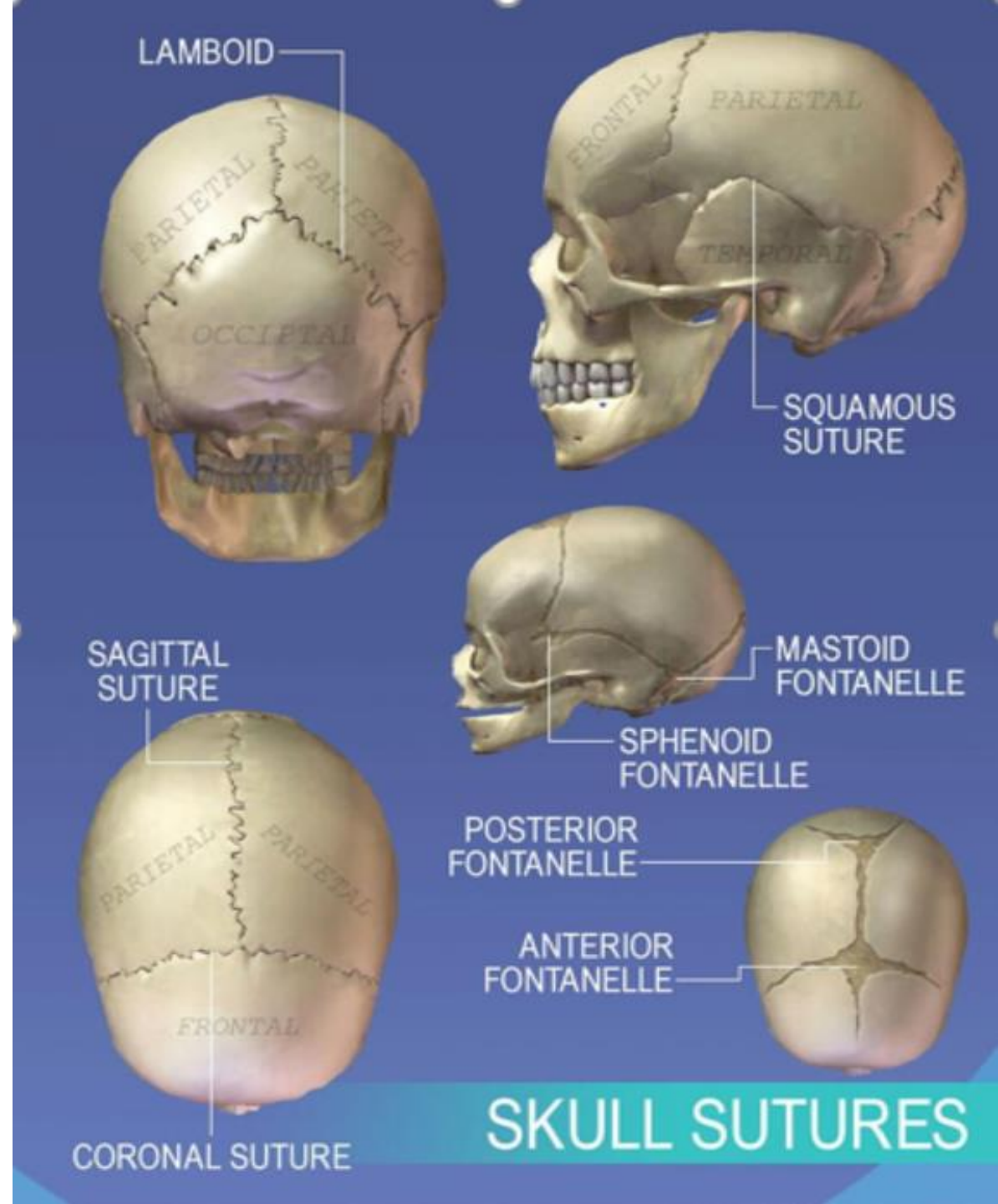
## Skull Sutures

In fetuses and newborn infants, cranial bones are connected by flexible fibrous sutures, including large regions of fibrous membranes called **fontanelles**.

These regions allow the skull to enlarge to accommodate the growing brain.

The sphenoidal, mastoid, and **posterior fontanelles** close after two months, while the **anterior fontanelle** may exist for up to two years.

As fontanelles close, sutures develop. Skull sutures are immobile joints where cranial bones are connected with dense fibrous tissue.



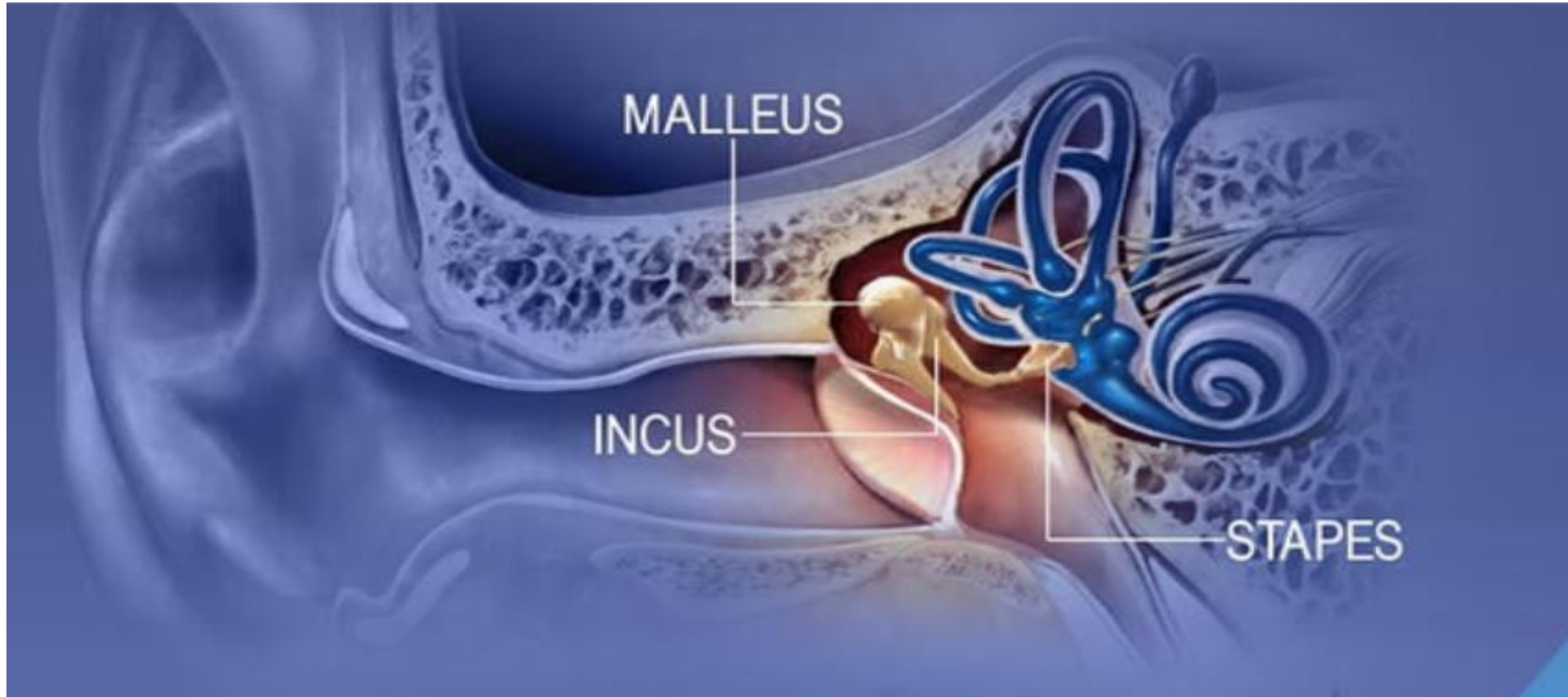
# The Hyoid Bone, Laryngeal Skeleton, and Bones of the Middle Ear Are Commonly Categorized with Skull Bones

## Laryngeal Skeleton

The **laryngeal skeleton**, also known as the larynx or voice box, is composed of nine cartilages.

It is located between the trachea and the root of the tongue. The hyoid bone provides an anchor point. The movements of the laryngeal skeleton both open and close the glottis and regulate the degree of tension of the vocal folds, which—when air is forced through them—produce vocal sounds.





## **Bones of the Middle Ear**

Inside the petrous part of the temporal bone are the three smallest bones of the body: the malleus, incus, and stapes. These three bones articulate with each other and transfer vibrations from the tympanic membrane to the inner ear.



# VERTEBRAL COLUMN

It is a flexible curved structure formed of **33** vertebrae (irregular bones).

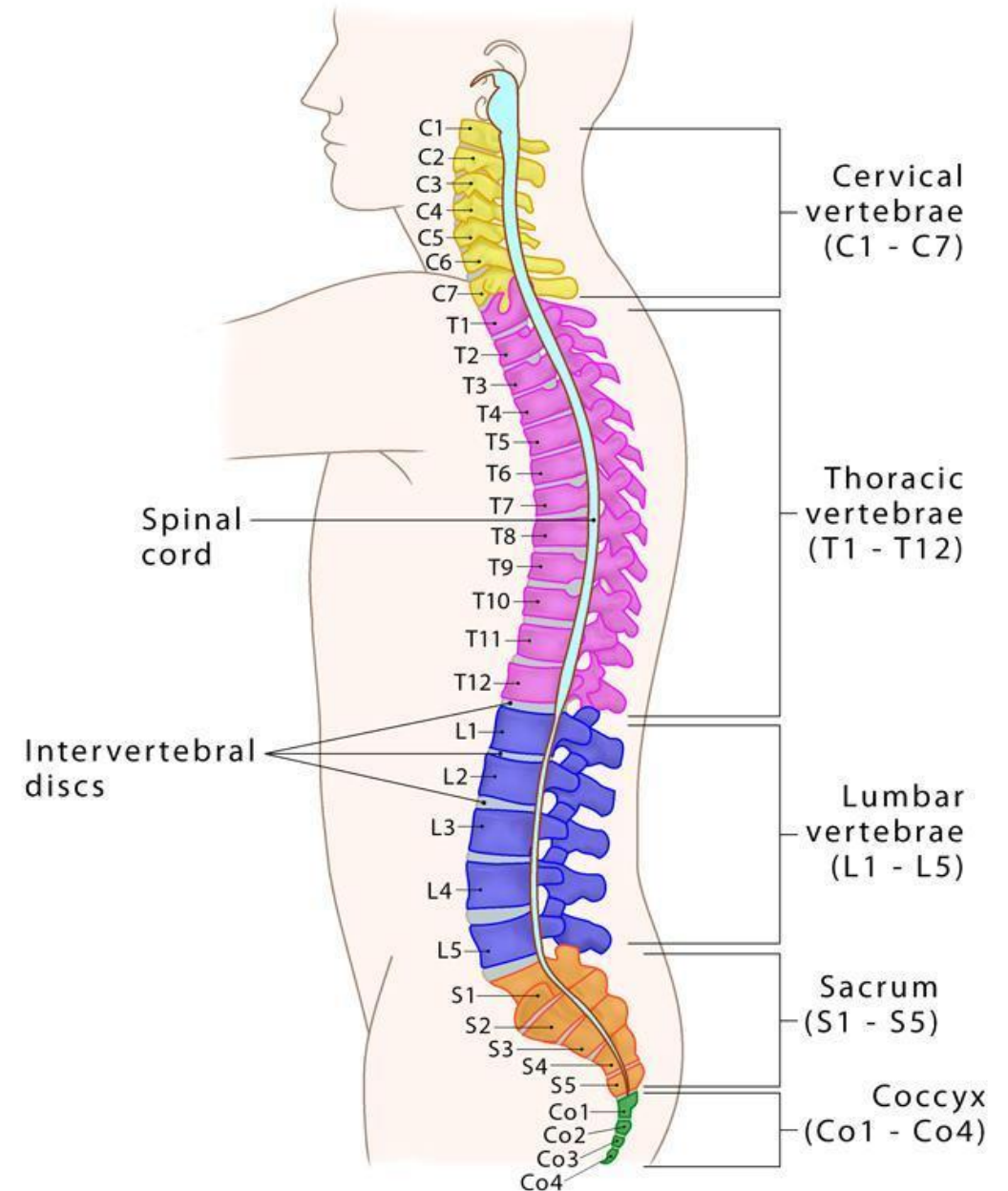
Running through its cavity is the spinal cord

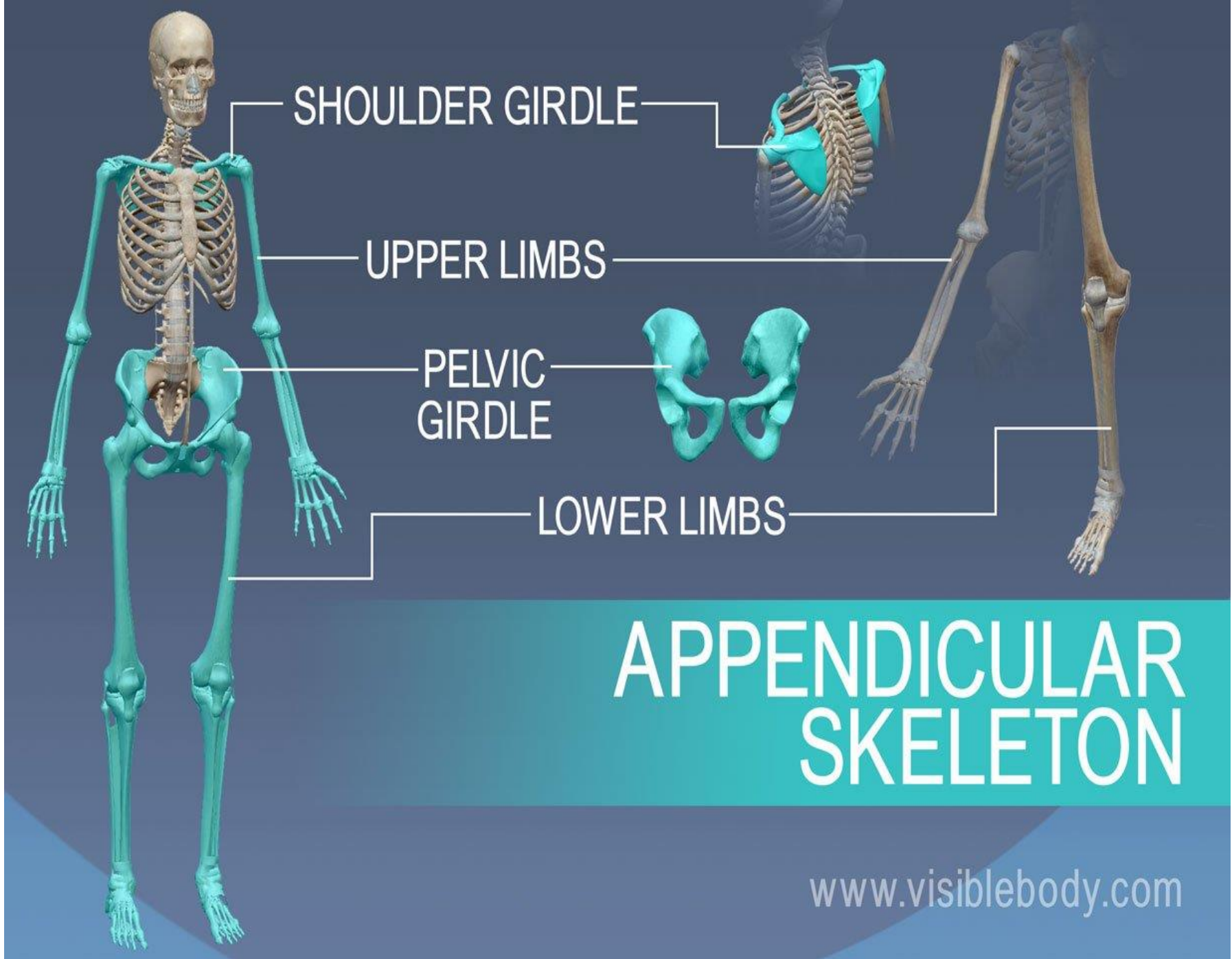
Formed of :

1. **Cervical vertebrae** 7
2. **Thoracic vertebrae** 12
3. **Lumbar vertebrae** 5
4. **Sacral vertebrae fused to form sacrum**  
(triangular bone) 5
5. **coccygeal vertebrae fused to form coccyx**  
(small bone) 4

## Vertebral Column

(Composed of 33 vertebrae)





SHOULDER GIRDLE

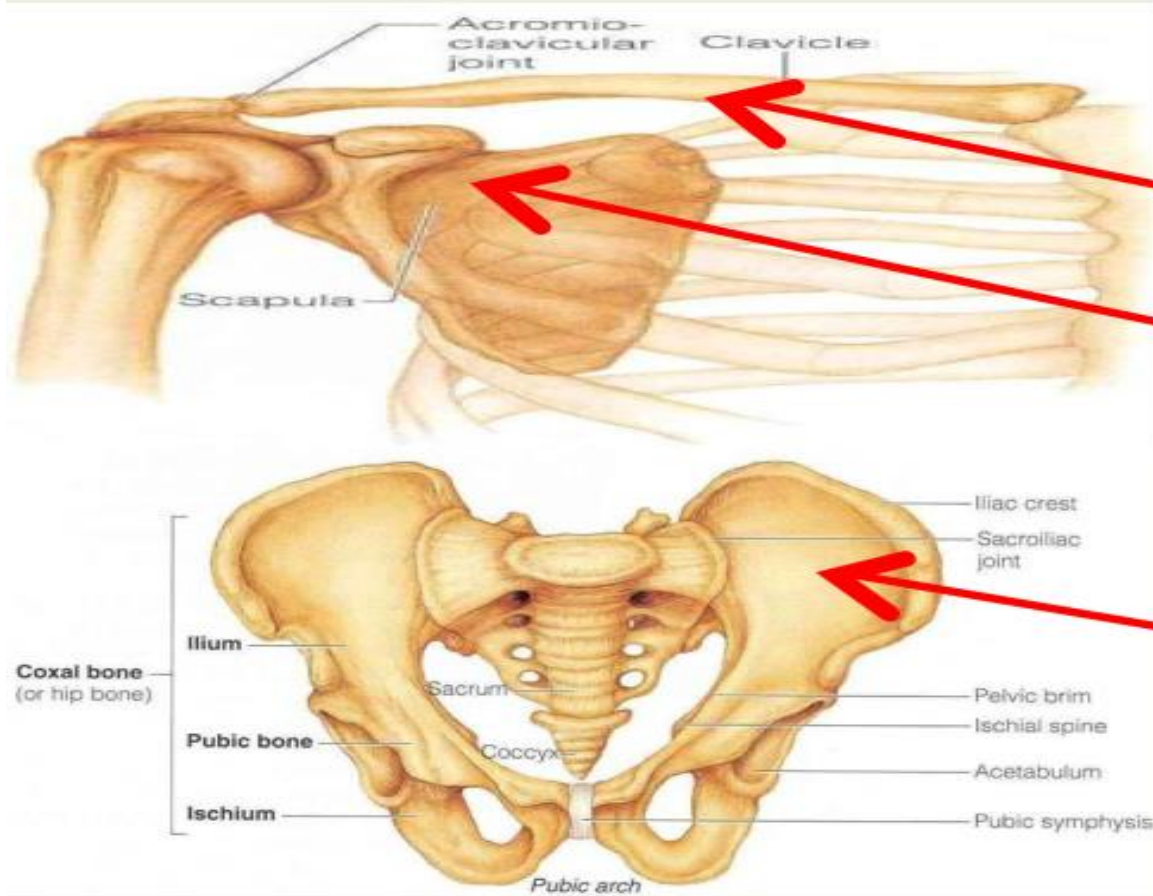
UPPER LIMBS

PELVIC GIRDLE

LOWER LIMBS

# APPENDICULAR SKELETON

# BONES OF APPENDICULAR SKELETON



## PECTORAL GIRDLE

- ❑ Connects upper limb with axial skeleton
- ❑ Formed of: **clavicle & scapula** (2 bones on each side)

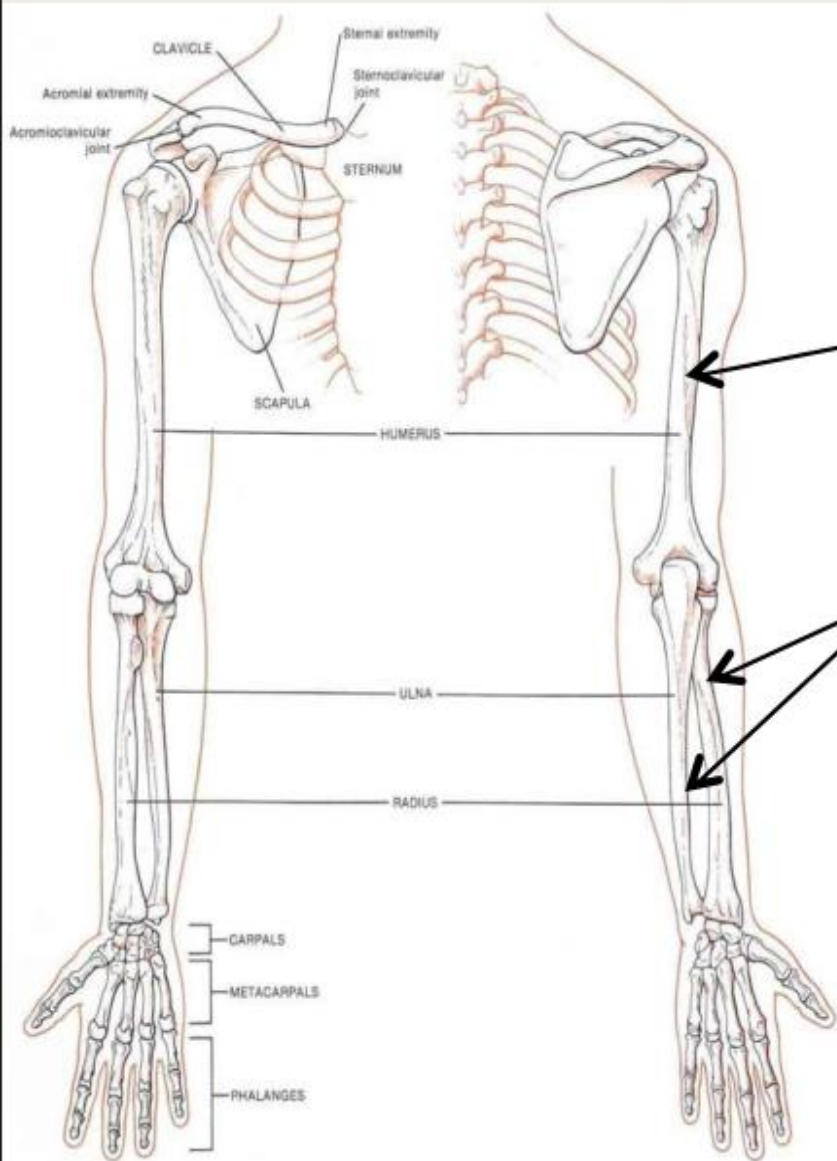
## PELVIC GIRDLE

- ❑ Connects lower limb with axial skeleton
- ❑ Formed of: **hip bone** (one bone on each side)

Each hip bone is a large, flattened, and irregularly shaped fusion of three bones: the **ilium, ischium, and pubis**.



# BONES OF APPENDICULAR SKELETON



## UPPER LIMB

- Bone of arm: humerus
- Bones of forearm: radius (lateral) & ulna (medial)
- Bones of hand:
  - 8 carpal bones
  - 5 metacarpal bones
  - 14 phalanges: 2 for the thumb & 3 for each of medial 4 fingers

The **upper limbs**:

include the bones of the arm (**humerus**), forearm (**radius and ulna**), wrist, and hand.

The only bone of the arm is the humerus, which articulates with the forearm bones—the radius and ulna—at the elbow joint.

The ulna is the larger of the two forearm bones.



## BONES OF APPENDICULAR SKELETON

### *Lower limb*

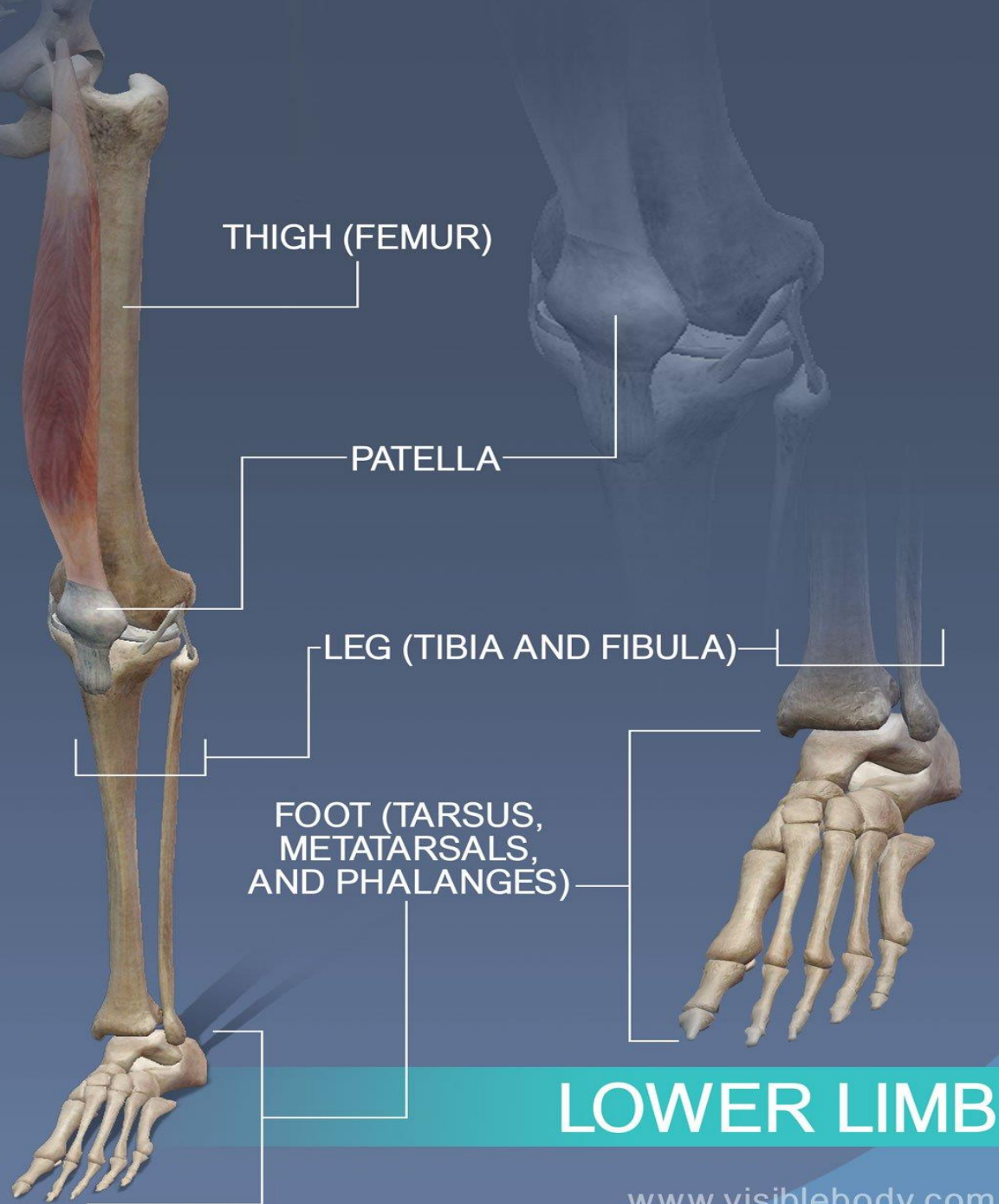
- ❑ Bones of thigh → **Femur** .
- ❑ Bones of leg → **Fibula (lateral) & Tibia (medial)**.
  - ❑ Patella.
  - ❑ Bones of foot :
    - i. **7 tarsal bones** .
    - ii. **5 metatarsal bones**
    - iii. **14 phalanges** 2 for big toe & 3 for each four lateral toes .

### The **lower limbs**

include the bones of the thigh, leg, and foot. **The femur** is the only bone of the thigh. It articulates with the two bones of the leg—the larger **tibia** (commonly known as the shin) and smaller **fibula**.

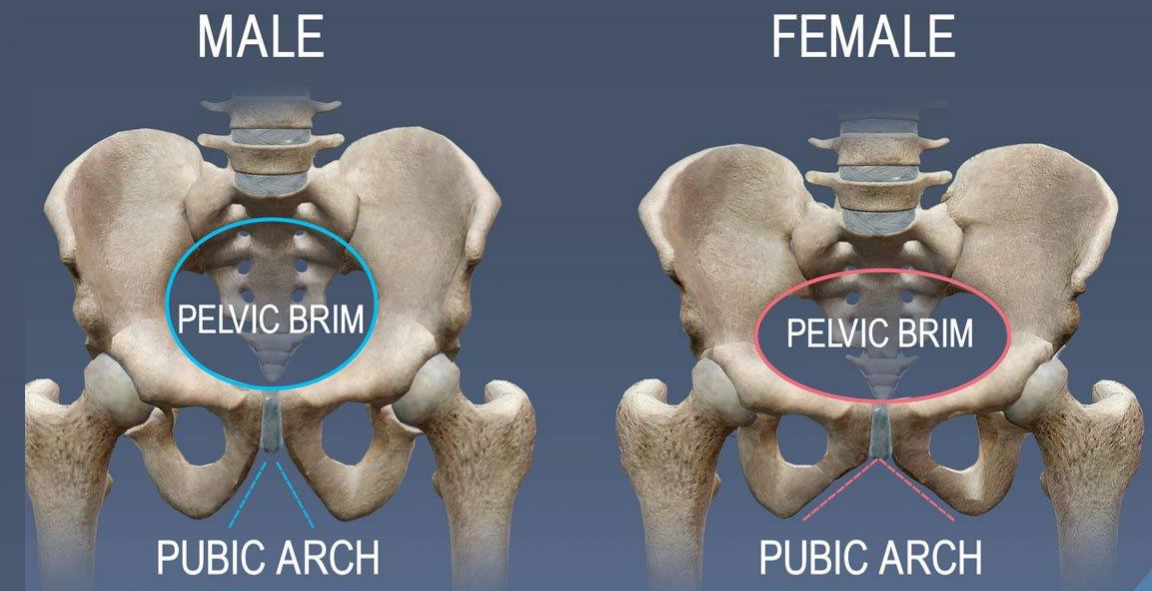
The thigh and leg bones articulate at the knee joint that is protected and enhanced by the patella bone. The bones of the foot include the **tarsus**, **metatarsus**, and **phalanges**.





## LOWER LIMB

[www.visiblebody.com](http://www.visiblebody.com)



## MALE AND FEMALE PELVIS

[www.visiblebody.com](http://www.visiblebody.com)

**Female and Male Pelvis.** The female and male pelvises differ in several ways due to childbearing adaptations in the female.

The female pelvic brim is larger and wider than the male's.

The male pelvis is deeper and has a narrower pelvic outlet than the female's.



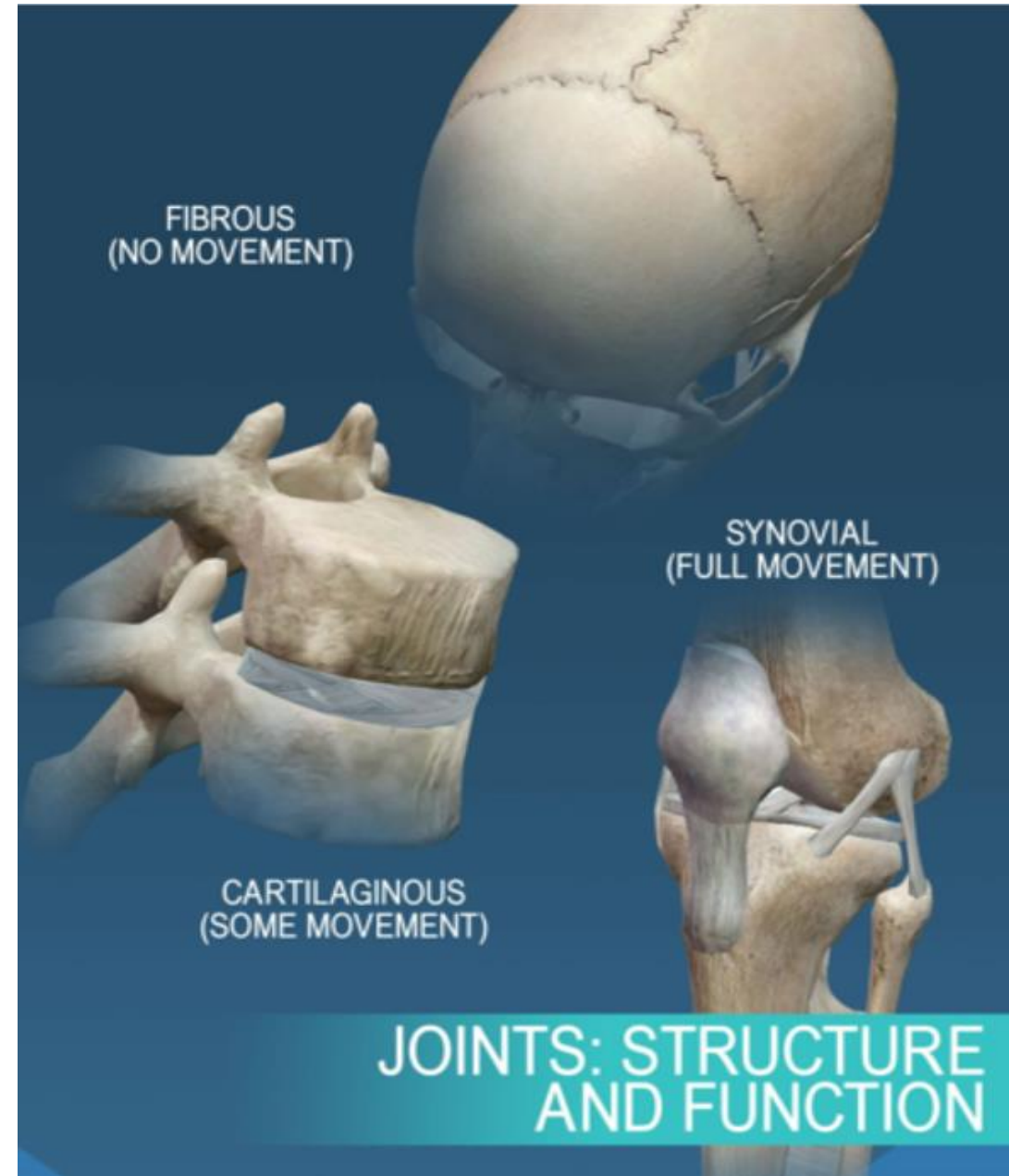
## Bones Come Together: Types of Joints in the Human Body

Joints hold the skeleton together and support movement.

There are two ways to categorize joints:

The first is by **joint function**, also referred to as **range of motion**.

The second way to categorize joints is by the material that holds the bones of the joints together; that is an organization of **joints by structure**.



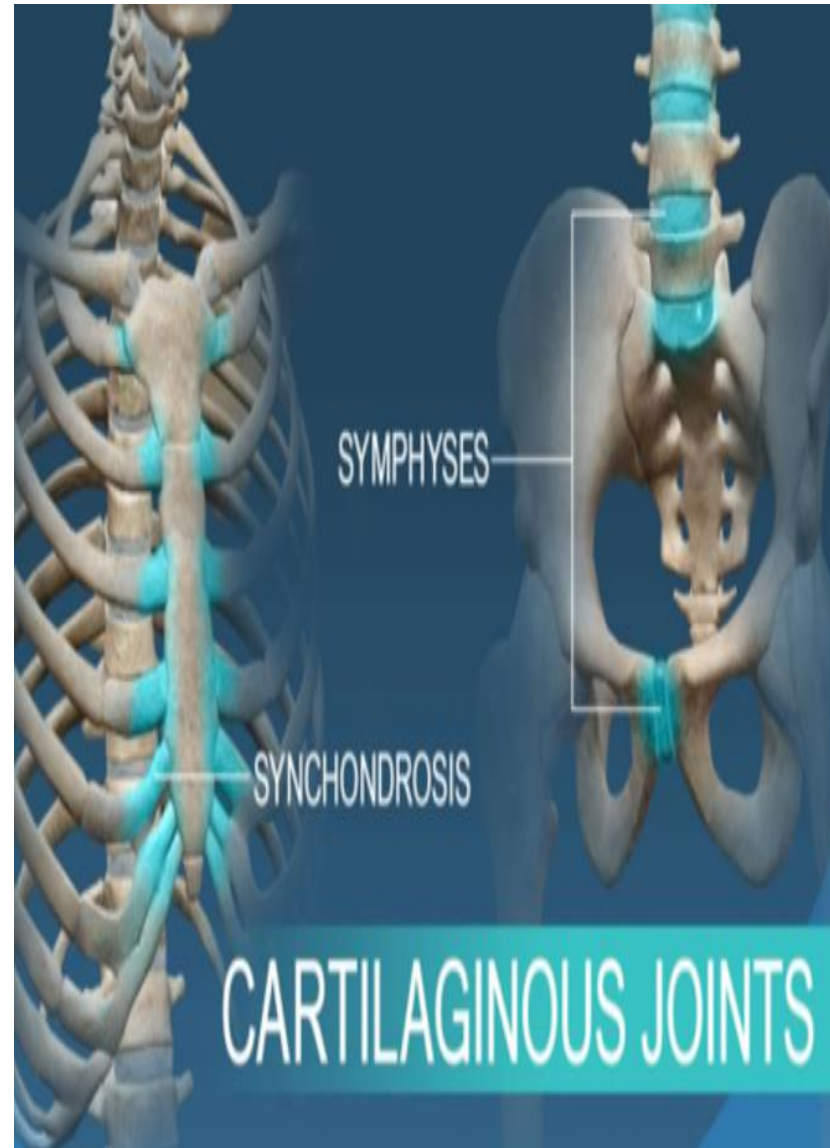
# 1. Joints Can Be Grouped By Their Function into Three Ranges of Motion

Type of Joint Function	Examples
<b>1. Synarthrosis (range of joint motion: no movement)</b>	Skull Sutures, articulations of bony sockets and teeth in facial skeleton
<b>2. Amphiarthrosis (range of joint motion: little Movement)</b>	distal joint between the tibia and the fibula and the pubic symphysis
<b>3. Diarthrosis (range of joint motion full movement)</b>	Elbow, shoulder, ankle





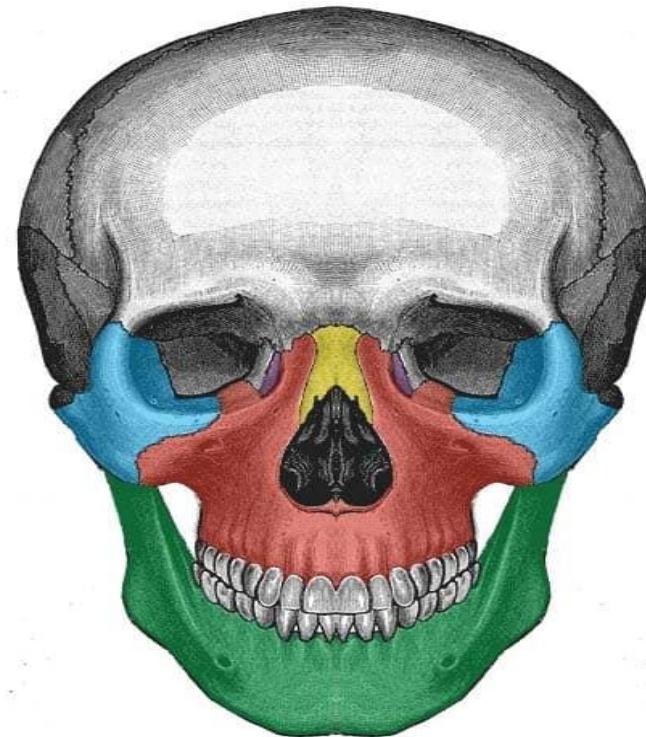
## 2. Joints Can Be Grouped By Their Structure into Fibrous, Cartilaginous, and Synovial Joints







# THANK YOU!



-  Zygomatic
-  Maxilla
-  Nasal
-  Lacrimal
-  Mandible