

MED439  
KING SAUD UNIVERSITY

# Joints

## Musculoskeletal Block - Lecture 2

### Objective:

- ✓ 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.

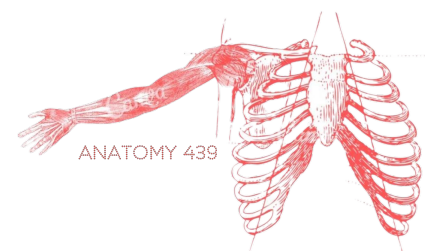
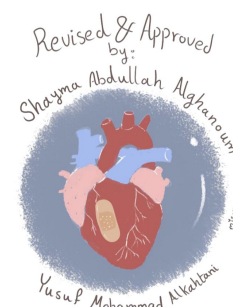
Color index:

**Important**

In male's slides only

In female's slides only

Extra information, explanation



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# Joints

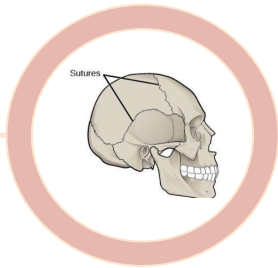
## Definition

It is the site where two or more bones meet together  
union of two or more bones of the body

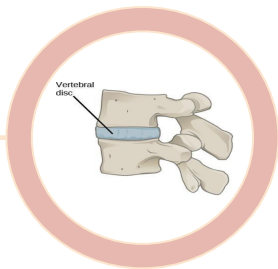
## Classification Of Joints

They are classified according to:

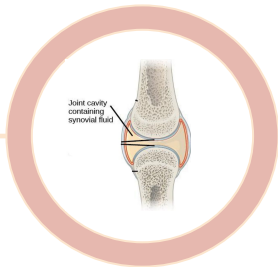
tissues that lie between the articulating bones



01 **Fibrous**



02 **Cartilaginous**



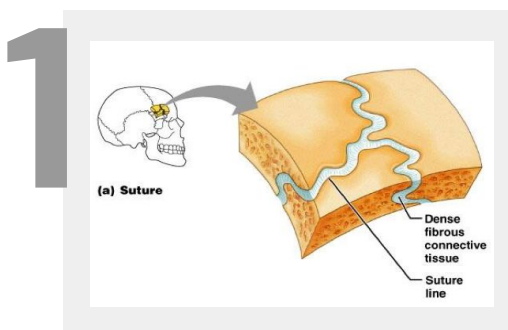
03 **Synovial**

## 1) Fibrous joints : ★

The articulating surfaces are joined by **fibrous connective tissue**, where **No** or **very mild movement (Negligible)**.

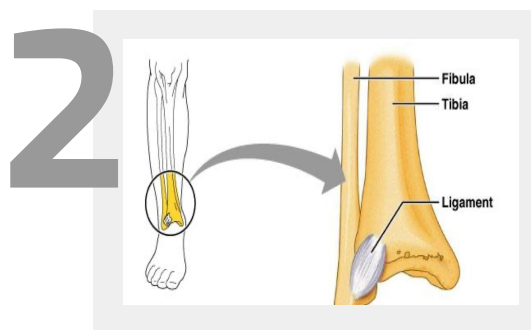
For example :

### Skull sutures:



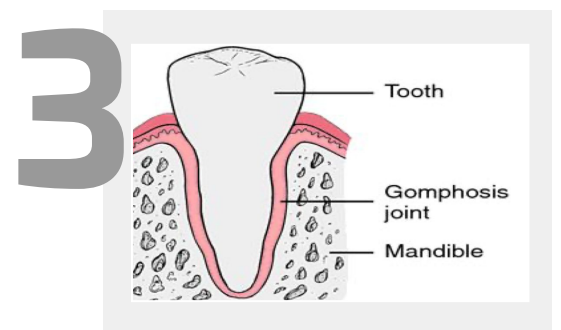
- no movement
- temporary (as it ossify later) They will become bones

### Inferior tibiofibular joints (syndesmosis):



- minimal movement
- permanent joints.

### Gomphosis

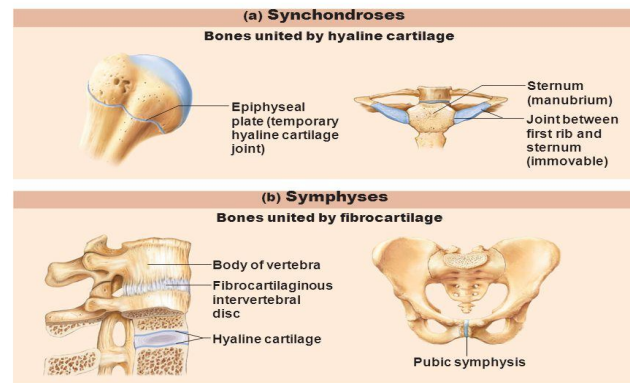


- dental alveolar joints.

Articulation between root of the tooth with the mandible (between the teeth & their socket)

# 2) Cartilaginous Joints:

Happens when two bones are joined by cartilage. They are classified into 2 types:



## Primary Cartilaginous (synchondrosis):

1

**Structure:**  
The bones are united by a **plate** or a bar of **hyaline cartilage**.  
& it's one where **bone** and **cartilage** meet. It's a very strong joint and immobile.

2

**Movement:**  
**No** movement,  
**temporary** joints (ossify later).

3

-Between the **Epiphysis** and the **Diaphysis** of a growing bone. note: (epiphyseal plate).  
-Between the First Rib and the Sternum (1st sternocostal joint). → junctions of ribs with their costal cartilage.

The rest of the sternocostal joints are synovial plane joints

## Secondary Cartilaginous: (midline<sup>2</sup> or symphysis)

1

**Structure:**  
The bones are united by a plate of **fibrocartilage**.  
Their articulating surfaces are covered by a thin plate of **hyaline cartilage**.

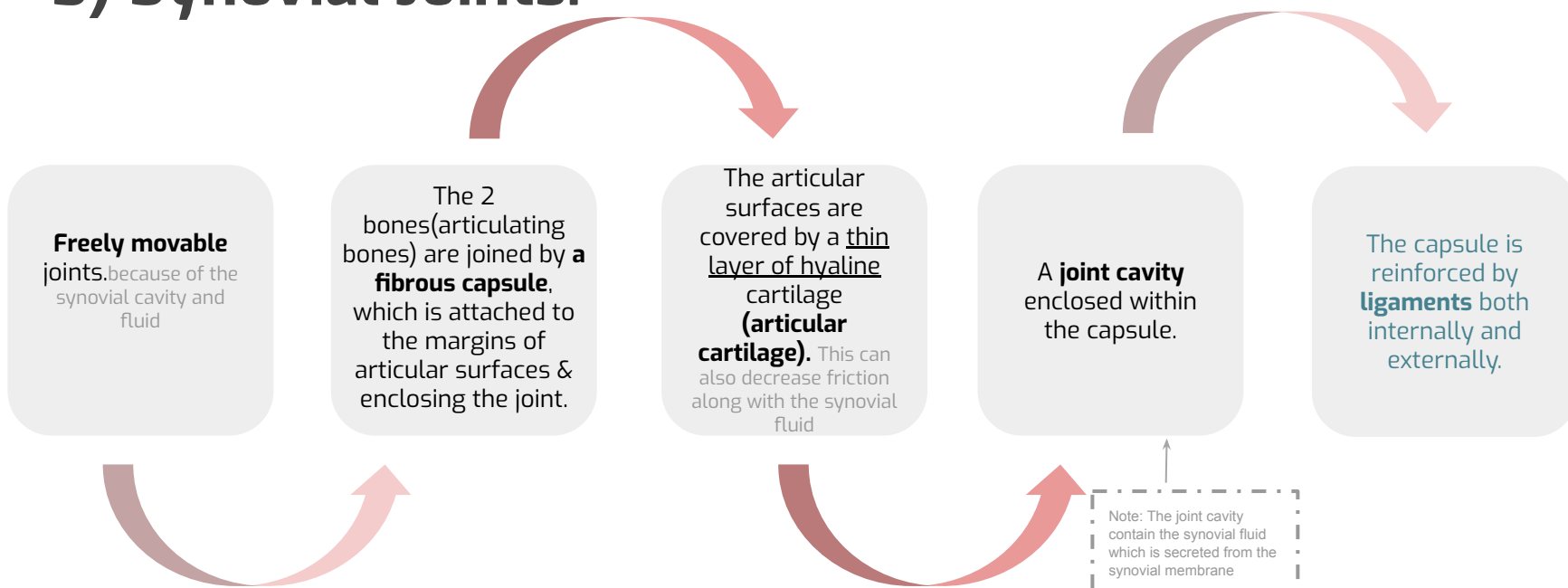
2

**Movement:**  
**Little** movement,  
**permanent** joints.

3

**Example:**  
-Joints between the Vertebral Bodies (intervertebral discs).  
-Symphysis Pubis. between the two hip bones .

# 3) Synovial Joints:



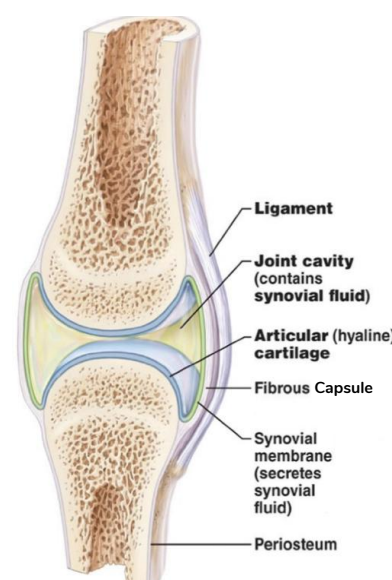
All joints in appendicular skeleton are synovial joint

### Synovial membrane :

a thin vascular membrane lining the inner surface of the capsule. It produces the synovial fluid.

### 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** (shape) of the articular surfaces.
- The **range of movement** that are possible

According to the range of movement they are classified into:

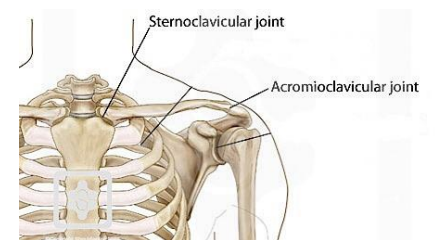
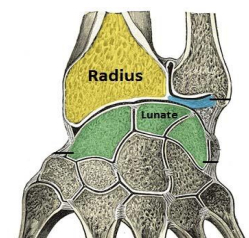
• **Plane synovial joints**

**Movement**  
Gliding Movement (minimal)

**Arrangement**  
The articulating surfaces are flat and the bones slide on one another.

**Examples**

- **Intercarpal & intertarsal joints**
- Sternoclavicular joint
- Acromioclavicular joint
- **Between the 2nd and 7th sternocostals**



• **Axial synovial joints**

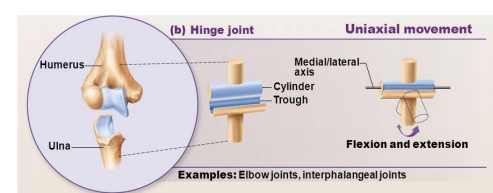
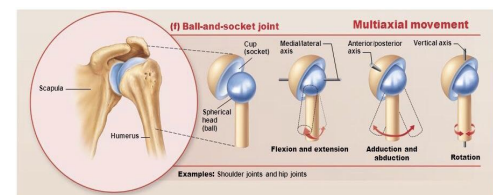
**Movement:**

- **Transverse (x-axis):** flexion and extension
- **Longitudinal (y-axis):** rotation
- **Antero-posterior (z-axis):** abduction and adduction

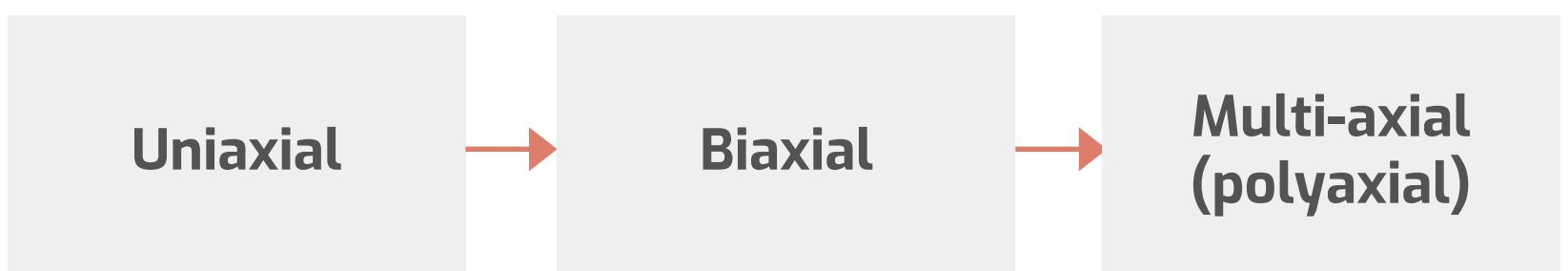
**Arrangement**  
The articulating surfaces occur along axis.

**Examples**

- Elbow joint
- Shoulder joint
- Radio-ulnar joint

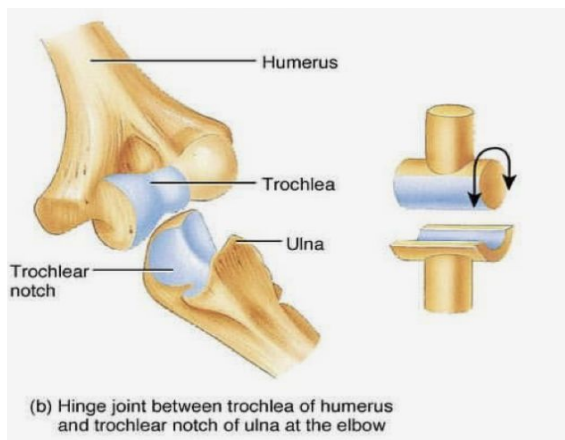


Axial joints are divided to:

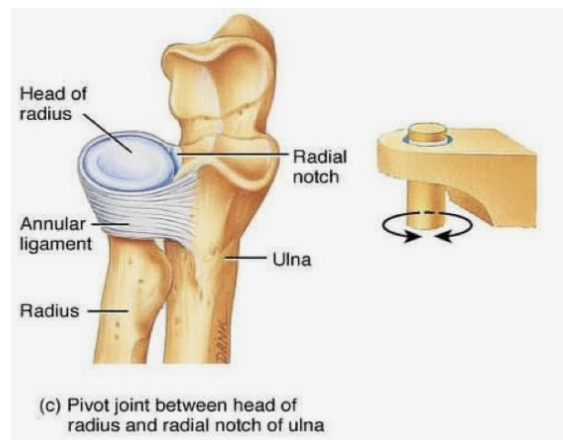


	Uniaxial		Biaxial		Multiaxial
Type	Hinge	Pivot	<b>Ellipsoid</b> an elliptical convex fits in an elliptical (oval) concave articular surface)	<b>Saddle</b> The articular surfaces are reciprocally concavoconvex.	<b>Ball &amp; socket</b>
Axis	Transverse	longitudinal	Transverse & antero-posterior	They resemble a <b>saddle</b> on a horse's back	A ball-shaped head of a bone fits into a socket-like concavity of another
Movement	Flexion & extension	Rotation	1.Flexion & extension. 2.Abduction & adduction.  <b>BUT rotation is impossible.</b>	1.Flexion & extension. 2.Abduction & adduction.  <b>Small range of rotation</b>	1.Flexion & extension. 2.Abduction & adduction.  <b>rotation along separate axis</b>
Examples	1.Elbow joint 2.Ankle joint	1.Radio-ulnar joint (supination & pronation) 2.Atlantoaxial joint	Wrist joints	Carpometacarpal joint of the <b>thumb</b>	1.Shoulder joint 2.Hip joint

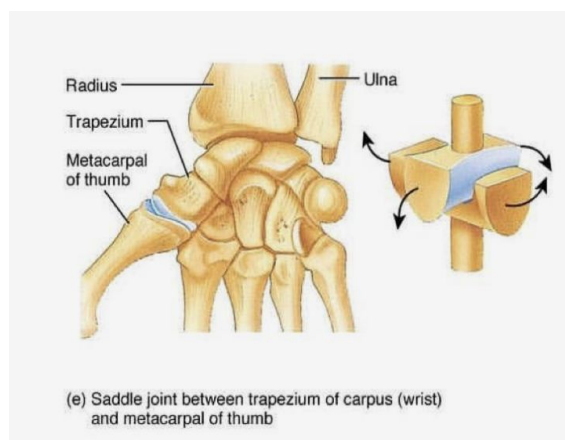
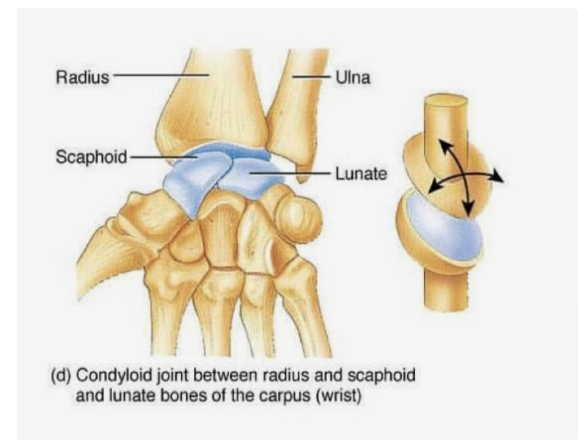
1- Hinge e.g. Elbow joint.



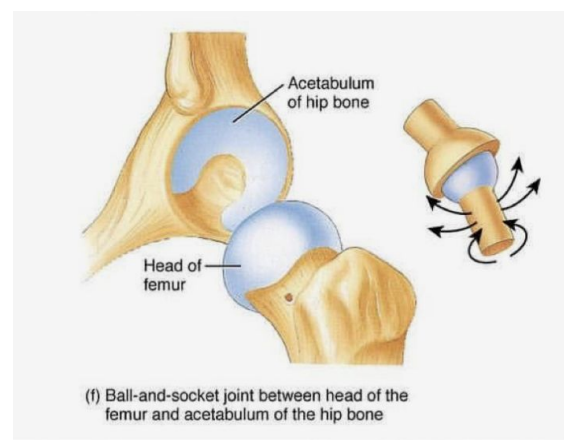
2- pivot e.g. Radio-ulnar joint.



3- Ellipsoid e.g. Wrist joint.



4- saddle e.g. carpometacarpal joint of the thumb



5- Ball & socket e.g. hip joint.



Helpful video

# Factors Affecting 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 the shape of the bone to maintain joint stability.
- The shape of the bones forming the **Knee joint** has nothing to do for stability.

## 2. Strength of the ligaments:

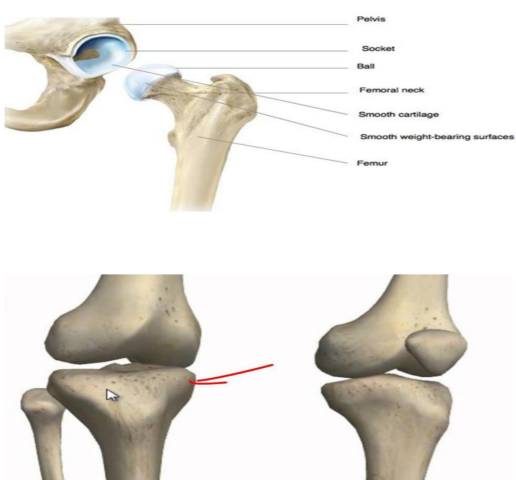
- They prevent excessive movement in a joint.
- e.g. **Cruciate ligaments** of the knee joint.

## 3. Tone of the surrounding muscles:

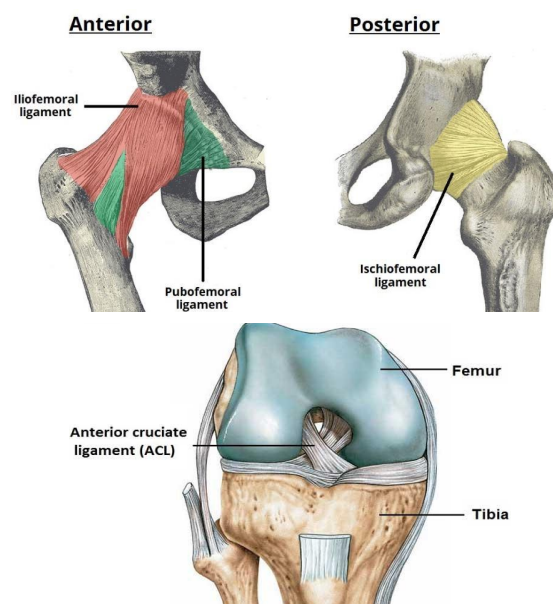
- In most joints, it is the major factor controlling stability.
- e.g. The short muscles around the shoulder joint (**Rotator cuff muscles**) keeps the head of the humerus in the shallow glenoid cavity.

## 4. Atmospheric pressure

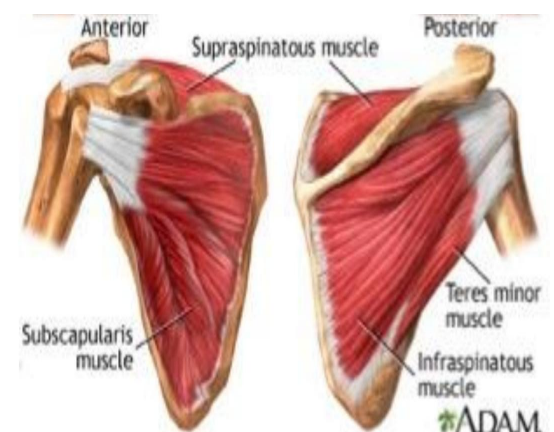
### 1. The shape of the articular surfaces:



### 2. Strength of the ligaments:



### 3. Tone of the surrounding muscles:

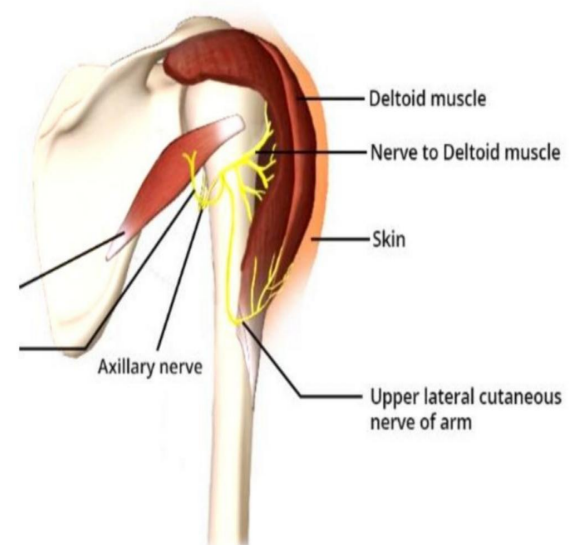


## NERVE SUPPLY OF JOINTS

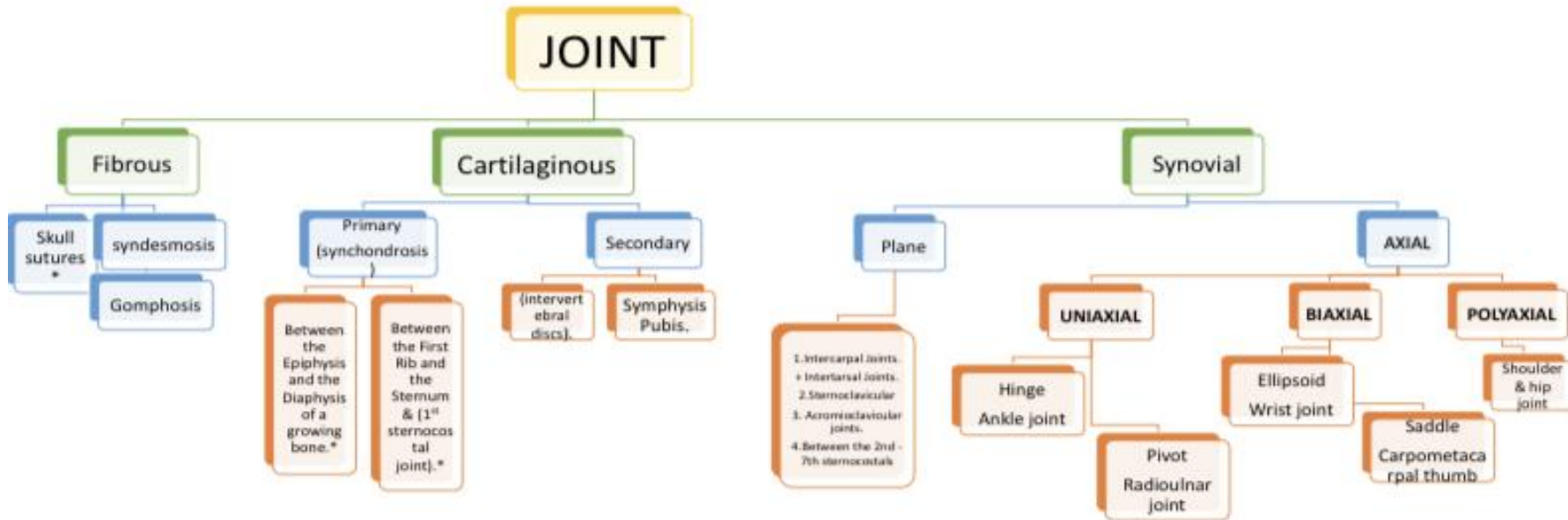
- The **capsule** and **ligaments** receive an abundant sensory nerve supply.

### Hilton's Law:

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



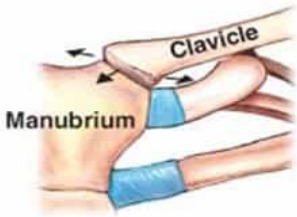
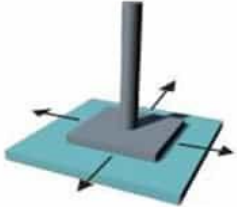

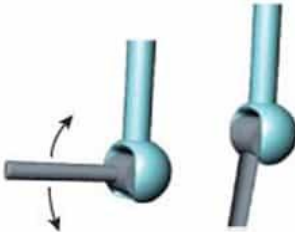
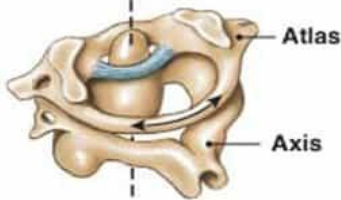
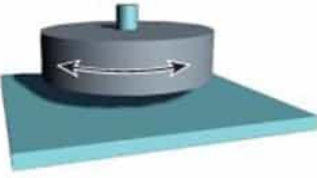

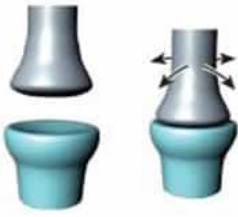
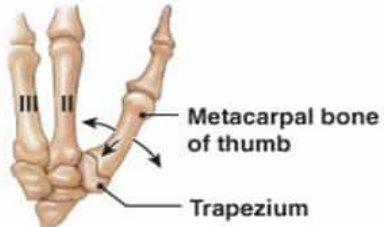
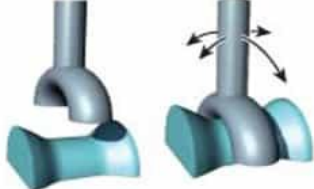
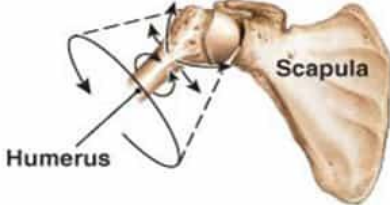
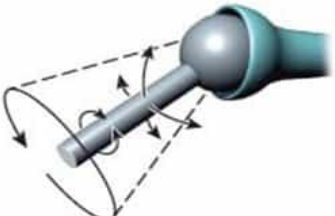
# SUMMARY med436



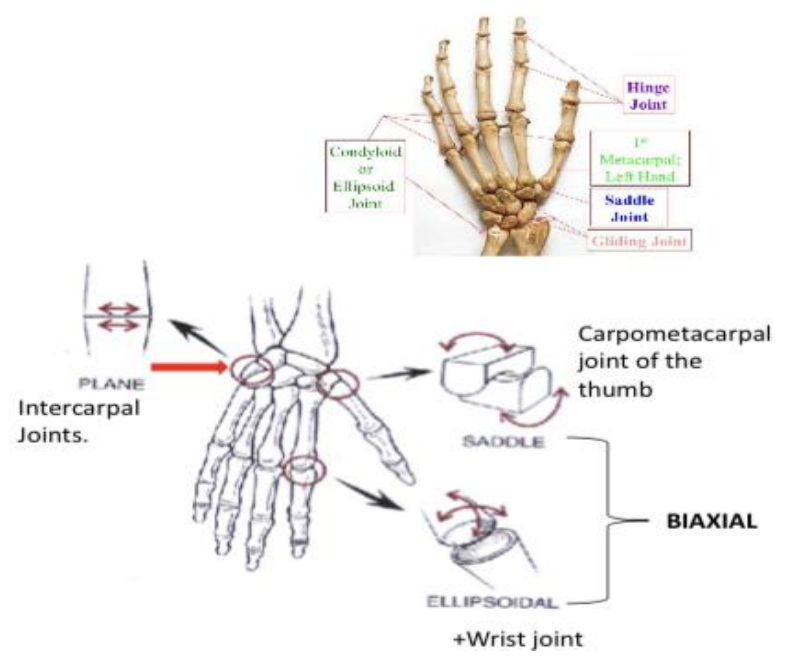
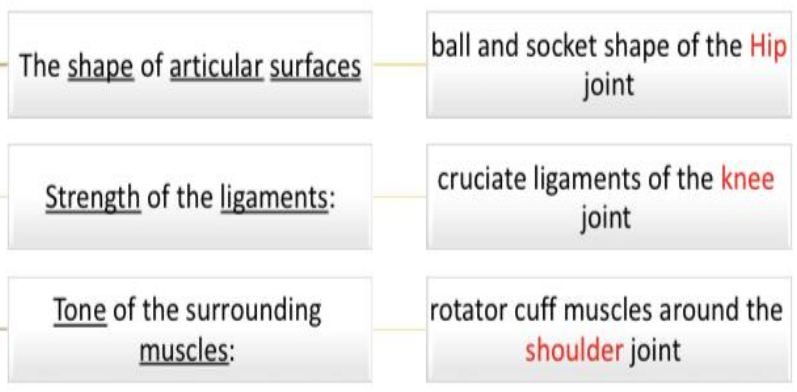
'No movement, Temporary (as it ossify later)

<p>sutures in skull</p> <ul style="list-style-type: none"> <li>No movement</li> <li>Temporary</li> <li>Example of : Fibrous joint</li> </ul>		<p>Shoulder</p> <ul style="list-style-type: none"> <li>ball and socket</li> <li>Flexion, extension, adduction, abduction, and rotation</li> <li>Ex. Of : Polyaxial Synovial Joint</li> </ul>
<p>sternoclavicular joint</p> <ul style="list-style-type: none"> <li>Articulate surface is flat</li> <li>Gliding movement</li> <li>Ex. Of :Plane Synovial Joint</li> </ul>		<p>Between vertebrae in column</p> <ul style="list-style-type: none"> <li>Secondary</li> <li>Articulate surfaces covered by hyaline cartilage</li> <li>Limited movement</li> <li>Permanent</li> <li>Ex. Of: Cartilaginous joint</li> </ul>
<p>Radioulnar joint</p> <ul style="list-style-type: none"> <li>Pivot</li> <li>Longitudinal</li> <li>Rotation</li> <li>Ex. Of : Uniaxial Synovial joint</li> </ul>		<p>Wrist</p> <ul style="list-style-type: none"> <li>Ellipsoid</li> <li>Flexion, extension, adduction, abduction</li> <li>Ex. Of: Biaxial Synovial joint</li> </ul>
<p>Carpometacarpal joint of thumb</p> <ul style="list-style-type: none"> <li>Saddle</li> <li>Flexion, extension, adduction, abduction, and limited rotation</li> <li>Ex. Of : Biaxial Synovial Joints</li> </ul>		<p>Epiphyseal plate in femur</p> <ul style="list-style-type: none"> <li>Primary Bones are joined through hyaline cartilage</li> <li>No movement</li> <li>Temporary</li> <li>Ex. of: Cartilaginous joint</li> </ul>
<p>Ankle</p> <ul style="list-style-type: none"> <li>Hinge joint</li> <li>Transverse movement</li> <li>Flexion and extension</li> <li>Ex. Of : Uniaxial Synovial Joint</li> </ul>		

# SUMMARY med436

Types of Synovial Joints	Models of Joint Motion	Examples
<b>Gliding joint</b> 		<ul style="list-style-type: none"> <li>• Acromioclavicular and sternoclavicular joints</li> <li>• Intercarpal and intertarsal joints</li> <li>• Vertebrocostal joints</li> <li>• Sacro-iliac joints</li> </ul>
<b>Hinge joint</b> 		<ul style="list-style-type: none"> <li>• Elbow joints</li> <li>• Knee joints</li> <li>• Ankle joints</li> <li>• Interphalangeal joints</li> </ul>
<b>Pivot joint</b> 		<ul style="list-style-type: none"> <li>• Atlas/axis</li> <li>• Proximal radio-ulnar joints</li> </ul>
<b>Ellipsoid joint</b> 		<ul style="list-style-type: none"> <li>• Radiocarpal joints</li> <li>• Metacarpophalangeal joints 2-5</li> <li>• Metatarsophalangeal joints</li> </ul>
<b>Saddle joint</b> 		<ul style="list-style-type: none"> <li>• First carpometacarpal joints</li> </ul>
<b>Ball-and-socket joint</b> 		<ul style="list-style-type: none"> <li>• Shoulder joints</li> <li>• Hip joints</li> </ul>

## Stability Of Synovial Joints





# MCOs

Q1: The primary cartilaginous joint is found in the ?

- A.Symphysis Pubis.
- B.Intercarpal Joints.
- C.Epiphyseal Plate.
- D.Elbow joint.

Q2: Sternoclavicular joint is a plane synovial joint take place between the ?

- A.Sternum and the clavicle
- B.2nd rip and 3rd rip.
- C.Ulna and the humerus
- D.Ulna and the radius

Q3: The rotation of the axial synovial joint is in the \_\_\_\_\_ Axis ?

- A.Transverse axis.
- B.Longitudinal axis.
- C.Antero-posterior axis.
- D.Z-axis.

Q4: what is the other name of Inferior tibiofibular joints ?

- A.Gomphosis
- B.syndesmosis
- C.synchondrosis
- D.symphysis

Q5: joints are classified according to ?

- A. type of bone
- B.tissues that lie between the articulating bones
- C. Number of bone
- D. Size of bone

Q6: the site where two or more bones meet together ?

- A. Cartilage
- B. Tendon
- C. Joint
- D.non of the above

Q7: what type of joint that has No or very mild movement ?.

- A. Fibrous joints
- B. Cartilaginous joints
- C. Synovial Joints
- D. Non of the above

Q8: Secondary cartilaginous joints are united by ?

- A.Hyaline cartilage
- B.elastic cartilage
- C.fibrous tissue
- D.fibrocartilage

Q9: Which type of uniaxial synovial joints can do supination & pronation of the forearm?

- A.Hinge
- B.Pivot
- C.Saddle
- D.Ellipsoid

Q10: Which of the following is true about Multiaxial (polyaxial) synovial joints ?

- A.Flexion & Extension.
- B.Rotation along separate axis.
- C.Abduction & Adduction.
- D.All of the above.

Q11: In most joints, it is the major factor controlling stability ?

- A.The shape of the articular surfaces.
- B.Strength of the ligaments.
- C.Tone of the surrounding muscles.
- D.Atmospheric pressure.

Q12: According to Hilton's law "A sensory nerve supplying a joint also supplies..." relating to that joint ?

- A.Bone & muscles
- B.Muscles & skin
- C.Bone & skin
- D.None of the above

- |   |     |   |      |
|---|-----|---|------|
| C | (6) | B | (12) |
| B | (5) | C | (11) |
| B | (4) | D | (10) |
| B | (3) | B | (9)  |
| A | (2) | D | (8)  |
| C | (1) | A | (7)  |

## SAOs:

**Q1:**The joint cavity contain the \_\_\_\_\_ which is secreted from the \_\_\_\_\_.

**Q2:** list the 3 type of joint

**Q3:**List the 5 types of the axial synovial joints with an example for each.

Q1:Synovial fluid - synovial membrane.  
Q2:1-Cartilaginous 2-Fibrous 3-Synovial  
Q3:1-Hinge e.g. Elbow joint. 2-Pivot e.g. Radio-ulnar joint. 3-Ellipsoid e.g. Wrist joint.  
4-Ball & socket e.g. hip joint. 5-Saddle e.g. carpometacarpal joint of the thumb.

### This lecture was done by:



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SPECIAL THANKS TO THE AMAZING  
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