

The Joint System

Arthrology & Skeletal Connections

Objectives	Course Plan
<ul style="list-style-type: none">• Define a joint• Understand its functions• Classify joints	<ol style="list-style-type: none">1. Introduction & Definition2. Embryological Review3. Classification (Functional & Morphological)4. Joint Adaptation Structures5. Joint Physiology6. Pathologies & Examination

Introduction & Definition

Definitions

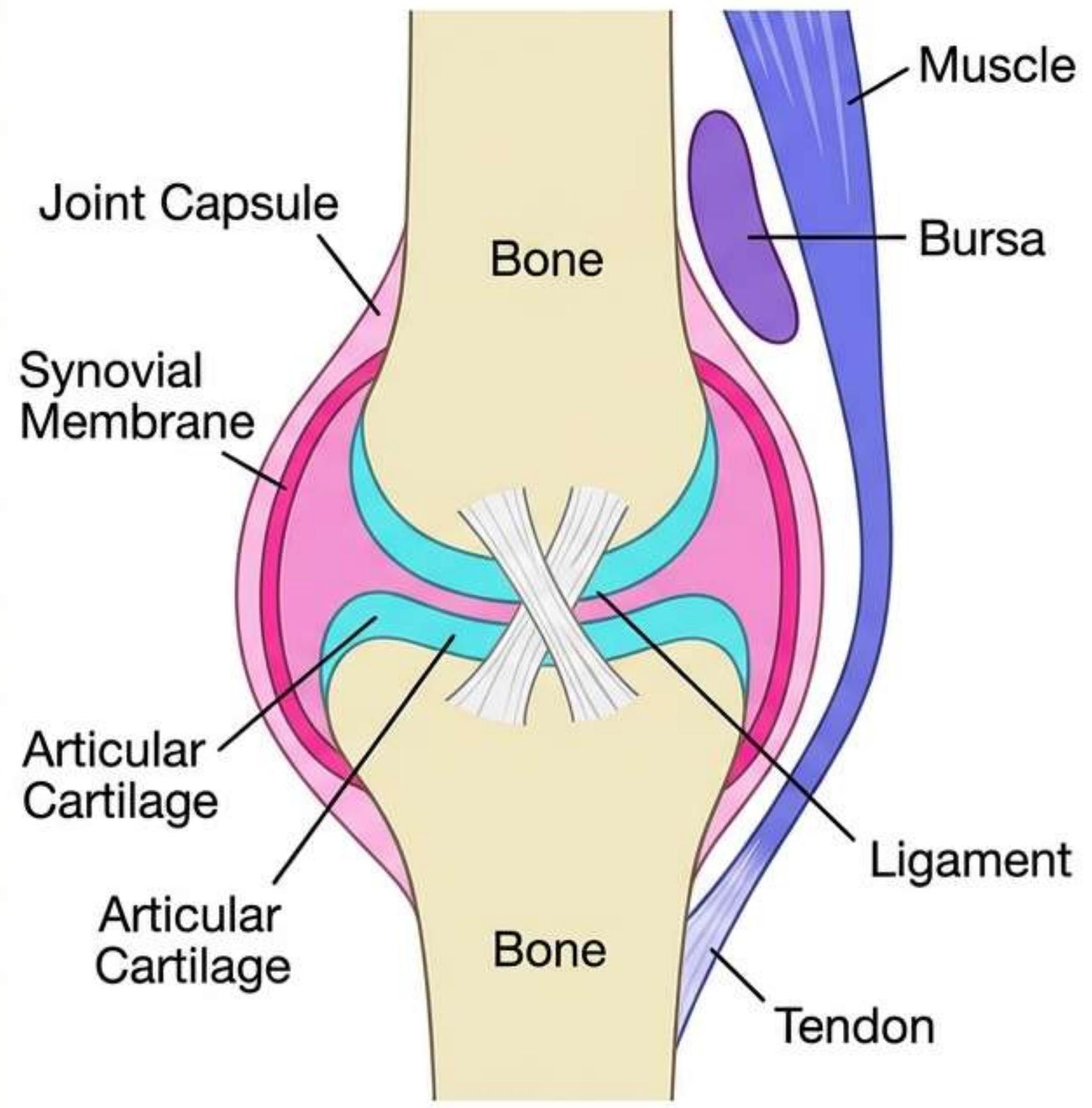
Joint: The set of fibro-cartilaginous formations that join two or more bones together. Also referred to as articulations. It is the organ that connects one or more parts of the skeleton or between a bone and a tooth. [Ref: Q17] [Ref: Q24]

Arthrology: [Greek: *arthron* = joint; *logia* = theory] The science that studies joints.

Functions & Characteristics

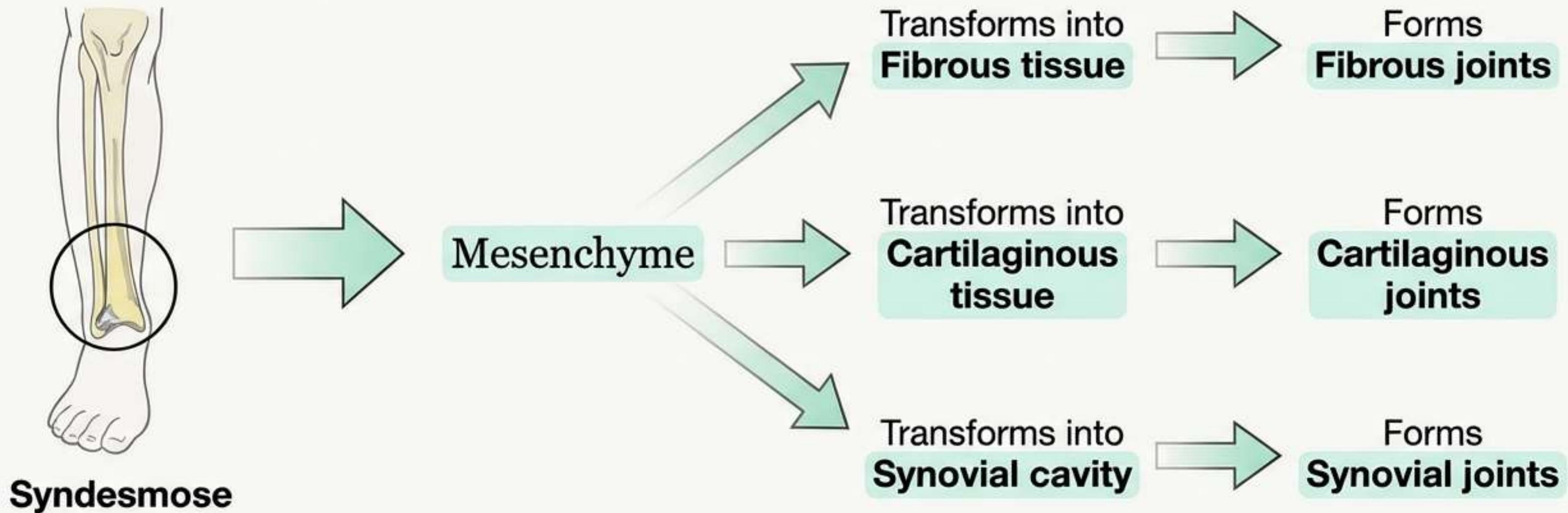
Essential Functions: Mobility and Protection. [Ref: Q18]

They are the weakest components of the skeleton.



Embryological Reminder

Joints form from the fifth week of gestation.



Classification Systems

Classification Systems

1. Functional (Mobility)

Synarthroses = Immobile joints

[Ref: Q5] [Ref: Q24]

Amphiarthroses = Semi-mobile joints

[Ref: Q3] [Ref: Q6] [Ref: Q19] [Ref: Q22]

Diarthroses = Mobile joints

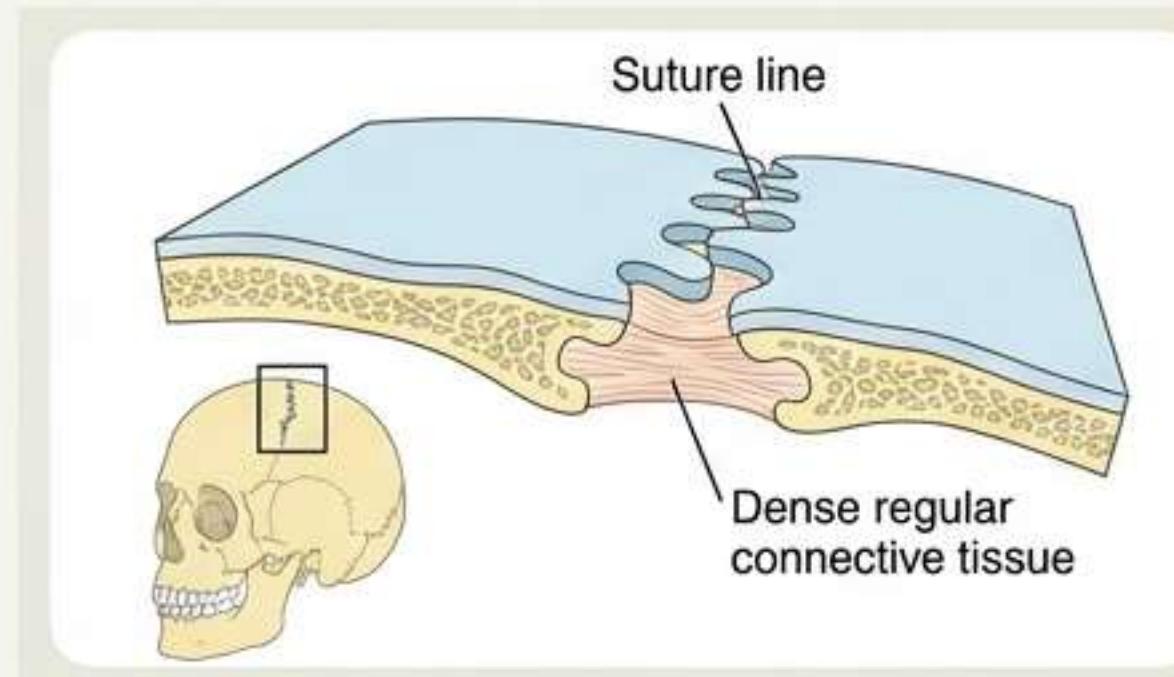
[Ref: Q4] [Ref: Q7] [Ref: Q21] [Ref: Q25]

2. Morphological (Structure)

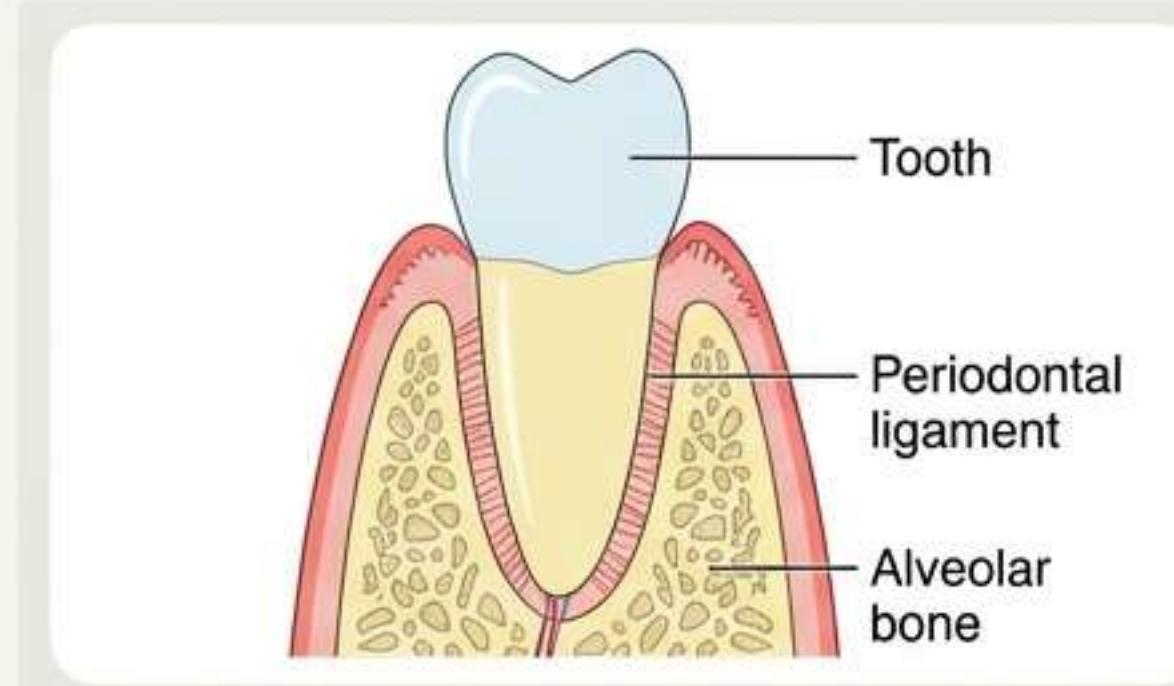
- **Fibrous:** Composed of fibrous tissue.
- **Cartilaginous:** Composed of hyaline cartilage or fibrocartilage.
- **Synovial:** Composed of a joint cavity containing synovial fluid.

Morphological Types: Fibrous Joints

Definition: A fibrous joint is composed of fibrous tissue. [Ref: Q9]



Sutures: Union of two bones through the interposition of fibrous tissue. [Ref: Q9]



Gomphosis: Union of a tooth to an alveolus by fibrous tissue. [Ref: Q2] [Ref: Q9] [Ref: Q14]

Morphological Types: Cartilaginous Joints

Composed of hyaline cartilage or fibrocartilage. [Ref: Q10]

**Syndesmosis

- The bone surfaces are joined by a ligament.
- Presence of a crest opposite a groove.
- **Critical Note:** According to this specific lesson, Syndesmosis is classified as a *Cartilaginous* joint.



Synovial Joints (Diarthroses)

Defined by the presence of a fluid-filled **joint cavity** contained within a **fibrous capsule**.

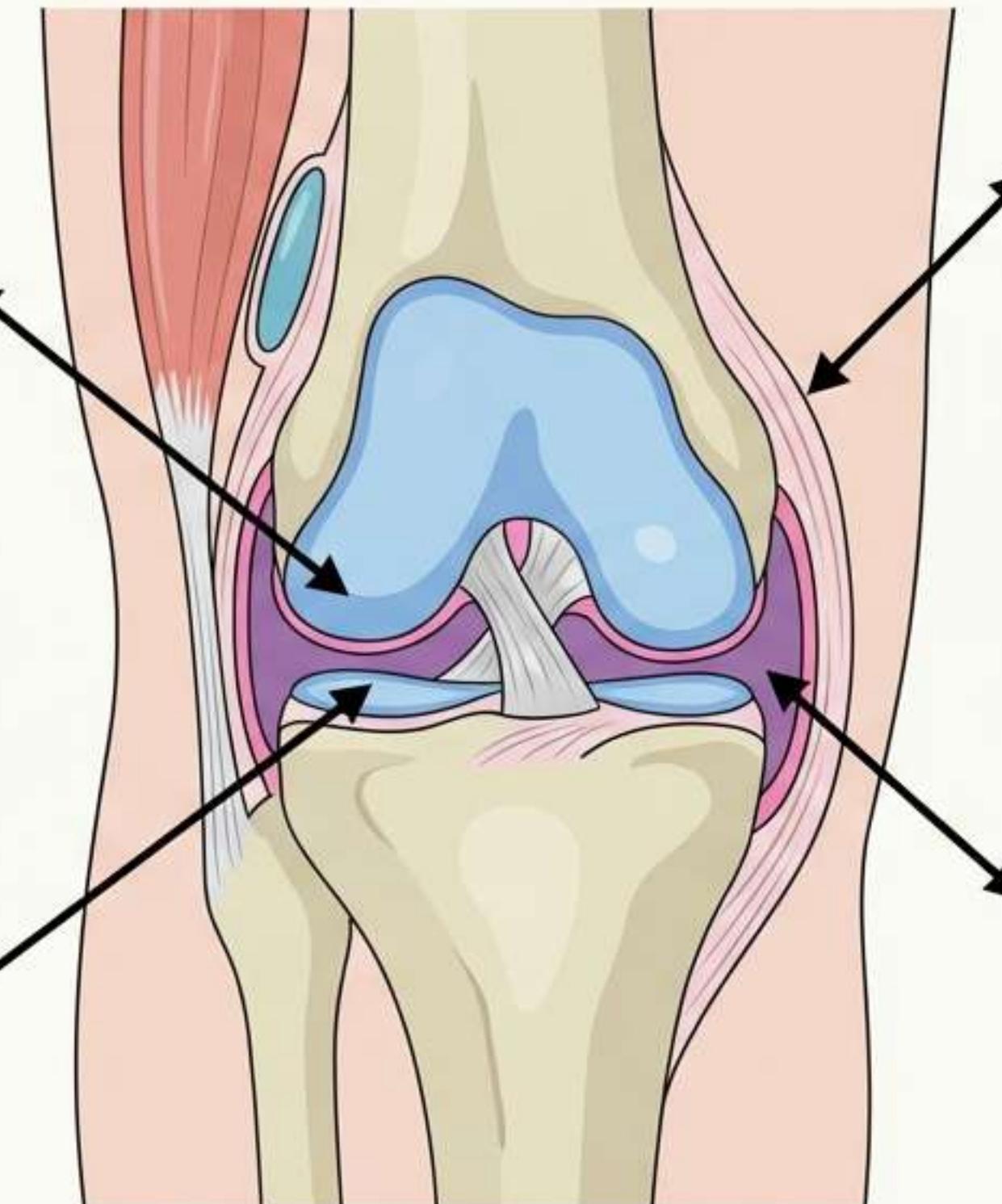
[Ref: Q4] [Ref: Q11] [Ref: Q20]
[Ref: Q23] [Ref: Q25]

Articular surfaces are **covered by cartilage**.

[Ref: Q11] [Ref: Q16]

They are **freely movable (Diarthrosis)**.

[Ref: Q4] [Ref: Q11] [Ref: Q21]

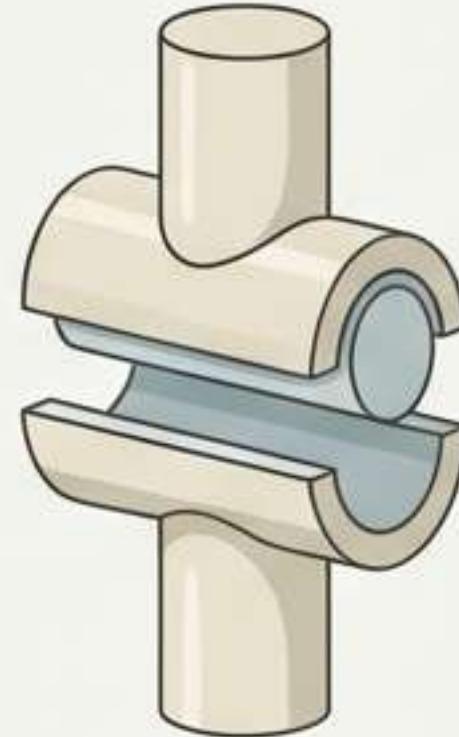


The **synovial membrane** lines the **INNER** face of the capsule.

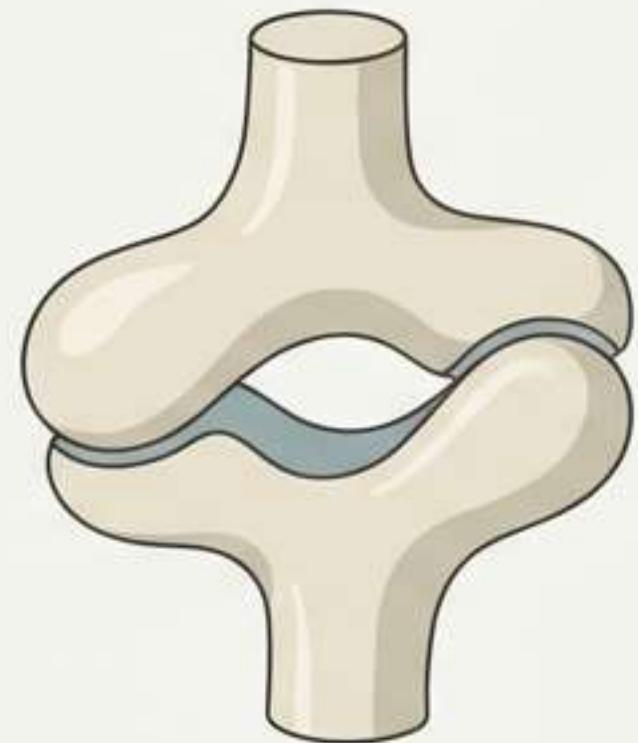
[Ref: Q4] [Ref: Q11] [Ref: Q20]

Synovial Sub-Classification (Part I)

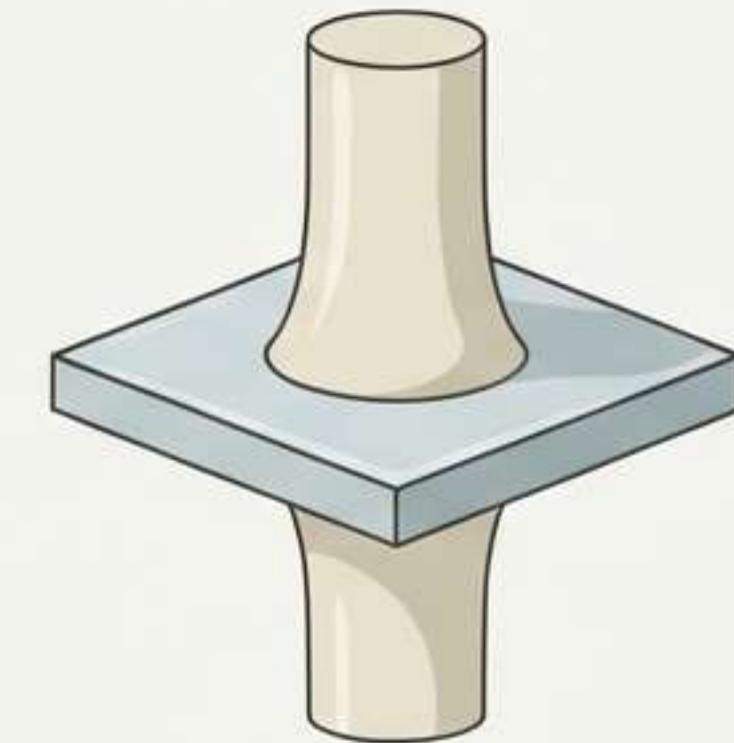
1. Hinge



2. Saddle



3. Plane



Permits movement in one plane (usually **flexion and extension**).

E.g., Elbow joint, Ankle joint, Knee joint.

Resemblance to a saddle. Characterized by opposing articular surfaces with a **reciprocal concave-convex shape**.

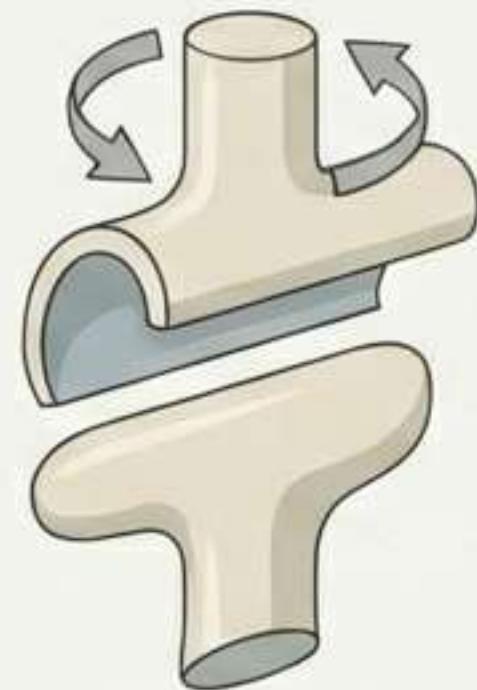
E.g., Carpometacarpal joints.

Articular surfaces are relatively flat, allowing bones to **glide** over one another.

E.g., Acromioclavicular joint, Subtalar joint.

Synovial Sub-Classification (Part II)

4. Pivot



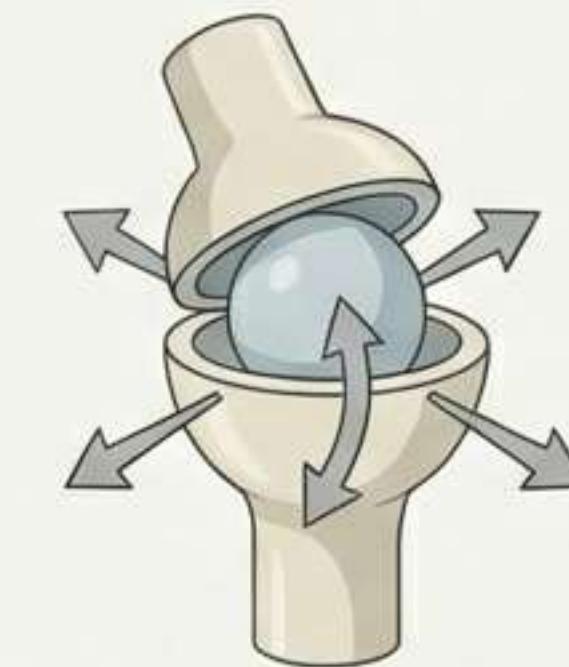
Allows for **rotation only**.
Formed by a central bony pivot surrounded by a bony-ligamentous ring.
E.g., Proximal/distal radioulnar joints.

5. Condyloid (Ellipsoid)



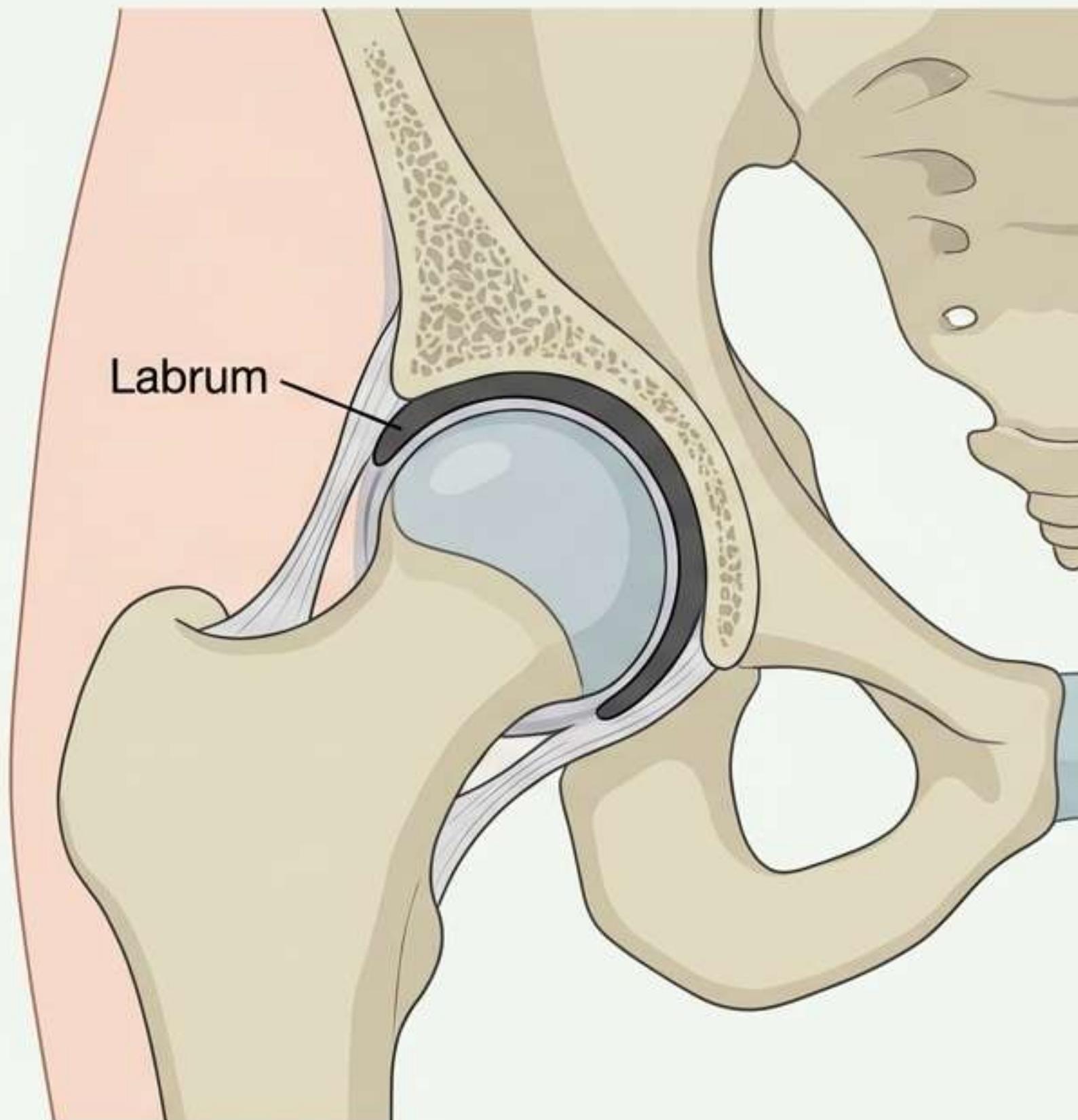
Convex surface articulates with a concave elliptical cavity.
E.g., Wrist joint.
The **Condyle** is the articular eminence. [Ref: Q8]

6. Ball and Socket (Spheroïde)



Ball-shaped surface fits into a cup-like depression.
E.g., Hip joint, Shoulder joint.
Permits free movement in **numerous axes (3 axes)**.
[Ref: Q1] [Ref: Q12]

Joint Adaptation Structures



Definition: Structures that enable joint surfaces to adapt.

1. The Labrum (Joint Rim)

Marginal ring with a triangular cross-section. Has a free surface and two adherent sides (one to capsule, one to joint surface).

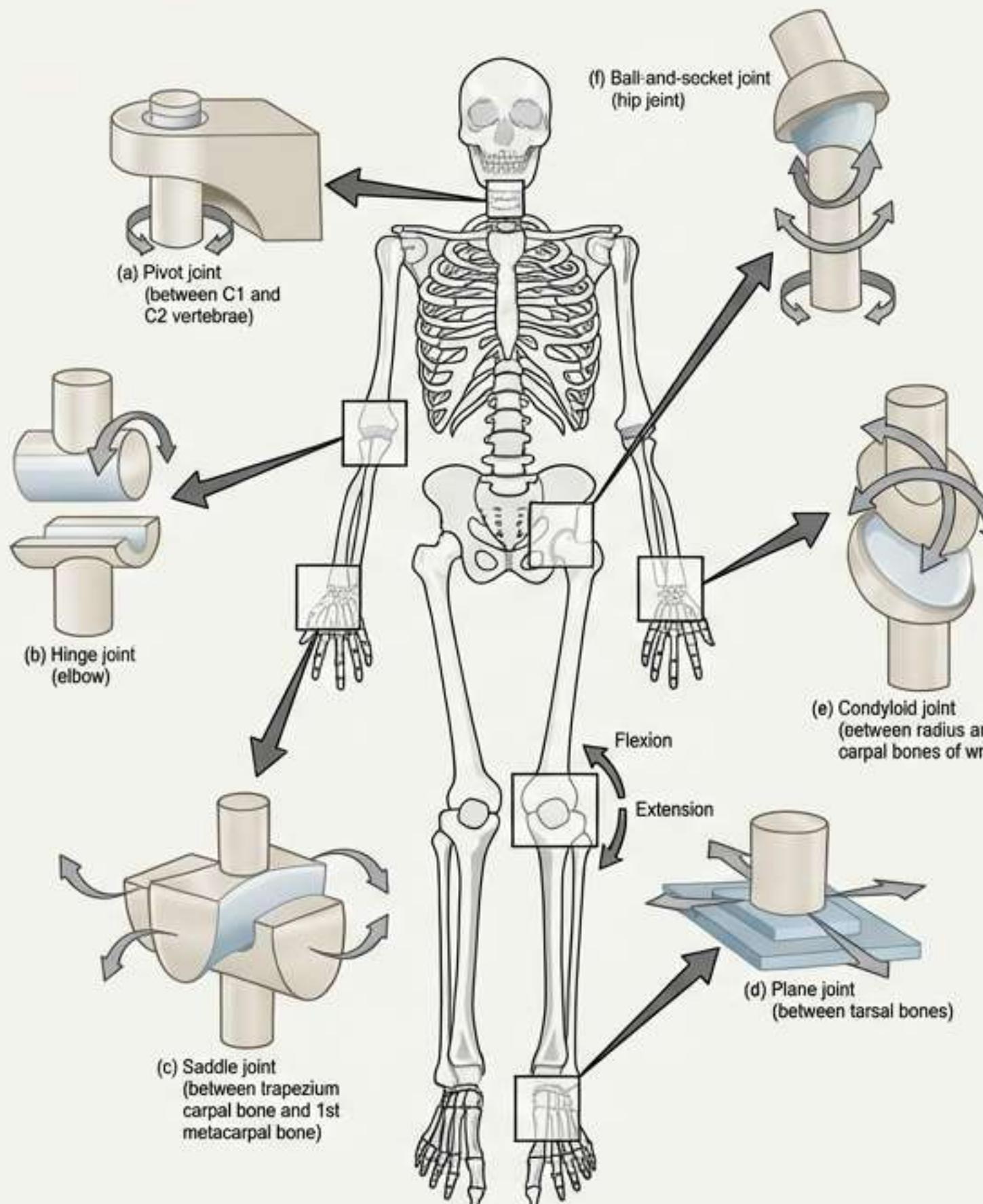
2. The Meniscus

Joint structure in the form of a **marginal ring**. [Ref: Q13]
Has two free sides and one side that adheres to the joint capsule.

3. The Disc

A partition located **inside the joint cavity**. [Ref: Q6]
Attached to the capsule by its peripheral edge.

Physiology: Simple Movements (0° to 180°)

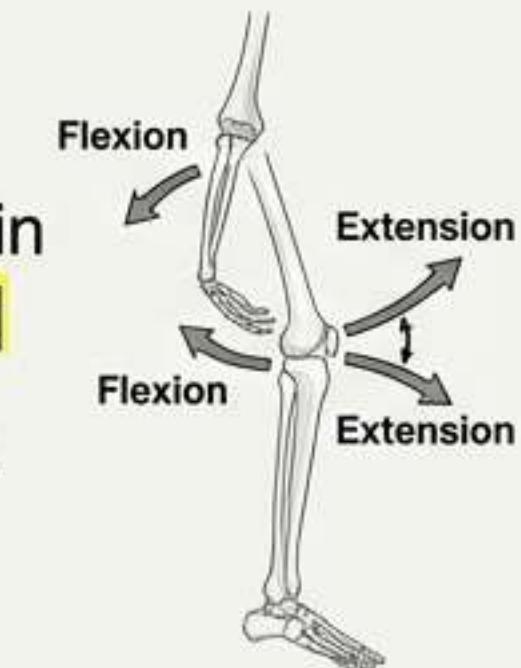


1. Flexion / Extension

→ Performed along a **Transverse axis**, in a **Sagittal plane**. [Ref: Q1] [Ref: Q26]

Flexion: Folds one part over another.

Extension: Places parts in line.



2. Adduction / Abduction

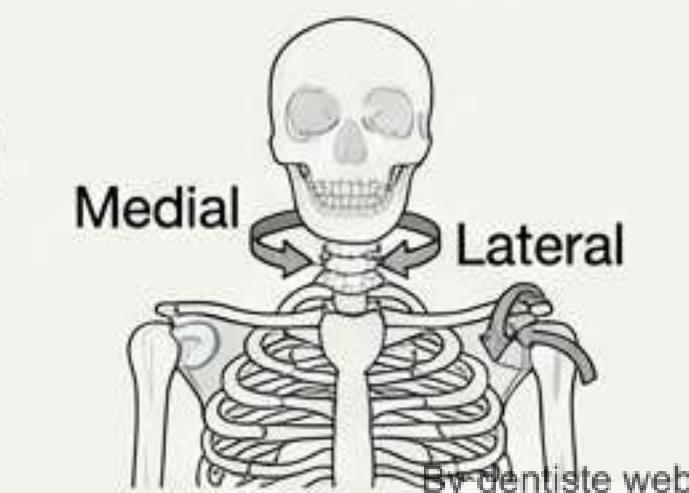
→ Performed along the **Sagittal axis**, in a **Frontal plane**.

Abduction: Moves a limb **away** from the central axis.
[Ref: Q1] [Ref: Q13]

Adduction: Brings a limb closer to the central axis.

3. Medial / Lateral Rotation

→ Performed along a **Vertical axis**, in a **Transverse plane**.



Physiology: Special & Complex Movements

Special Movements

Antepulsion: Moves limb forward (vertical axis).

Retropulsion: Brings limb back.

Prono-supination: Complex movements allowing one part of the limb to **rotate** in relation to another. [Ref: Q1]



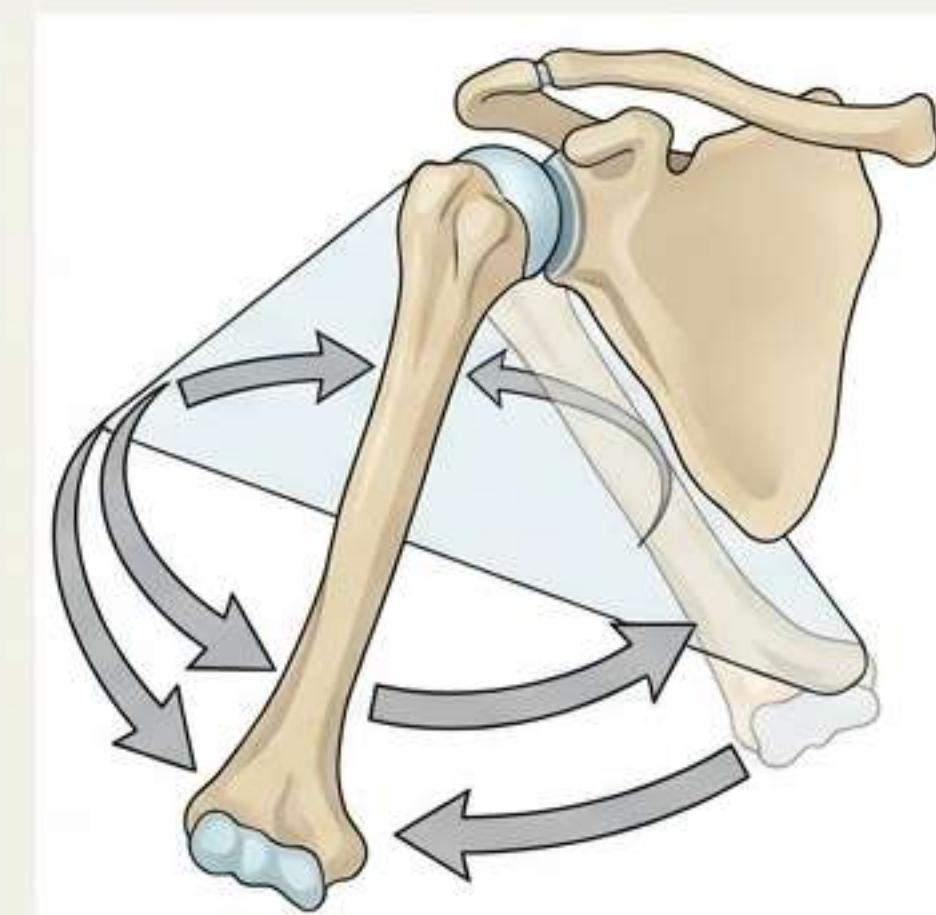
Protraction/Retraction: Anterior/posterior movements (e.g., Mandible).

Elevation/Lowering: E.g., opening/closing the mouth.

Complex Movement

Circumduction

Movement of a limb describing a **cone in space**, combining several movements.

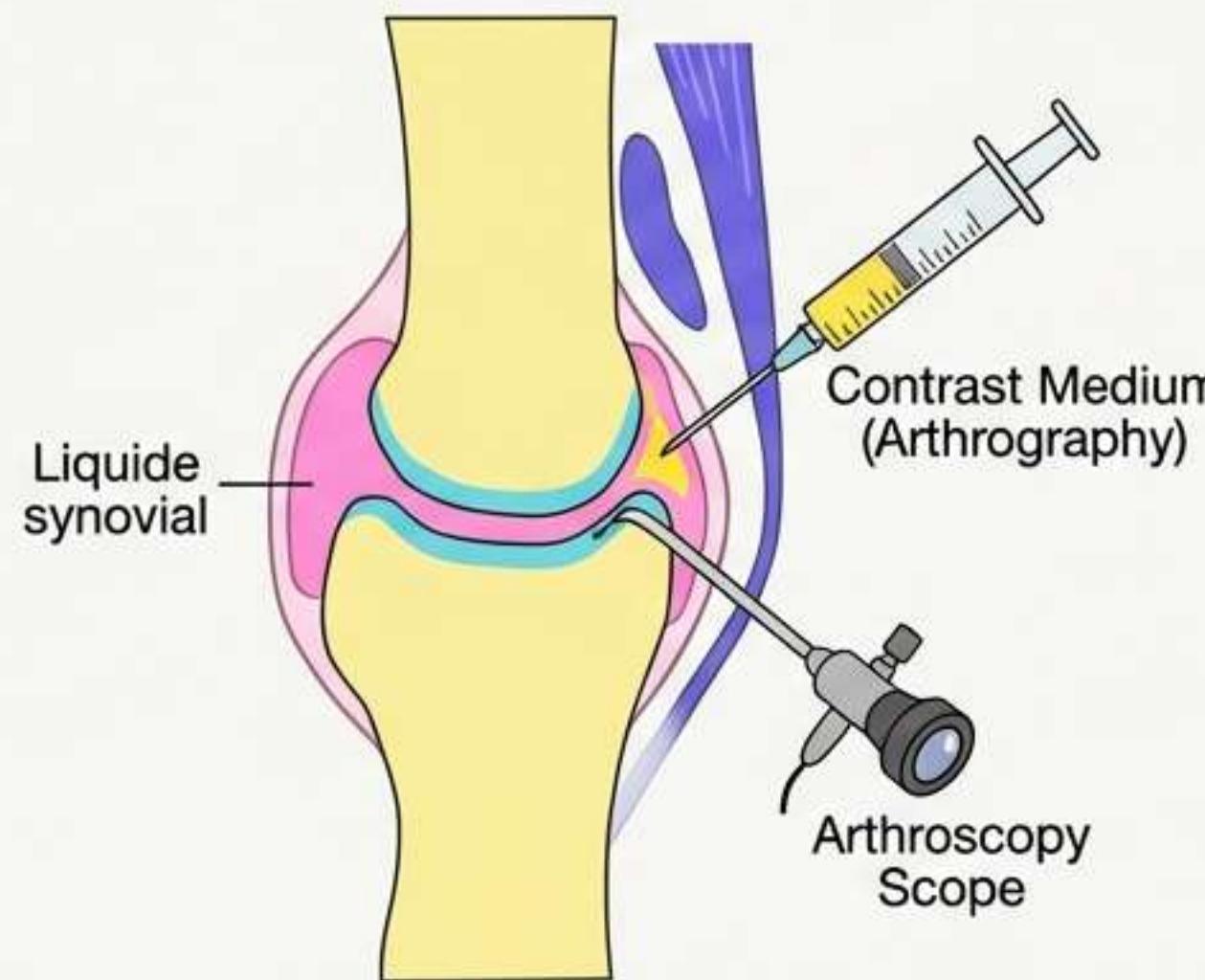


Clinical Examination & Imaging

A. Clinical Examination

Involves a **bilateral** and **comparative** assessment of range and direction. Must be both **passive** and **active**.

B. Imaging Hierarchy



1. **Standard X-ray:** Simplest; visualizes bone surfaces and joint space.
2. **Arthrography:** Injection of contrast medium (can be combined with CT).
3. **Ultrasound & MRI:** Visualizes articular cartilage and fibrocartilage.
4. **Arthroscopy:** Direct endoscopy; allows visualization and interventional procedures (e.g., removal of meniscal fragments).

Joint Pathologies

Joints are susceptible to degenerative, inflammatory, infectious, traumatic, and tumorous damage.

Osteoarthritis

Most commonly affects the knee, hip, and hand joints.

Arthritis

A process characterized by inflammation of the joints or synovial membranes.



High-Yield Study Review

Essential Associations for the Exam:

Synarthrosis = Immobile [Ref: Q5]

Amphiarthrosis = Semi-mobile [Ref: Q3]

Diarthrosis = Mobile = Synovial [Ref: Q4]

Gomphosis = Fibrous [Ref: Q2]

Syndesmosis = Cartilaginous (According to this Lesson Text)

Flexion/Extension = Sagittal Plane / Transverse Axis [Ref: Q26]

Ball & Socket = 3 Axes [Ref: Q1]