JOINTS

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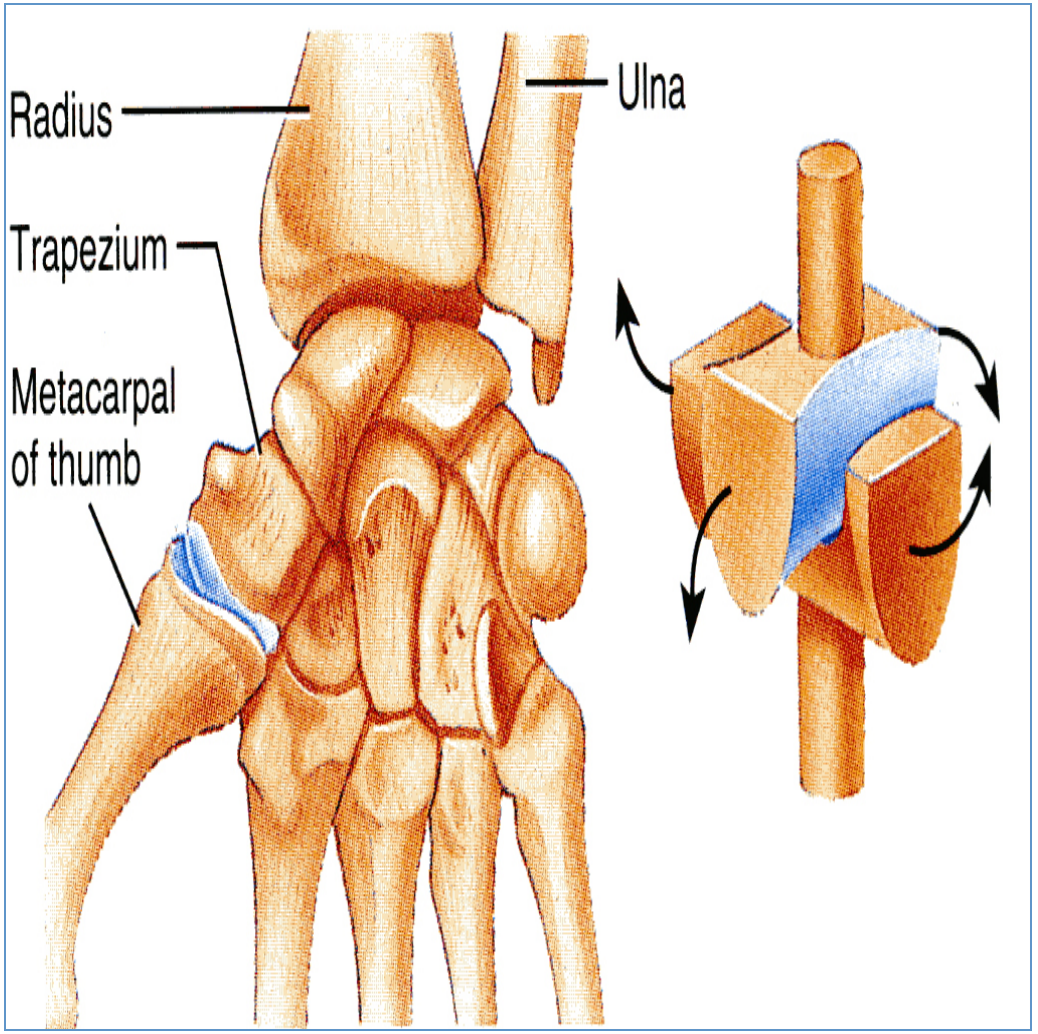
OBJECTIVES

By the end of the lecture, students should be able to:

- *Define the term "Joint".*
- *Describe the classification of the 3 types of joints & give an example of each.*
- *Describe the characteristics of synovial joints.*
- *Describe the classification of synovial joints & give an example of each.*
- *List factors maintaining stability of joints.*
- *Recite "Hilton's law" for nerve supply of joints.*

DEFINITION

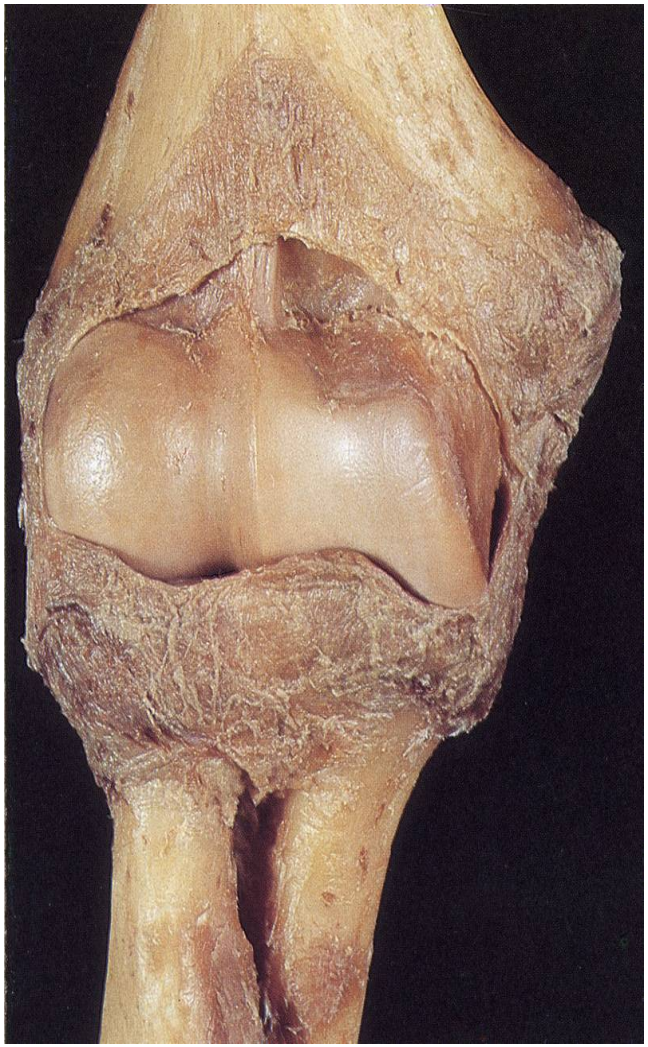
- **What is a joint?**
- **It is the site where two or more bones meet together.**

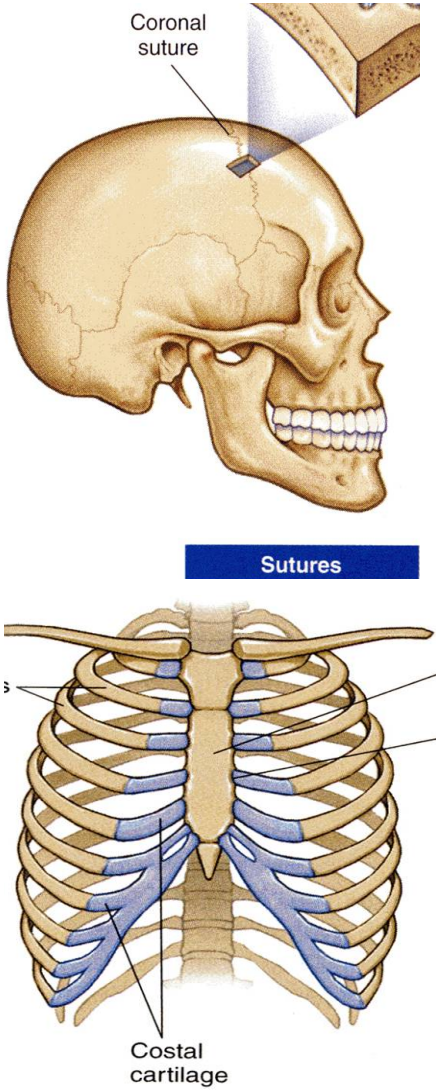


CLASSIFICATION

- Joints are classified according to the tissues that lie between the bones into:

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





FIBROUS JOINTS

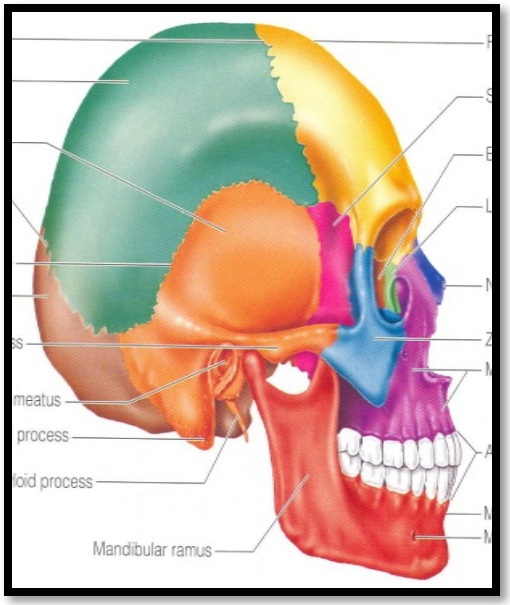
- The articulating surfaces are joined by fibrous connective tissue, where No or very mild movement

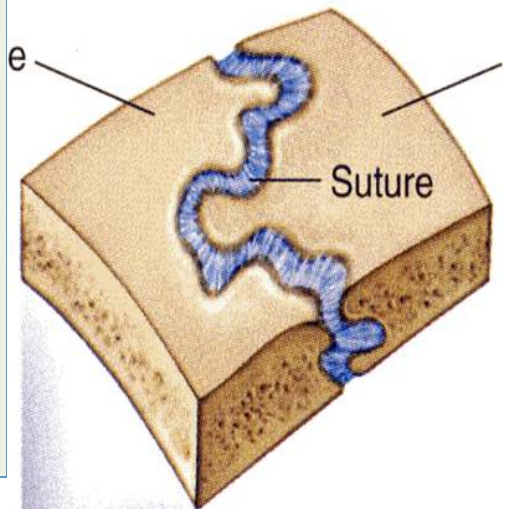
1. Skull sutures:

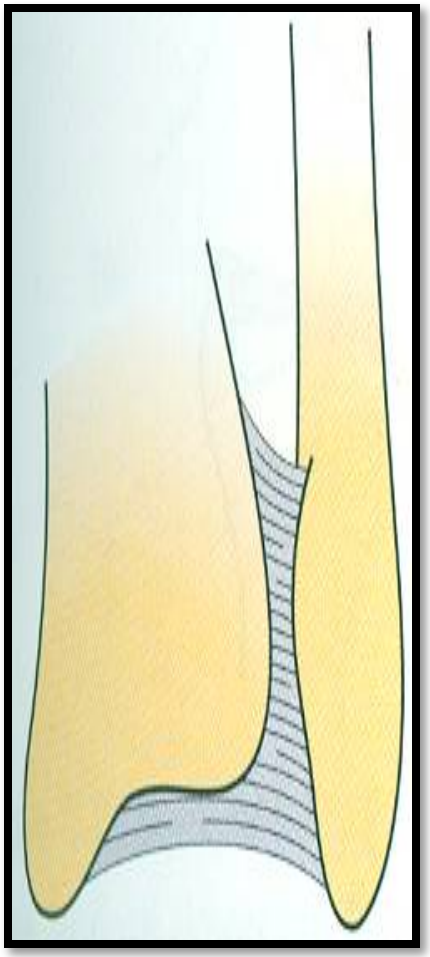
   Temporary (as it ossify later).

2. Inferior tibiofibular joints (syndesmosis): minimal movement, permanent joints.

3. Gomphosis: dental alveolar joints.







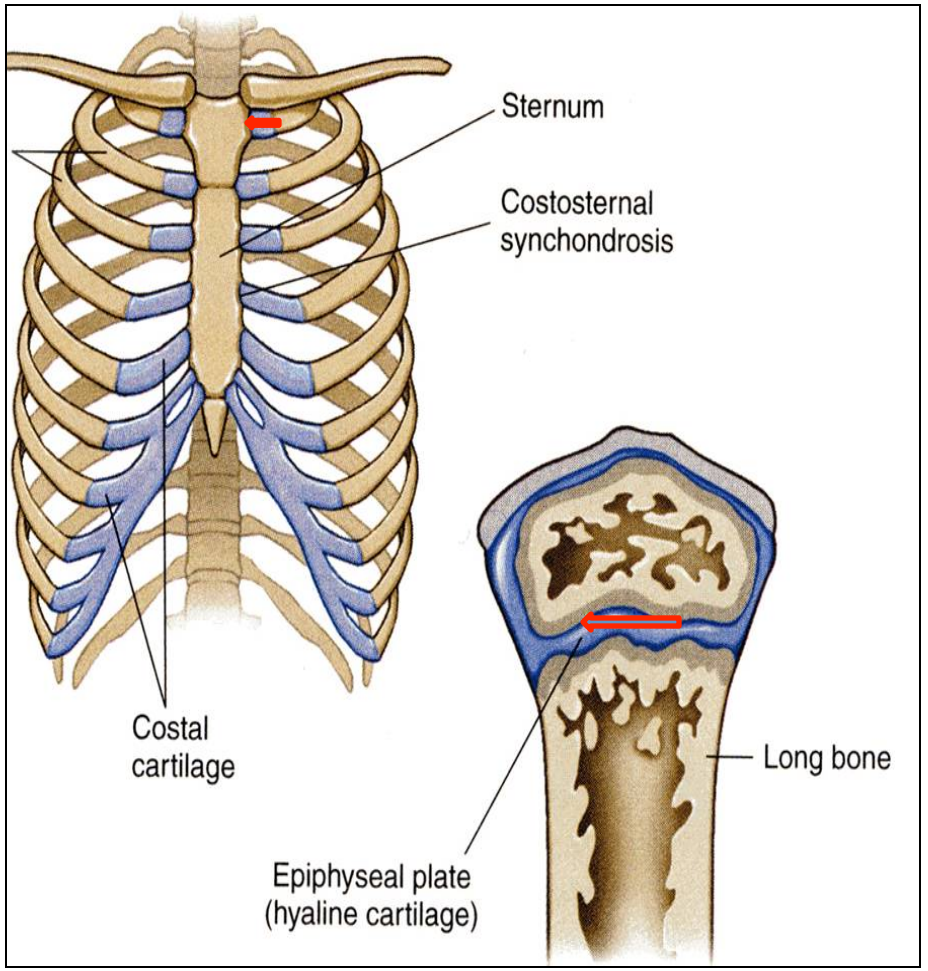
CARTILAGINOUS JOINTS

- The Two bones are joined by cartilage.
- It is of 2 types:

❑ *Primary Cartilaginous (synchondrosis):*

- The bones are united by a plate or a bar of hyaline cartilage.
- No movement, temporary joints (ossify later), example:

1. Between the Epiphysis and the Diaphysis of a growing bone.
2. Between the First Rib and the Sternum (1st sternocostal joint).
   (The rest of the sternocostal joints are synovial plane joints.)



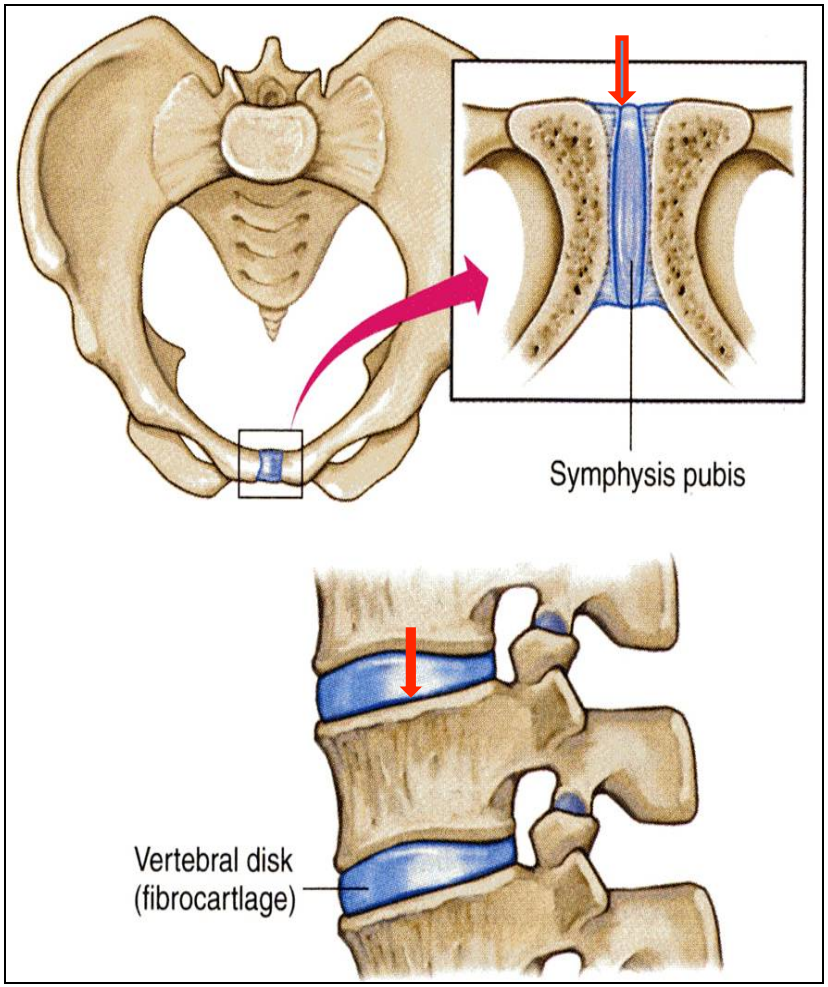
Primary Cartilaginous

CARTILAGINOUS JOINTS

❑ *Secondary Cartilaginous*

- The bones are united by a plate of ***fibrocartilage.***
- Their articulating surfaces are covered by a thin plate of hyaline cartilage.
- Little movement, permanent joints.
- The are called Midline joints.

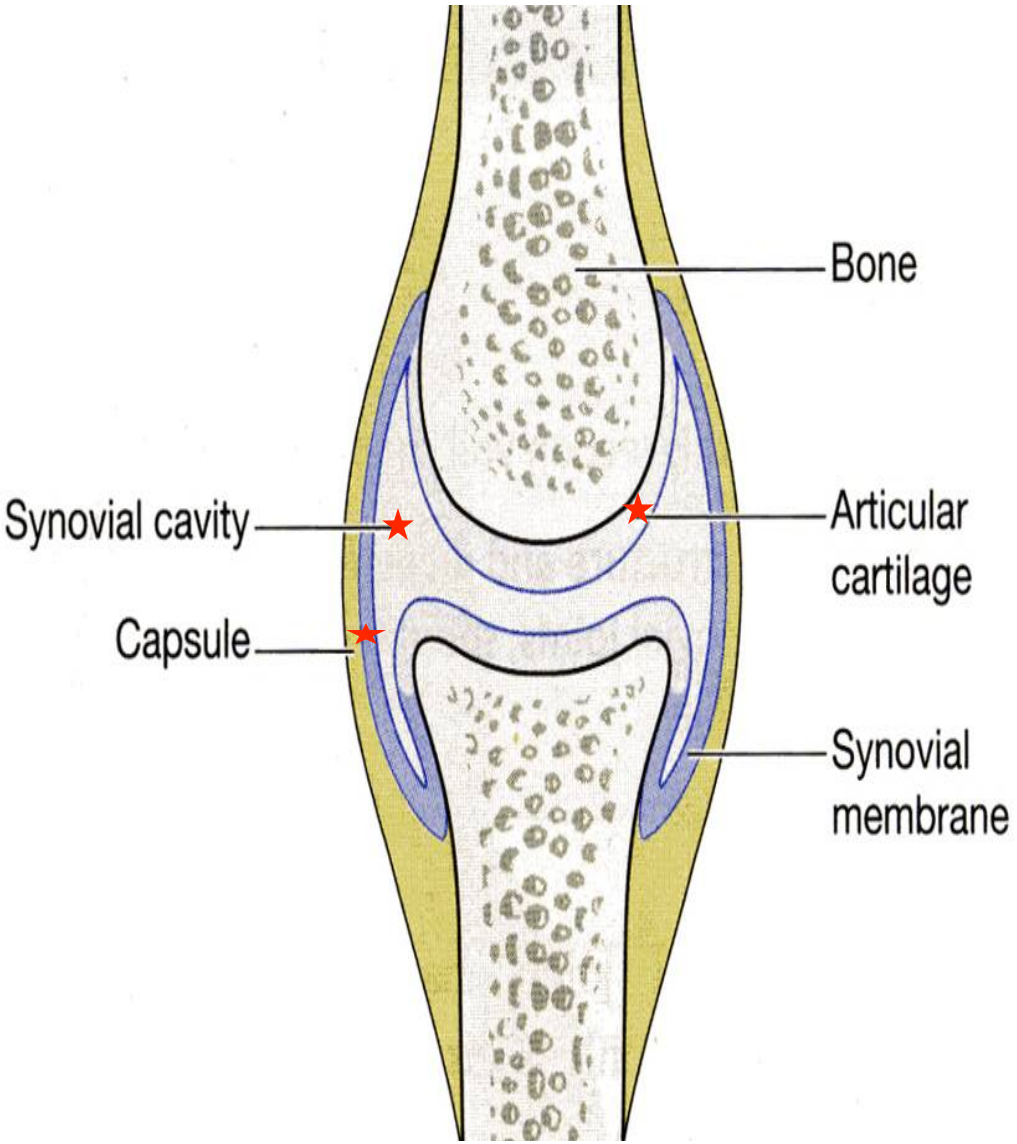
1. Joints between the ***Vertebral Bodies*** (intervertebral discs).
2. ***Symphysis Pubis***.



SYNOVIAL JOINTS

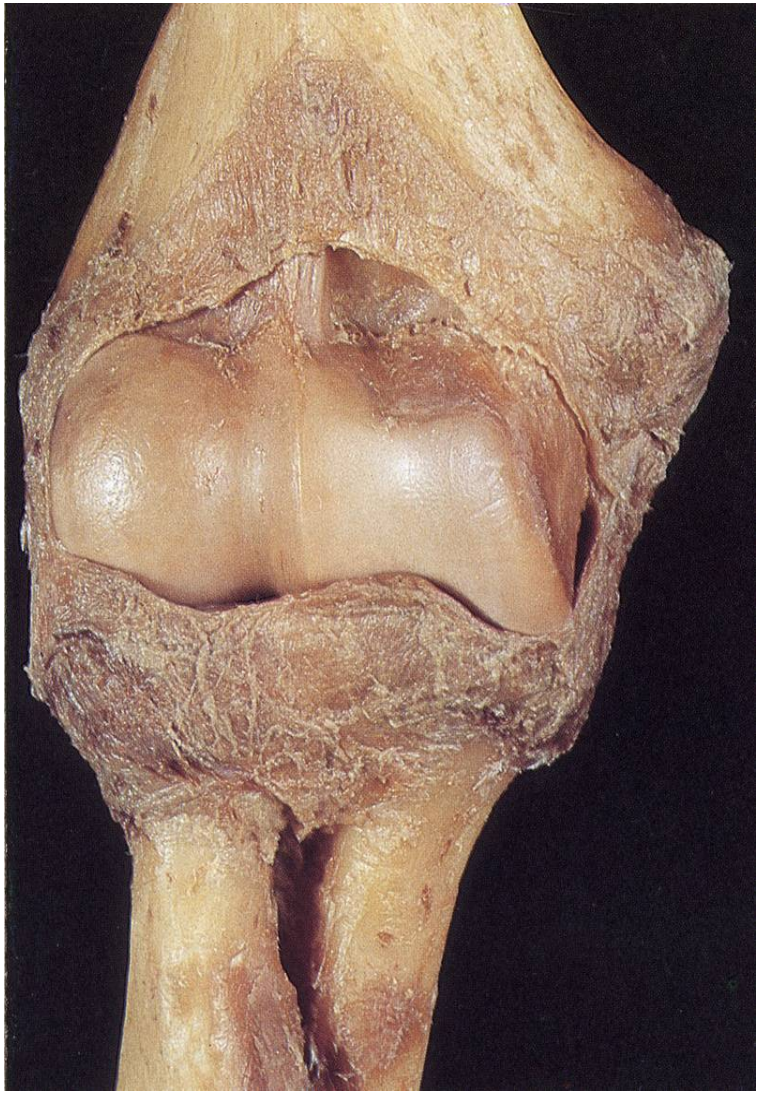
❑ Characteristic features:

- **Freely movable** joints.
- The 2 bones are joined by a **fibrous capsule**, which is attached to the margins of articular surfaces & enclosing the joint.
- **The articular surfaces** are covered by a **thin layer of hyaline cartilage** (articular cartilage).
- A **joint cavity** enclosed within the capsule.



SYNOVIAL JOINTS

- **Synovial membrane : a thin vascular membrane lining the inner surface of the capsule.**
- **Synovial fluid : a lubricating fluid produced by the synovial membrane in the joint cavity.**
- **The fluid minimizes the friction between the articular surfaces.**



CLASSIFICATION OF SYNOVIAL JOINTS

Synovial joints can be classified according to:

- The **arrangement** of the **articular surfaces.**
- The **range of movement** that are possible

❑ **So according to the range of movement synovial joints are classified into:**

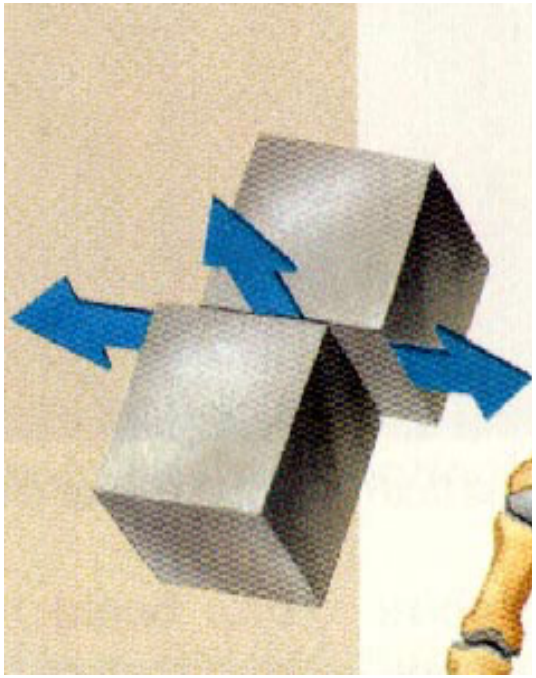
- **Plane synovial joints.**
- **Axial synovial joints.**

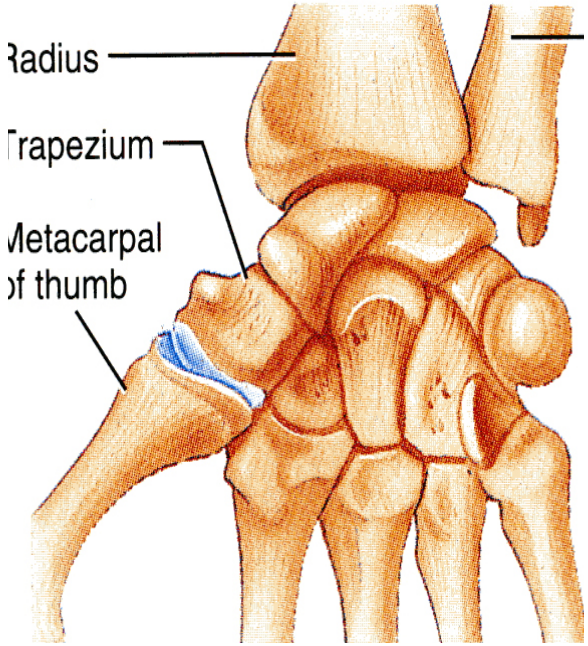
PLANE SYNOVIAL JOINTS

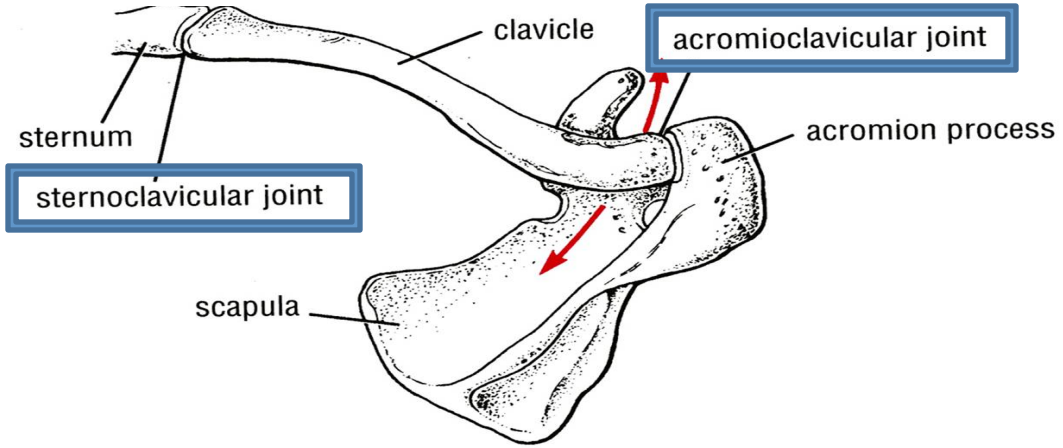
- **The articulating surfaces** are **flat** and the bones slide on one another, producing a **gliding movement**.

example;

1. **Intercarpal Joints.**
2. **Sternoclavicular**
3. **Acromioclavicular joints.**







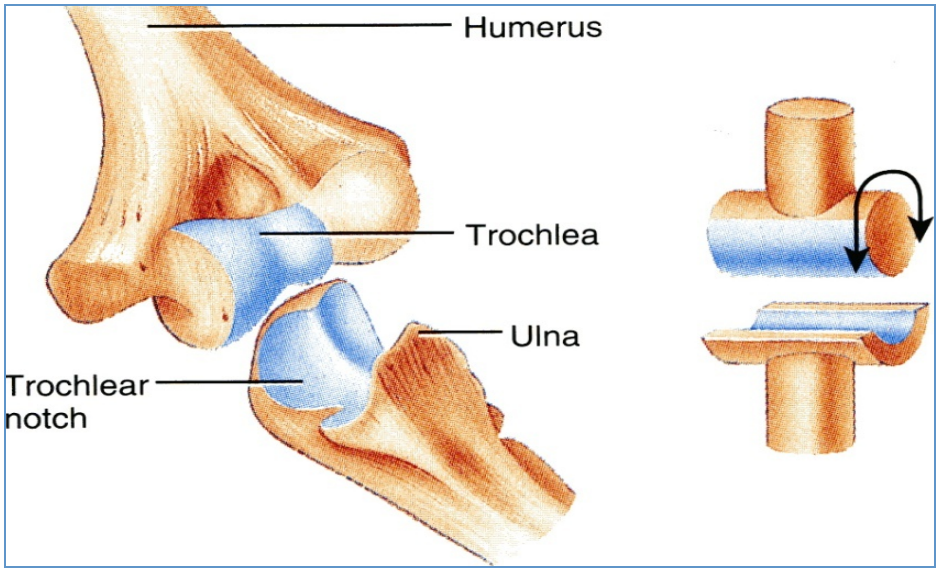
AXIAL SYNOVIAL JOINTS

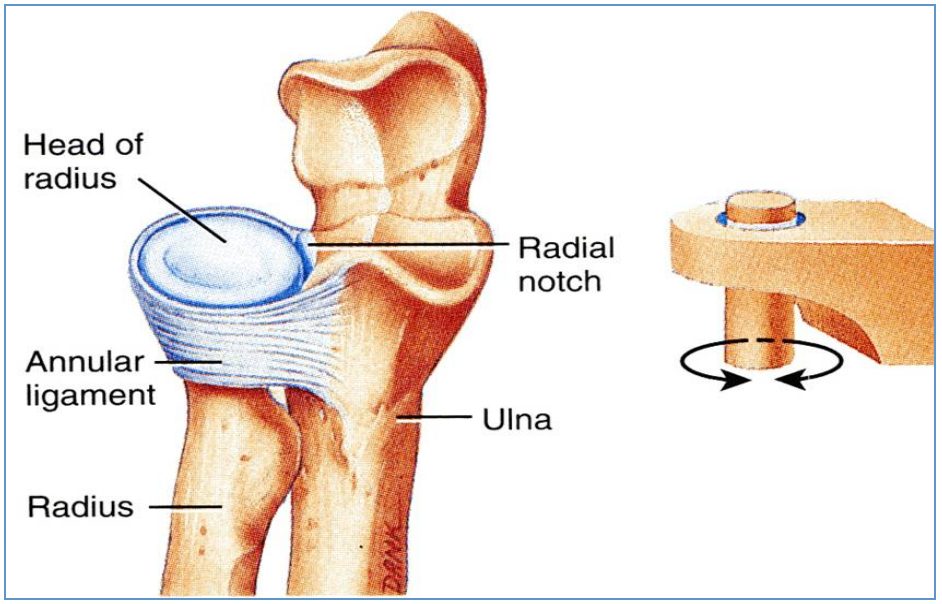
- Movements occur **along axes:**

1. **Transverse:** flexion & extension occur.
2. **Longitudinal:** rotation occurs.
3. **Antero-posterior:** abduction & adduction occur.

- **Axial joints are divided into:**

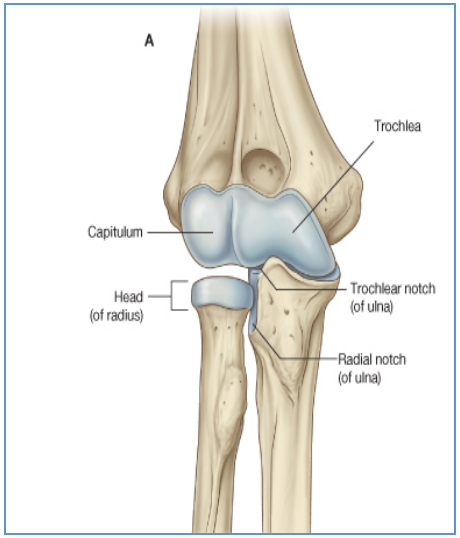
1. Uniaxial.
2. Biaxial.
3. Multi-axial (polyaxial).

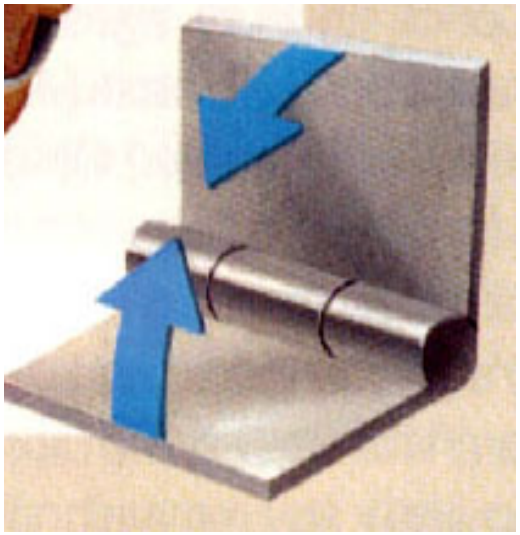


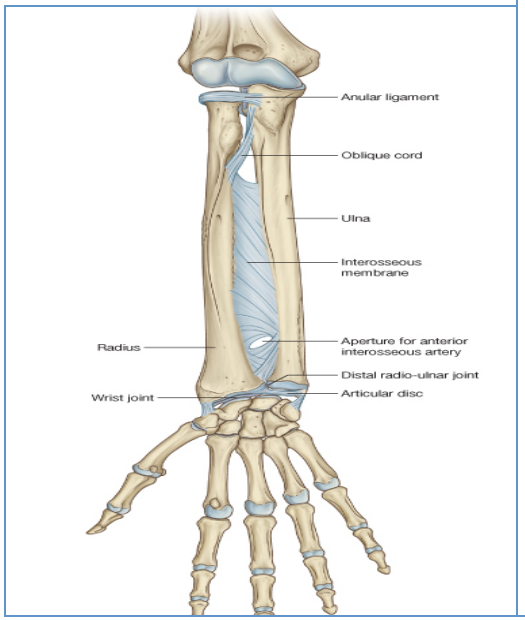


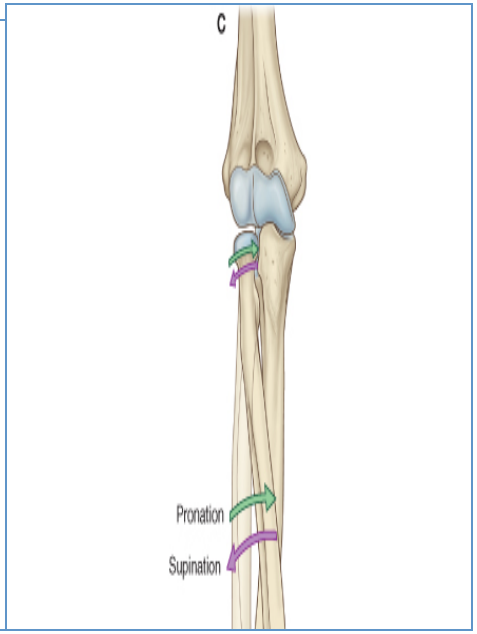
UNIAXIAL SYNOVIAL JOINTS

- **Hinge joints:**
  - Axis: transverse.
  - Movements: flexion & extension.
  - Example: elbow and ankle joints.
- **Pivot:**
  - Axis: longitudinal.
  - Movements: rotation.
  - Example: radio-ulnar joints





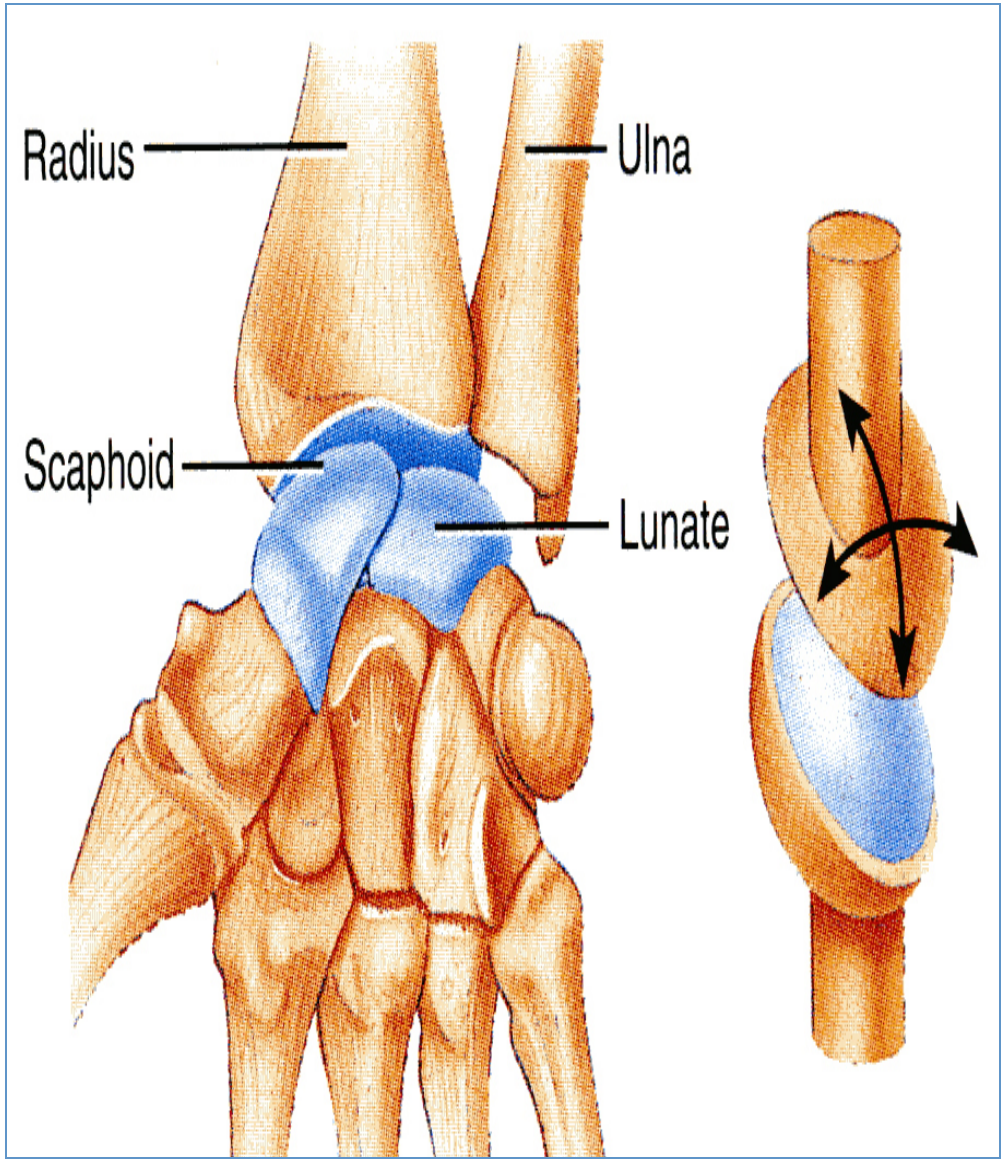




BIAXIAL SYNOVIAL JOINTS

❑Ellipsoid joints:

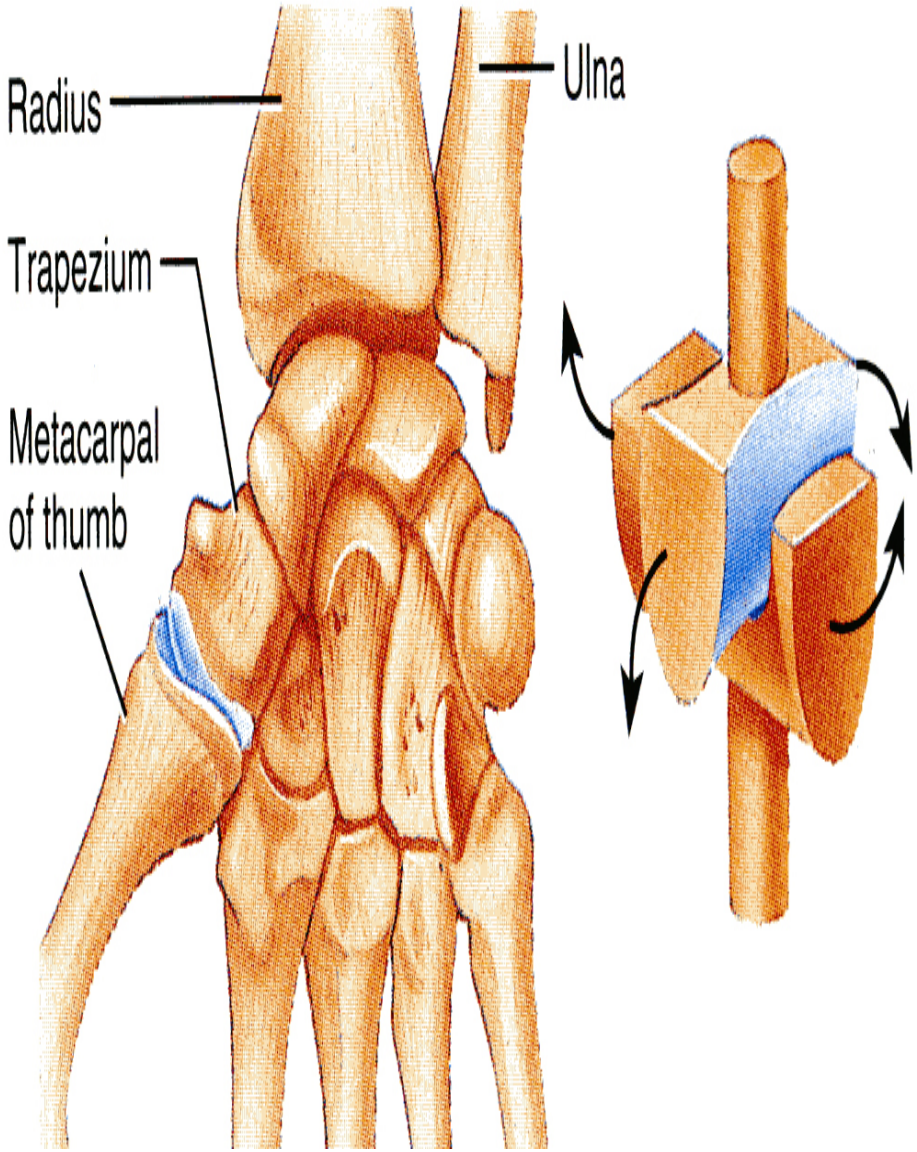
- An elliptical **convex** fits into an elliptical **concave** articular surface.
- **Axes:** Transverse & antero-posterior.
- **Movements:** Flexion & extension + abduction & adduction but rotation is impossible.
- **Example: Wrist joint.**



BIAXIAL SYNOVIAL JOINTS

❑Saddle joints:

- **The articular surfaces** are reciprocally **concavoconvex.**
- They **resemble a saddle** on a horse's back.
- **Movement:** As ellipsoid joints (Flexion & extension + abduction & adduction) + *a small range of rotation .*
- **Example:** **Carpometacarpal joint of the thumb.**

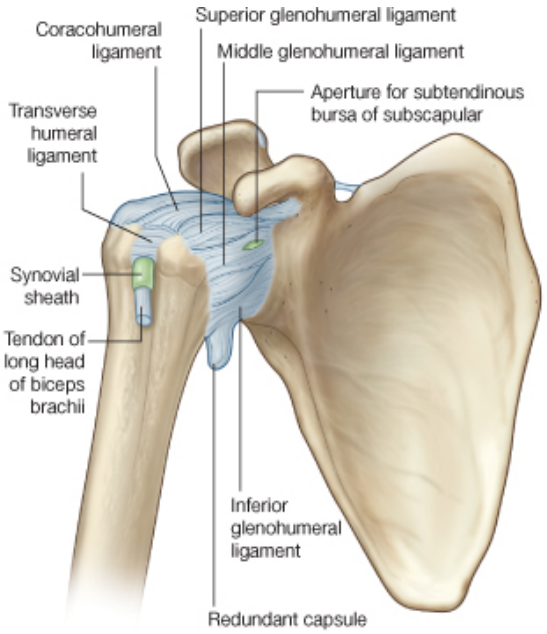


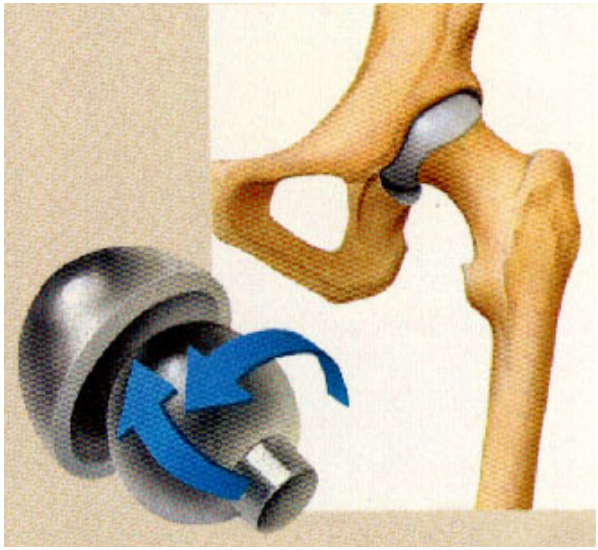
POLYAXIAL SYNOVIAL JOINTS

❑ Ball-and-socket joints:

- A ball –shaped head of a bone fits into a socket-like concavity of another.
- **Movements:** Flexion & extension + abduction & adduction) + rotation along a separate axis.
- **Examples:**

1. **Shoulder joint.**
2. **Hip Joint.**

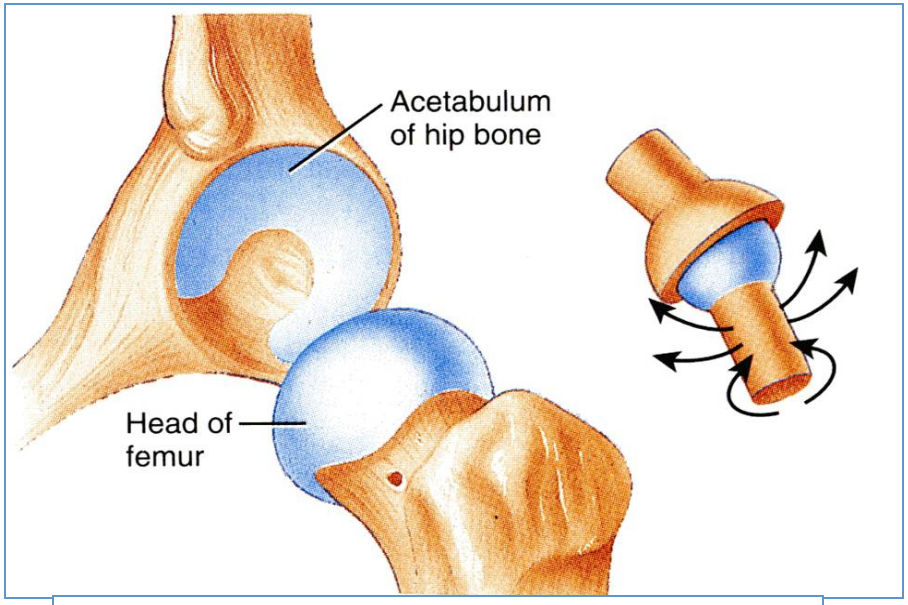


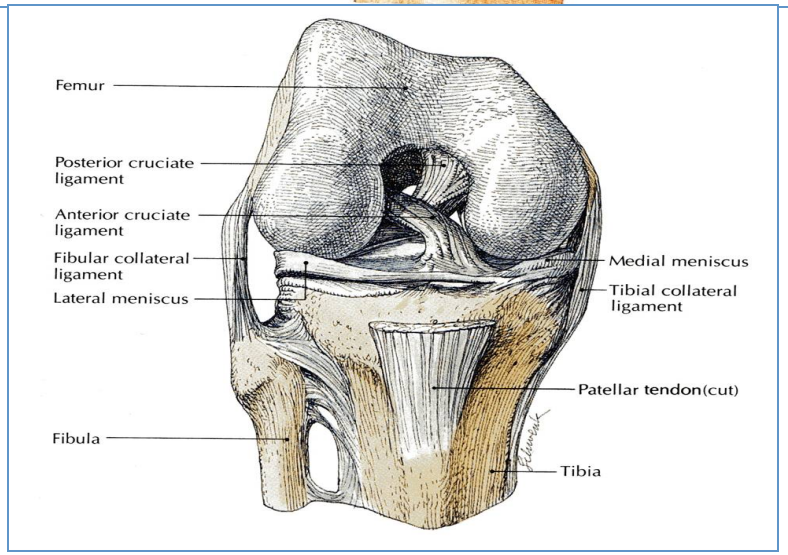


STABILITY OF SYNOVIAL JOINTS

1-The shape of articular surfaces:

- **The ball and socket** shape of the **Hip joint** is a **good examples** of the importance of bone shape to maintain joint **stability.**
- The shape of the bones forming the **Knee joint** has nothing to do for stability.

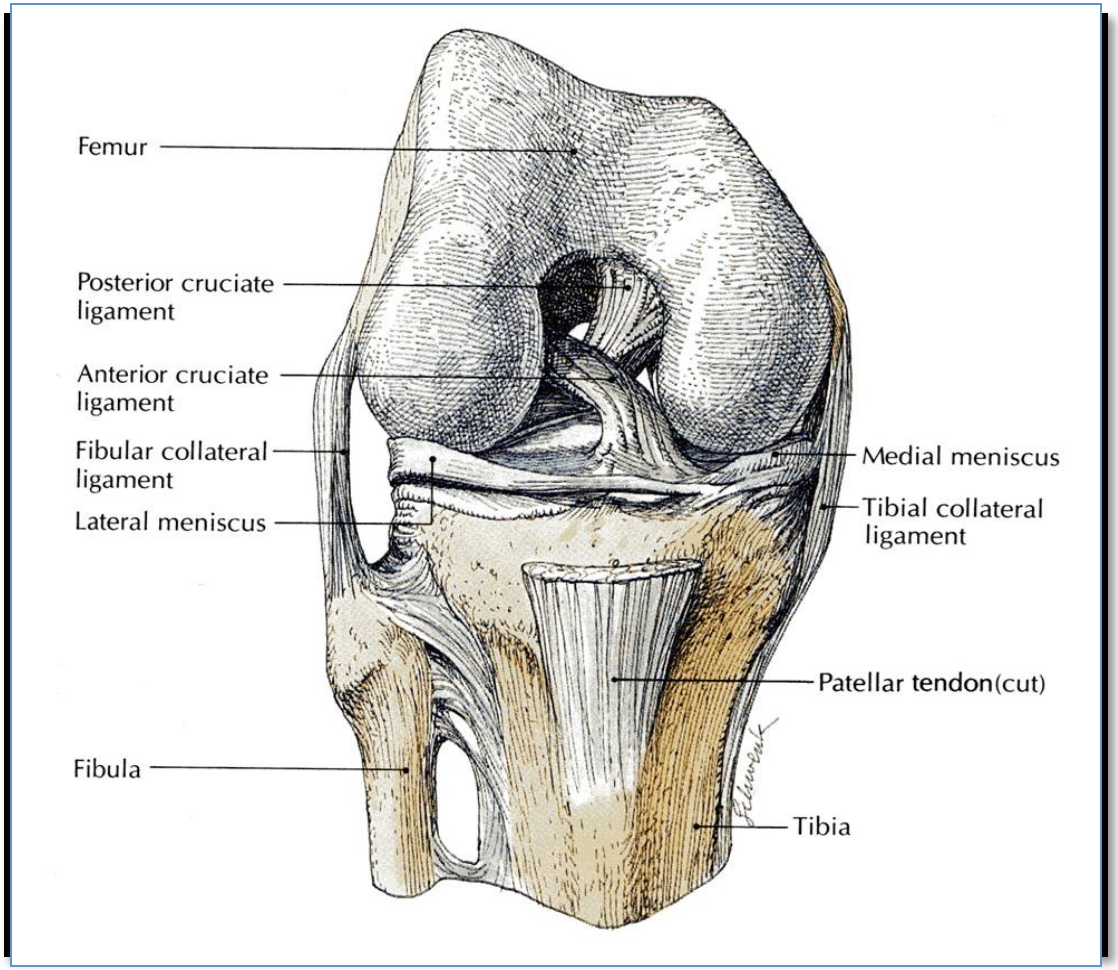




STABILITY OF SYNOVIAL JOINTS

2-Strength of the ligaments:

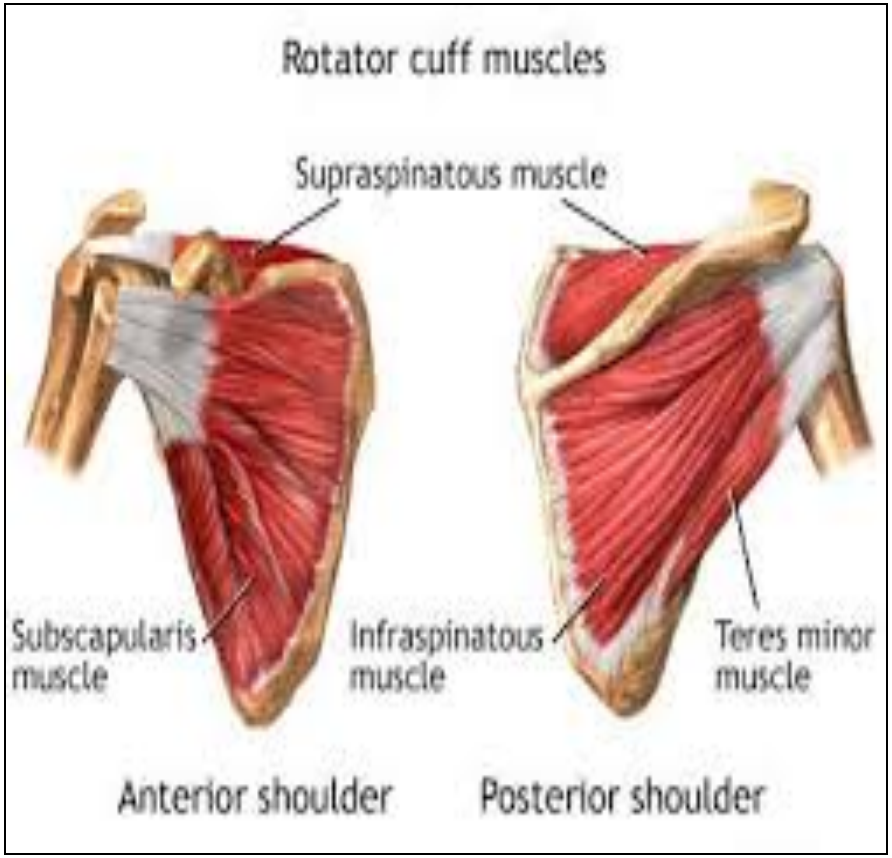
- They prevent excessive movement in a joint.
- **Example:** cruciate ligaments of the knee joint.



STABILITY OF SYNOVIAL JOINTS

3- Tone of the surrounding muscles:

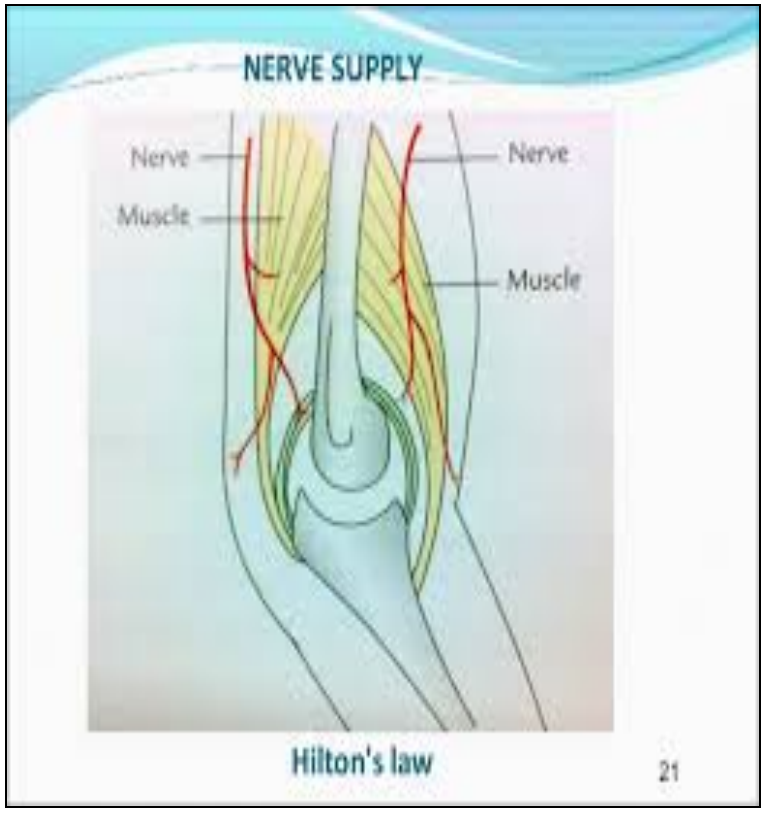
- In most joints, it is the major factor controlling stability.
- **The short muscles around the shoulder joint** keeps the head of the humerus in the shallow glenoid cavity.



NERVE SUPPLY OF JOINTS

- The capsule and ligaments receive an abundant sensory nerve supply.
- ***Hilton's Law:***

  "A nerve supplying a **joint** also supplies the **muscles** moving that joint and the **skin** overlying the insertions of these muscles."



GOOD LUCK

SUMMARY

- Joint is the site where two or more bones come together, whether movement occurs or not between them.
- Joints are classified according to the tissues that lie between the bones into 3 types: fibrous, cartilaginous & synovial.
- Synovial joints are freely movable & characterized by the presence of : fibrous capsule, articular cartilage, synovial membrane & joint cavity containing synovial fluid.

SUMMARY

- Synovial joints are classified according to the range of movement into: plane and axial.
- Axial are divided according to the number of axes of movements into: uniaxial, biaxial & polyaxial or multiaxial.
- Stability of synovial joints depends on: shape of articular surfaces, ligaments & muscle tone.
- Joints have same nerve supply as muscles moving them.

QUESTION

- Which of the following is a hinge synovial joint?

1. Shoulder.
2. Elbow. 
3. Sternoclavicular.
4. Symphysis pubis.

QUESTION

- Which of the following is a cartilaginous joint?

1. Hip.
2. Elbow.
3. Sternoclavicular.
4. Symphysis pubis. ⟵

Which of the following is a pivot synovial joint?

1. Shoulder.
2. Elbow.
3. Sternoclavicular.
4. Radioulnar. ⟵

QUESTION 1

- In the synovial joint :

1. articular surfaces are united by a plate of fibrocartilage.
2. the synovial membrane is not vascular.
3. stability is not related to muscle tone.
4. movement is free. 

QUESTION 2

- **The elbow joint:**

1. is a fibrous joint.
2. is a secondary cartilaginous joint.
3. allows only flexion & extension.
4. Is a synovial pivot joint.