The University Of Jordan
Faculty Of Medicine

Muscoskeletal system

BY

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The Muscoskeletal system includes:

1-Bones (skeleton)

2-Joints

3- Muscles

4-Cartilages

5-Ligaments

The adult skeleton has 206 bones

It Divided into two divisions:

A-Axial skeleton (skull, ribs and vertebra)

B-Appendicular skeleton (pelvis, extremities)

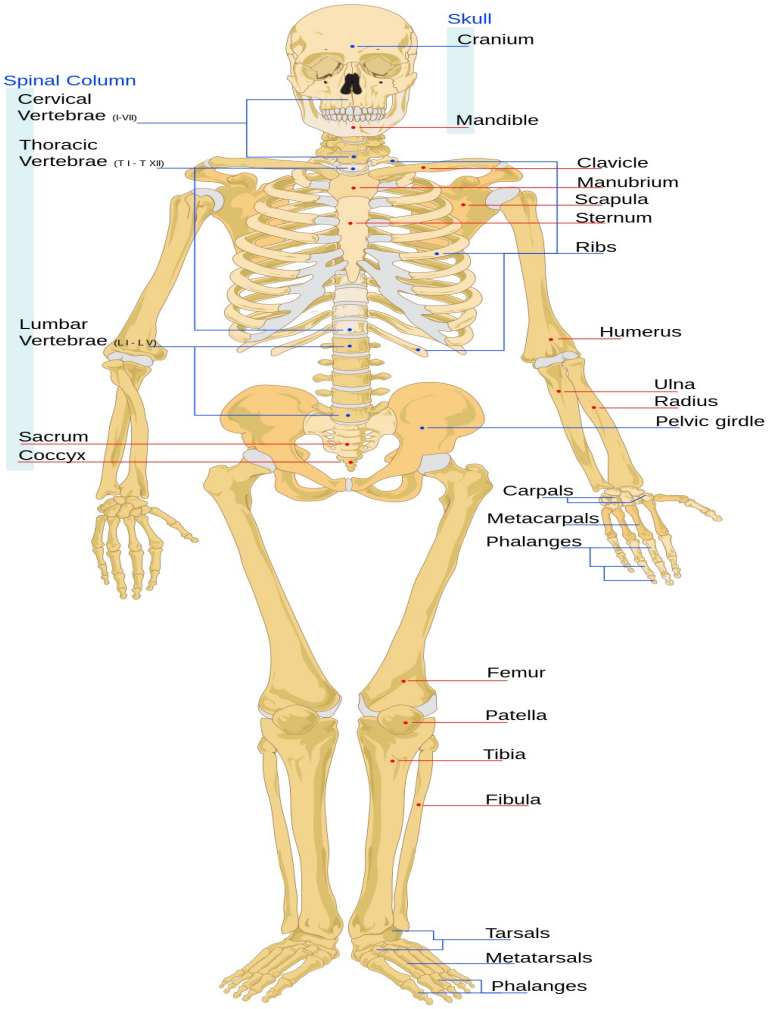
The skeleton is divided into

Axial and appendicular skeleton

A.Axial skeleton contains

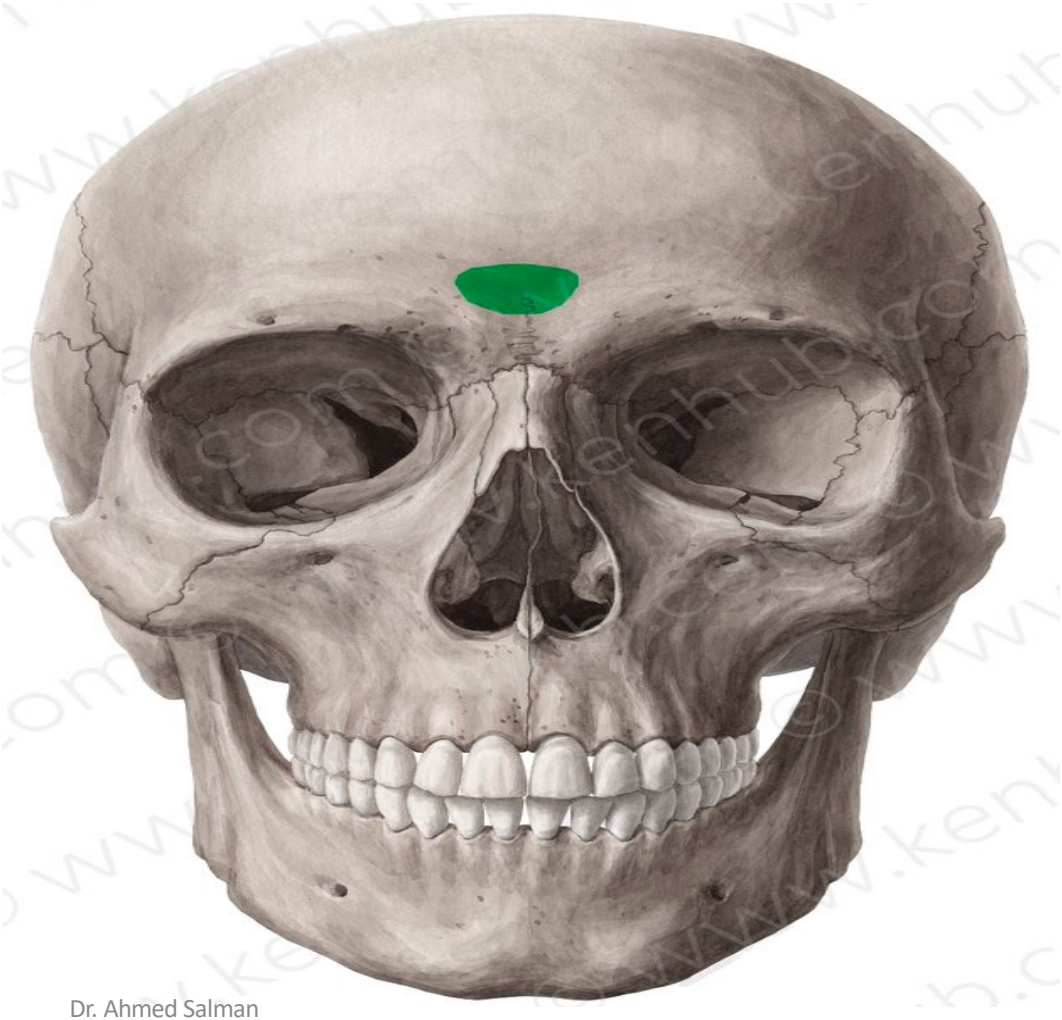
- ❖ Skull
- ❖ Vertebral column
- ❖ Ribs and sternum
- ❖ Hyoid Bone

  The only bone that does not articulate with another bone



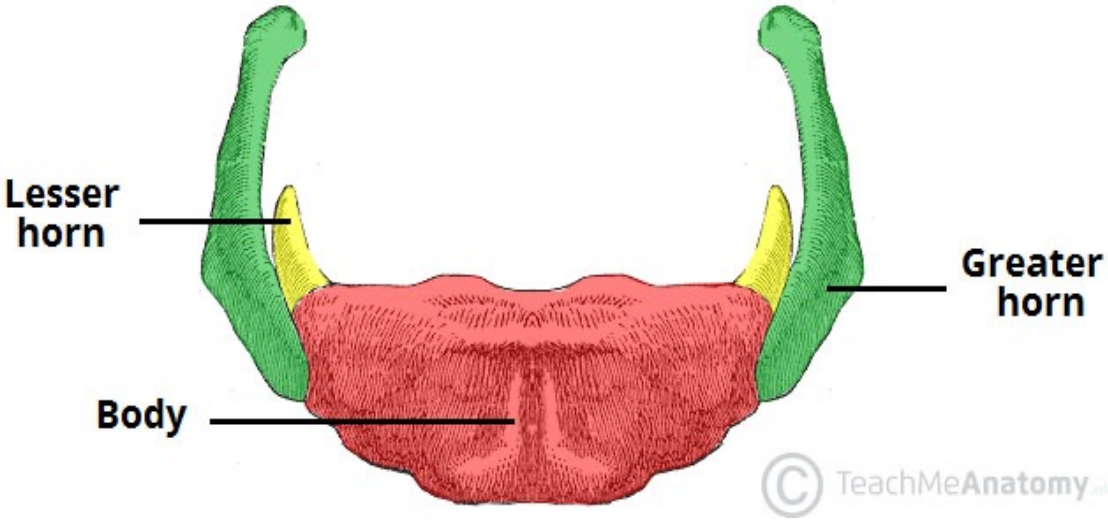
Skull
It is formed of 22 bones

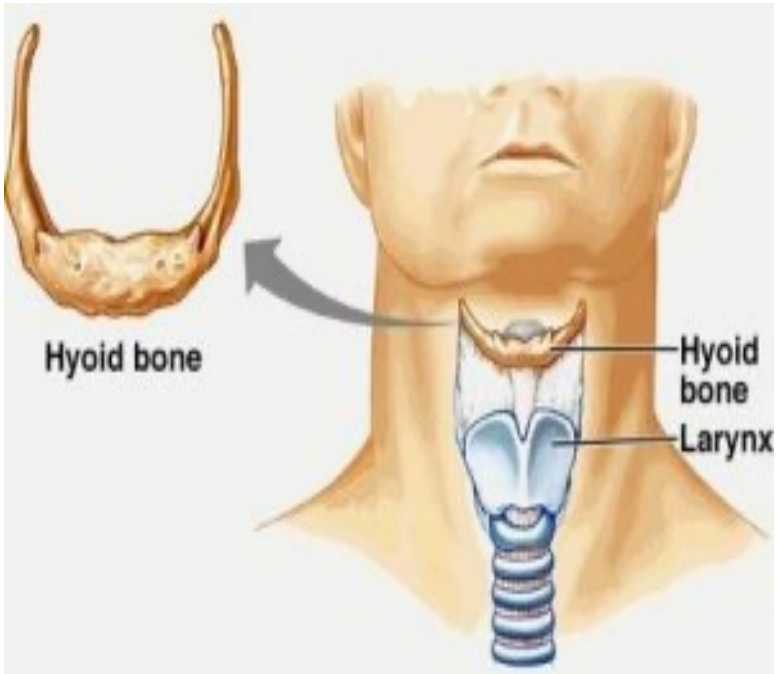
Mandible
It is the lower Jaw



Hyoid Bone

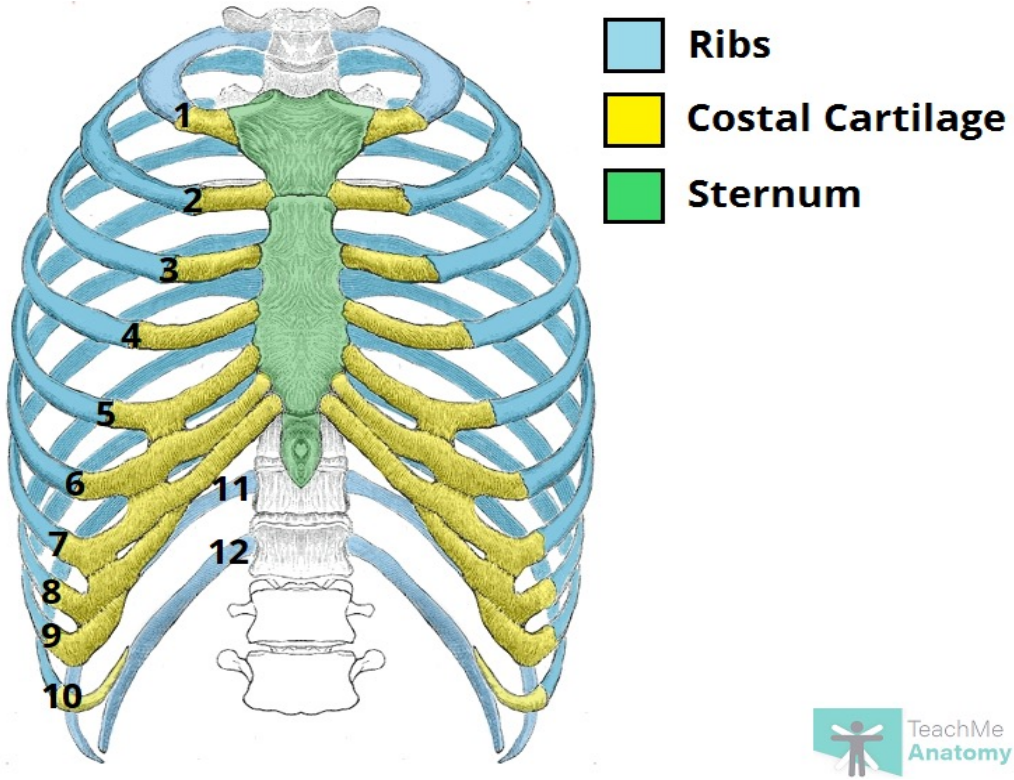
The only bone that does not articulate with another bone





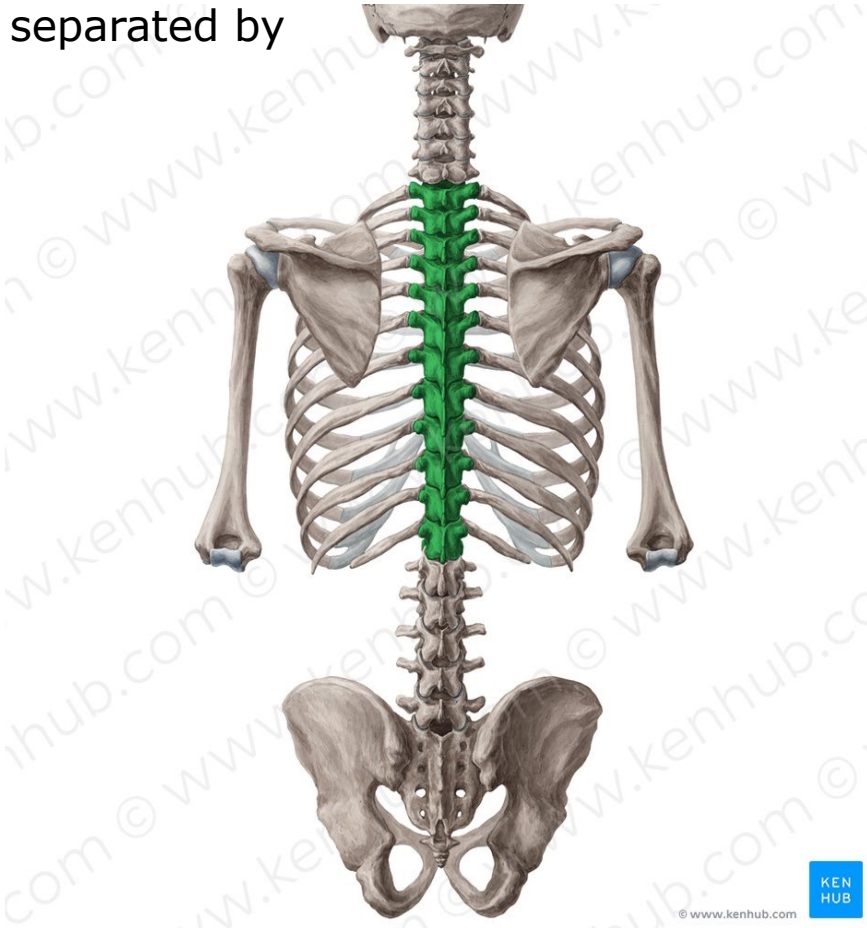
Skeleton of the thorax

This is an Osseo cartilaginous cavity composed of :
1-Sternum
2-Ribs
3- Costal cartilage
4- Thoracic Vertebra



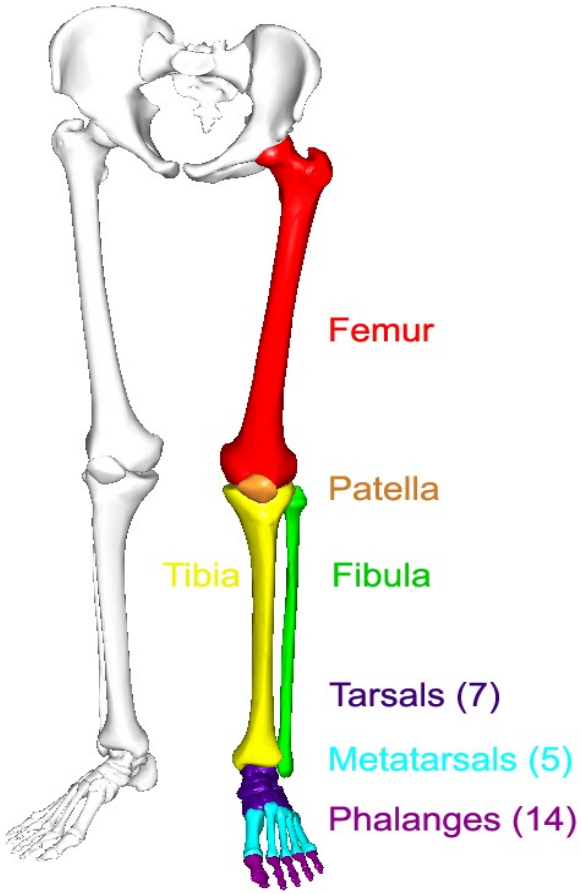
Vertebral Column

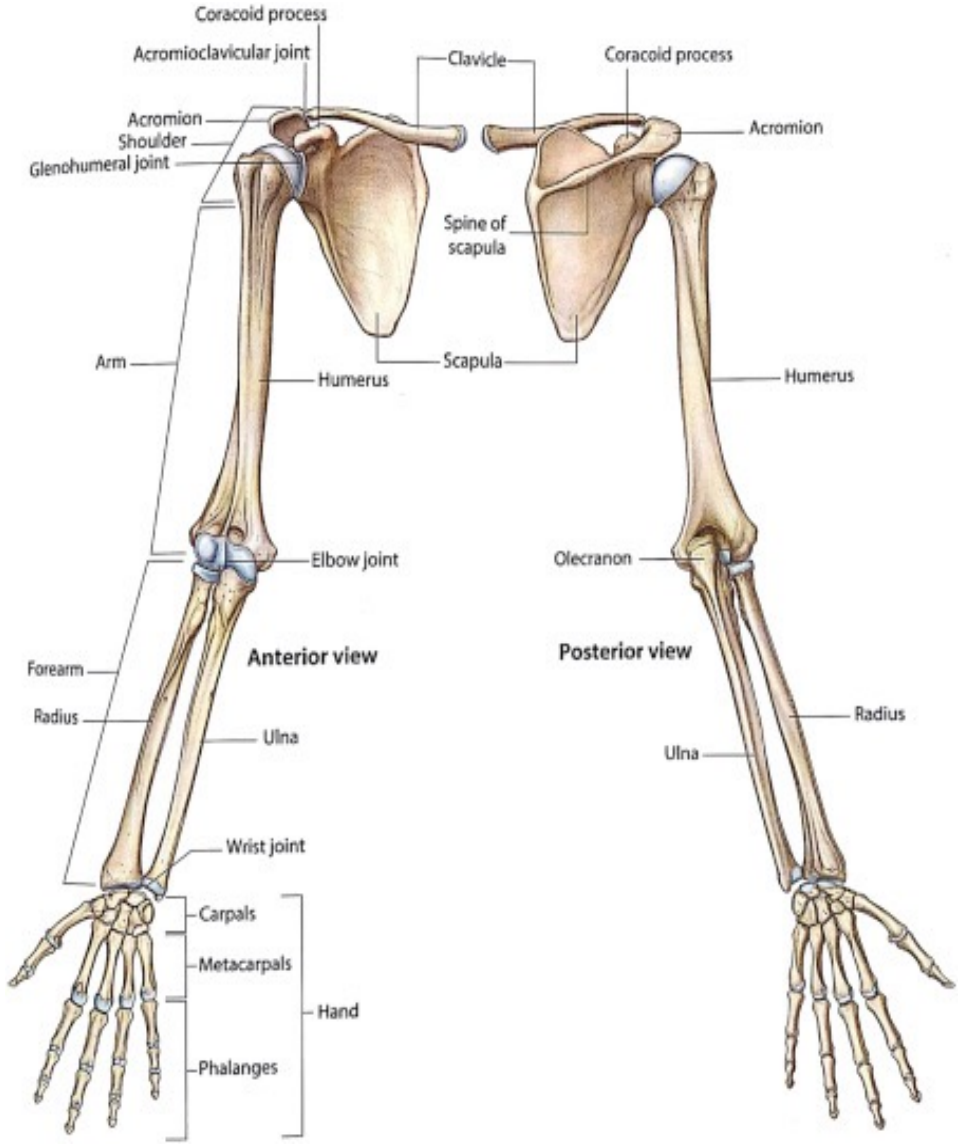
It composed of 32-33 Vertebrae separated by intervertebral discs



B. Appendicular skeleton contains

Bones of the upper and lower limbs

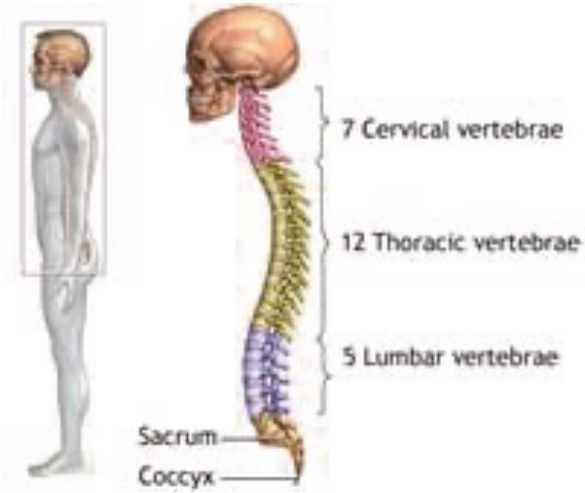




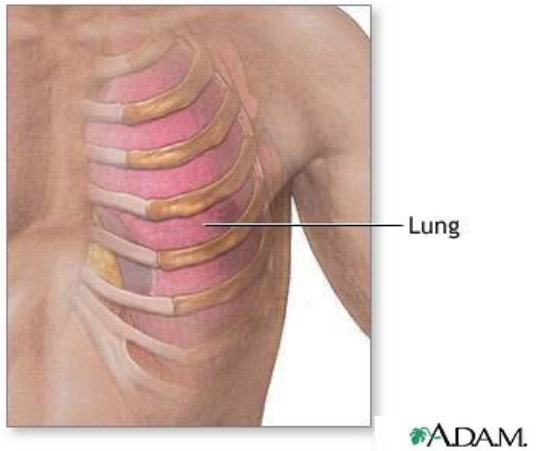
Functions of the Bone

1. **Movement:** Skeletal system provides points of attachment for muscles.

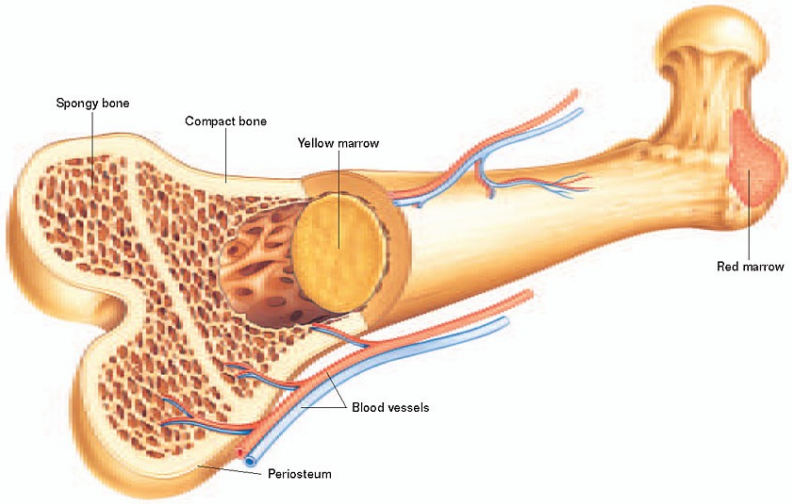
2. **Support:** The backbone is the main support center for the upper body.



3. **Protection:** The bones of your skull protect your brain. Your ribs protect your lungs and heart from injury.



4. **Makes Blood:** Red and white blood cells are formed by Bone marrow.



5. **Storage**: Bones store minerals, such as calcium and phosphorus.

Protection – Support – Movement – Factory - Storage

Types of Bone According Shape

1- Long Bone

2- Short Bone

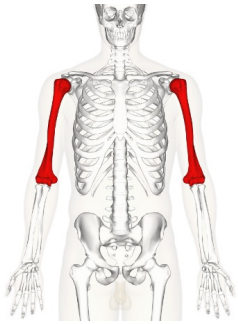
3-Flat Bone

4- Irregular Bone

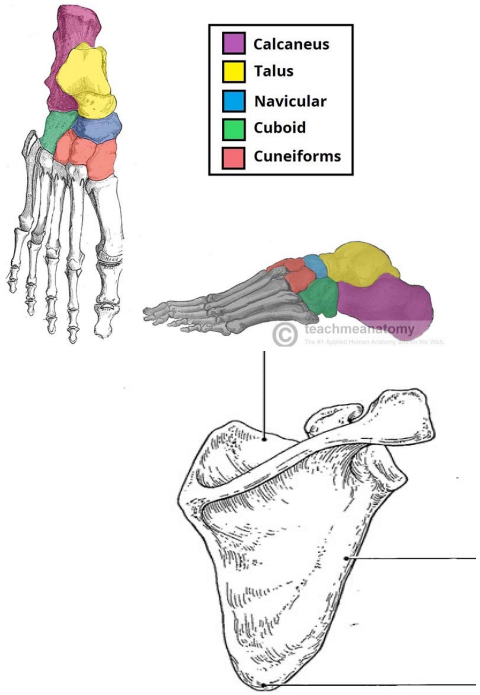
5- Sesamoid Bone

6-Pneumatic Bone

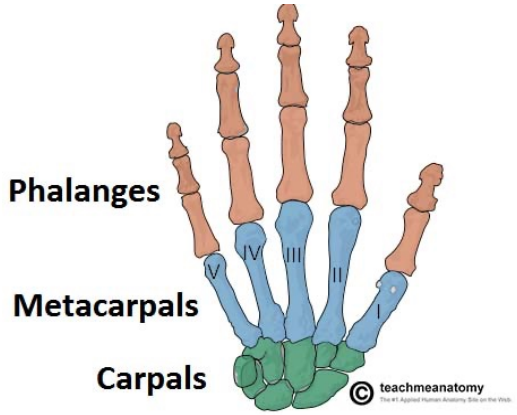
1- Long Bone e.g. Femur, Humerus



2- Short Bone e.g. carpal and tarsal bone



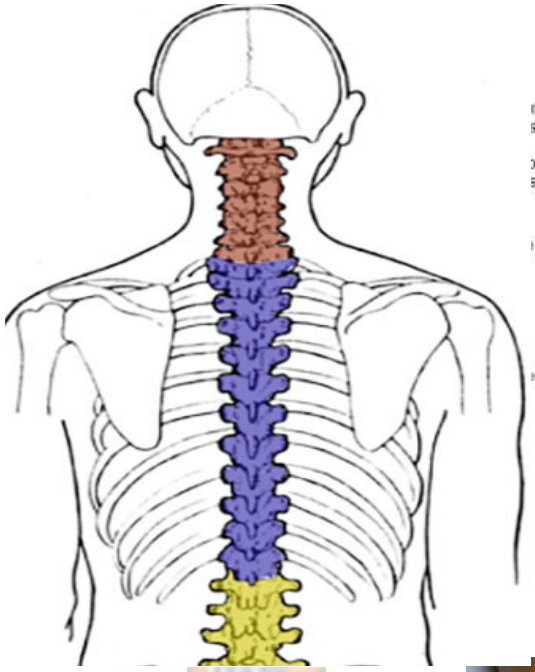
3-Flat Bone e.g. Scapula

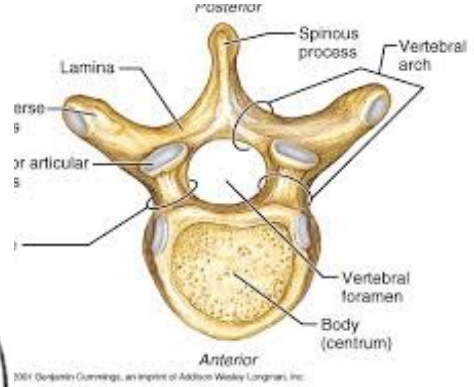


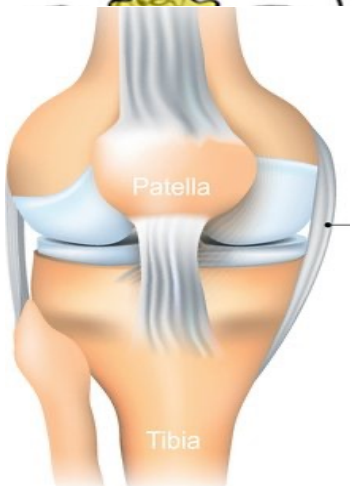
4- Irregular Bone e.g. Vertebra

5- Sesamoid Bone e.g. Patella

Function: They diminish friction between tendons and underlying bones.







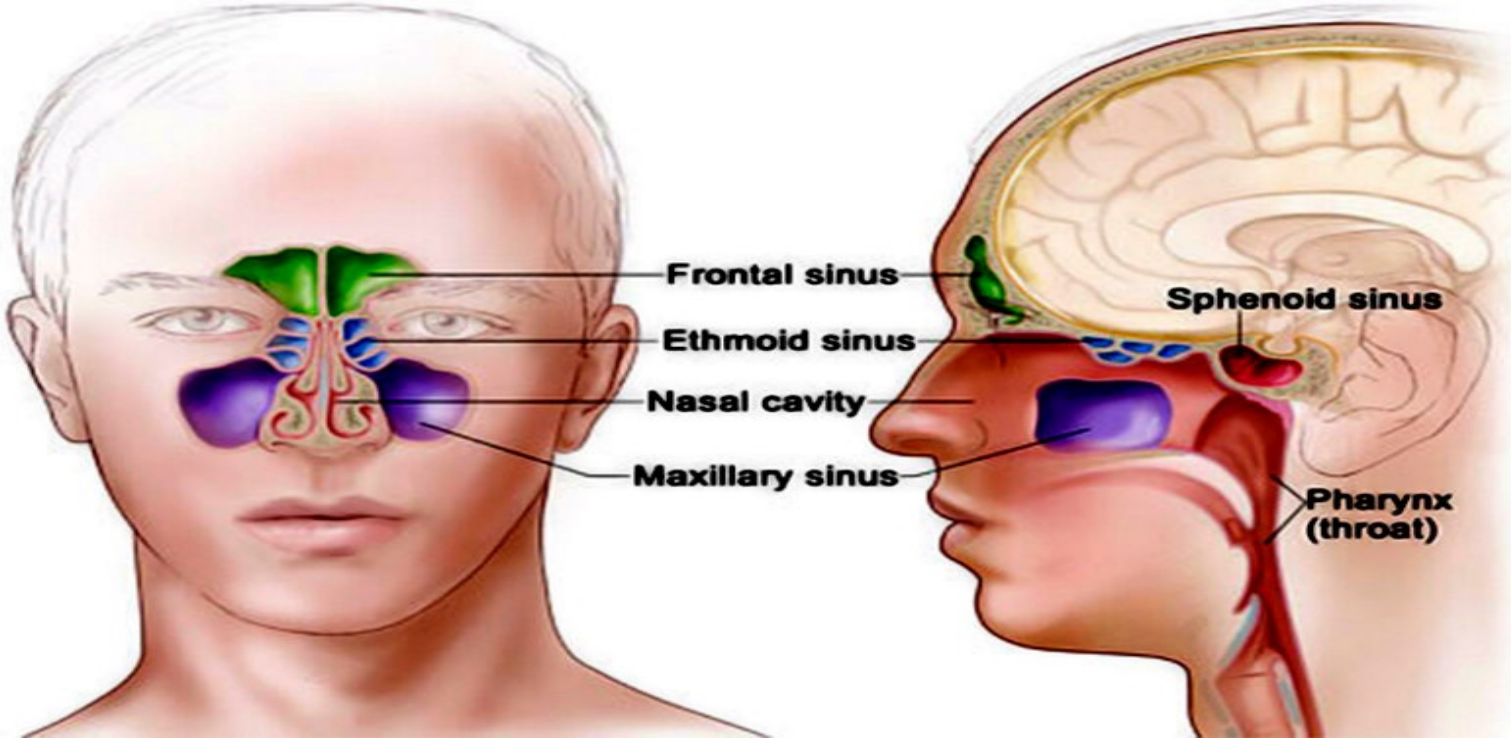
6-Pneumatic bone e.g. skull contains air sinus

Function :

1.They decrease the **weight** of skull.

2.They lead to resonance of **voice.**

3.They have a highly vascular mucosa to **warm** the inspired air.



Parts of the Long Bone

1. Epiphysis Ends of the bone

It is used for **articulation** and its articular surface is **covered** with a layer of hyaline **cartilage called articular cartilage**

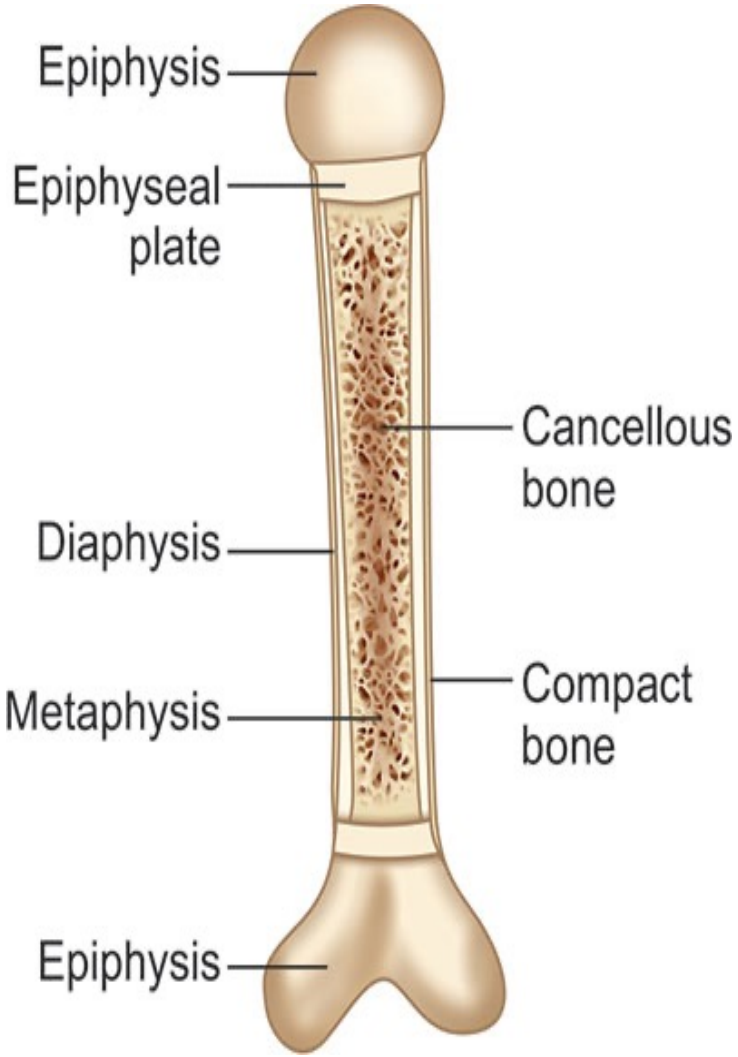
2. Diaphysis : Shaft which is covered externally by periosteum

3.Metaphysis : Between Diaphysis and Epiphysis

4.Epiphyseal plate (Cartilage) : in the metaphysis at each end of a long bone

It is the site of bone growth

5. Medullary cavity: Cavity of the shaft which Contains bone marrow




A


Parts of a Growing Bone
Wrist Bones
wrist joint
Epiphysis
Physis
(Growth Plate)
Metaphysis
Diaphysis
Ulna
Radius
B

Figure 1

Figure 2

Terms of external features of bones

Bony Elevations

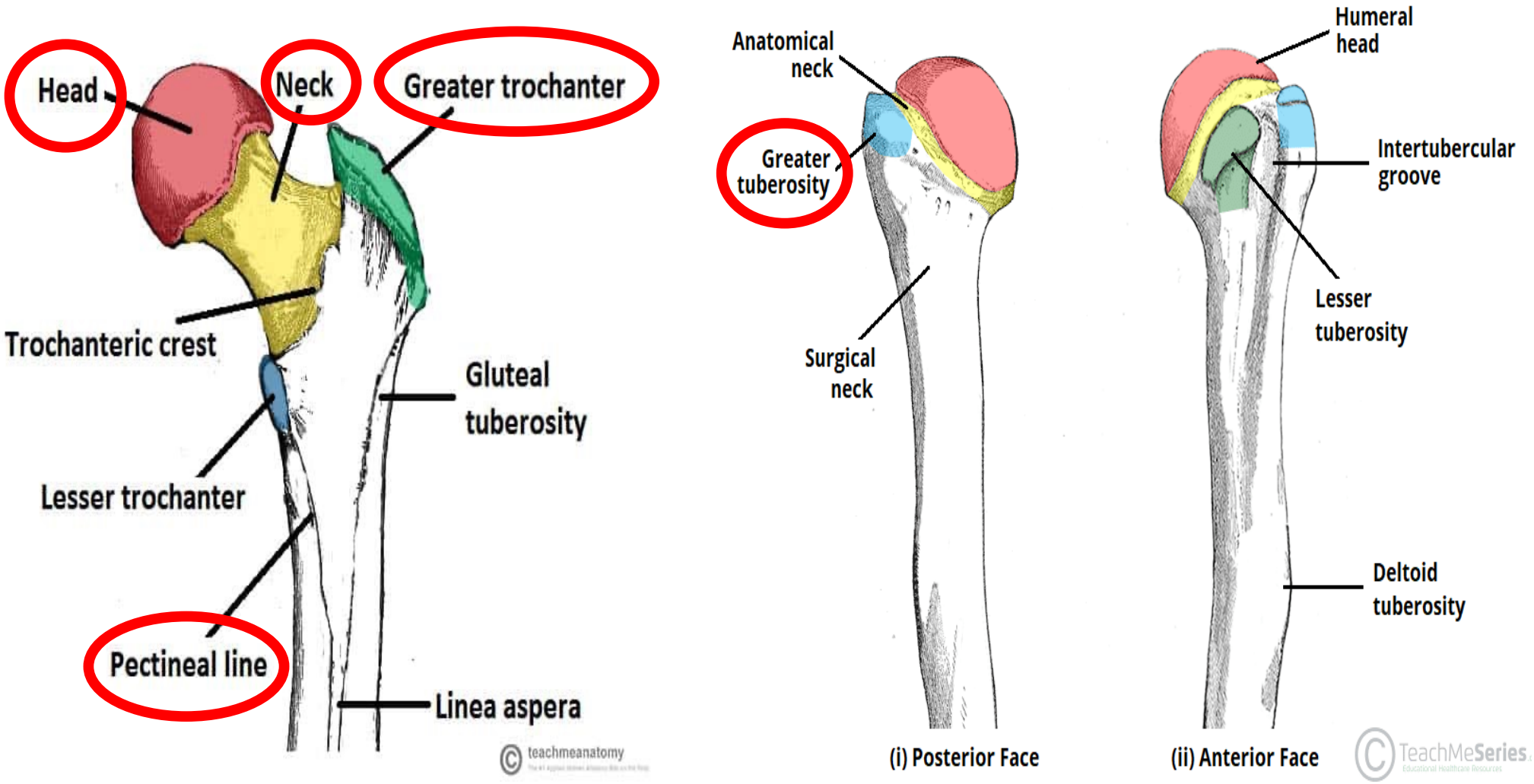
REED ONLY

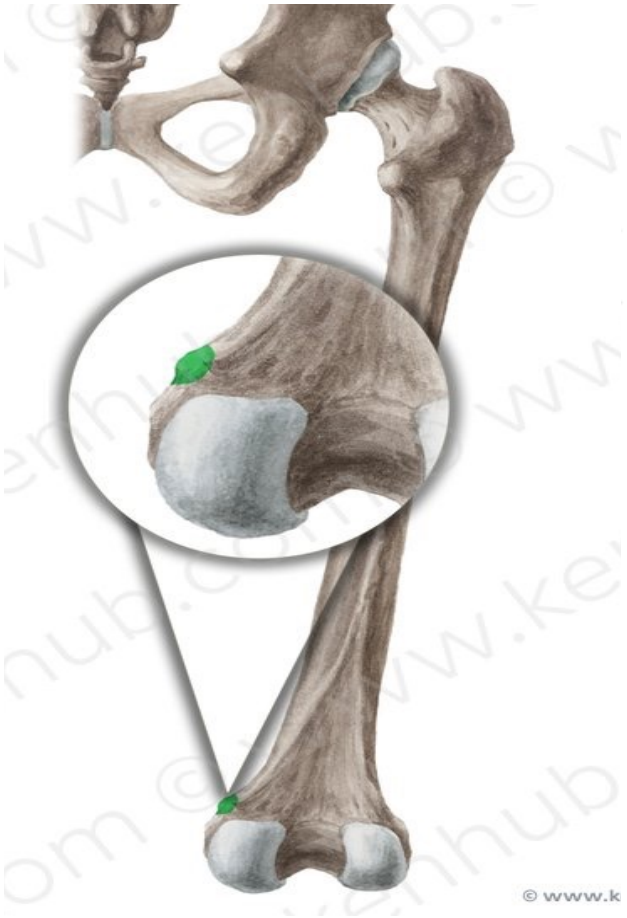
1. **Head :** **Rounded end** of bone
2. **Neck :** **Constricted** bone follows the head.
3. **Process :** It is an elongated projection with a **blunt** end.
4. **Spine :** It is an elongated projection with a **pointed** tip.
5. **Tubercle, tuberosity and trochanter :**

They are localized **rounded elevations**.

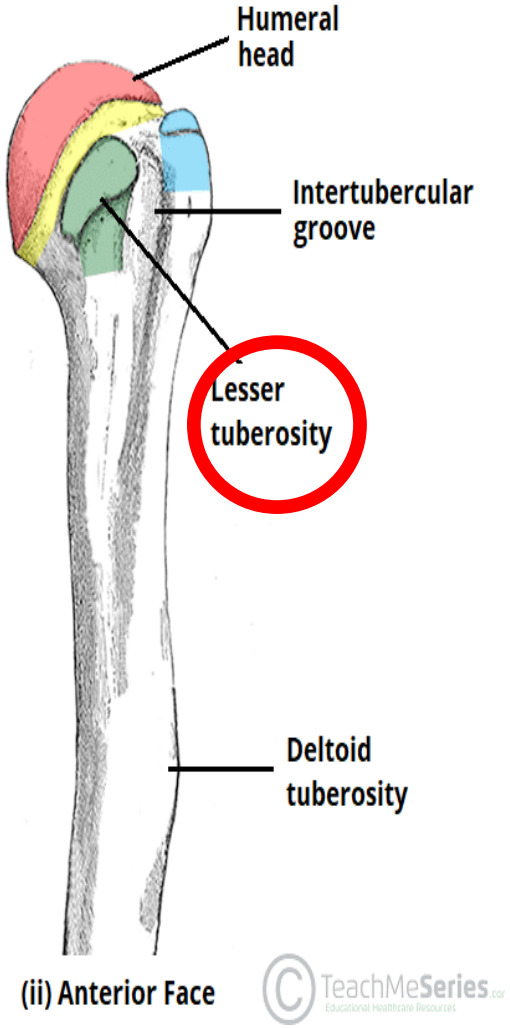
The tubercle is the smallest while the trochanter is biggest and tuberosity is medium-sized.

6. **Condyle :** It is a convex **elevated articular surface**.
7. **Epicondyle :** It is a localized elevation of small size situated **just above a condyle** or articular surface.
8. **Line :** Slightly elevated or just a rough linear landmark.
9. **Crest :** An elongated ridge which usually lies on the top of a bone.

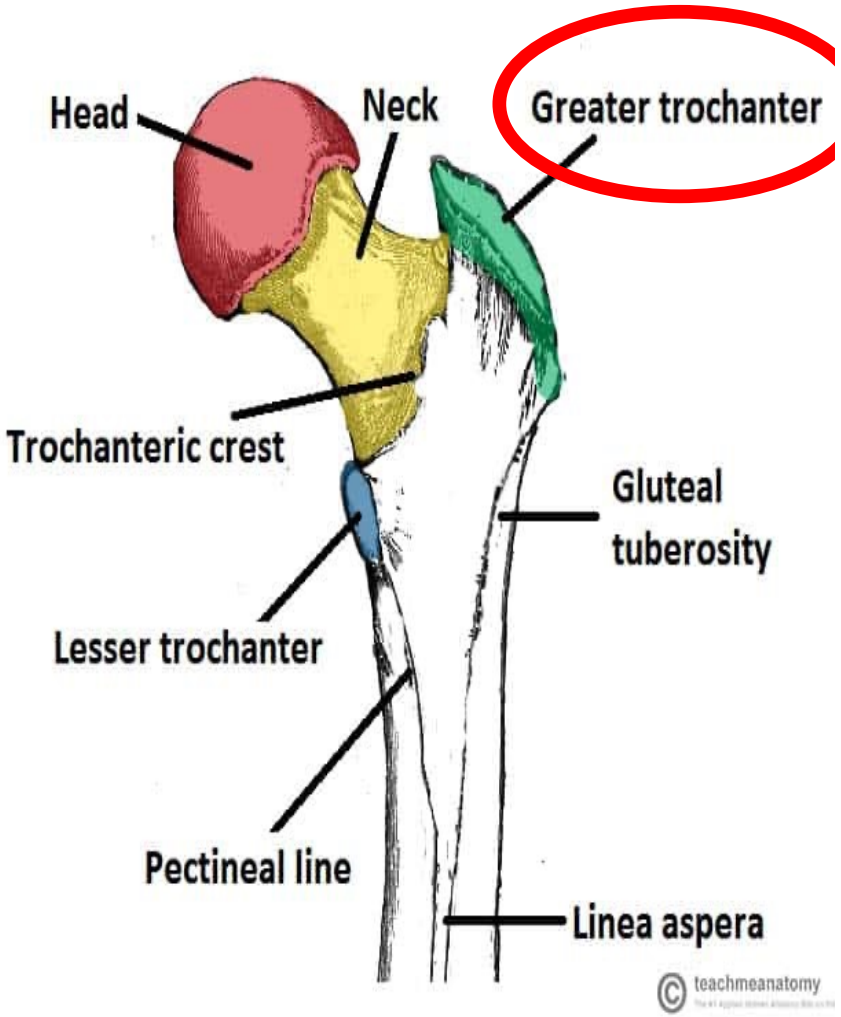

Head
Neck
Greater trochanter
Trochanteric crest
Gluteal tuberosity
Lesser trochanter
Pectineal line
Linea aspera
© teachmeanatomy
Anatomical neck
Greater tuberosity
Surgical neck
(i) Posterior Face
Humeral head
Intertubercular groove
Lesser tuberosity
Deltoid tuberosity
(ii) Anterior Face
© TeachMeSeries

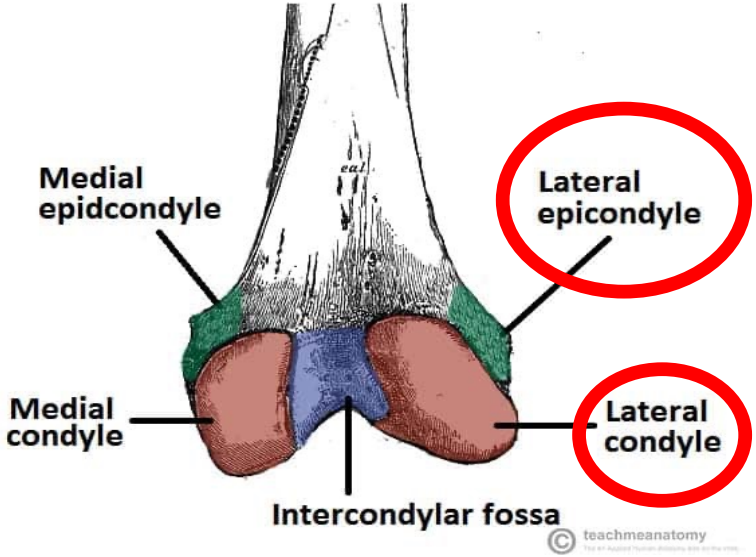


Adductor Tubercle



(ii) Anterior Face




Medial epidcondyle
Lateral epicondyle
Medial condyle
Lateral condyle
Intercondylar fossa
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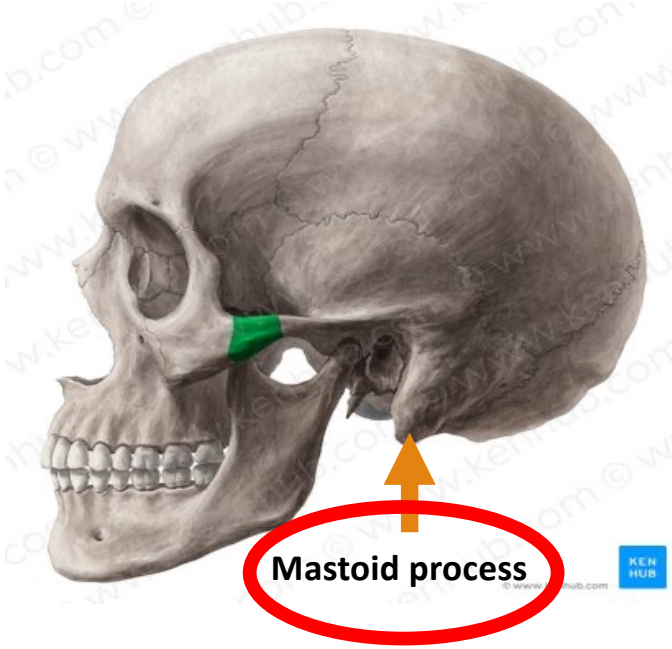
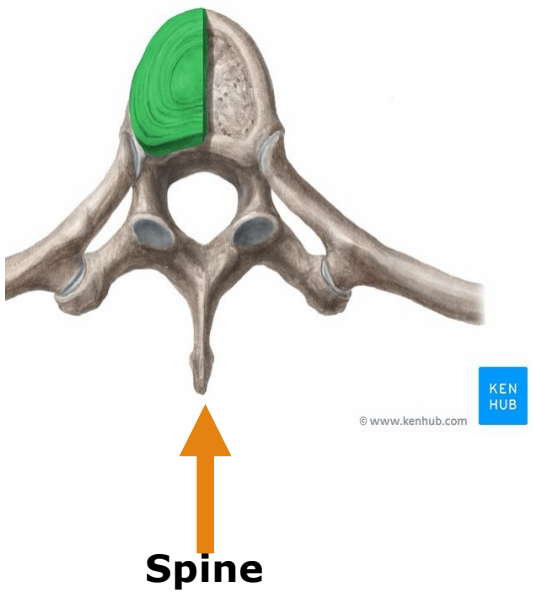

Mastoid process


Spine
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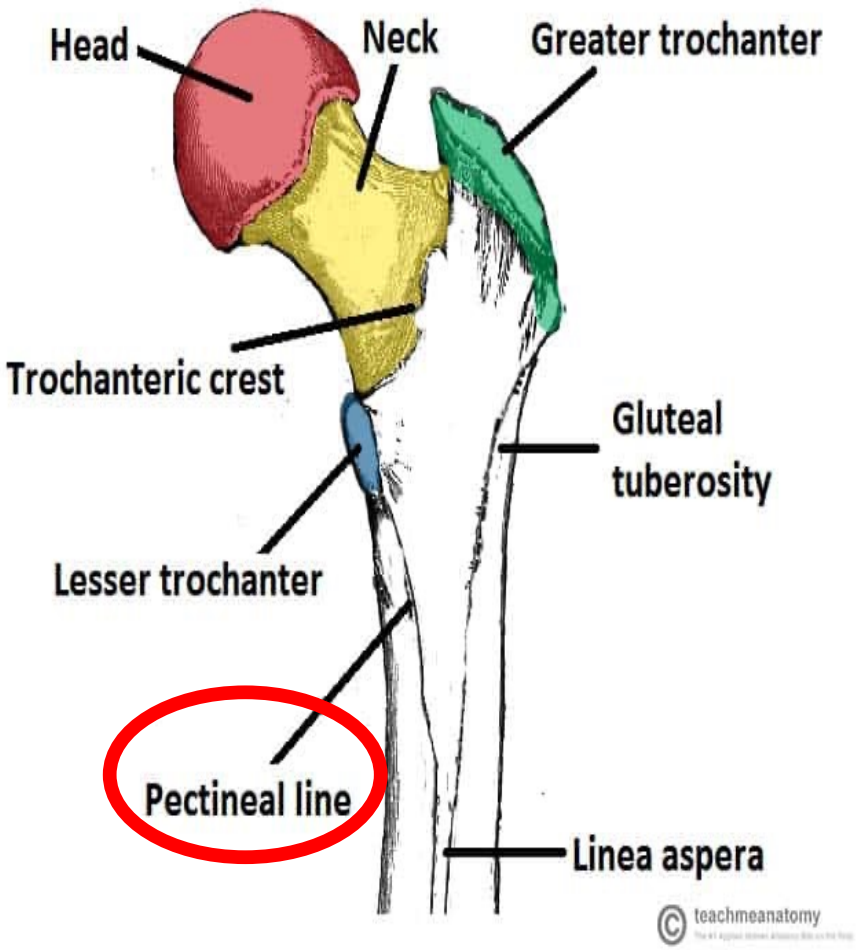
Head
Neck
Greater trochanter
Trochanteric crest
Gluteal tuberosity
Lesser trochanter
Pectineal line
Linea aspera
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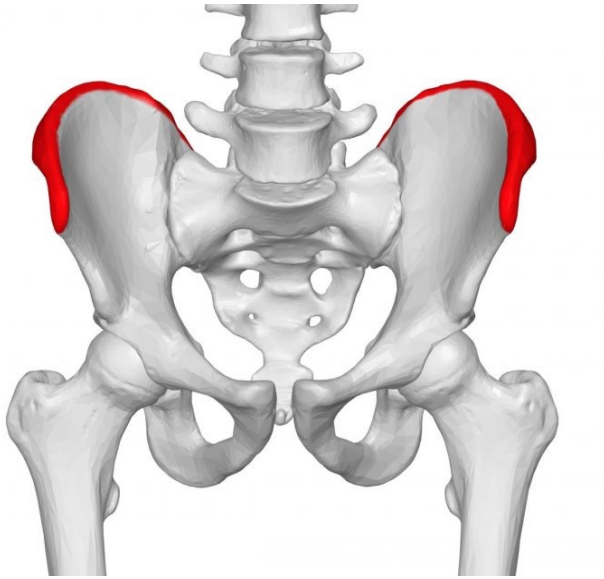

Iliac crest

Bony Depressions, Grooves and Canals

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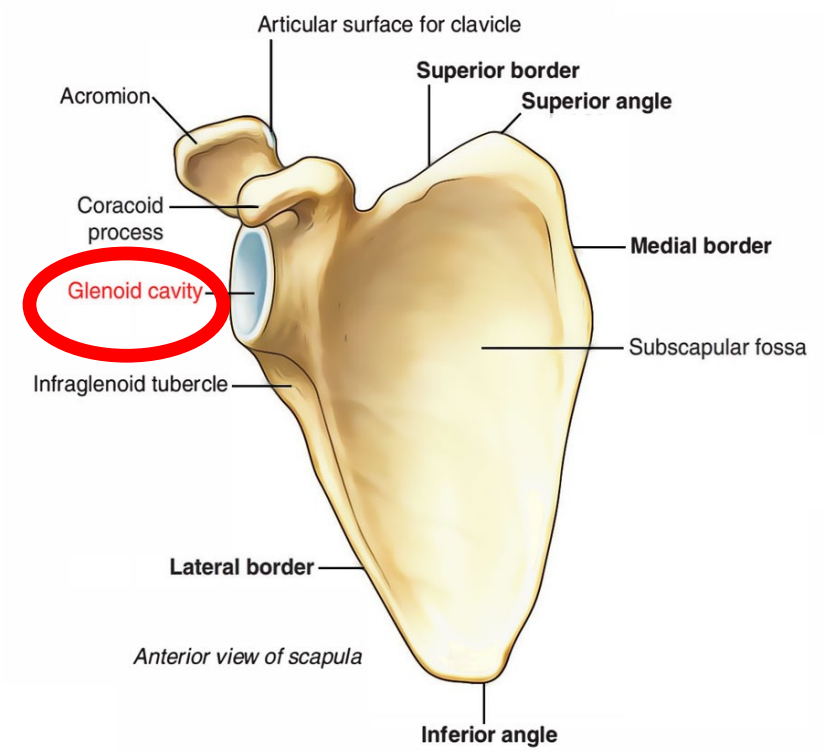
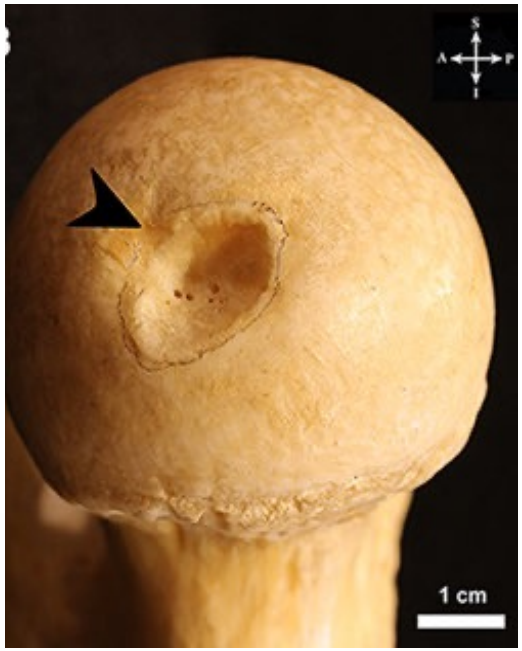
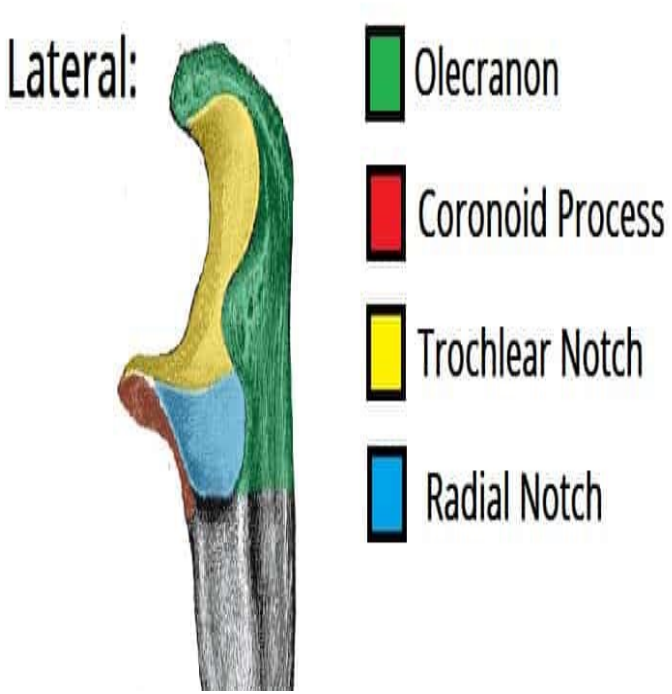
1. **Fossa :** A depression on a surface. Fovea is a small fossa.
2. **Notch :** A semicircular depression , on a surface or a border. It has 2 limiting edges.
3. **Groove or sulcus :** An elongated depression
4. **Fissure :** A long cleft between flat bones, e.g. skull.
5. **Foramen :** It is a hole through a bone.
6. **Aperture :** It is a large hole
7. **Canal :** It is a track of some length in a bone having 2 open ends.
8. **Meatus :** A bony canal having one closed end
9. **Impression :** A slight indentation or depression.





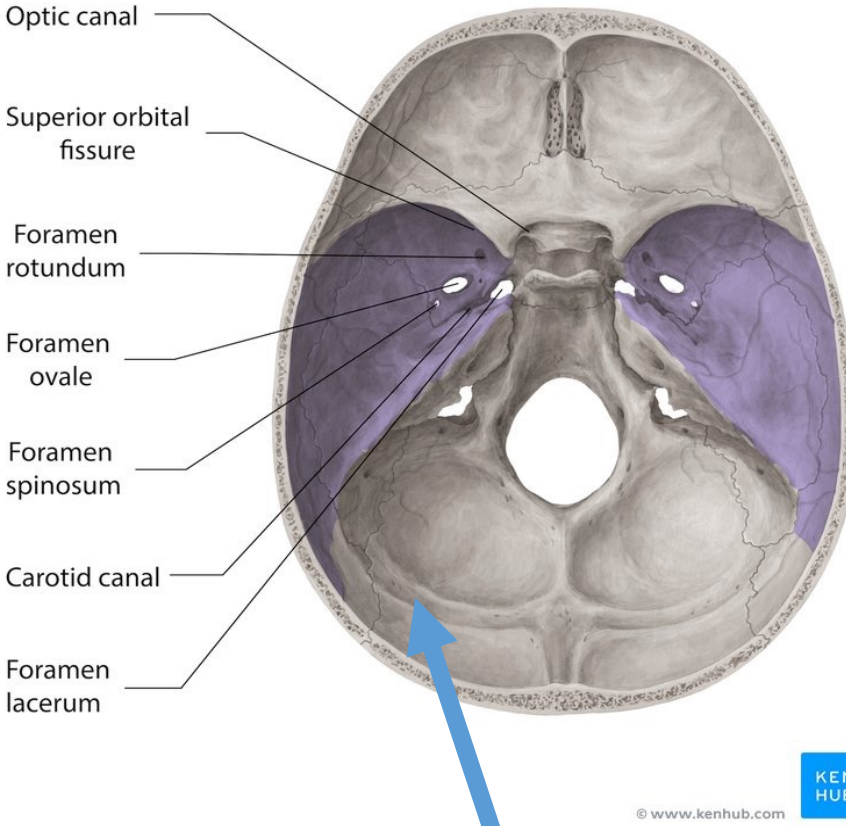


1- Glenoid cavity (fossa)

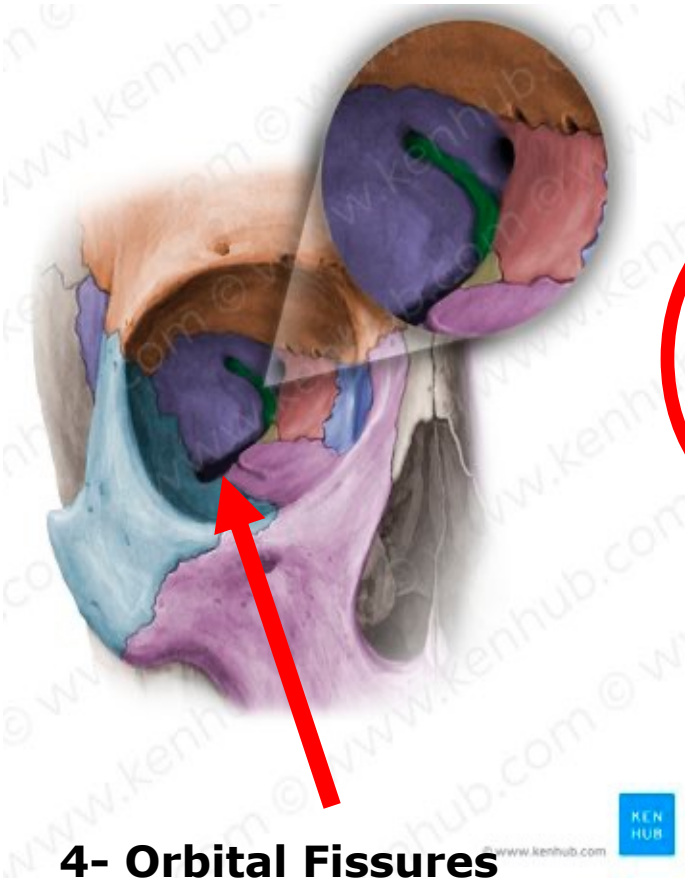
fovea

2- Notch

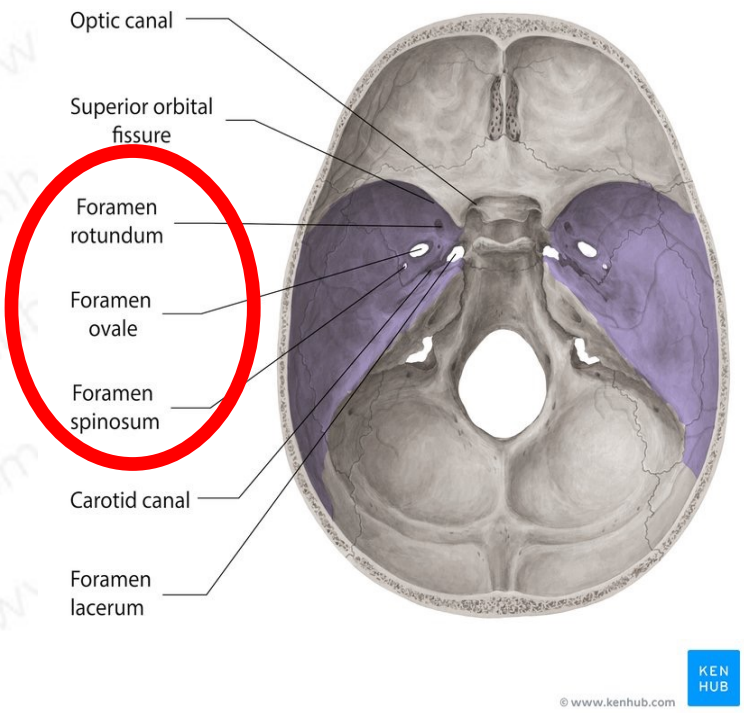
2- Suprascapular notch (green)



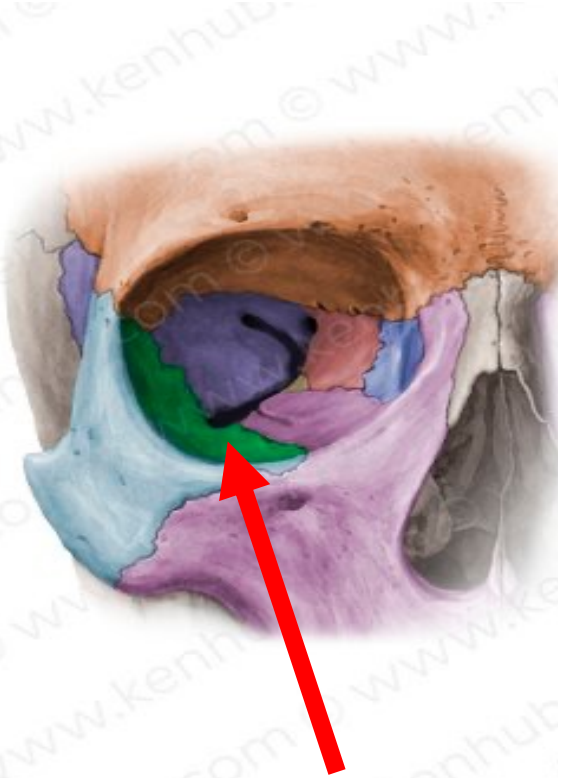
3-Sulcus



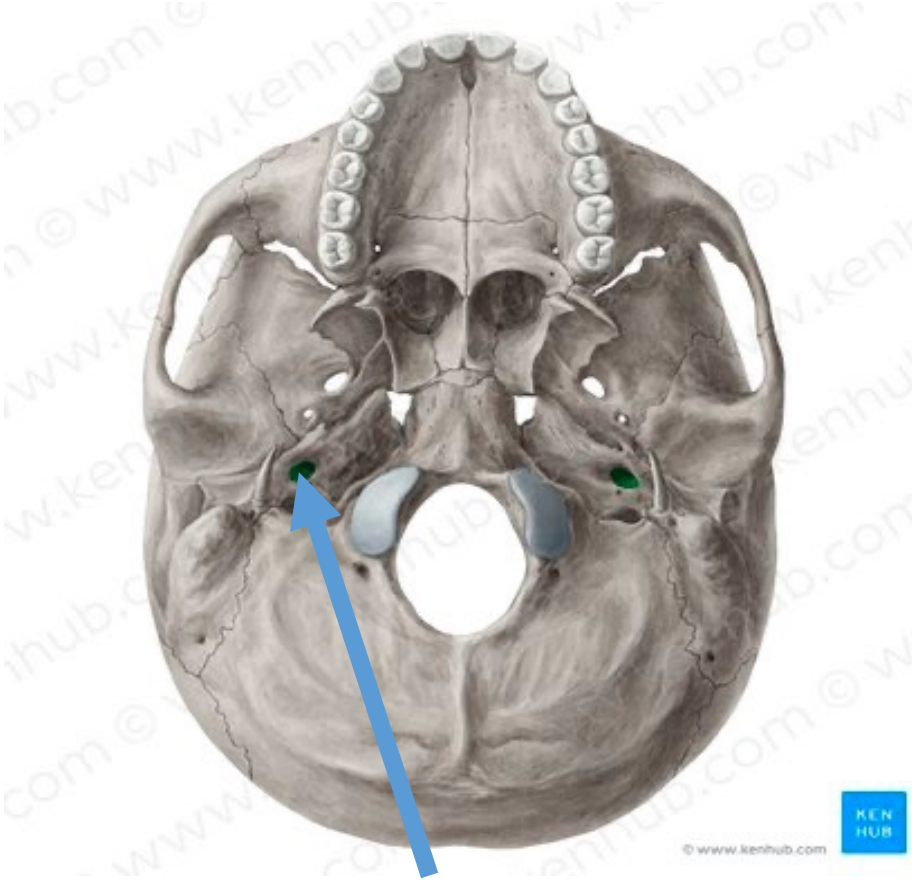
4- Orbital Fissures



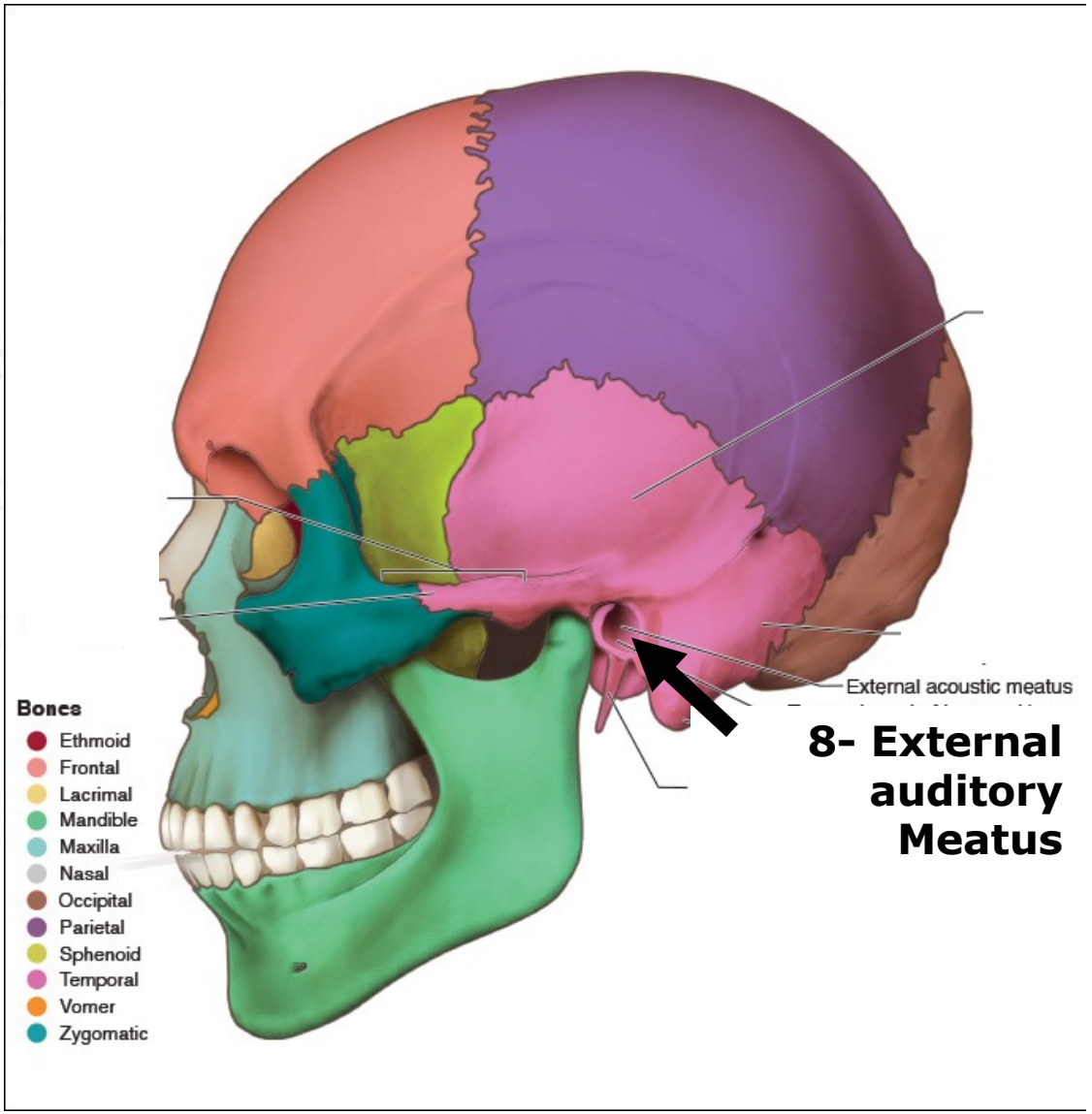
5-Foramen



6-Orbital aperture



7- Carotid canal



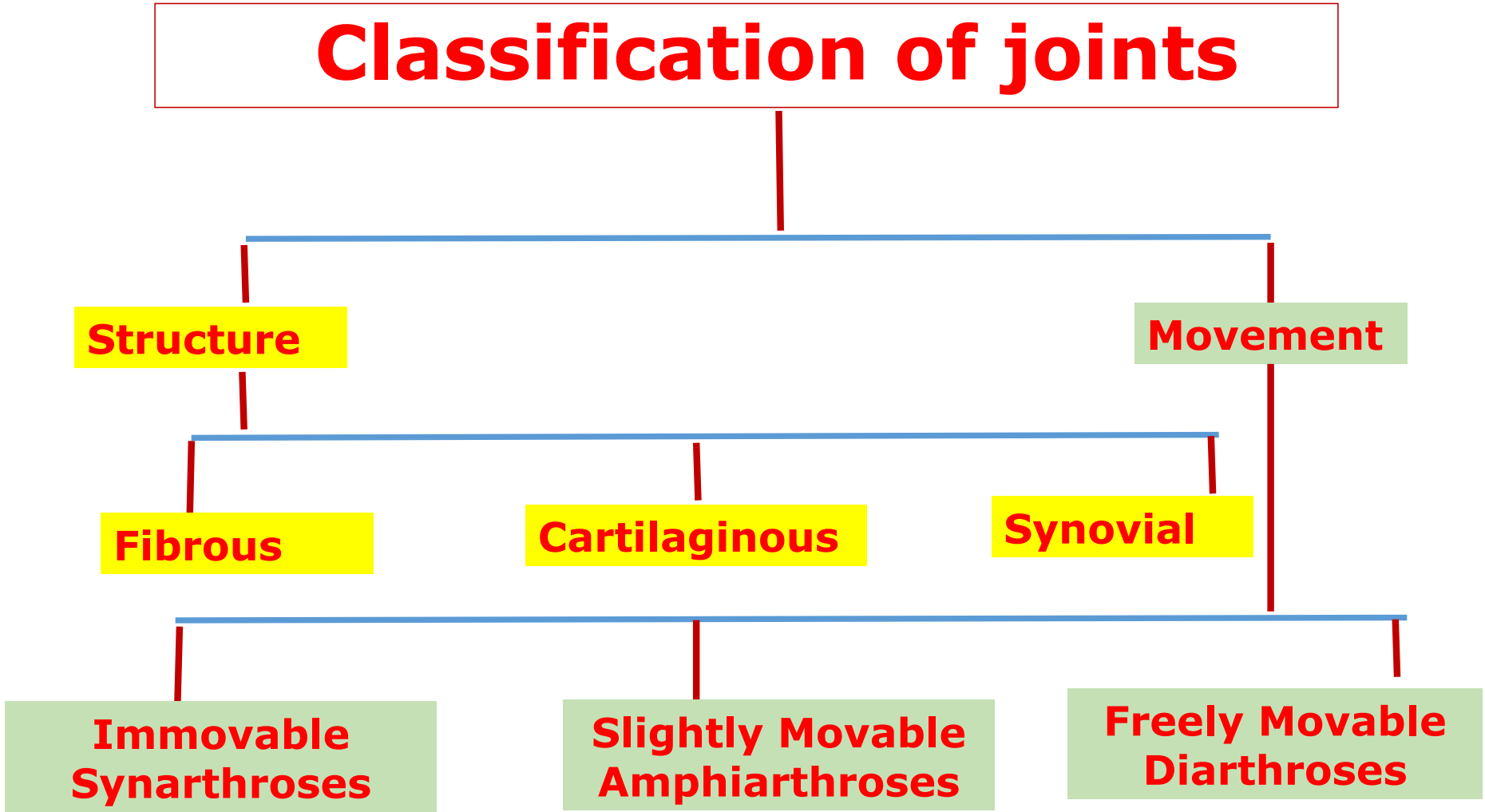
8- External auditory Meatus

Impression for costoclavicular ligament

Joints

It is the site of articulation (joining) between bones

Classification of joints

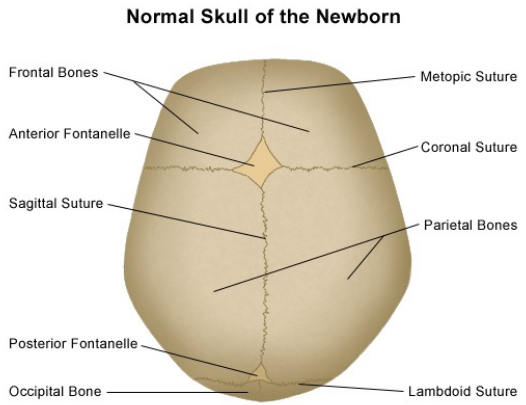


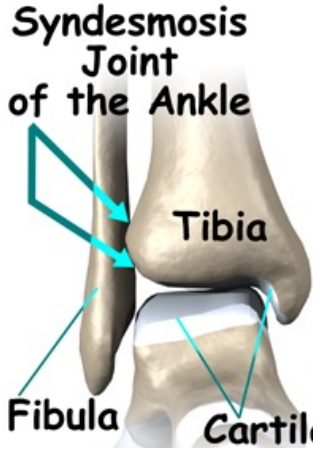
Fibrous Joints

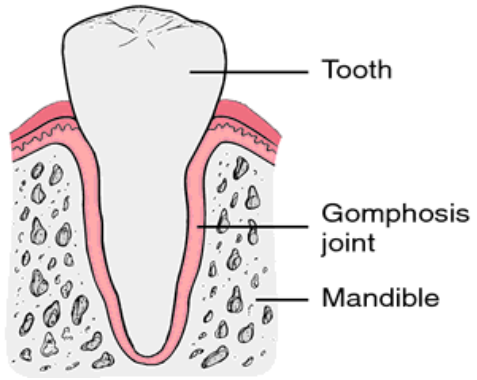
Bones united by fibrous tissue

Examples

- Sutures (Skull sutures)
- Syndesmoses.e.g. distal end of tibia and fibula
- Gomphosis : Between root of the teeth and socket of the jaw.







Cartilaginous Joints

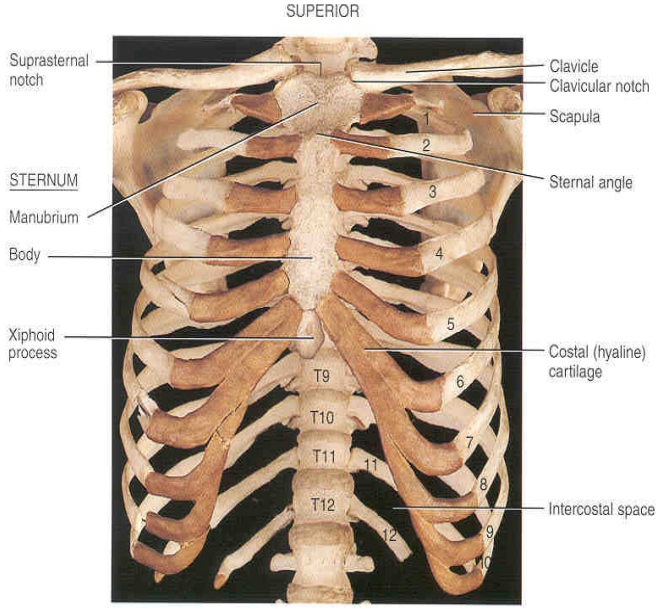
Bones are connected by cartilage

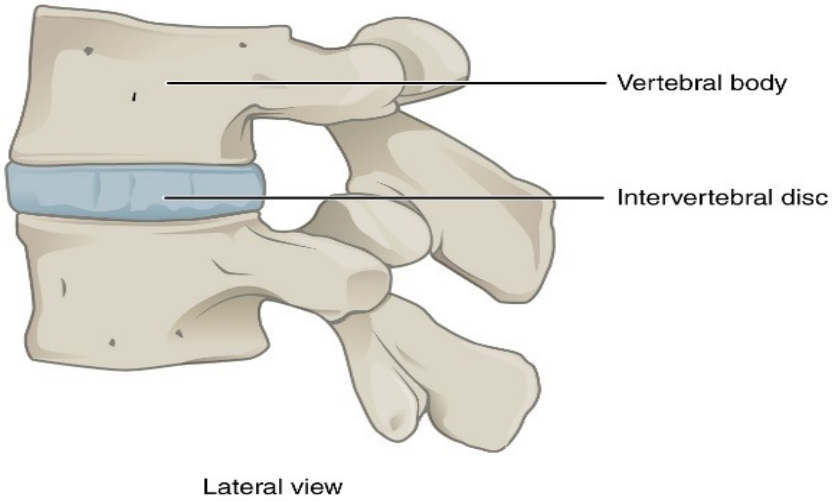
Types

- **Primary Cartilaginous** (Synchondrosis)

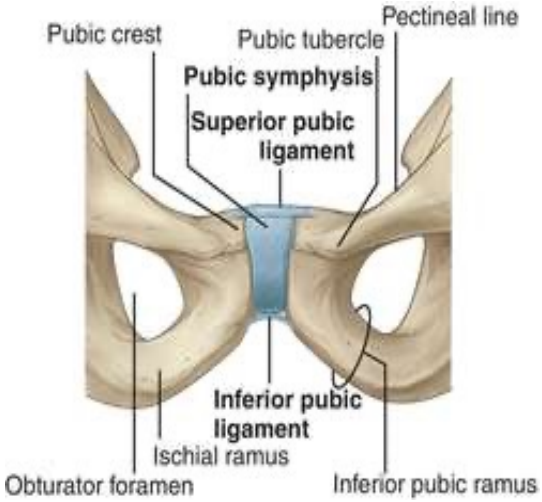
e.g. Chostochondral joint ,Epiphyseal plate of cartilage.

- **Secondary Cartilaginous** (MIDLINE OF BODY)
  e.g. Intervertebral disc joints, symphysis pubis



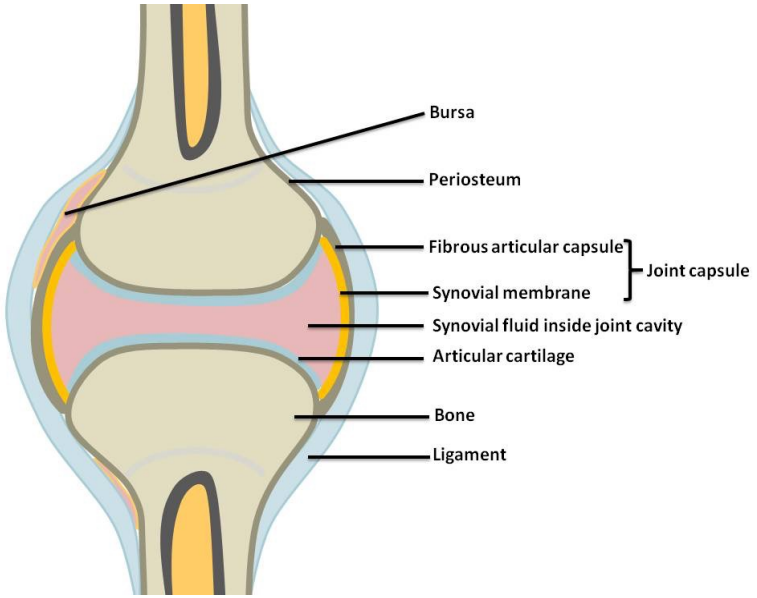


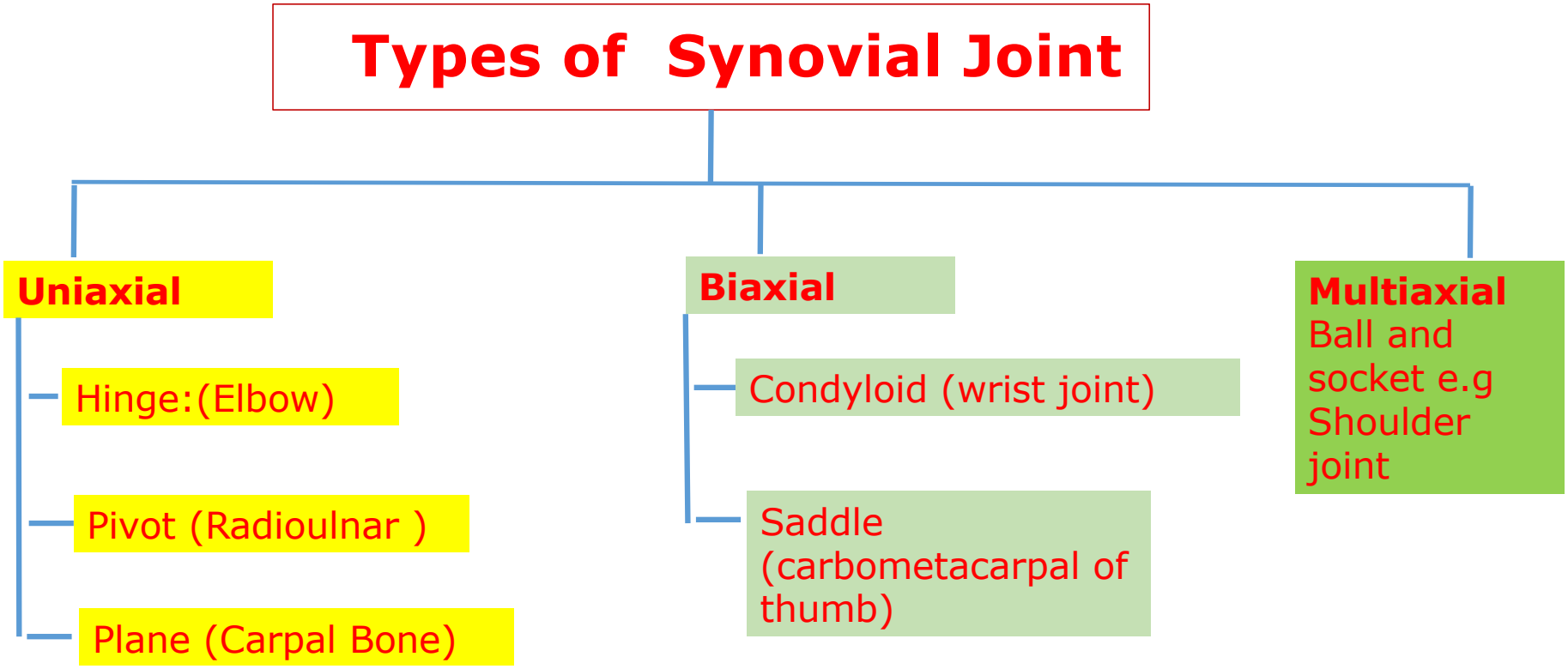
Lateral view



Synovial Joints

- Articulating bones are separated by a joint cavity
- Articular cartilage (hyaline cartilage) covers the ends of bones
- Joint surfaces are enclosed by a fibrous articular capsule
- The Joint capsule is lined by synovial membrane
- Have a joint cavity filled with synovial fluid
- Ligaments reinforce the joint

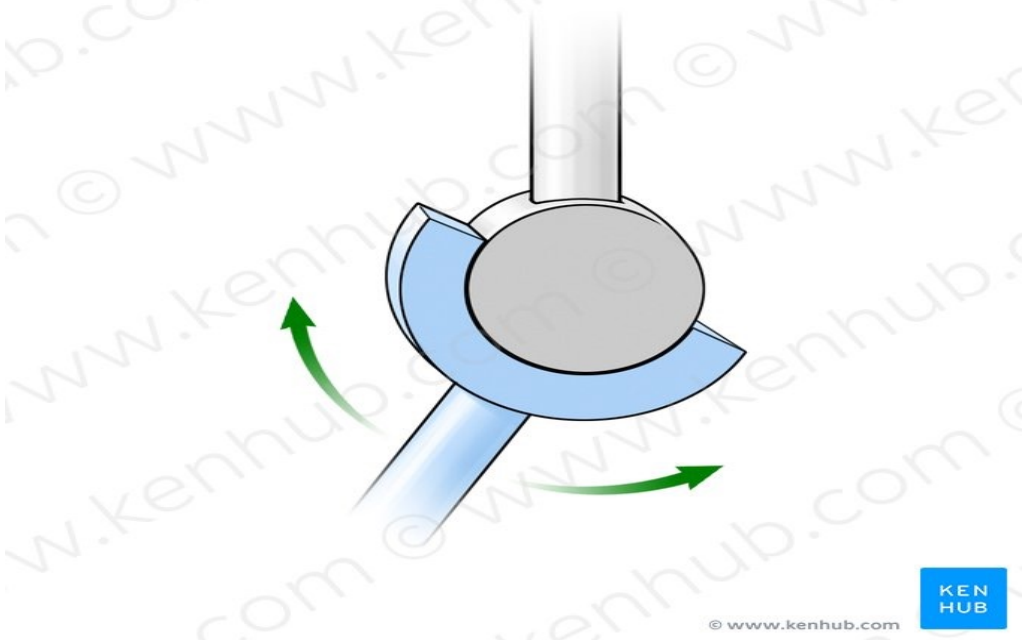



Types of Synovial Joint
Uniaxial
Hinge:(Elbow)
Pivot (Radioulnar)
Plane (Carpal Bone)
Biaxial
Condyloid (wrist joint)
Saddle (carbometacarpal of thumb)
Multiaxial
Ball and socket e.g Shoulder joint

Uniaxial

Hinge: permit flexion and extension only

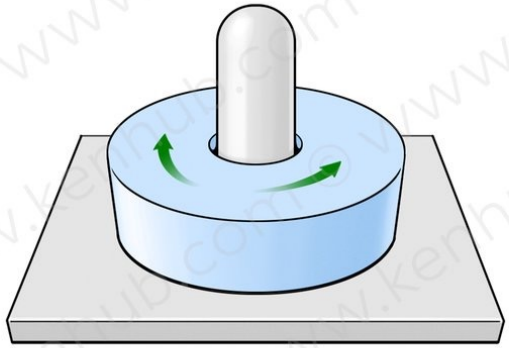
- Elbow
- Ankle

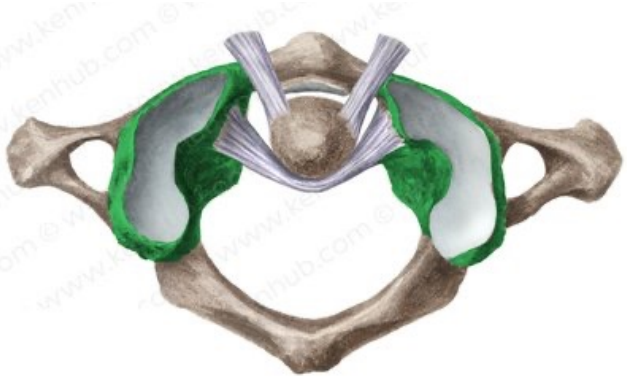


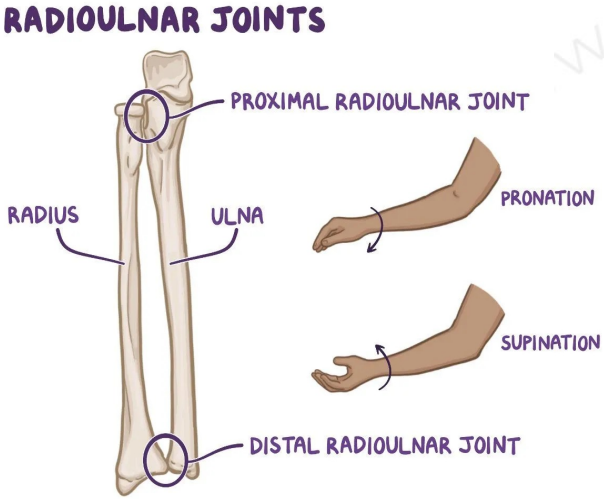
Uniaxial

Pivot : Rotation movement

- Radioulnar
- Atlantoaxial



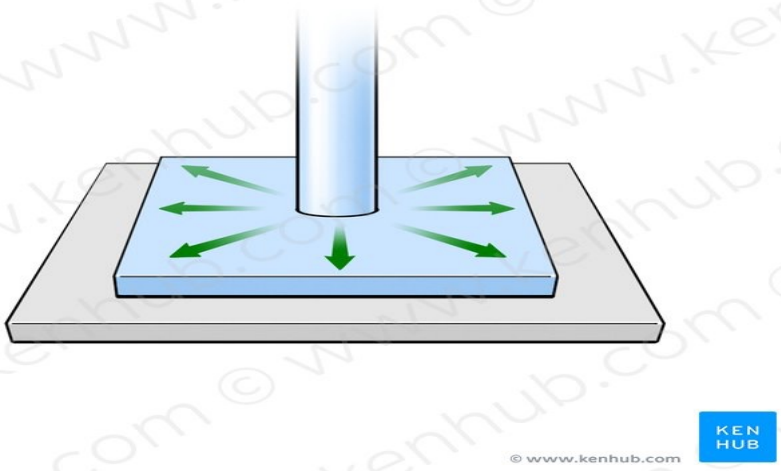


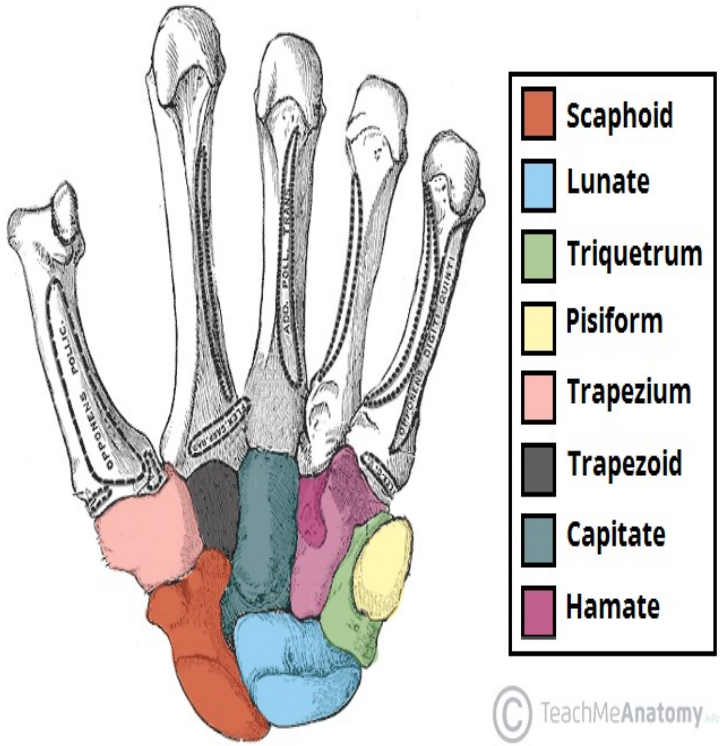


Uniaxial

Plane : the articular surfaces are flat, and they allow gliding movement.

- Intercarpal
- Between vertebral articular processes.



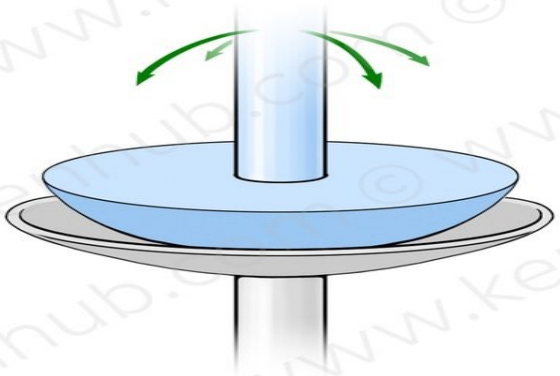


Biaxial

Condyloid between the shallow depression of one bone and the rounded structure of another bone or bones.

It permits : flexion/extension and abduction/adduction

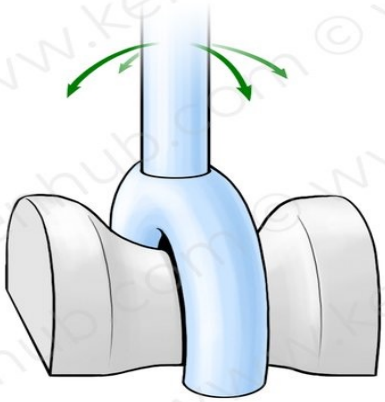
Example : Wrist joint

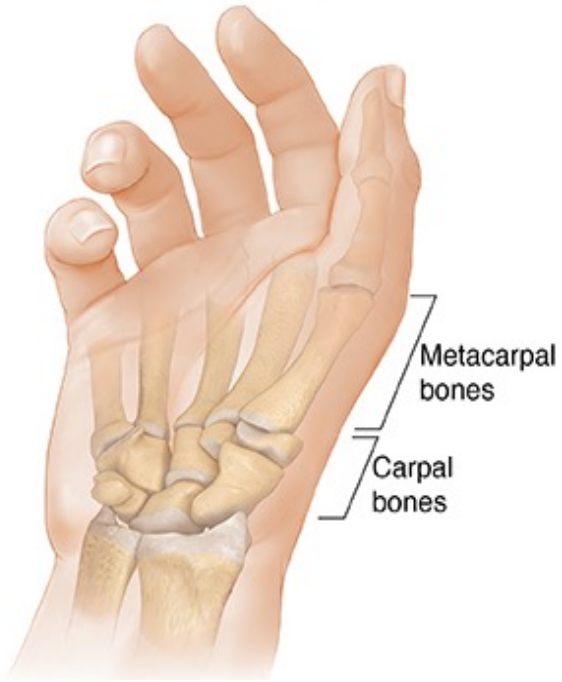


Biaxial

Saddle : Each articular surface has both concave and convex areas

Example : (carbometacarpal of thumb)

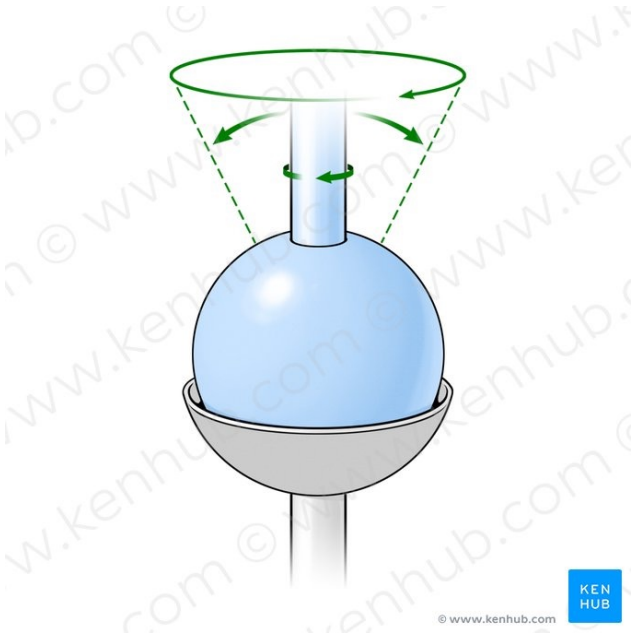


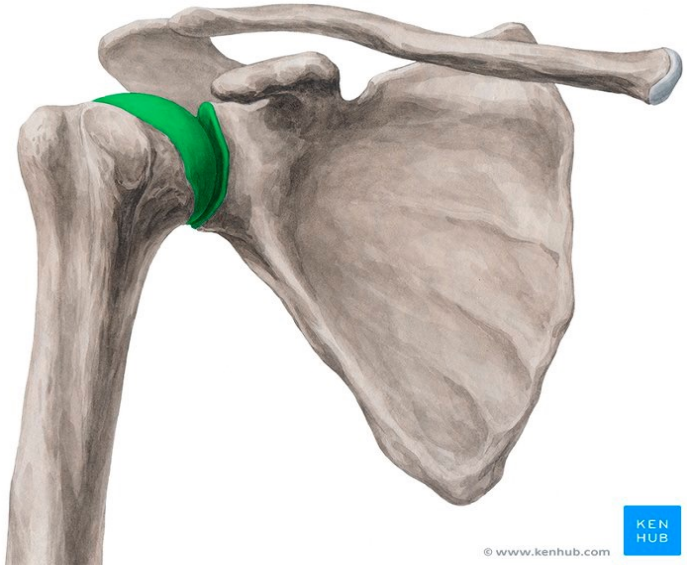


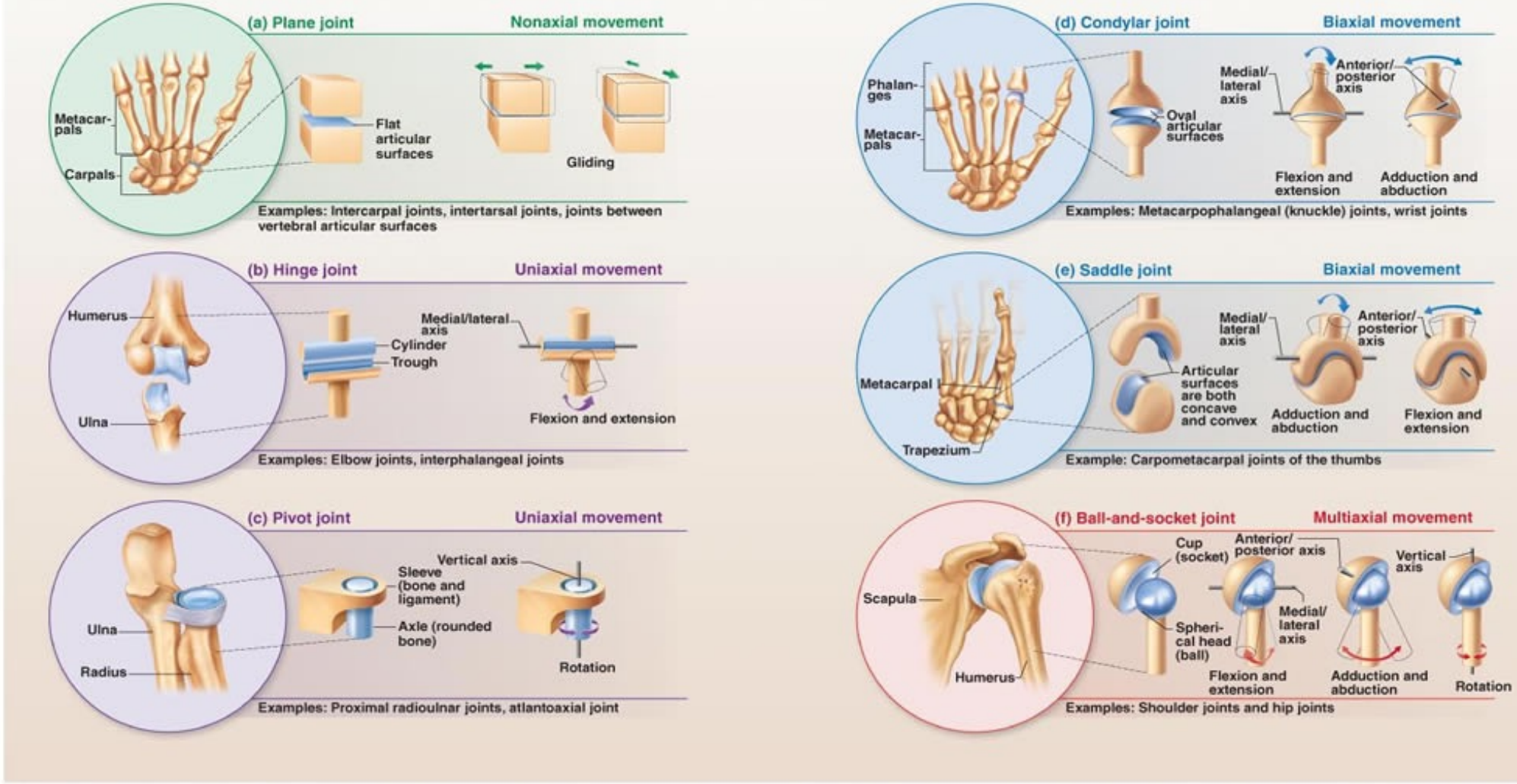
Multiaxial

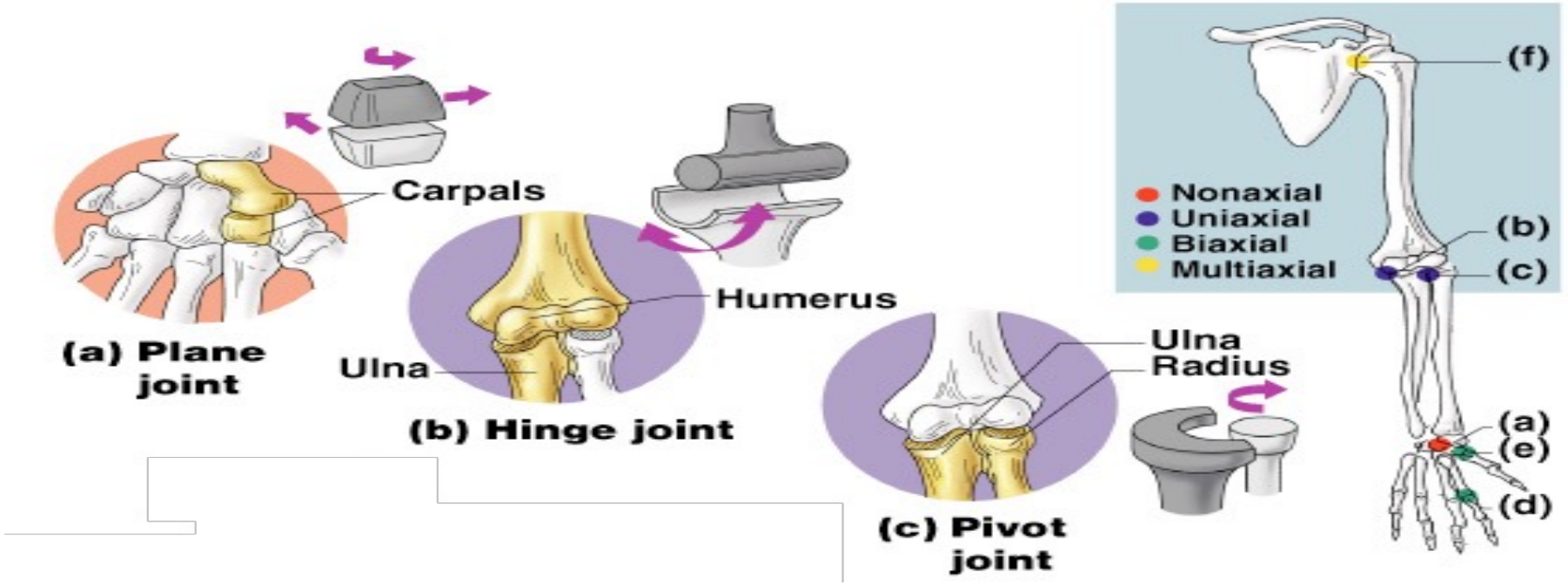
Ball and socket

Spherical or hemispherical head of one bone articulates with the cuplike socket of another
e.g Shoulder joint








Carpals
(a) Plane joint
Humerus
Ulna
(b) Hinge joint
Ulna
Radius
(c) Pivot joint
Nonaxial
Uniaxial
Biaxial
Multiaxial
(f)
(b)
(c)
(a)
(e)
(d)

Muscles

Muscles are classified into 3 types: skeletal ,smooth and cardiac.

(1) Skeletal muscles:

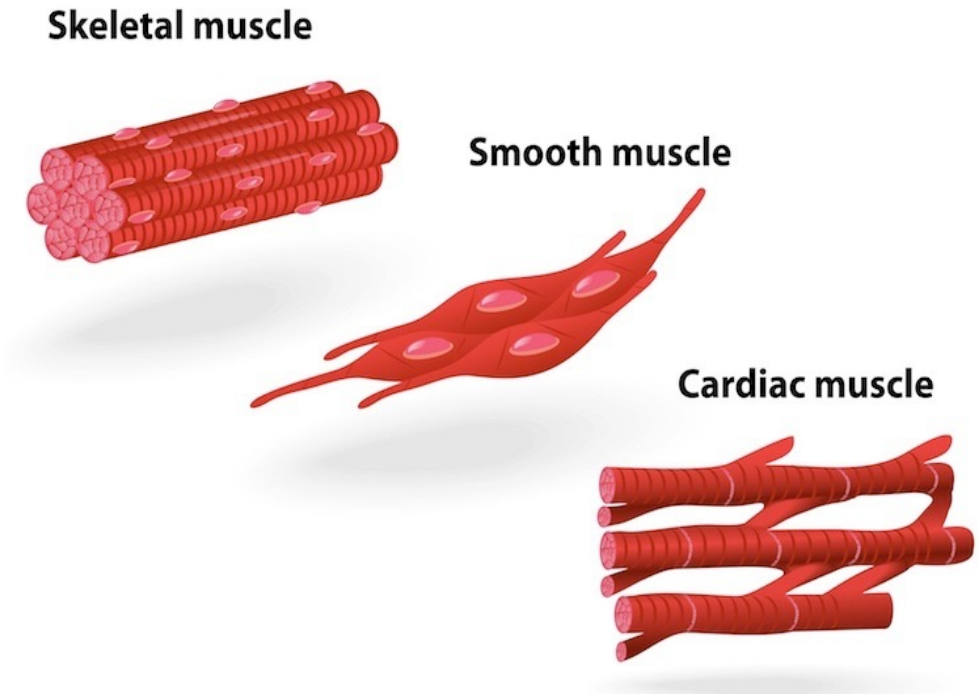
- Attached to and produce movement of the **skeleton**.
- **Voluntary** muscles
- **Nerve supply:** Somatic nerves.

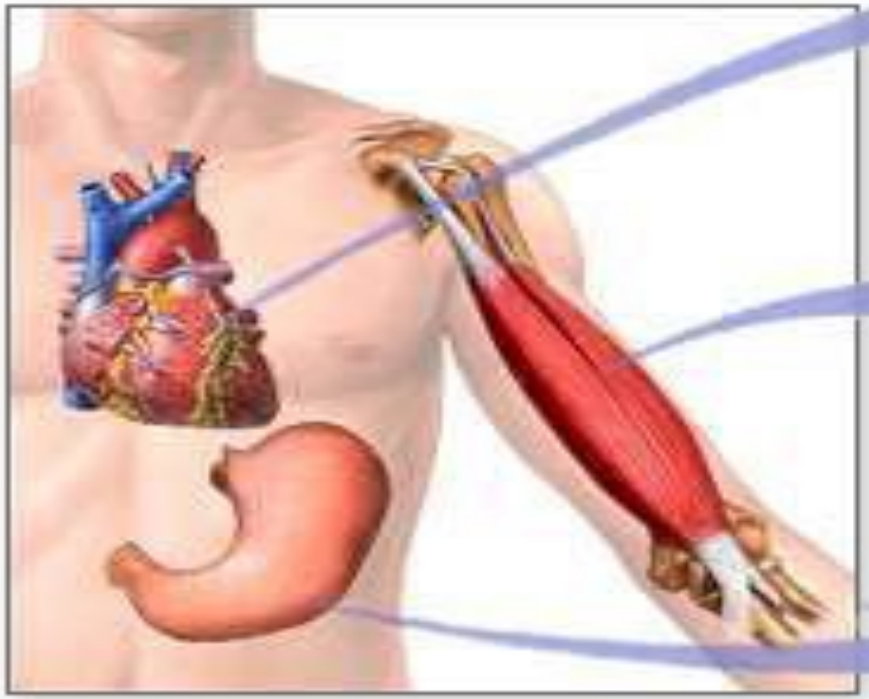
(2) Smooth muscles:

- Site: blood **vessels**& walls of **viscera**.
- **Involuntary** muscles
- **Nerve supply:** Autonomic nerves.

(3) Cardiac muscle:

- Site: Myocardium of the **heart**.
- **Involuntary** muscles
- **Nerve supply:** Autonomic nerves.





Cardiac muscle cell

Skeletal muscle cell

Smooth muscle cell

A.D.A.M.

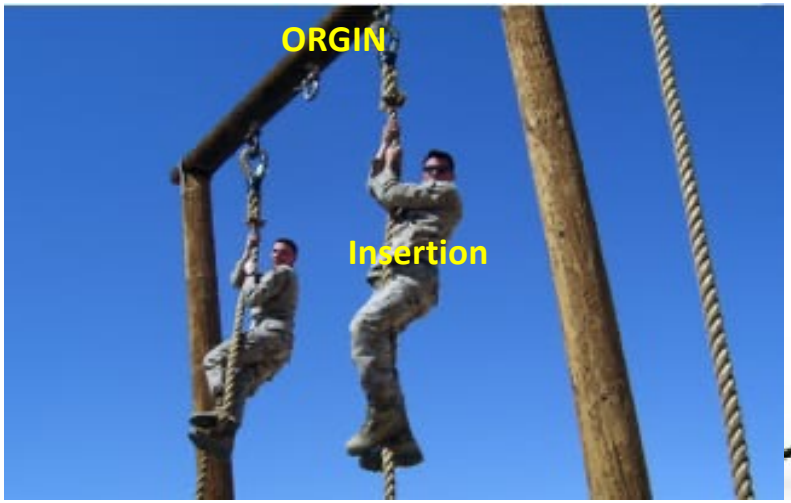
Skeletal Muscles

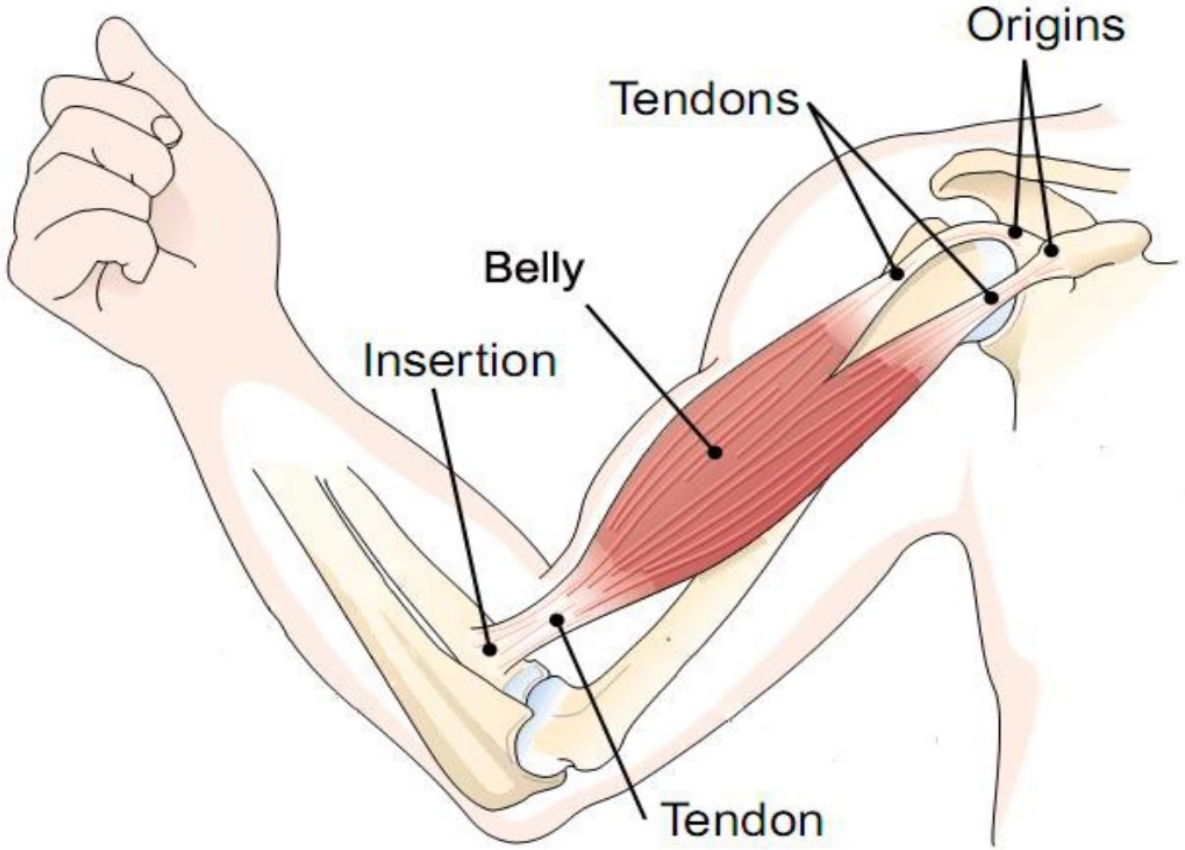
A muscle has **2** attachments:

1. Origin: is the more fixed attachment.

2. Insertion: is the more mobile attachment.

When a muscles contract, its fibers shorten and the insertion moves towards the origin, thus producing movement at the related joint.




Origins
Tendons
Belly
Insertion
Tendon

Action of skeletal muscles:

- Muscles are classified according to their action (function) into:

Prime movers: (AGONISTS)

- There are muscles responsible for **initiation** of a particular movement.

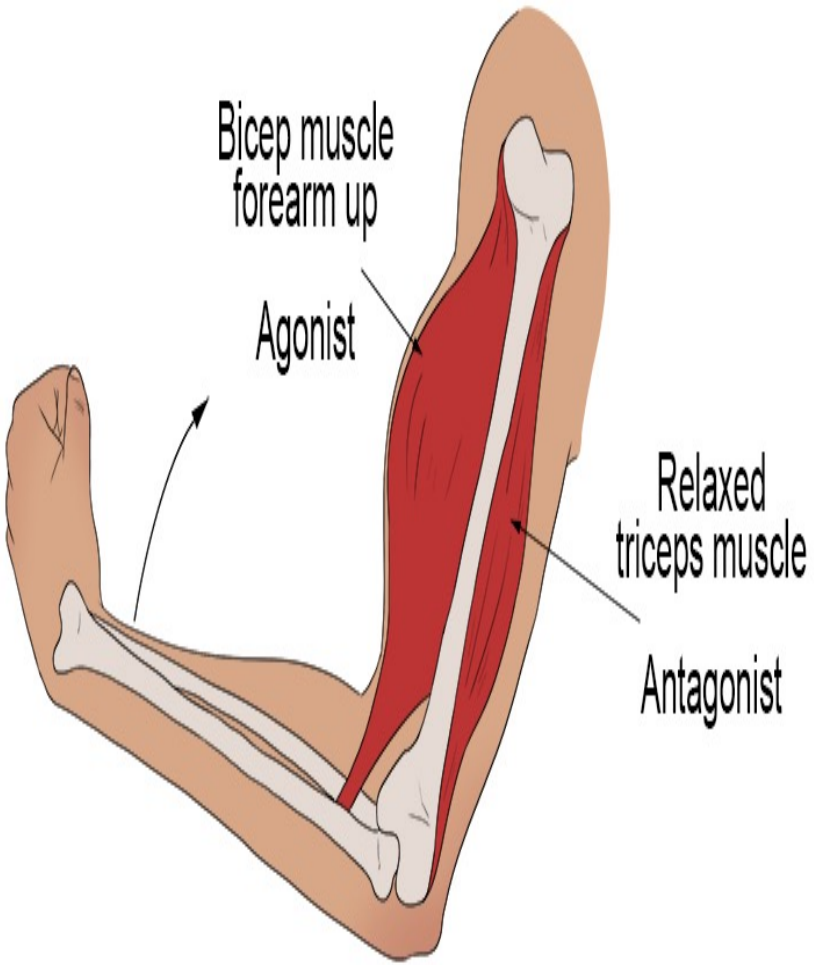
Antagonist:

- There are muscles, which **oppose** the action of prime movers.

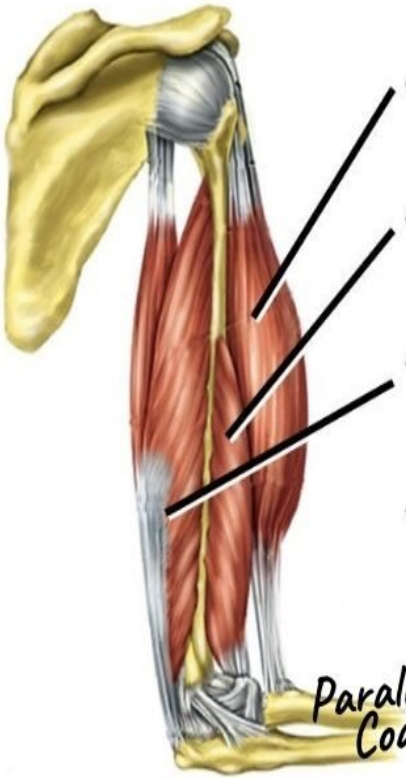
Synergists:

- Synergists are muscles that assist the prime mover in its role.

Fixators: (STABILIZERS):- Help the prime mover by fixing its origin or keep bones immobile when needed.



MUSCLE ACTIONS DURING A BICEPS CURL



- Prime mover (agonist) = biceps brachii
- Synergist = brachialis
- Antagonist = triceps brachii
- Fixator = muscle that holds scapula firmly in place such as rhomboideus

Parallel Coaching


THANK YOU