Introduction to Anatomy

1st Year Medical Students

2025-2026
Second Semester

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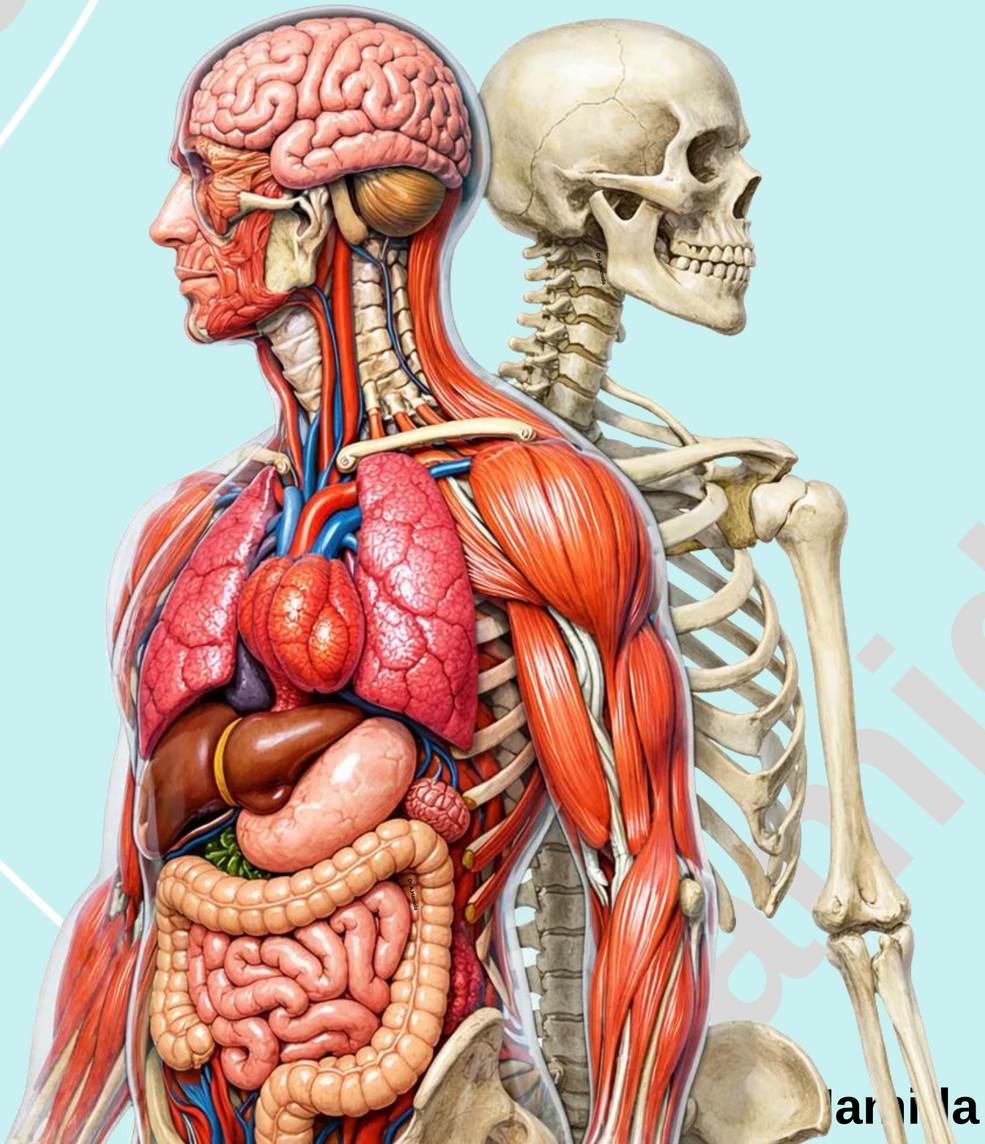
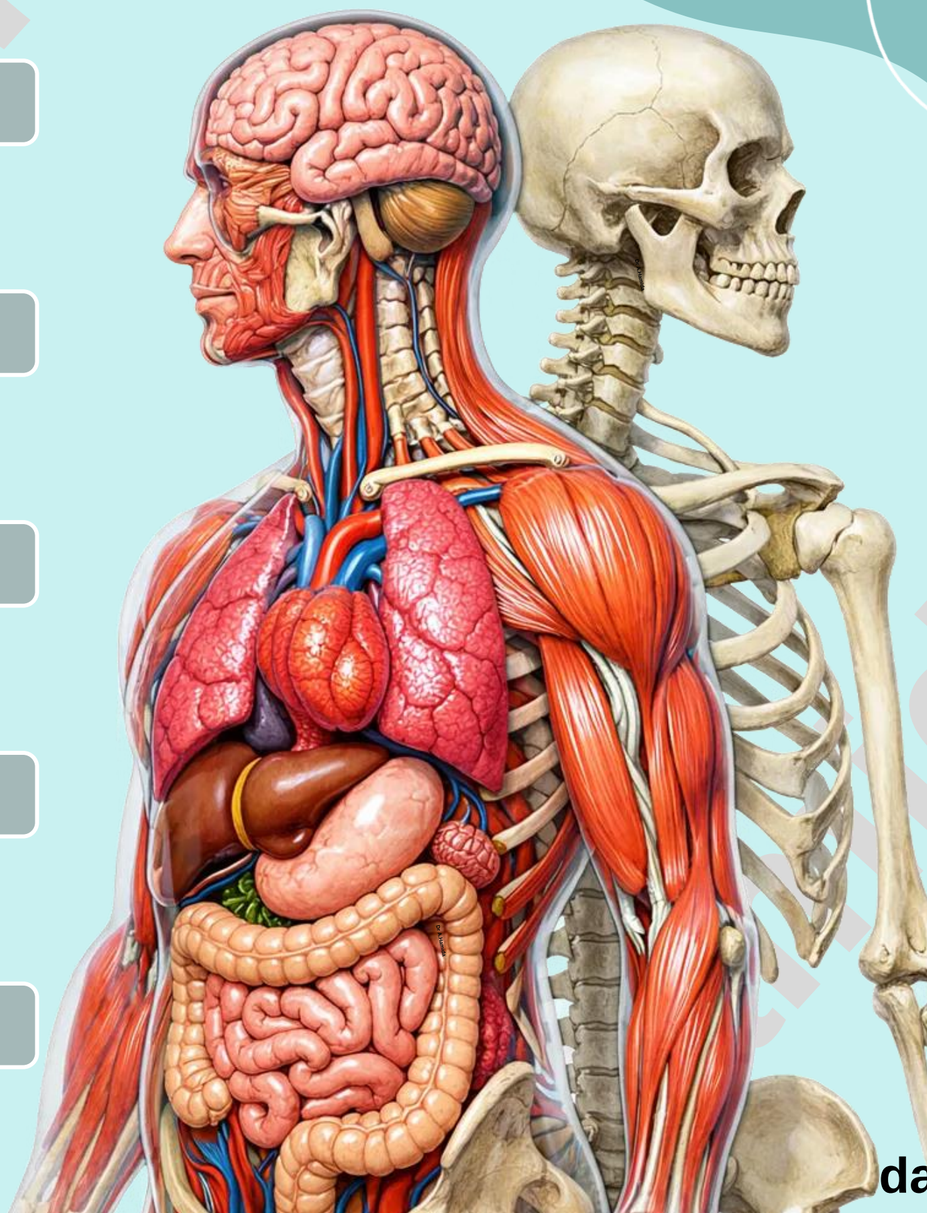


Course Outline:

Gross lecture-5

1. Introduction and Terminology
2. Skeletal System
3. Cardiovascular System
4. Lymphatic System
5. Nervous System
6. Muscular System
7. Respiratory System
8. Digestive System
9. Urinary System
10. Endocrine System



2 Skeletal System

Gross lecture-5

System Outline:

2.1 Axial Skeleton

2.2 Appendicular Skeleton

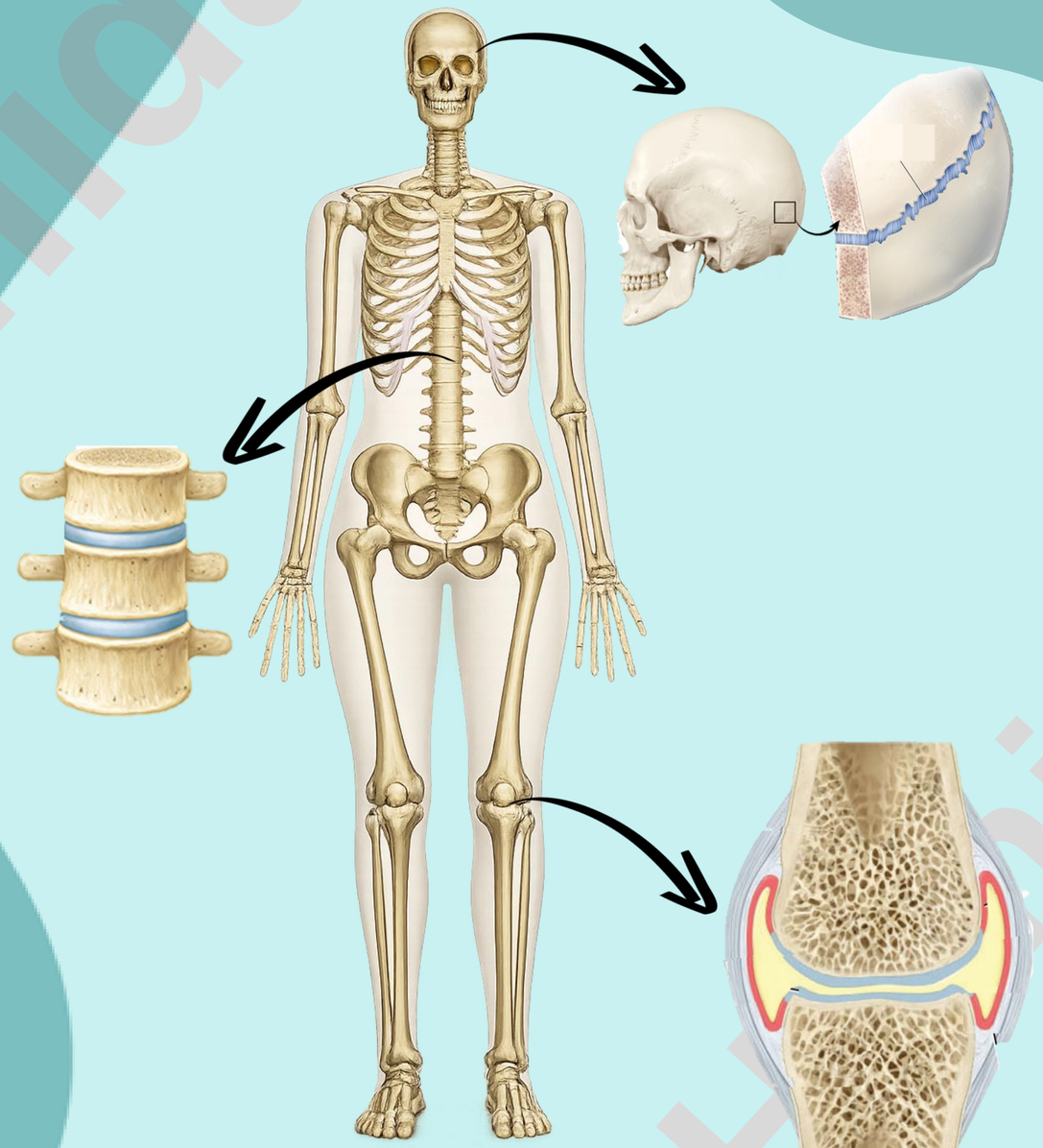
2.3 Joints

2

Gross lecture-5

Skeletal system

3. Joints



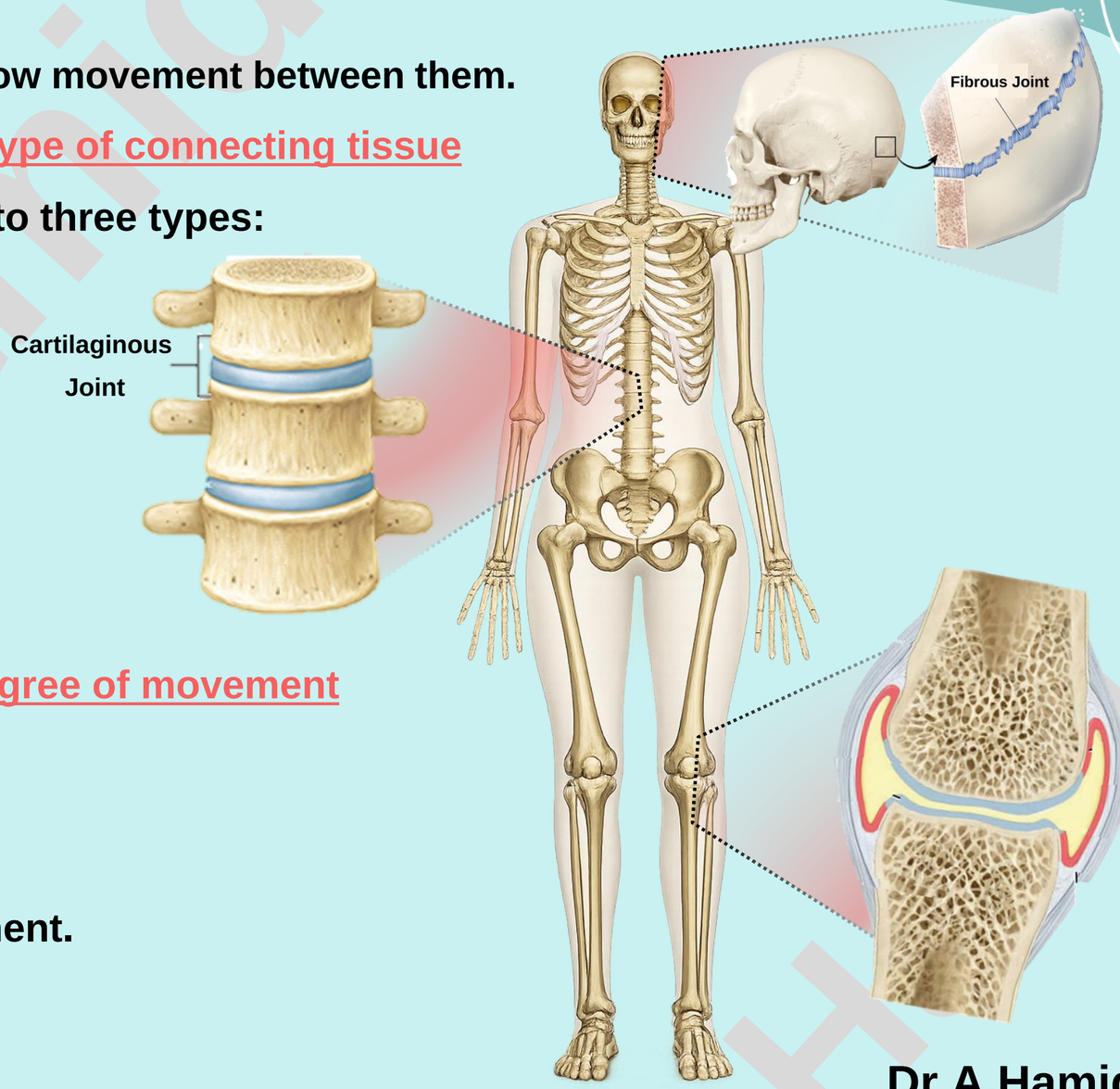
2.3 Skeletal System–Joints

Gross lecture-5

➢ Joints

- It is a junction between two or more bones that allow movement between them.
- Joints is classified structurally based upon the type of connecting tissue and the presence or absence of a joint cavity, into three types:

1. Fibrous Joint.
2. Cartilaginous Joint.
3. Synovial Joint.



- Joints can also be classified according to the degree of movement they provide, into:

1. Synarthrosis: immovable joints.
2. Amphiarthrosis: joints allowing slight movement.
3. Diarthrosis: freely movable joints.

2.3 Skeletal System–Joints

Gross lecture-5

Lecture Outline:

- 2.3.1 Fibrous Joints
- 2.3.2 Cartilaginous Joints
- 2.3.3 Synovial Joints

2.3.1 Fibrous Joints

Gross lecture-5

Description	Tissue between bones	The two bones are connected by dense fibrous connective tissue.
	Cavity	No cavity
	Movement	Can be either synarthrotic (immovable) or amphiarthrotic (slightly movable).
Types	1. Suture 2. Gomphosis 3. Syndesmosis	

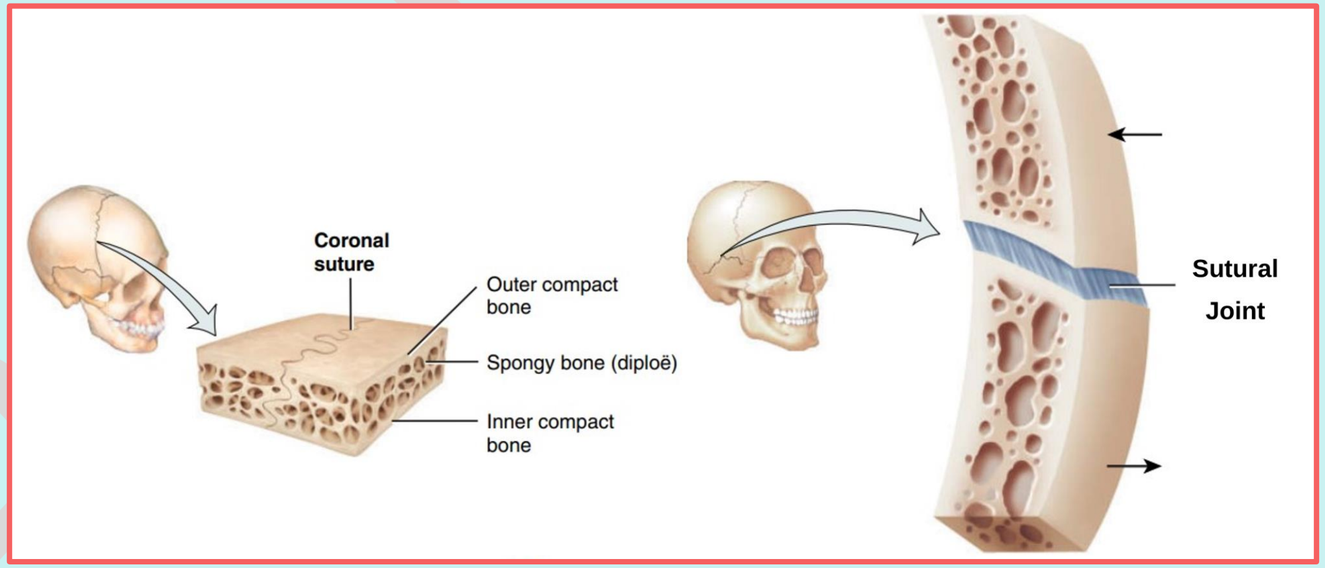
2.3.1

Fibrous Joints

Gross lecture-5

➢ Types of Fibrous Joint:

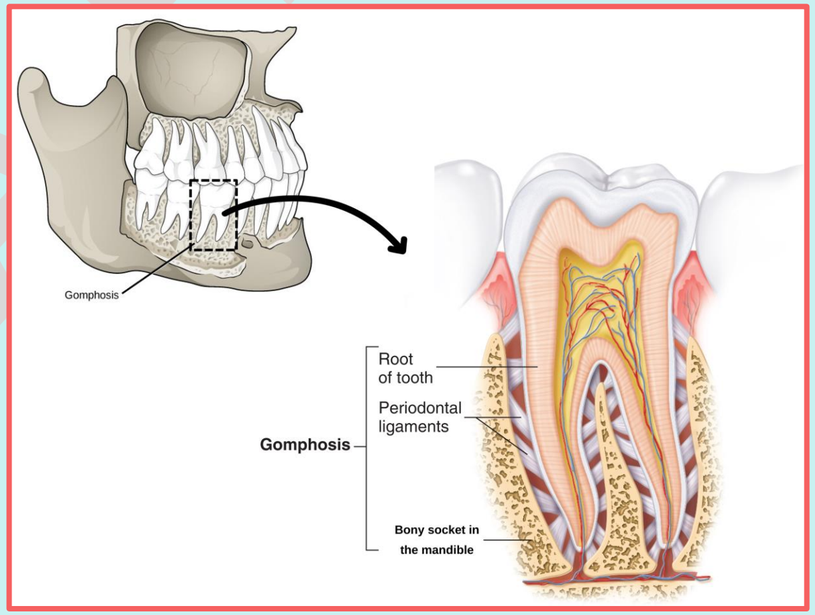
1. Suture	
Description	• A fibrous joint composed of a thin layer of dense irregular connective tissue that unites the bones.
Movement	• Immovable (synarthrosis) in adults, but slightly movable (amphiarthrosis) in infants and children.
Example	• Found only between the bones of the skull, e.g., coronal suture between the parietal and frontal bones.



Fibrous Joints

Types of Fibrous Joint:

2. Gomphosis	
Description	• A fibrous joint that anchors a tooth root into its bony socket in the maxilla or mandible via the periodontal ligament.
Movement	• Immovable (synarthrosis).
Example	• Between the teeth and their sockets in the maxilla and mandible.



2.3.1

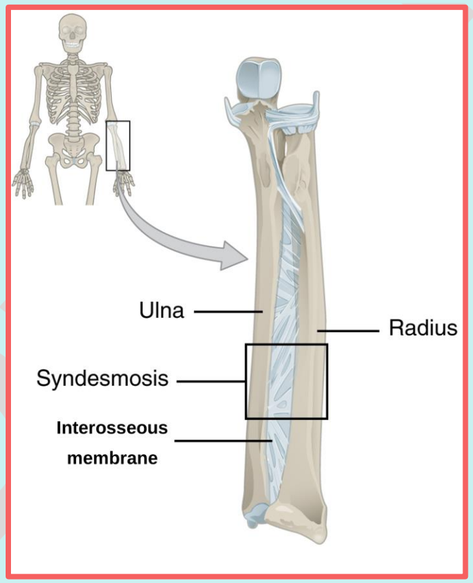
Fibrous Joints

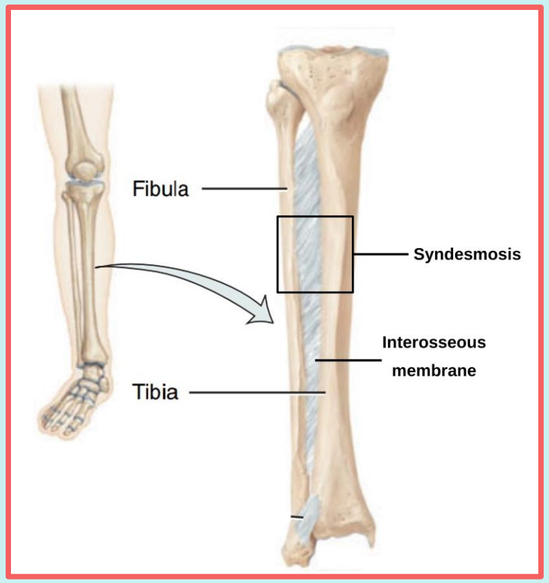
Gross lecture-5

Types of Fibrous Joint:

3. Syndesmosis

Description	• A fibrous joint where there is a greater distance between two adjacent bones, connected by dense irregular connective tissue arranged as a membrane known as interosseous membrane.
Movement	• Slightly movable (amphiarthrosis).
Example	• Interosseous membrane between the radius and ulna. • Interosseous membrane between the tibia and fibula





2.3.2 Cartilaginous Joints

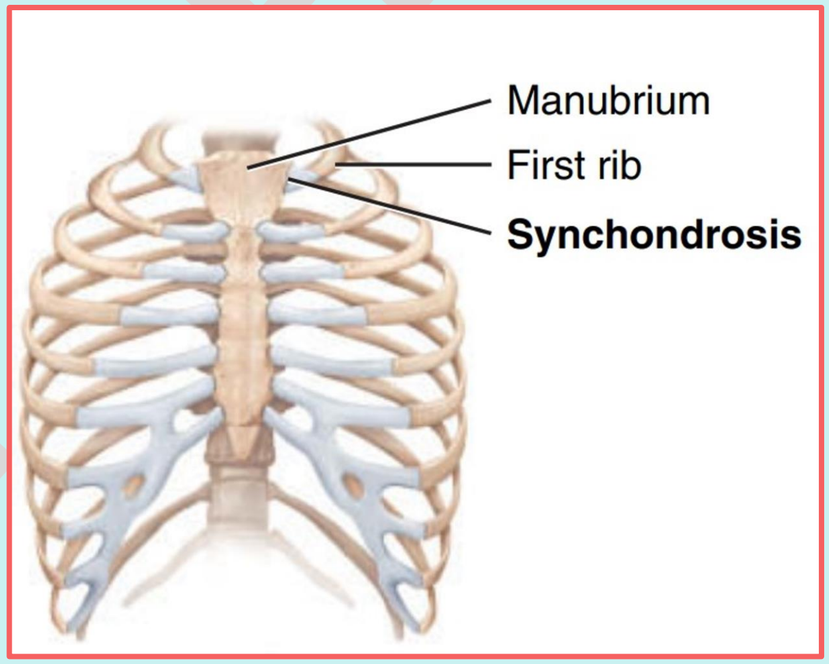
Gross lecture-5

Description	Tissue between bones	The two bones are connected by cartilage (hyaline cartilage or fibrocartilage).
	Cavity	No cavity
	Movement	Can be either synarthrotic (immovable) or amphiarthrotic (slightly movable).
Types	1. Primary cartilaginous joints (synchondroses) 2. Secondary cartilaginous joints (symphyses)	

2.3.2 Cartilaginous Joints

➢ Types of Cartilaginous Joint:

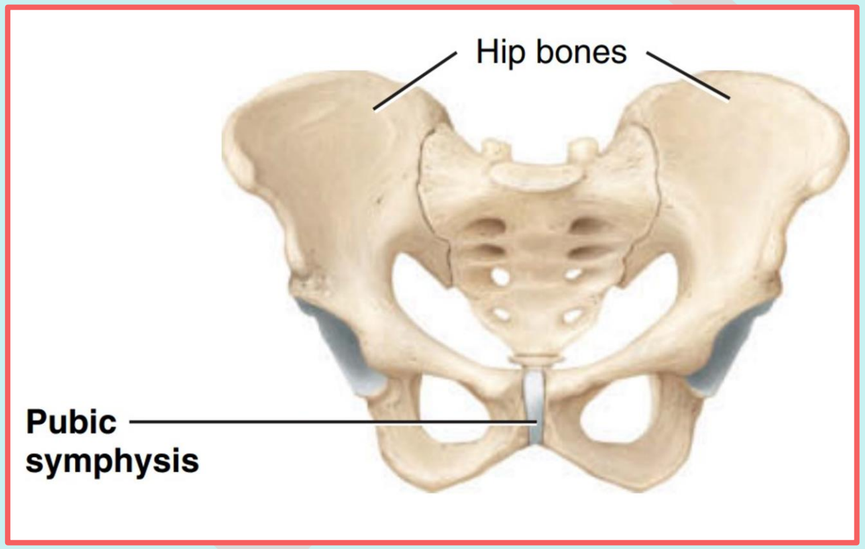
1. Primary cartilaginous joints (synchondroses)	
Description	• Bones are joined by a plate of hyaline cartilage.
Movement	• Immovable (synarthrosis)
Example	• The first costosternal joint (between the first rib and the manubrium of the sternum).

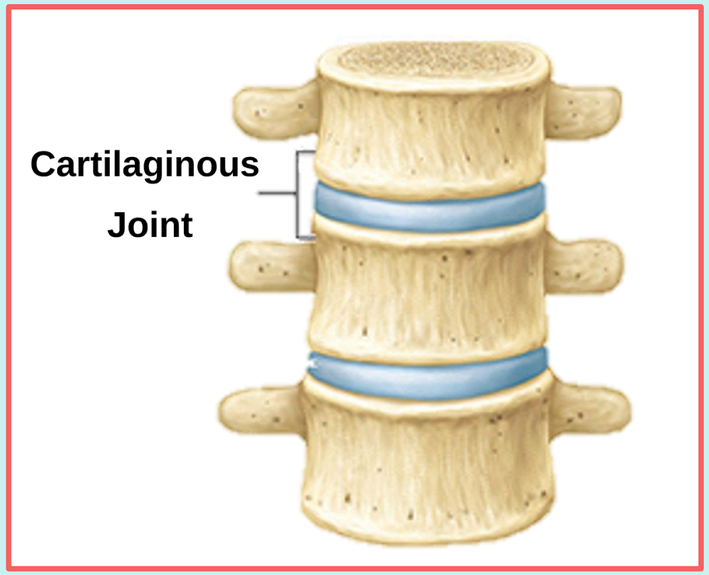


2.3.2 Cartilaginous Joints

Types of Cartilaginous Joint:

2. Secondary cartilaginous joints (symphyses)	
Description	• Bones are joined by fibrocartilage
Movement	• Slightly movable (amphiarthrosis).
Example	• Pubic symphysis (between the two pubic bones). • Intervertebral discs (between the bodies of adjacent vertebrae).



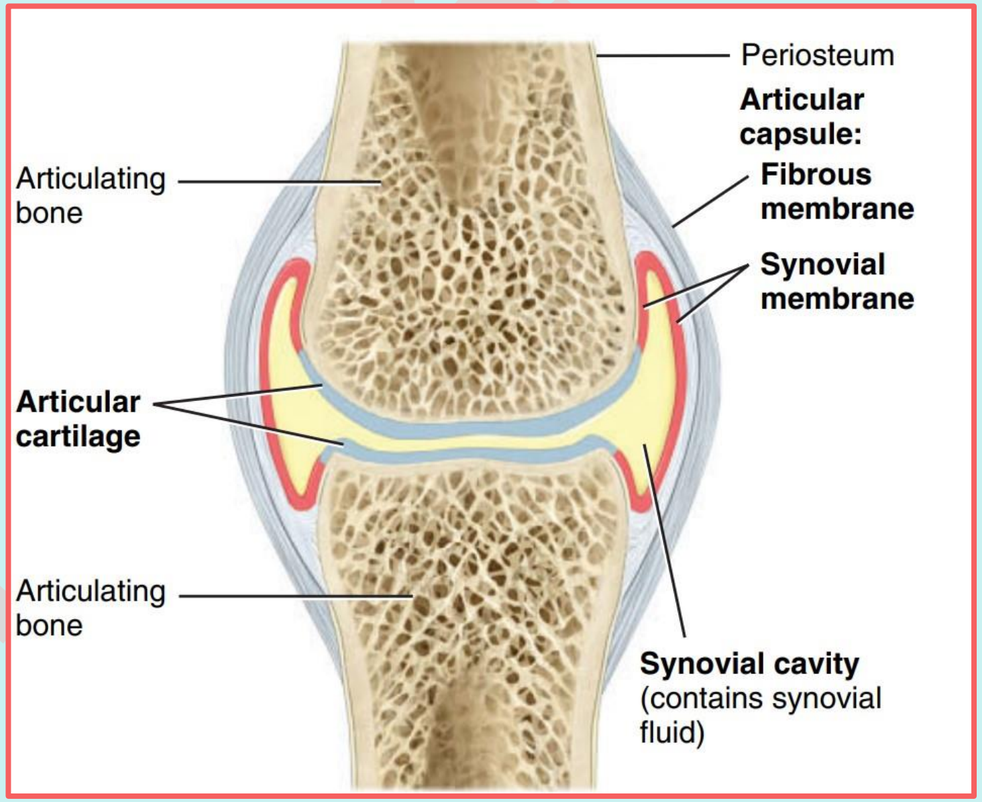


2.3.3

Synovial Joints

Gross lecture-5

Description	Tissue between bones	• There is a space between the articulating bones. • The articulating surfaces are covered with hyaline cartilage.
	Cavity	• The bones forming the joint have a synovial cavity, filled with a fluid called synovial fluid.
	Movement	• These joints are diarthrotic, allowing a wide range of movements.



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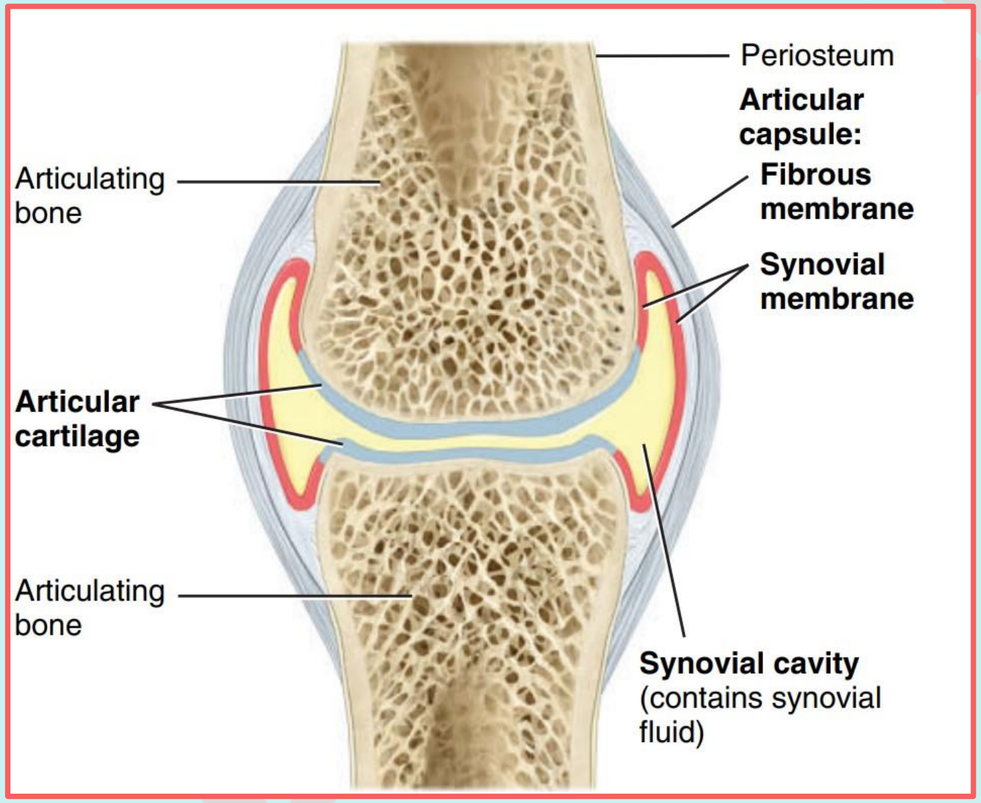
2.3.3 Synovial Joints

Gross lecture-5

Special Features	
	1. Joint capsule: an external fibrous capsule enclosing the joint cavity. 2. Synovial membrane: lines the inner surface of the joint capsule and secretes synovial fluid for lubrication. 3. Articular cartilage: the articulating surfaces of the bones are covered with hyaline cartilage. 4. Ligaments: strengthen and support the joint; may be extracapsular or intracapsular.



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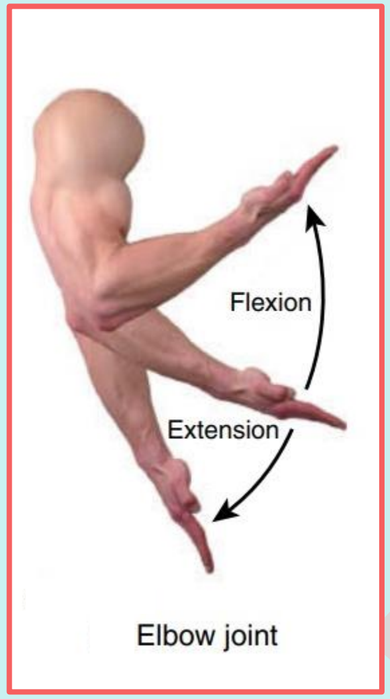
2.3.3 Synovial Joints

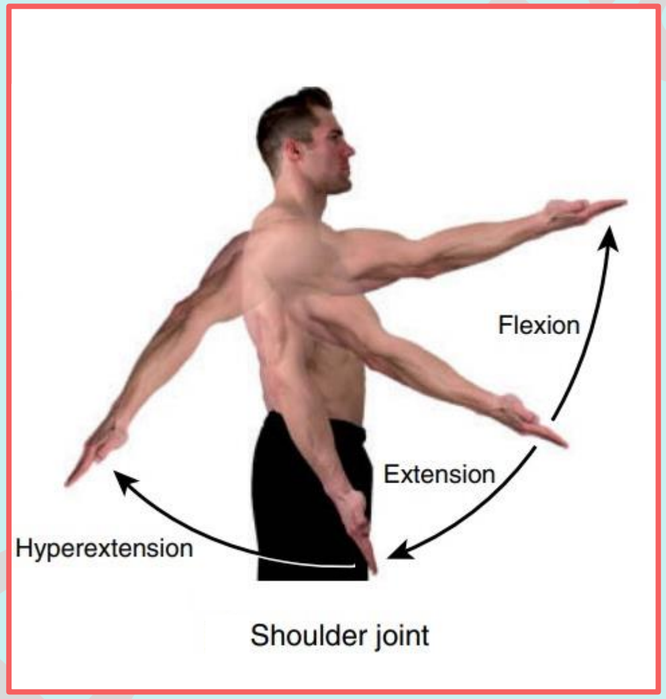
Gross lecture-5

Types of Movements at Synovial Joints:

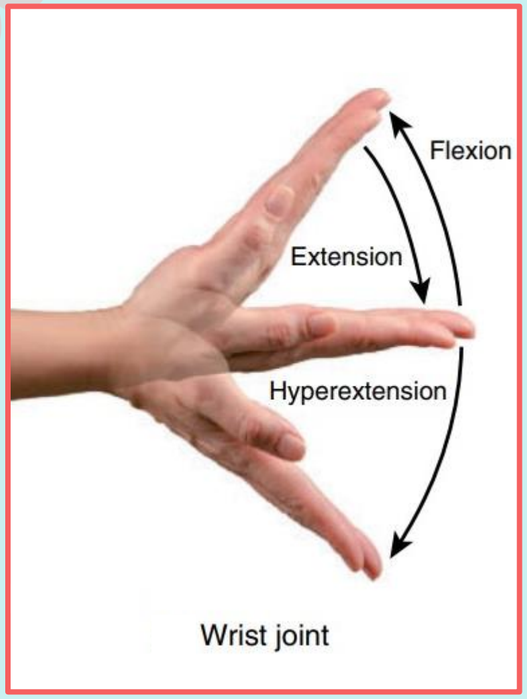
Flexion	**A movement that decreases the angle between two body parts at a joint.**
Extension	**A movement that increases the angle between two body parts at a joint.**



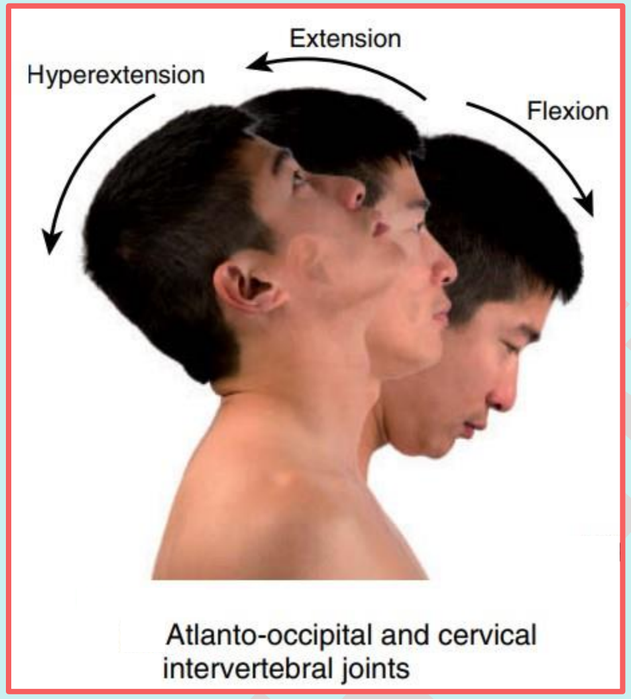
Elbow joint



Shoulder joint



Wrist joint

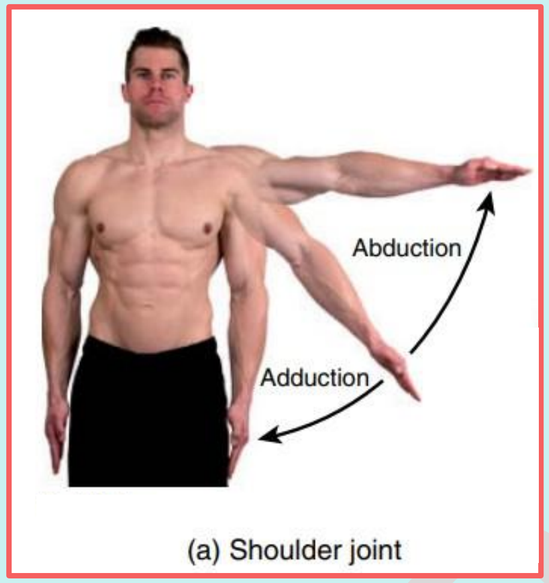


Atlanto-occipital and cervical intervertebral joints

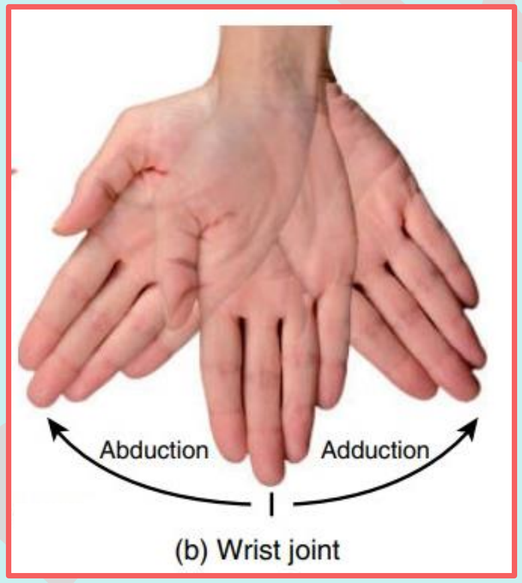
2.3.3 Synovial Joints

➢ Types of Movements at Synovial Joints:

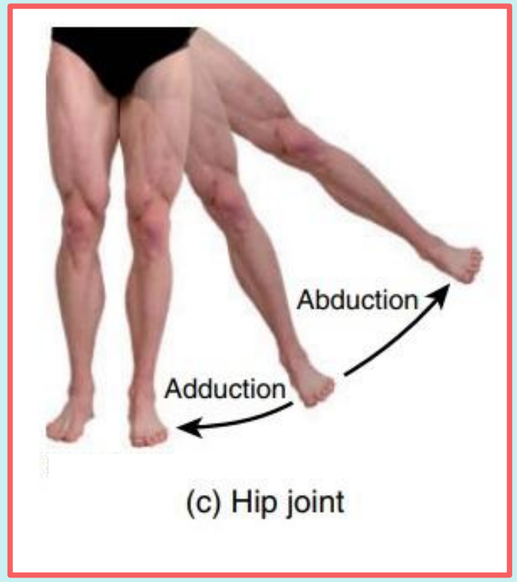
Abduction	**A movement away from the midline of the body or from the axis of a limb.**
Adduction	**A movement toward the midline of the body or toward the axis of a limb.**



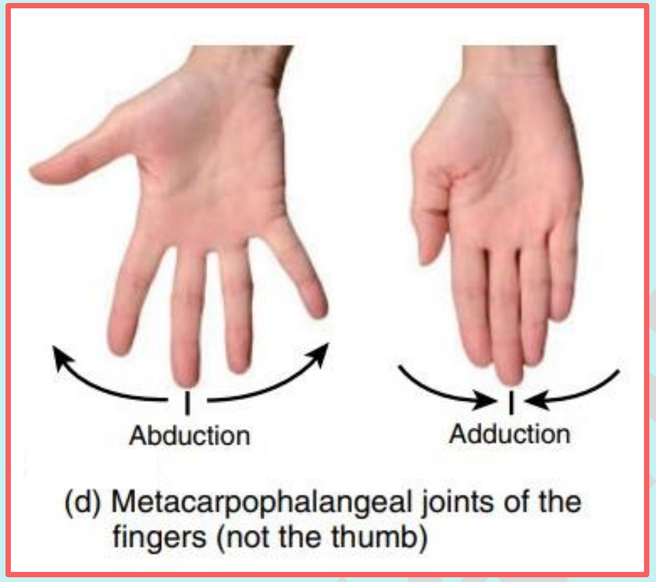
(a) Shoulder joint



(b) Wrist joint



(c) Hip joint

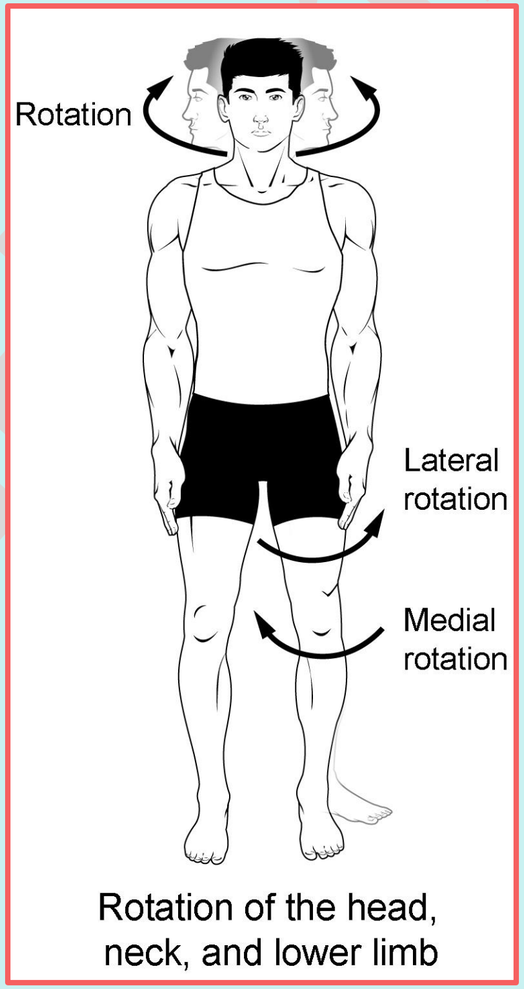


(d) Metacarpophalangeal joints of the fingers (not the thumb)

Synovial Joints

Types of Movements at Synovial Joints:

Rotation	**A movement in which a bone or entire limb turns around its own longitudinal axis.**



Rotation of the head, neck, and lower limb

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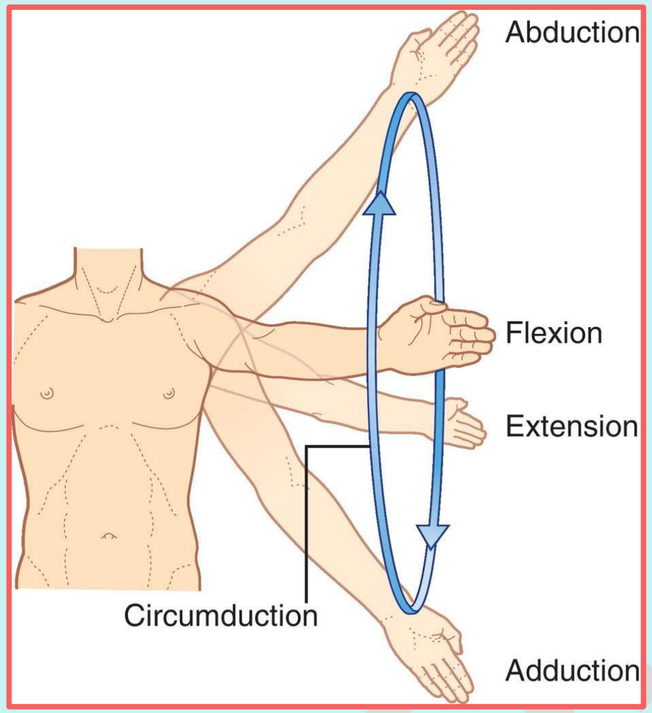
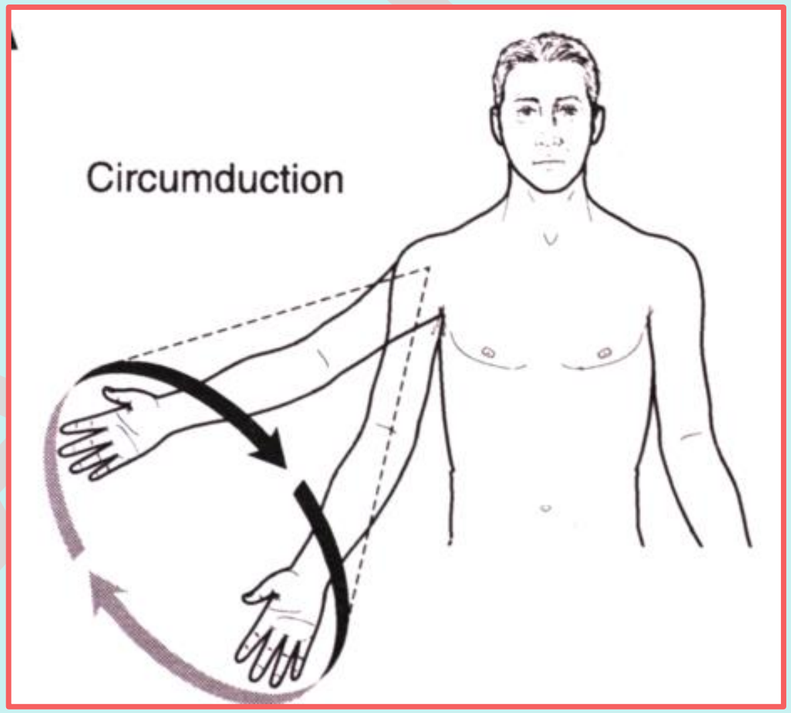
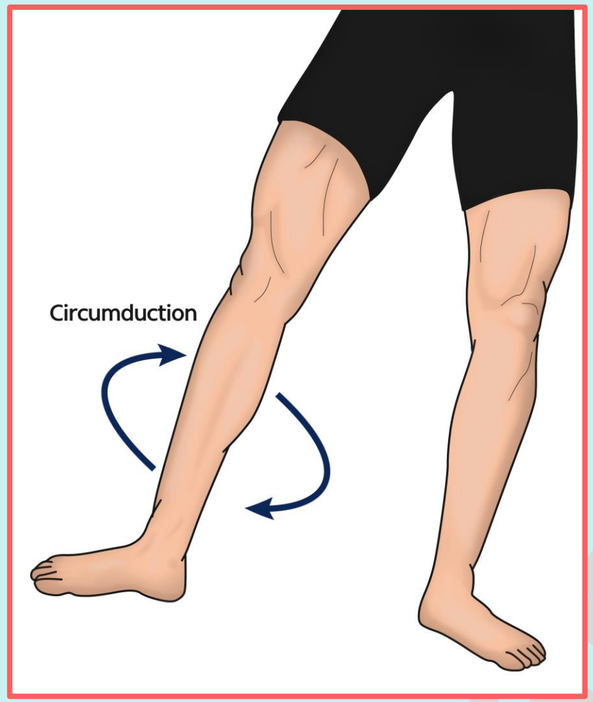
2.3.3 Synovial Joints

➢ Types of Movements at Synovial Joints:

Circumduction	**A circular, cone-like movement of a body part, involving a combination of flexion, extension, abduction, and adduction in successive order.**



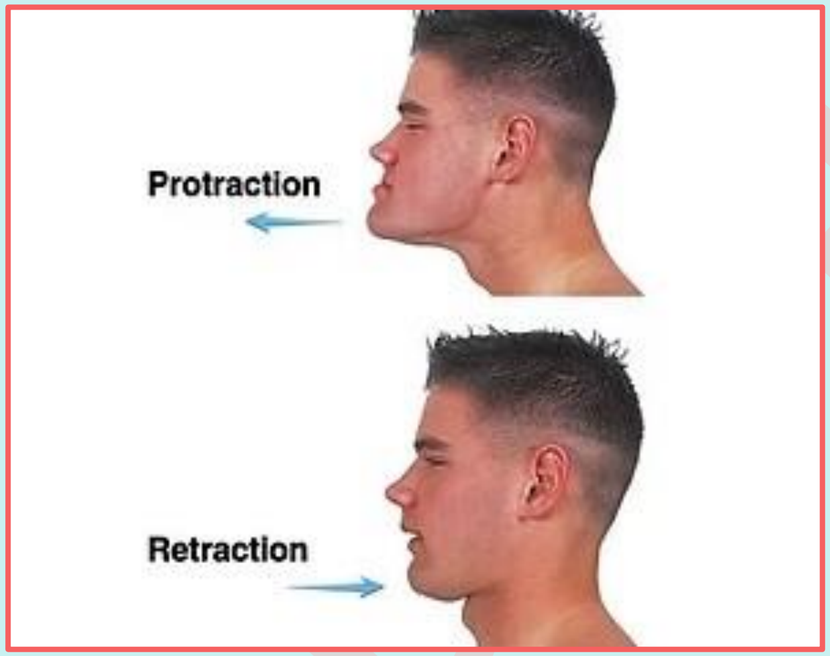




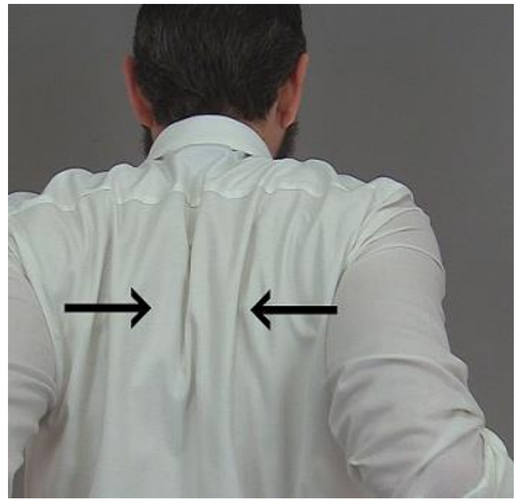
2.3.3 Synovial Joints

➢ Types of Movements at Synovial Joints:

Protraction	A forward movement of a body part on a plane parallel to the ground, e.g., protraction of the mandible and scapula.
Retraction	A backward movement of a previously protracted body part on a plane parallel to the ground, e.g., retraction of the mandible and scapula.



Protraction

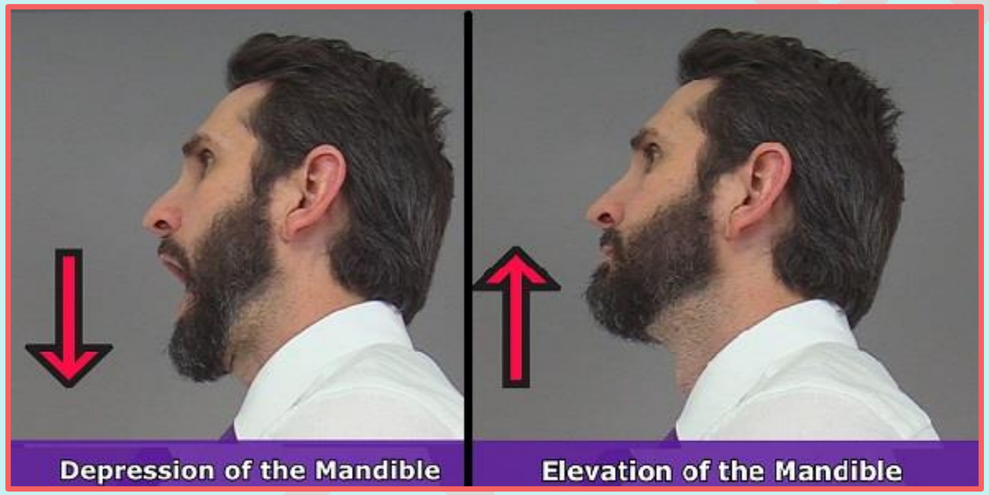


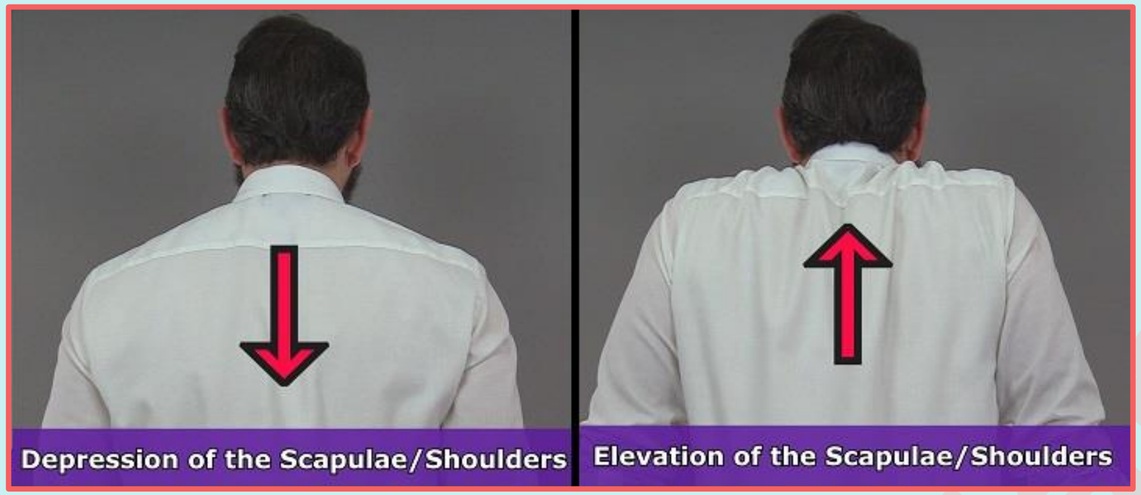
Retraction

2.3.3 Synovial Joints

➢ Types of Movements at Synovial Joints:

Elevation	An upward movement of a body part, e.g., elevation of the mandible to close the mouth, or lifting of the scapula to shrug the shoulder.
Depression	A downward movement of a body part. e.g., depression of mandible to open the mouth, or depression of the scapula to lower the shoulders.

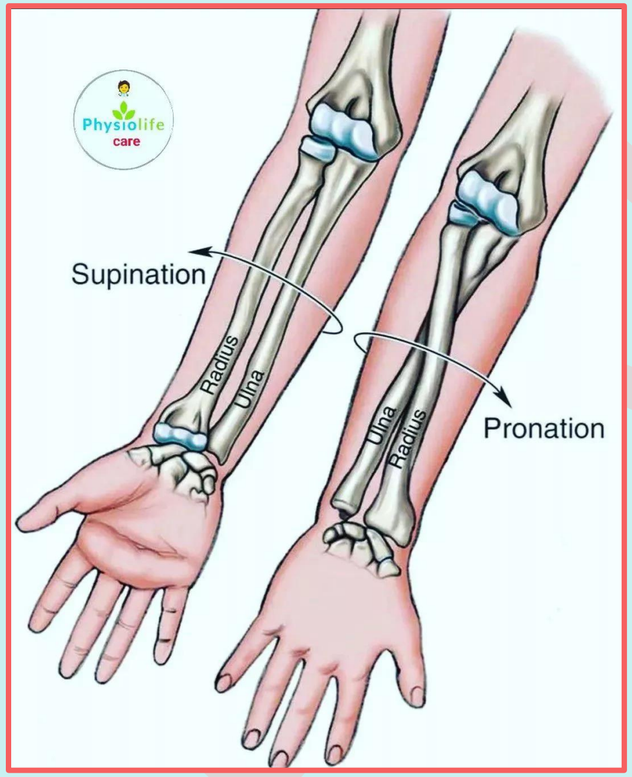


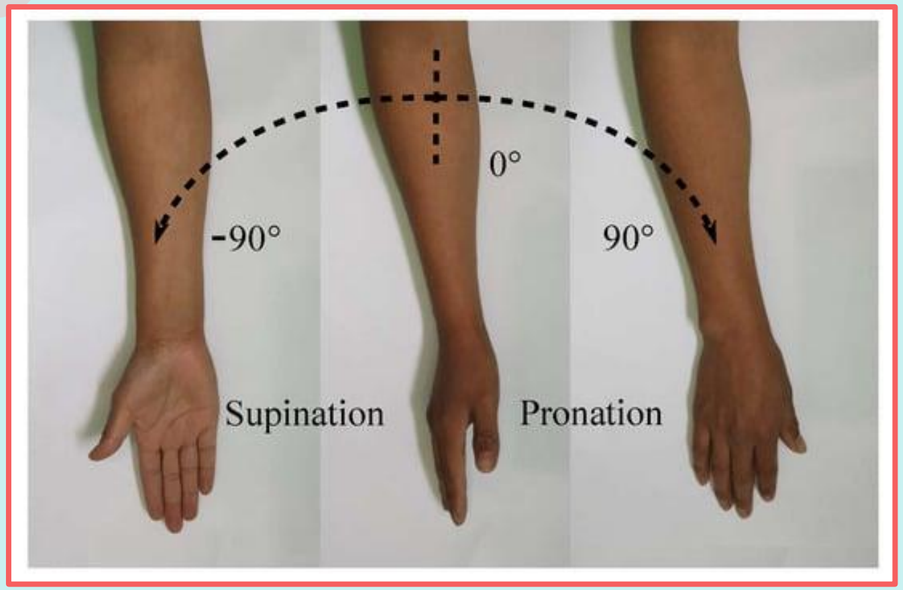


2.3.3 Synovial Joints

➢ Types of Movements at Synovial Joints:

Pronation	**A rotational movement of the forearm in which the palm faces downward (inward rotation)**
Supination	**A rotational movement of the forearm in which the palm faces upward (outward rotation).**





2.3.3 Synovial Joints

➢ Types of Movements at Synovial Joints:

Opposition	**A movement of the thumb across the palm to touch the tips of the fingers on the same hand.**

2.3.3 Synovial Joints

➢ Types of Movements at Synovial Joints:

Dorsiflexion	**A movement at the ankle joint in which the dorsum (top) of the foot moves upward toward the leg.**
Plantar Flexion	**A movement at the ankle joint in which the sole of the foot moves downward, as in pointing the toes.**

Dorsiflexion

Plantar Flexion

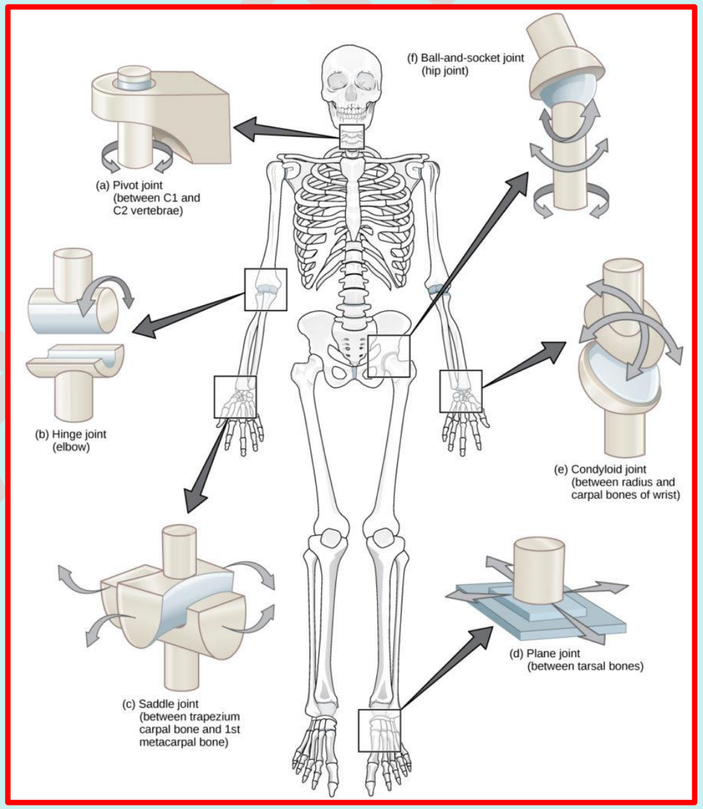
2.3.3 Synovial Joints

Gross lecture-5

Types of Synovial Joint

(based on the shape of their articular surfaces)

1. Hinge Joint.
2. Ball and Socket Joint.
3. Gliding (plane) Joint.
4. Pivot Joint.
5. Ellipsoid (condyloid) Joint.
6. Saddle Joint.



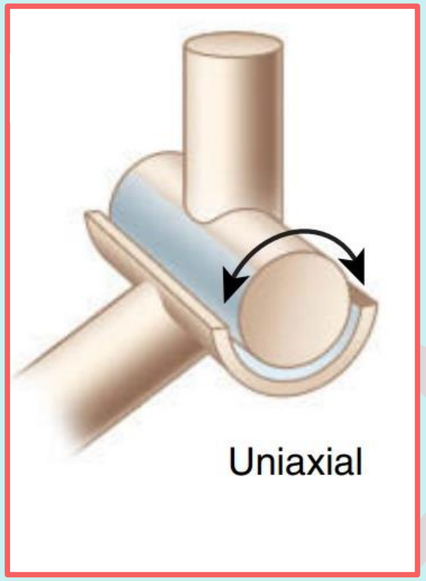
2.3.3

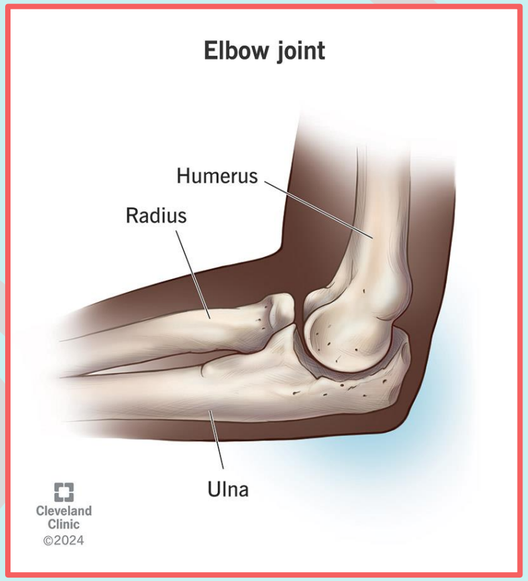
Synovial Joints

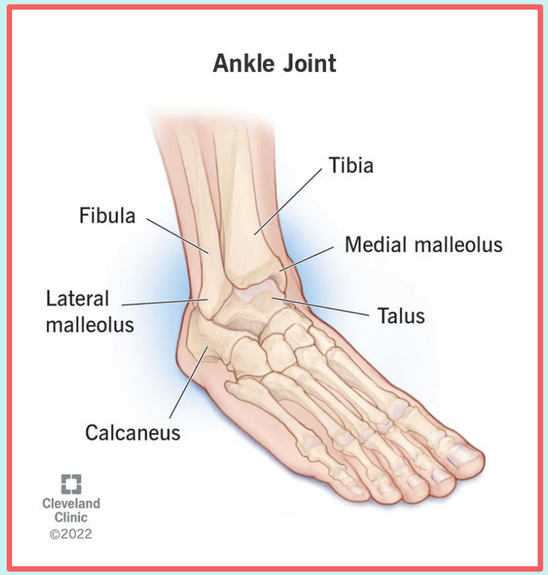
Gross lecture-5

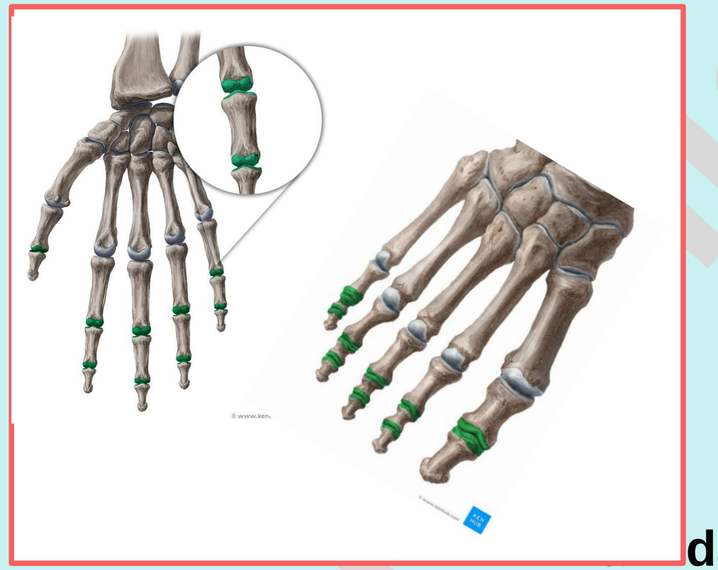
Types of Synovial Joint:

1. Hinge Joint	
Description	• The convex surface of one bone fits into the concave surface of another.
Movement	• As the name implies, allows movement primarily in one plane (uniaxial), flexion and extension, similar to the motion of a hinged door.
Example	• Elbow joint • Ankle joint • Interphalangeal joints









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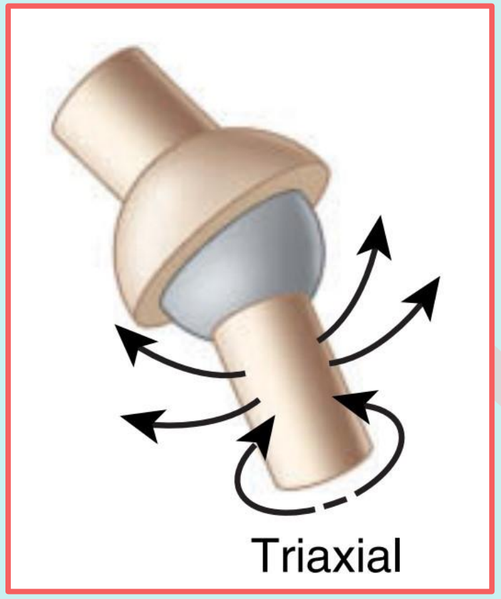
2.3.3

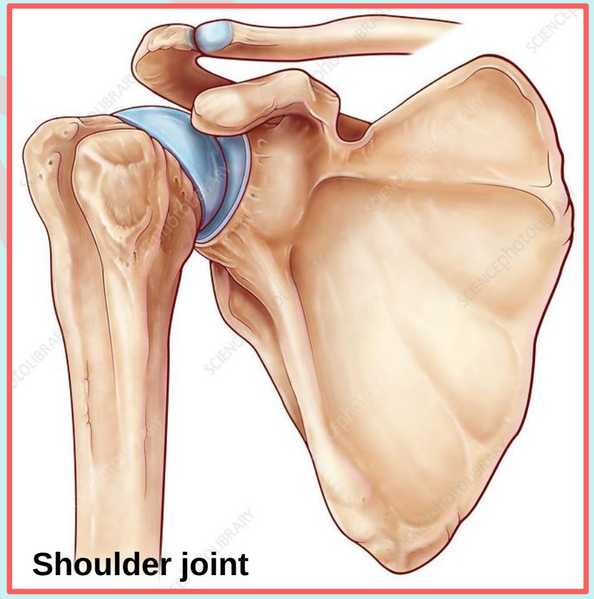
Synovial Joints

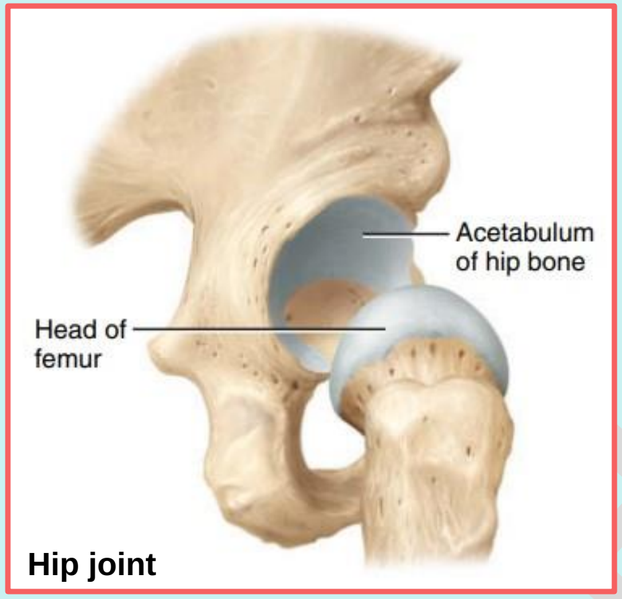
Gross lecture-5

Types of Synovial Joint:

2. Ball and Socket Joint	
Description	• A rounded, convex surface of one bone fits into the cup-like socket of another.
Movement	• Allows movement around three axes (triaxial): flexion–extension, abduction–adduction, and rotation.
Example	• Shoulder joint. • Hip joint.




Shoulder joint



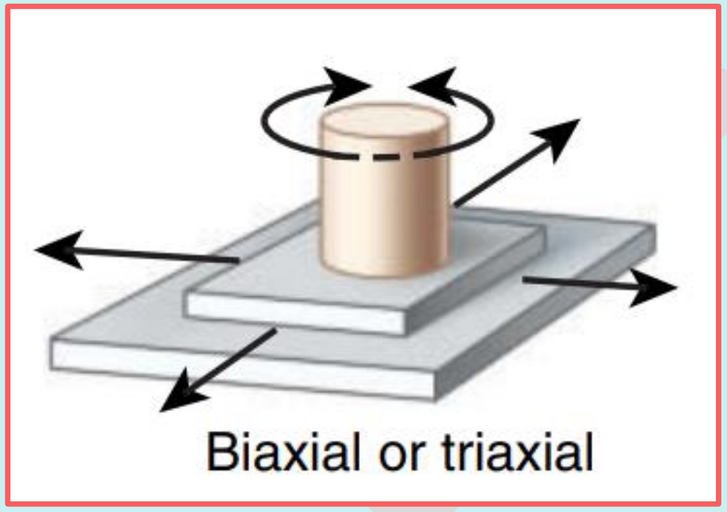
Hip joint

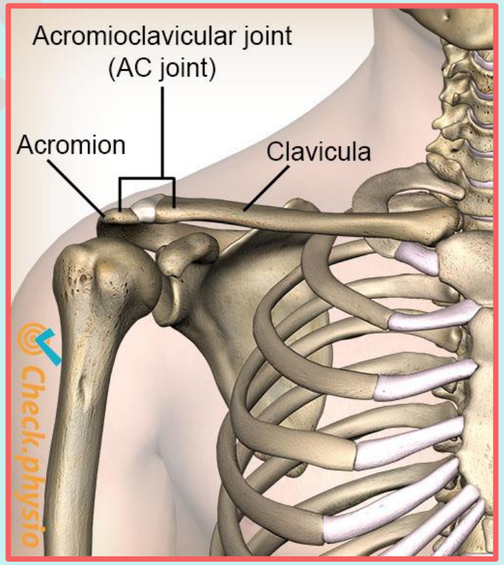
2.3.3 Synovial Joints

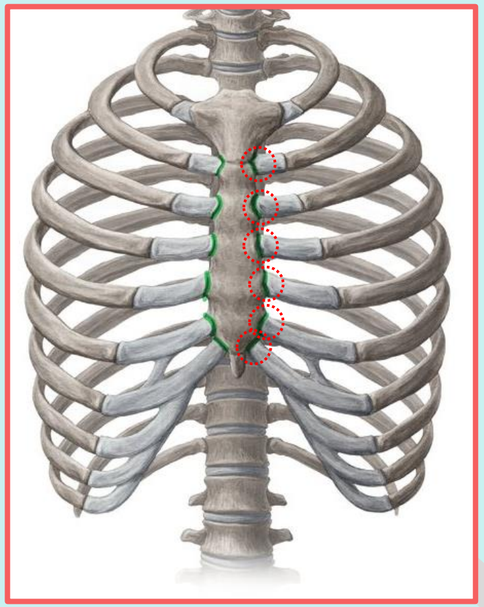
➢ Types of Synovial Joint:

3. Gliding (plane) Joint

Description	• The articular surfaces are nearly flat, allowing bones to glide over one another.
Movement	• Permits sliding or gliding movements in several directions, including side-to-side and back-and-forth, with slight rotation.
Example	• Acromioclavicular joints (between the acromion of the scapula and the clavicle) • 2nd - 7th costosternal joints (between the 2nd - 7th costal cartilages and sternum)



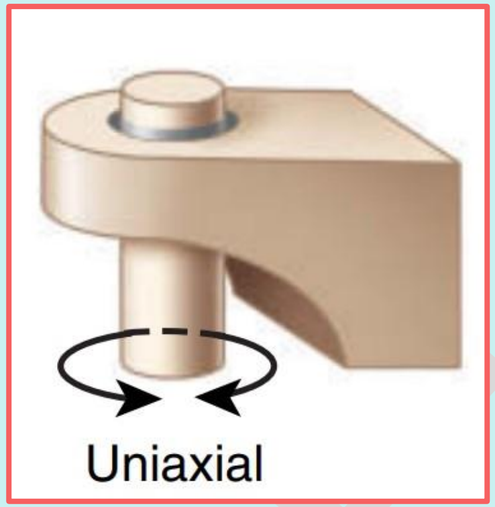


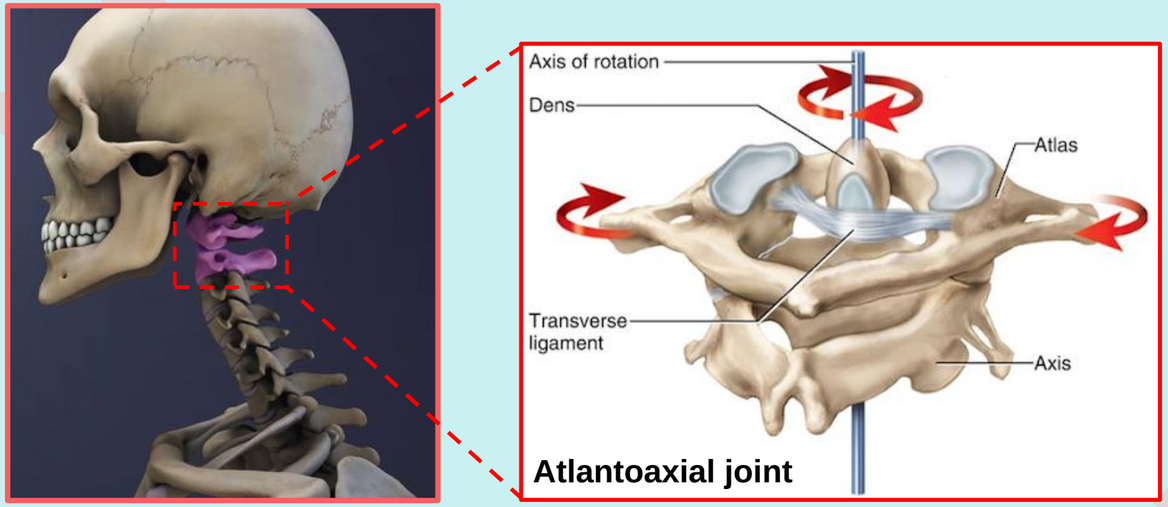


2.3.3 Synovial Joints

➢ Types of Synovial Joint:

4. Pivot Joint	
Description	• A rounded or pointed surface of one bone articulates with a ring formed by another bone and a ligament.
Movement	• Allows rotation around its longitudinal axis (uniaxial).
Example	• Atlantoaxial joint (between the atlas and axis vertebrae).



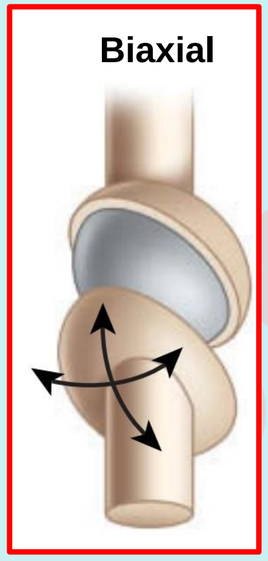


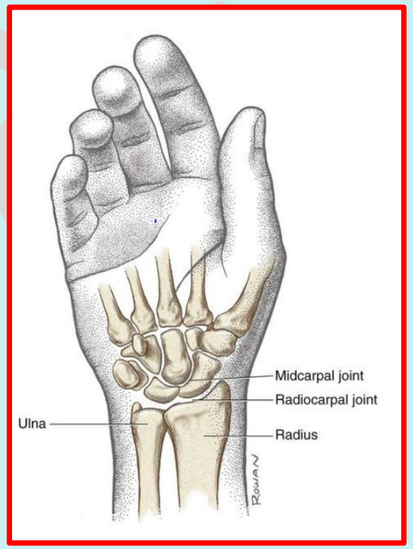
2.3.3 Synovial Joints

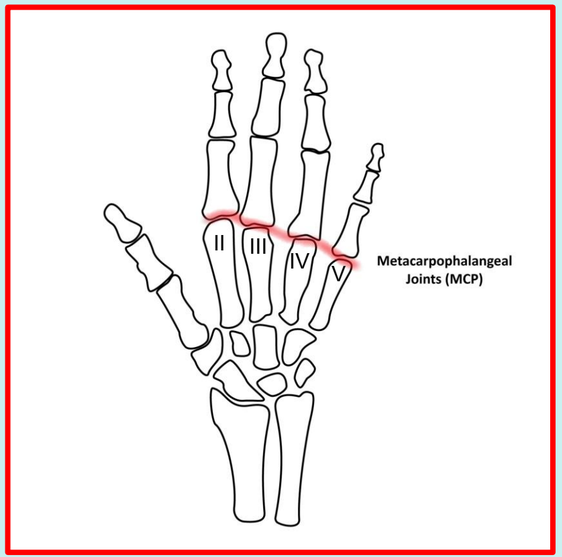
➢ Types of Synovial Joint:

5. Ellipsoid (condyloid) Joint

Description	• The oval (elliptical) convex surface of one bone fits into the elliptical concave surface of another.
Movement	• Permits movement in two planes (biaxial): - Flexion and extension around a transverse axis. - Abduction and adduction around an anteroposterior axis.
Example	• Wrist joint (radiocarpal joint) • Metacarpophalangeal joints between the metacarpals and proximal phalanges of digits II–V.





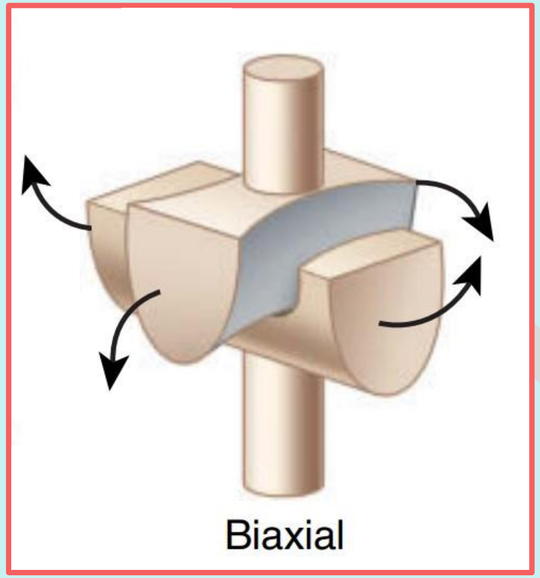


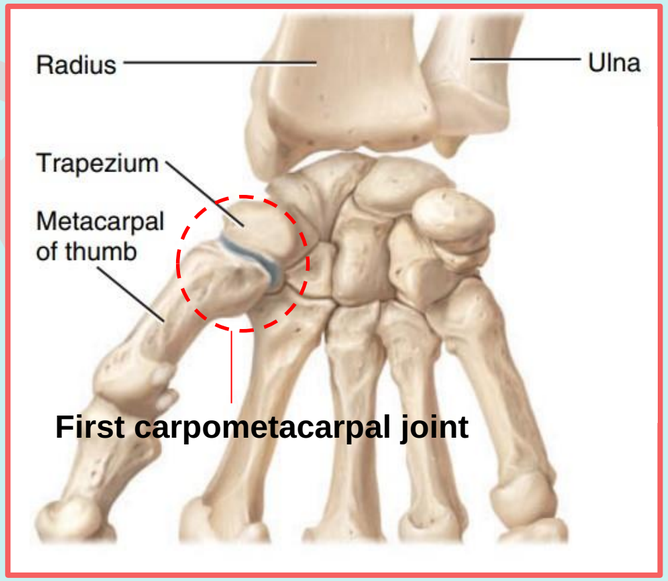
Synovial Joints

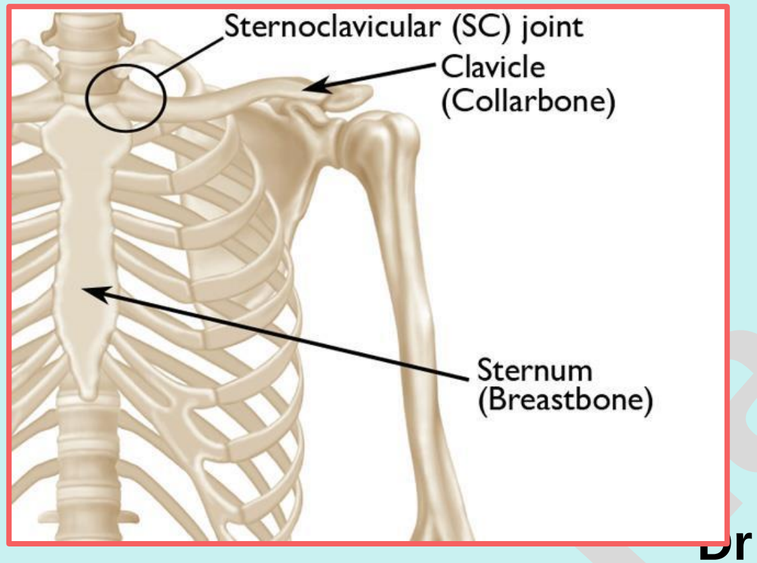
Types of Synovial Joint:

6. Saddle Joint

Description	• The articular surface of one bone is saddle-shaped, while the surface of the other bone fits into it like a rider on a saddle.
Movement	• Biaxial (flexion–extension and abduction–adduction) with limited circumduction.
Example	• First carpometacarpal joint (at the thumb): between the trapezium of the carpus and metacarpal of the thumb • Sternoclavicular joints (between the manubrium of the sternum and the clavicle)



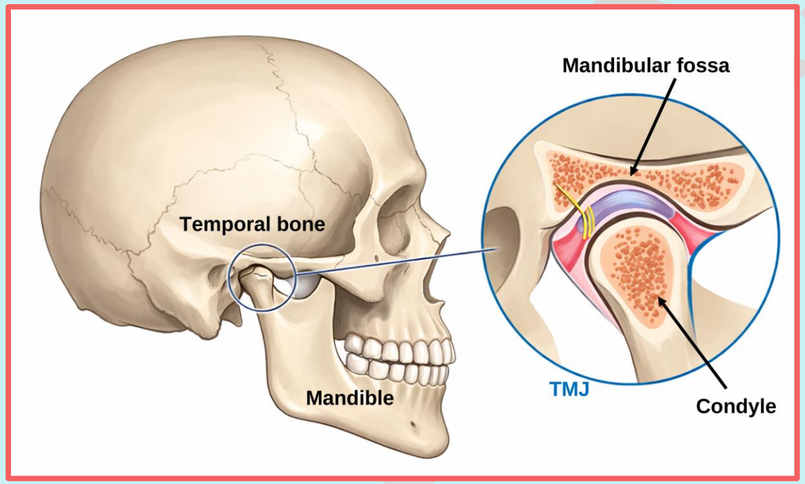




2.3.3 Synovial Joints

➢ Examples of Major Synovial Joints

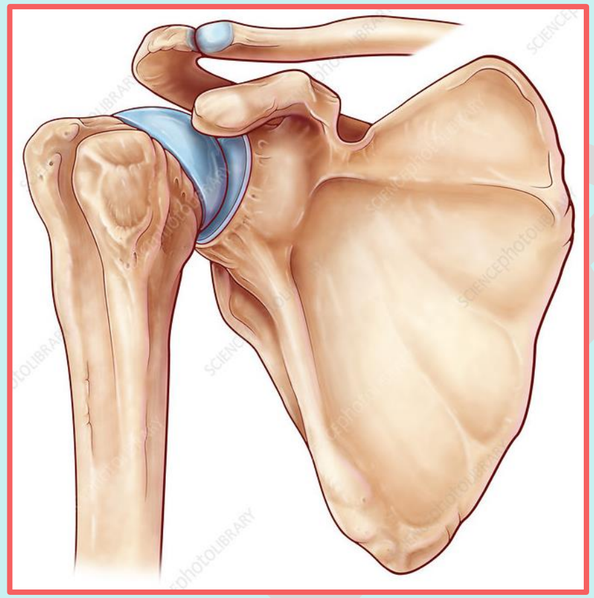
Temporo-Mandibular Joint (TMJ)	
Articulation	• Formed by the condylar process of the mandible and the mandibular fossa of temporal bone.
Type	• A combined hinge and plane joint. • It is the only freely movable joint between skull bones.
Movements	• Depression (jaw opening) and elevation (jaw closing). • Protraction (moving the mandible forward) and Retraction (moving the mandible backward). • Lateral (side-to-side) movement – moving the jaw left and right

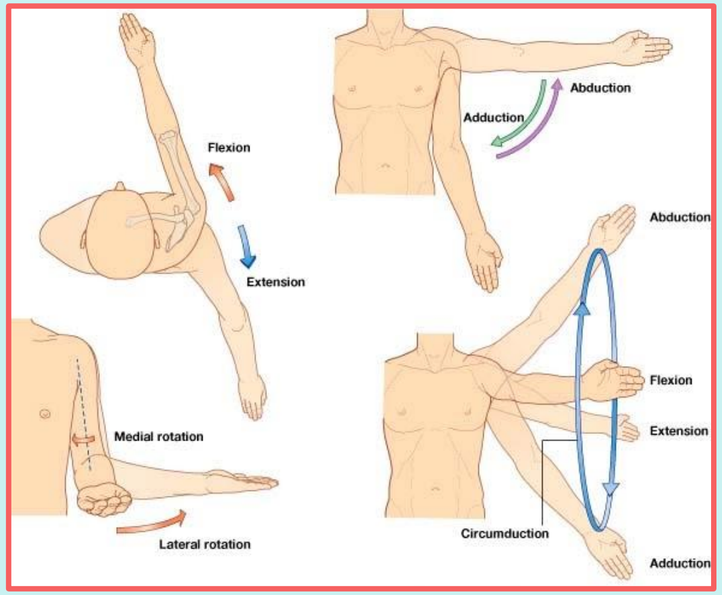


2.3.3 Synovial Joints

➢ Examples of Major Synovial Joints

Shoulder Joint	
Articulation	• Formed by the head of the humerus and the glenoid cavity of the scapula.
Type	• A ball-and-socket joint.
Movements	• Flexion, extension, hyperextension, abduction, adduction, medial rotation, lateral rotation, and circumduction of the arm.





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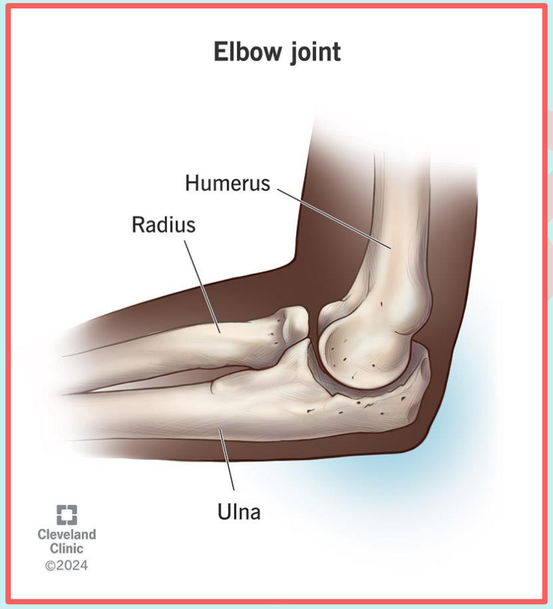
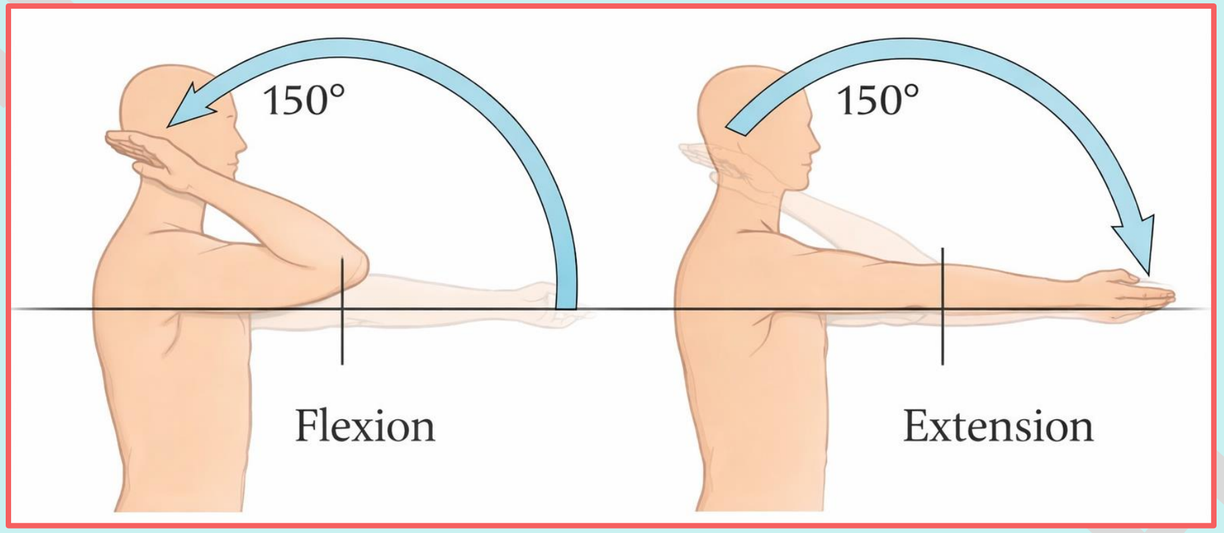
Synovial Joints

➢ Examples of Major Synovial Joints

Elbow Joint	
Articulation	• Formed by the humerus, ulna, and radius. trochlea and capitulum of the humerus, the trochlear notch of the ulna, and the head of the radius
Type	• A hinge joint.
Movements	• Flexion and extension of the forearm.

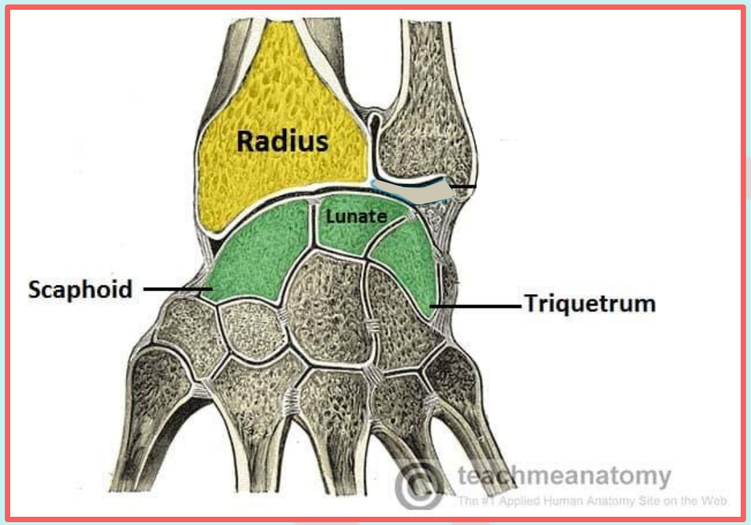


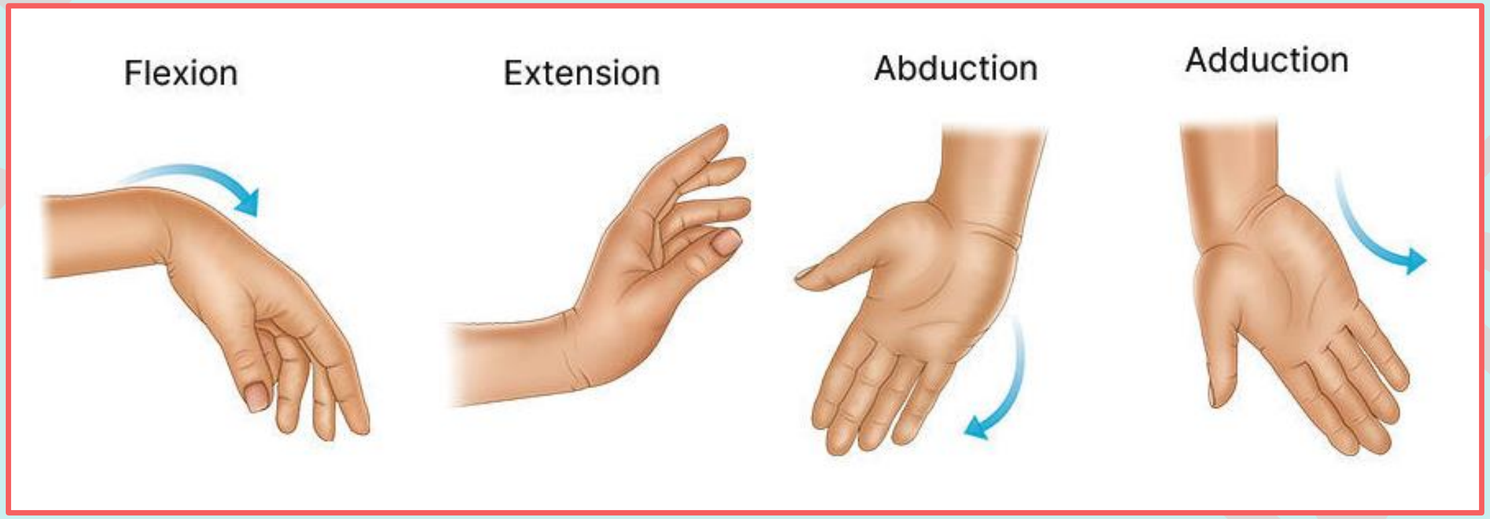


2.3.3 Synovial Joints

➢ Examples of Major Synovial Joints

Wrist Joint	
Articulation	• Formed by distal end of the radius and carpal bones (scaphoid, lunate, and triquetrum)
Type	• Ellipsoid (Condyloid) joint
Movements	• Flexion, extension, abduction, and adduction of the hand





2.3.3

Synovial Joints

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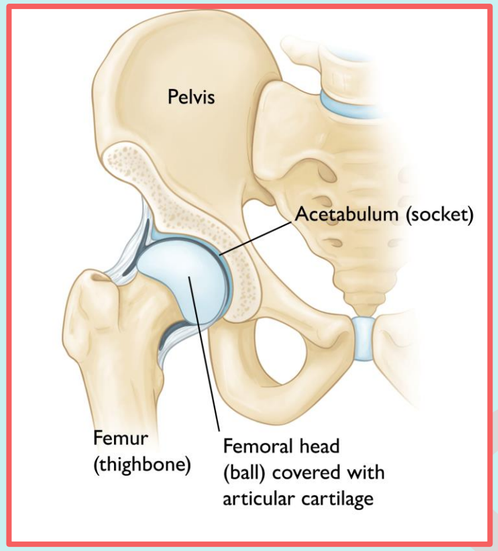
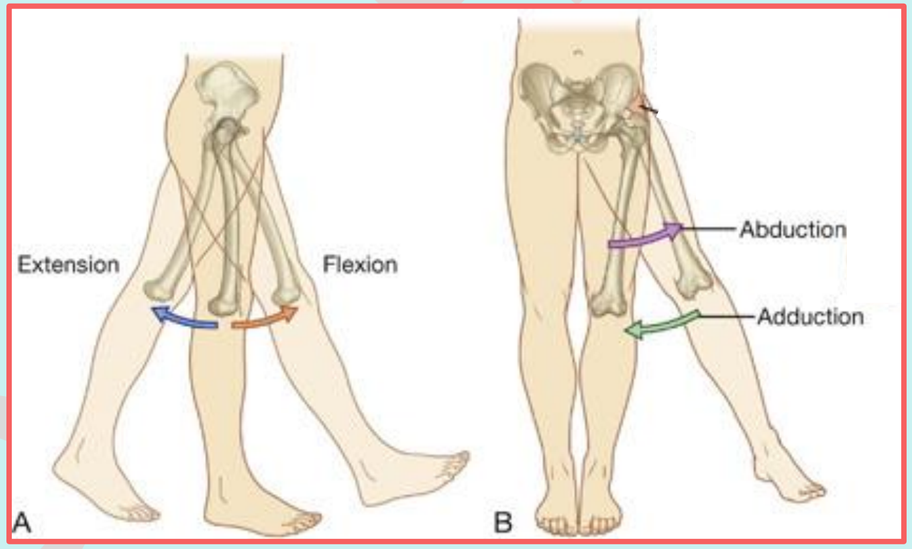
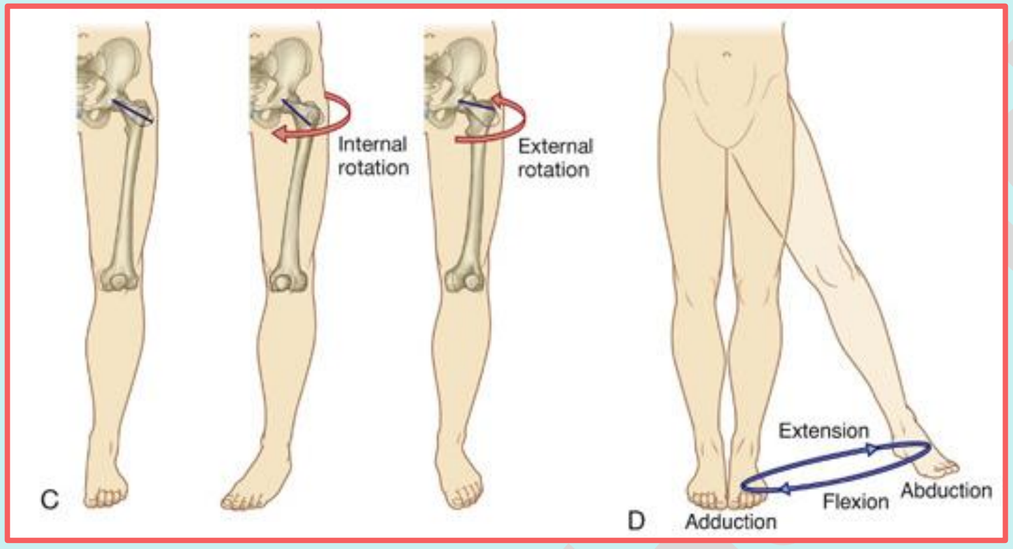
➢ Examples of Major Synovial Joints

Hip Joint	
Articulation	• Formed by the head of the femur and the acetabulum of the hip bone.
Type	• A ball-and-socket joint.
Movements	• Flexion, extension, abduction, adduction, medial rotation, lateral rotation, and circumduction of the thigh.







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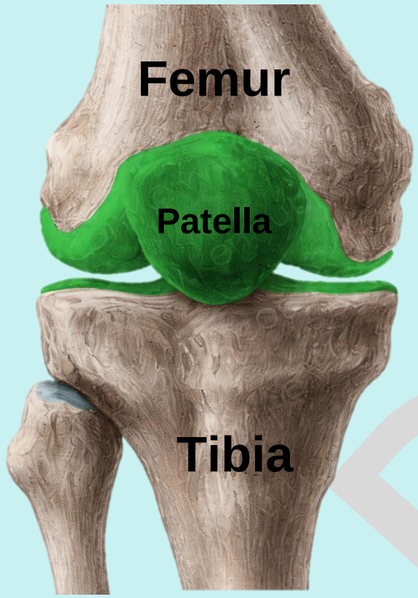
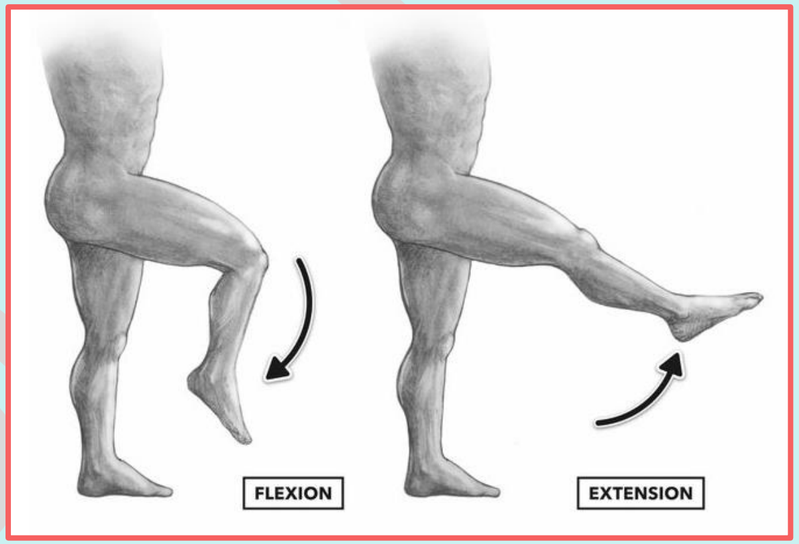
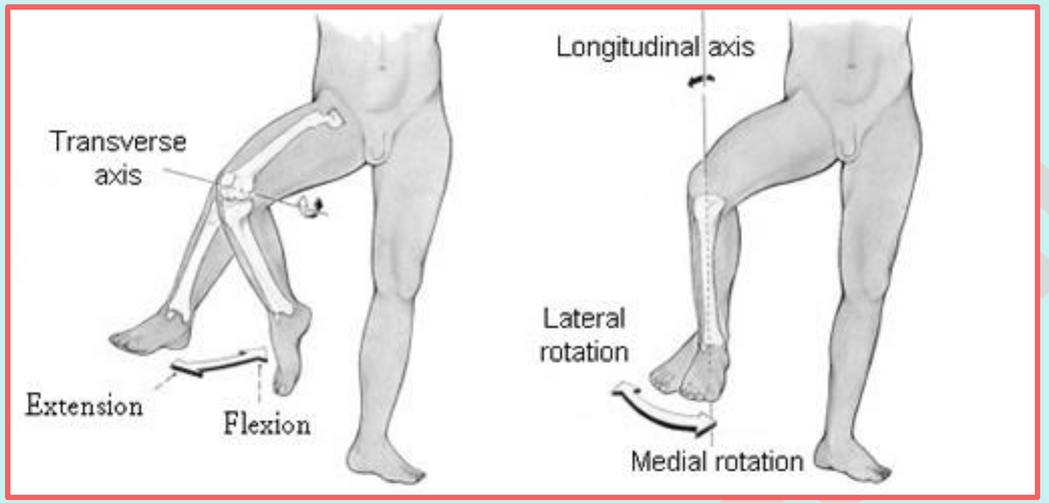
2.3.3 Synovial Joints

➢ Examples of Major Synovial Joints

Knee Joint	
Articulation	• Formed by the distal end of the femur, the proximal end of the tibia, and Posterior surface of the Patella with the femur
Type	• A modified hinge joint.
Movements	• Flexion, extension, and slight medial and lateral rotation of the leg (in the flexed position).



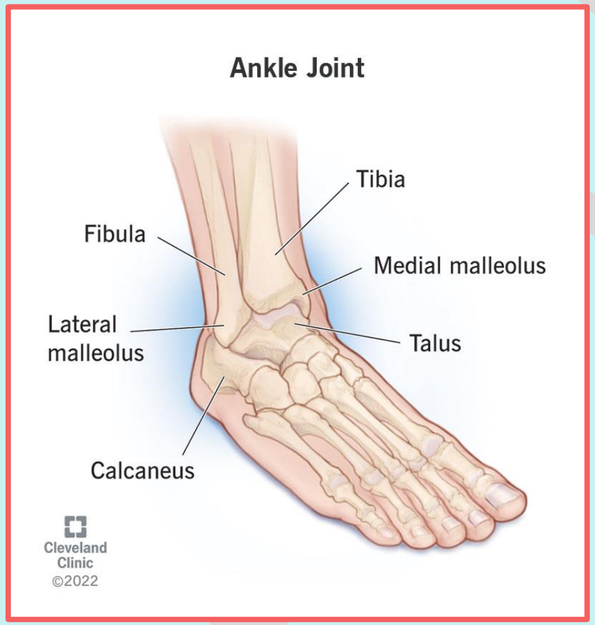


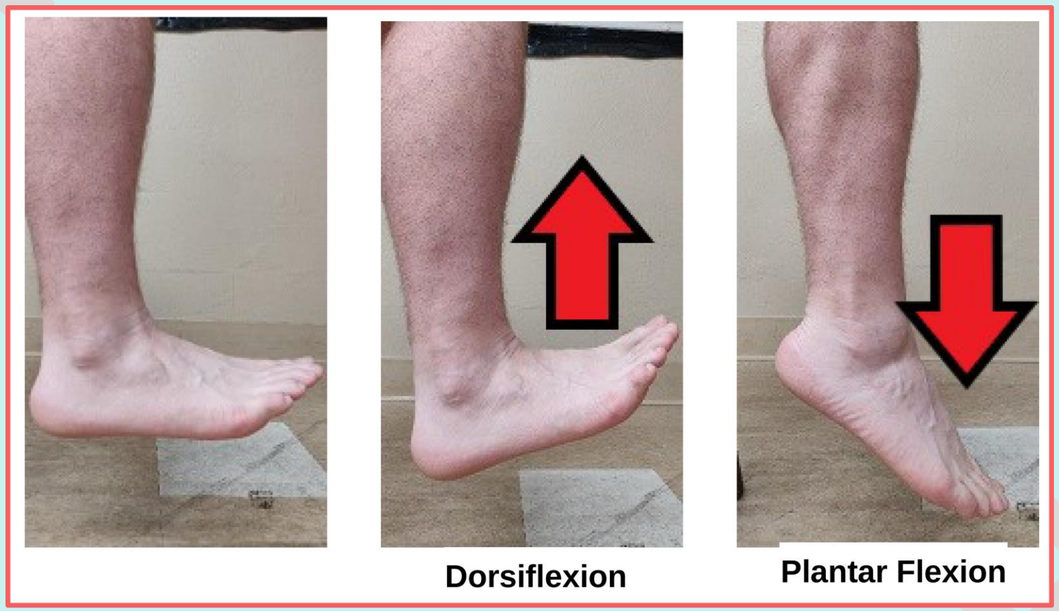


2.3.3 Synovial Joints

➢ Examples of Major Synovial Joints

Ankle Joint	
Articulation	• Formed by the distal ends of the tibia and fibula with the talus bone of the foot.
Type	• A hinge joint
Movements	• Dorsiflexion (bending the foot upward) • Plantar flexion (pointing the foot downward).





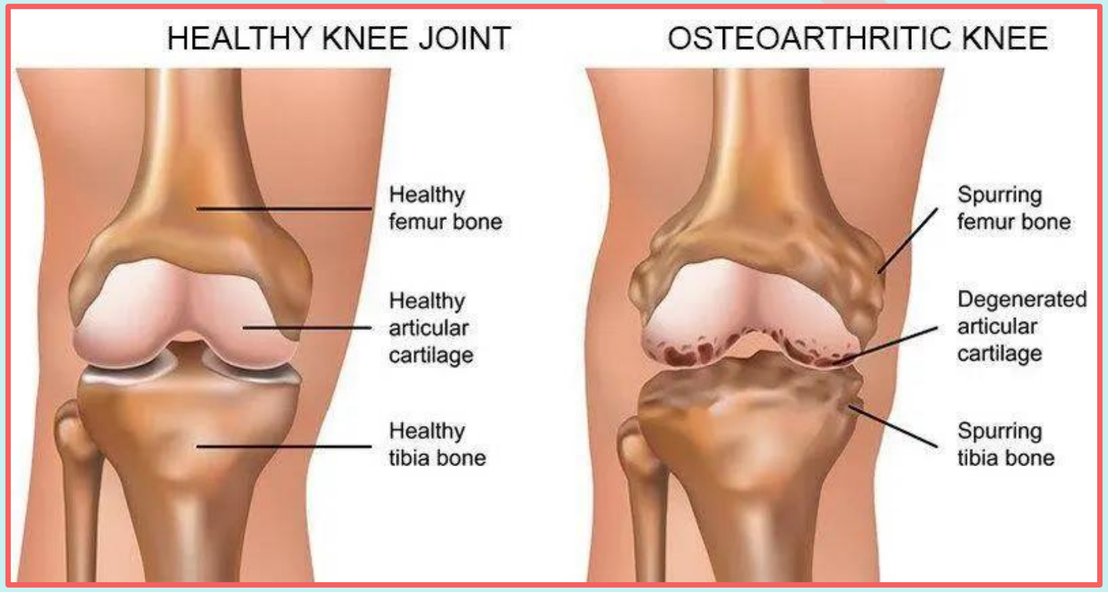
Synovial Joints

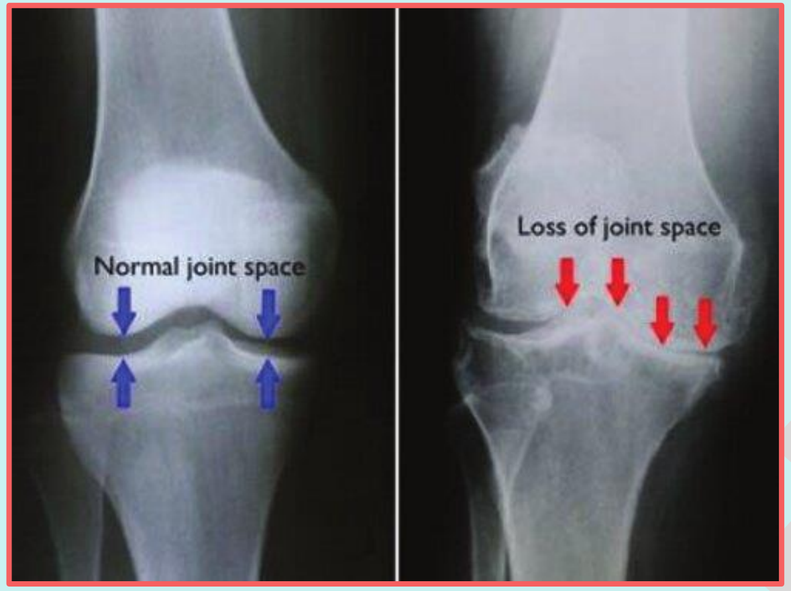
Clinical Correlation

Gross lecture-5

Osteoarthritis

- A degenerative disorder of synovial joints in which the articular cartilage is damaged, allowing the articular surfaces of bones to come into contact.
- As the bones degenerate, abnormal bone repair occurs, resulting in irregular and misshapen articular surfaces, leading to pain and restricted movement.
- It most commonly affects large weight-bearing joints, such as the hip and knee joints.



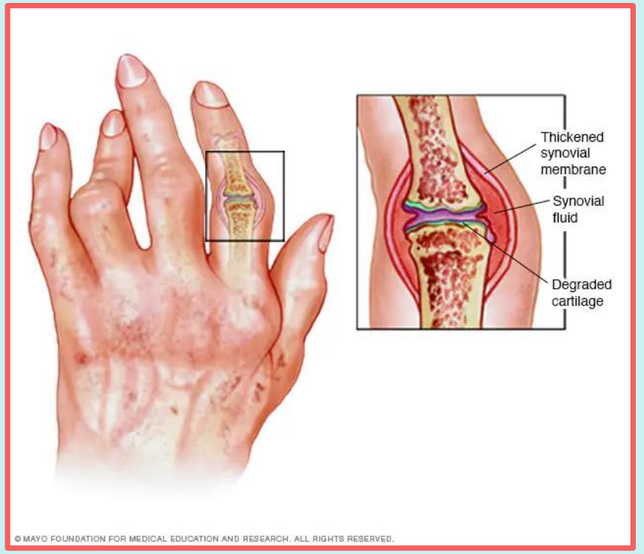


Synovial Joints

Clinical Correlation

Rheumatoid Arthritis

- A chronic, progressive, inflammatory autoimmune disease that primarily involves the synovial membrane of joints.
- It is characterized by pain, swelling, stiffness, and loss of joint function.
- The inflammation leads to thickening of synovial membrane, damage of cartilage and bone, and joint deformity.
- It commonly affects small joints of hands and feet.



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