Human Anatomy and Physiology

CHAPTERWISE NOTES

Osseous System

PHARMA

HUMAN ANATOMY & PHYSIOLOGY

Osseous System

Cartilage:

- **Perichondrium:** Outermost covering of the cartilage.
- **Chondrioblast:** Cartilage producing cells.
- **Chondriocytes:** Mature cells of cartilage.
- **Chondrioclast:** Cartilage destroying cells.
- **Chondrin:** Matrix of cartilage
- **Lacuna:** space in the matrix.

Types of cartilage:

1. Hyaline cartilage
2. Fibrous cartilage
   (a) Elastic cartilage
   (b) White fibrous cartilage
3. Calcified cartilage

1. Hyaline cartilage:

- Maximum in the human body.
- **Location -**Larynx, Nasal septum, 'C' shaped ring of trachea and bronchi, sternal ribs.

2. Fibrous cartilage:

(a) White Fibrous cartilage: Found in intervertebral disc, pubis symphysis bone.

(b) Elastic cartilage: Tip of Nose, Ear pinna, Epiglottis, wall of eustachian tube, Epiglottis

3. Calcified cartilage:

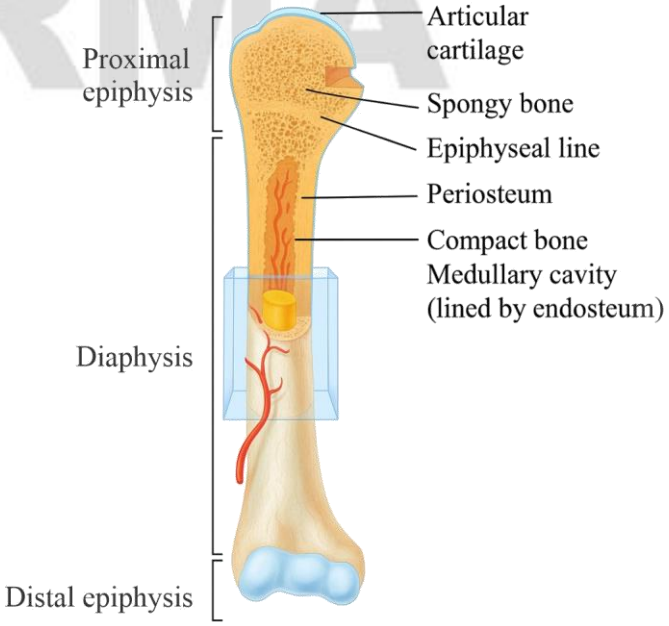
- **Hardest cartilage** of the body.
- Found in Head of femur, humerus, Supra scapula of pectoral girdle.

Bone:

- Study of Bone - **Osteology**
- Process - **Ossification**
- Outermost covering - **Periosteum**
- Bone forming cell - **Osteoblast**
- Mature cell of bone - **Osteocyte**
- Bone destroying cells - **Osteoclast**

Structure:

- It consists of three regions:-
  - Epiphysis
  - Diaphysis
  - Metaphysis



- **Epiphysis:** End part is called Epiphysis.If this part is present at the joint then Periosteum is absent & **Hyaline** cartilage is present.

  Cavity is called **trabeculae** (filled with red bone marrow)
- **Diaphysis:** Middle part ,hollow cavity is present called bone marrow cavity filled with yellow bone marrow (responsible for the storage of fats) .
- **Metaphysis:** Small part between the Epiphysis & Diaphysis.

  Epiphyseal plate is present which is made up of osteoblast cells .They divide to form osteocytes and also synthesize matrix of bone.

Internal structure of bone:

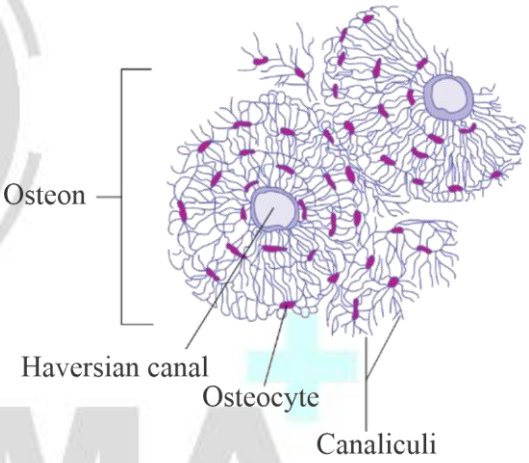
1. **Periosteum (**outermost covering of bone)
2. **Matrix (** Haversian canal & Volkmann's canal)
   - **Haversian canal**: Longitudinal canal arranged parallel to long axis of bone .
   - **Volkmann's canal:** Transverse canal .Haversian canals are interconnected by Volkmann's canal .

3. Endosteum:

It consists of two layers:

1. Towards the bone marrow cavity lined with reticular Fibrous connective tissue.
2. Towards matrix of bone endosteum lined with the layer of osteoblast cells.

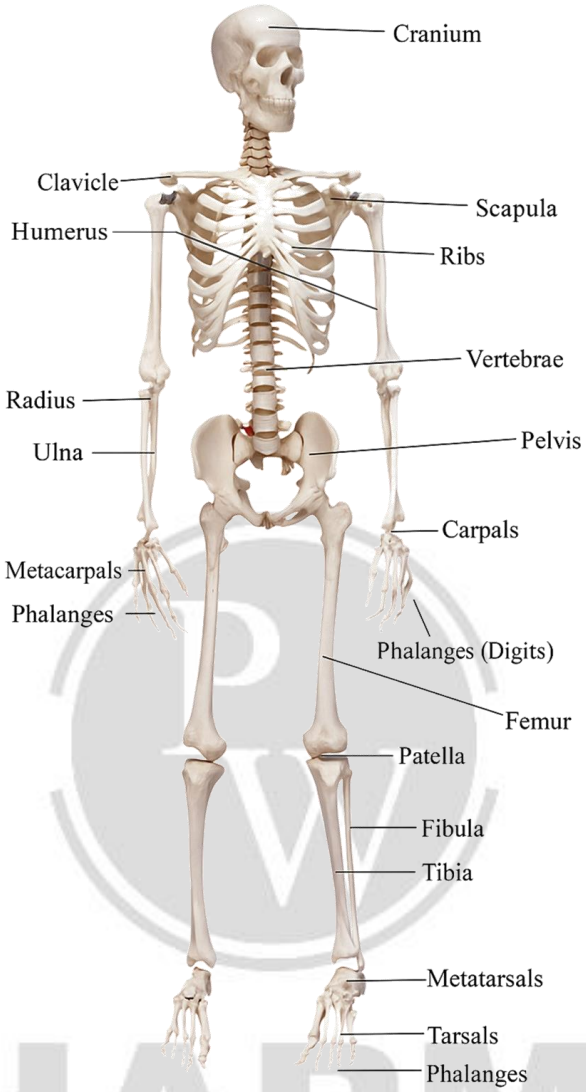
Bone marrow cavity: In the central region hollow cavity is present which is filled with YBM.It is composed of white fats.



Type of Bones:

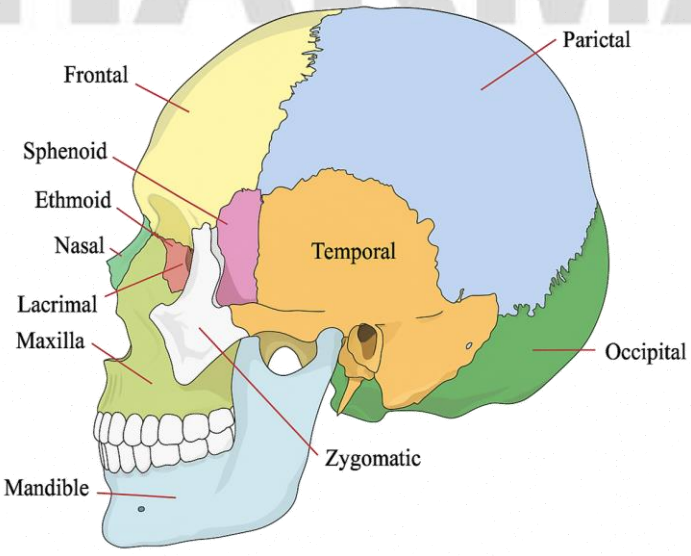
1. **Cartilagenous bone**
   - These bones are developed from the cartilage or they are formed by the ossification of cartilage .
   - Two types of cell are required for the formation of this bone .
     - **Chondrioclast:** It reabsorbs cartilaginous matter.
     - **Osteoblast:** It deposits bony matter into cartilage.
2. **Membranous bone:**
   - Develops from the connective tissue
   - **Eg:** Vomer, clavicle, Nasal bone, Scapula, Pubis, sternum, Maxilla, Palatine bone, Parietal, Frontal, Lachrymal, Temporal
3. **Sesamoid bone:**
   - Developed by the ossification of tendons at the joints
   - Ex- Patella
4. **Visceral bone:** In humans these bones are absent.

Human skeletal system:



(A) Axial skeleton:

1. **Skull (22)**



Cranial Bones (8)

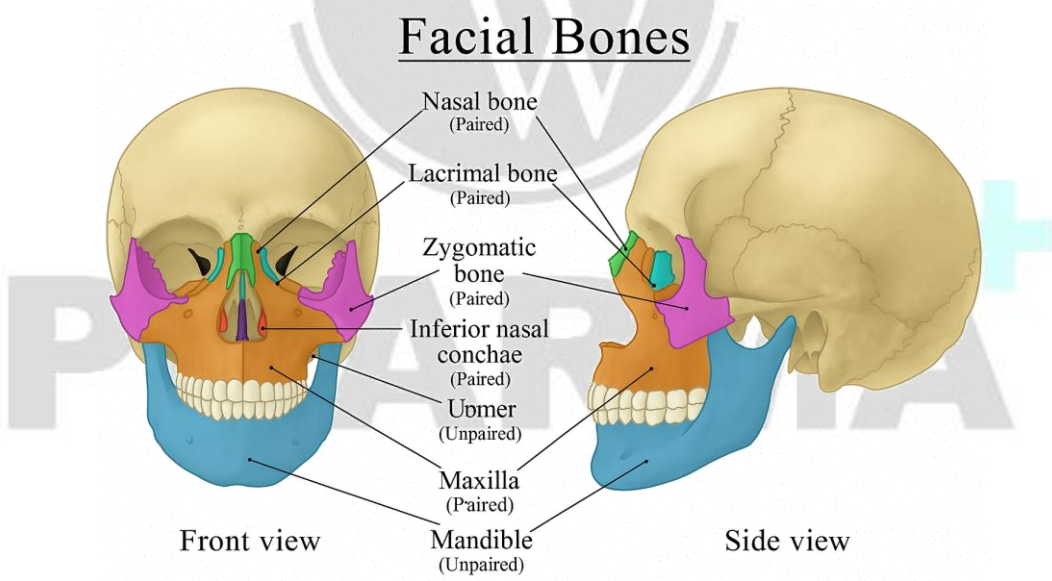
- Frontal (1)
- Parietal (2)
- Temporal (2)
- Occipital (1)
- Sphenoid (1)
- Ethmoid (1)

Facial Bones (14)

- Nasal (2)
- Maxillae (2)
- Zygomatic (2)
- Palatine (2)
- Lacrimal (2)
- Inferior nasal conchae (2)
- Vomer (1)
- Mandible (1)

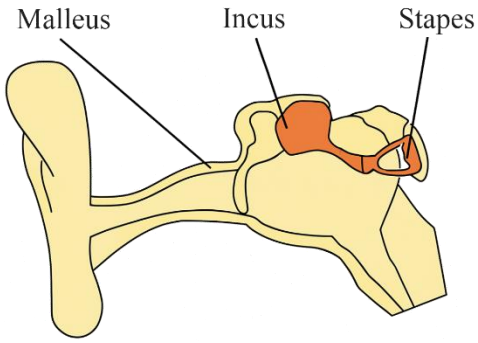
Mnemonics: वो Maxwell के शानदार चौके मैच को लेकर पलट न जाए

वो (V): Vomer
Maxwell (M): Maxilla
के
शानदार
चौके
मैच (Ma): Mandible
को (Co): Conchae
लेकर (L): Lacrimal
पलट (P): Palatine
न (N): Nasal
जाए (Z): Zygomatic



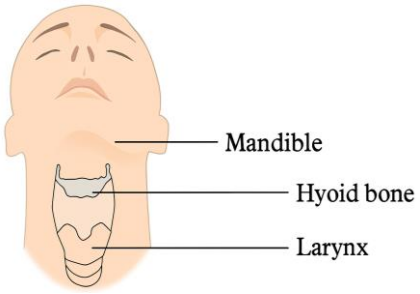
- Ear ossicles (3)

  Middle ear consists of 3 ear ossicles (Total 6 bones)
- **Malleus (Hammer shaped)**
- **Incus (Anvil shaped)**
- **Stapes (Stirrup shaped)** It is the smallest bone in the body.



- Hyoid (1)

  Single U shaped bone, present at the base of the buccal cavity.



(B) Ribs & sternum

Ribs (12 pairs) '24'

Sternum (1)

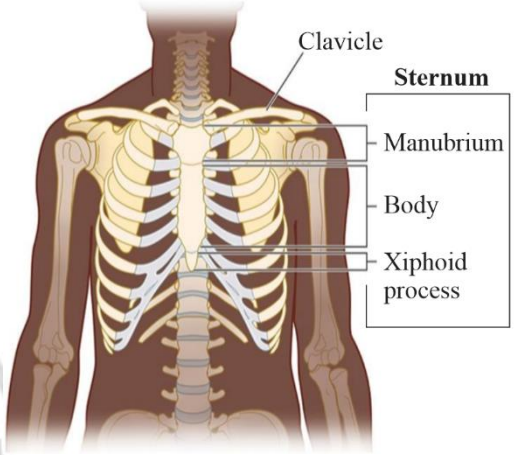
Ribs are further classified into

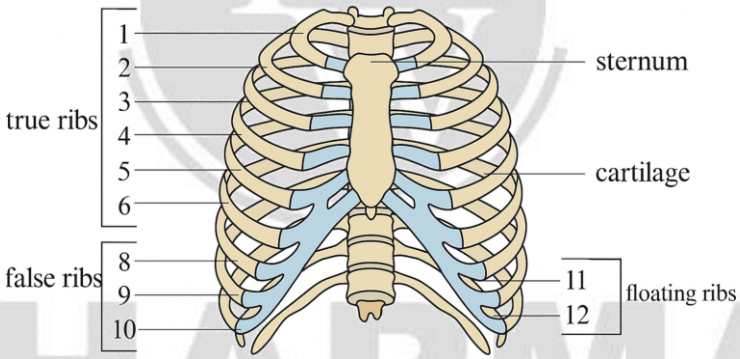
- **True ribs :-** First '7' pair

  Articulates at both sternum and vertebral column.
- **False ribs :-** 8th ,9th ,10th pair

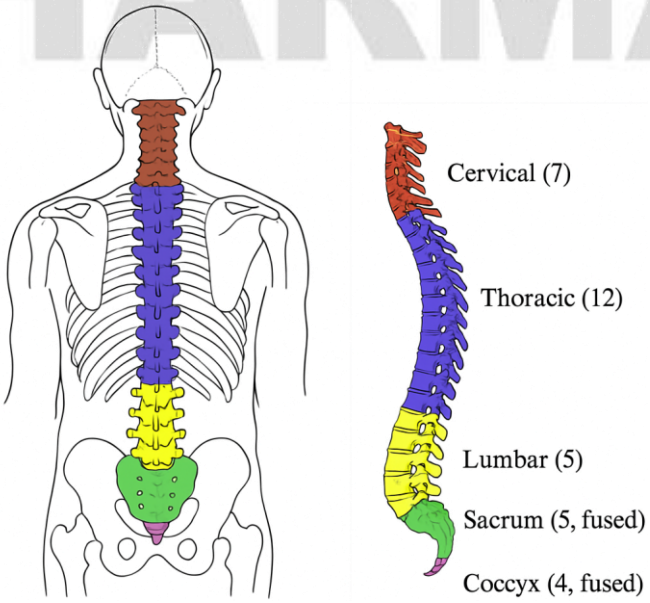
  Articulates indirectly to the 7th pair and this pair articulates with the sternum.
- **Floating ribs:** 11th and 12th pair

  Ventrally free and dorsally attached to the vertebral column.





Vertebral column



Name	Number
Cervical	**7**
Thoracic	**12**
Lumbar	**5**
Sacral	**1**
Coccygeal	**1**

1st cervical vertebrae: Atlas

2nd cervical vertebrae: Axis

Appendicular skeleton: (120)

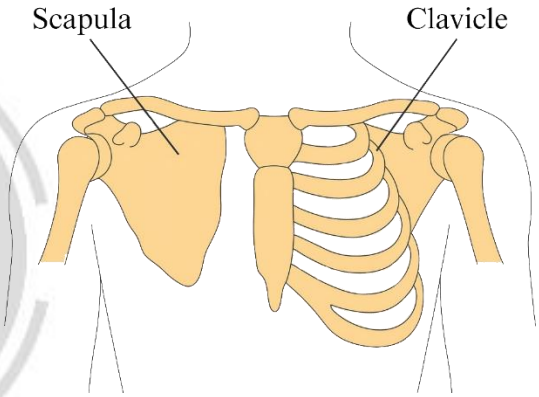
Girdles (6)

Limb bones (120)

- **Girdles:**

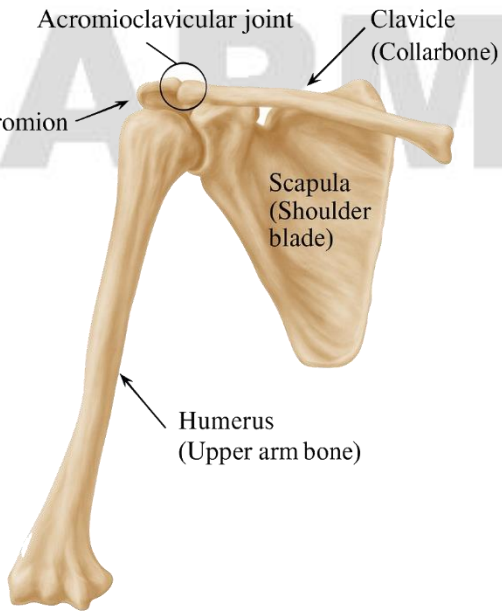
(A) Pectoral girdle: Each half of the pectoral girdles are having 2 bones:

1. Clavicle
2. Scapula



Scapula:

Triangular bone located between the 2nd and 7th rib.



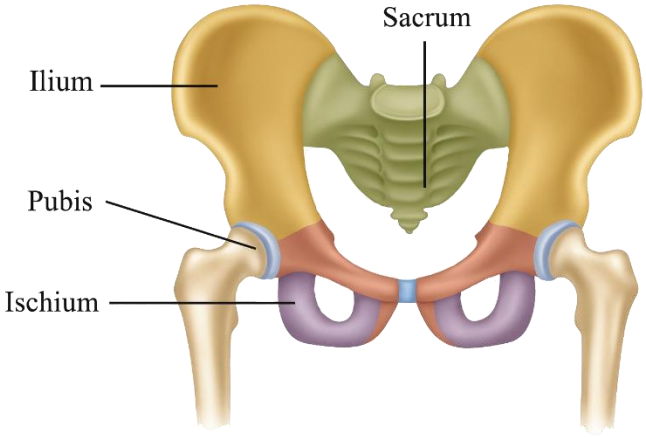
Has the Glenoid cavity into which the head of the humerus bone fits to form a ball and socket joint.

Clavicle:

Collar bone /attached to clavicle and scapula

(B) Pelvic Girdles (2): Each half of the pelvic girdle has 1 bone known as coxal bone which is formed by the fusion of ilium, ischium pubis

Each half of the coxal bone is attached to the pubis bone of the both side fused ventrally called pubis symphysis.



- **Limb bone:**
  - (A) Forelimb
  - (B) Hind limb

Each forelimb contains (30 bones)

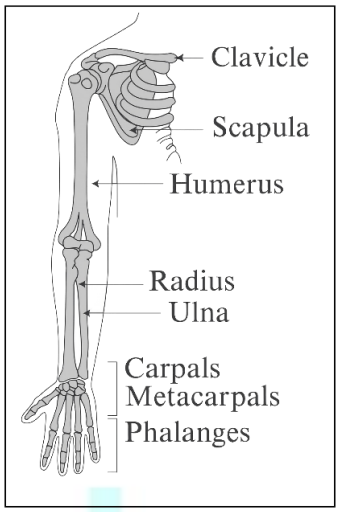
Humerus (1)

Radius (1) & Ulna (1)

Wrist bone (carpals) (8)

Palm (Metacarpals) (5)

Phalanges (Finger) (14)



Hind limb:

- Each hind limb has 30 bones
- Total :- 30× 2 = 60 bones

Femur (1)

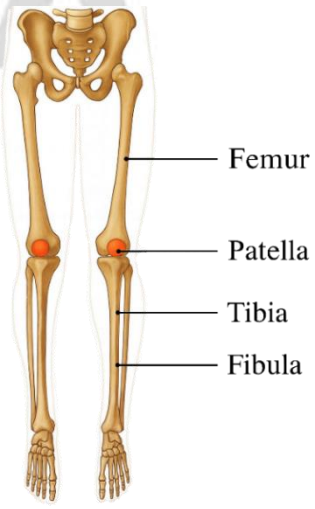
- Thigh bone
- Longest bone of the human body

Tibia (1) Fibula (1)

Tarsala (7)

Metatarsal (5)

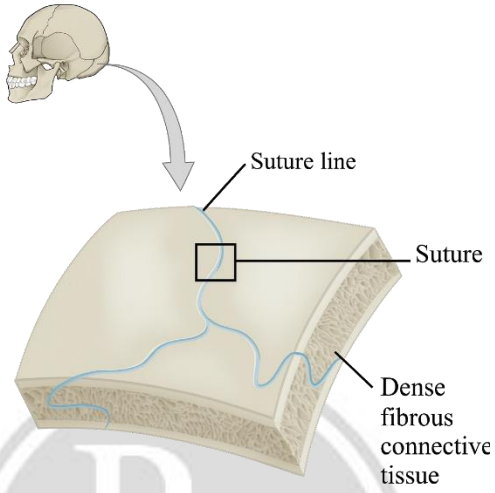
Phalanges (14)



Patella (Knee cap)

Joints:

1. Fibrous joints
2. Cartilaginous joints
3. Synovial joints



Fibrous joints:

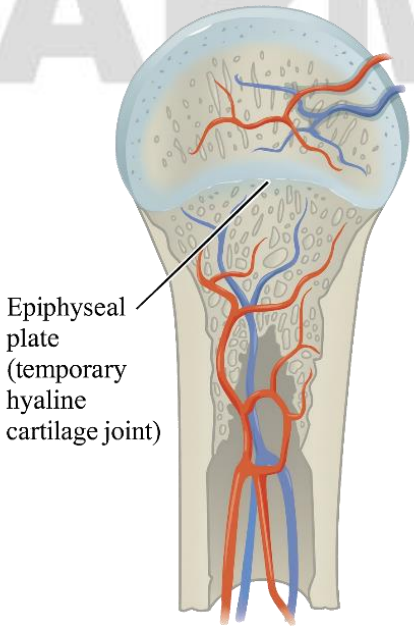
- Bones are joined via collagen fibres.
- Immovable joints (Synarthrose joints)
- **Eg:** Suture of skills

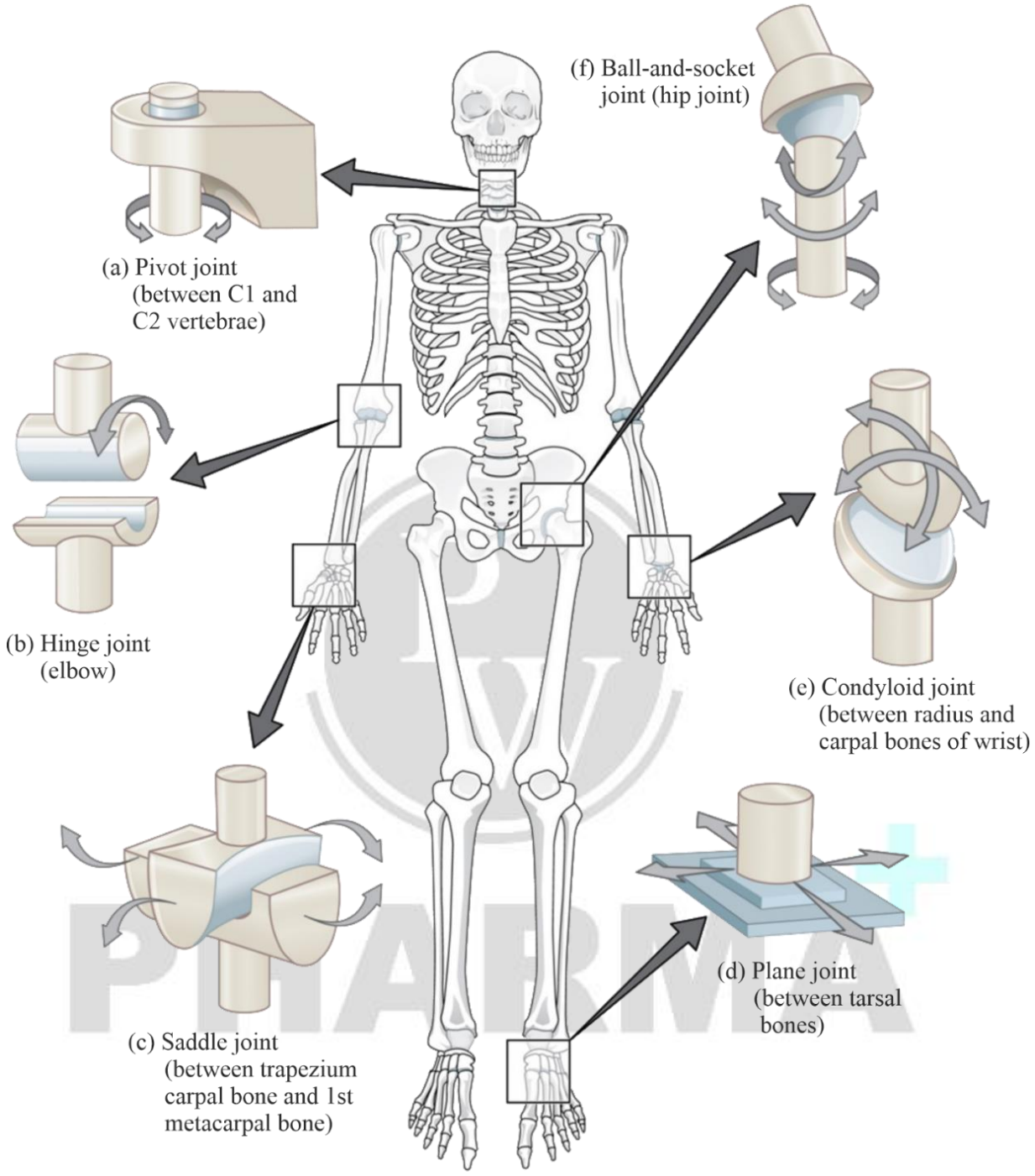
Cartilaginous joints:

Joints formed with the help of the cartilage

Slightly movable joints (Amphiarthrose)

Eg: Ribs & Sternum, Pubis symphysis, Intervertebral disc





Synovial joints:

- Shows maximum movement (Diarthrose)
- Synovial fluid is present between them.