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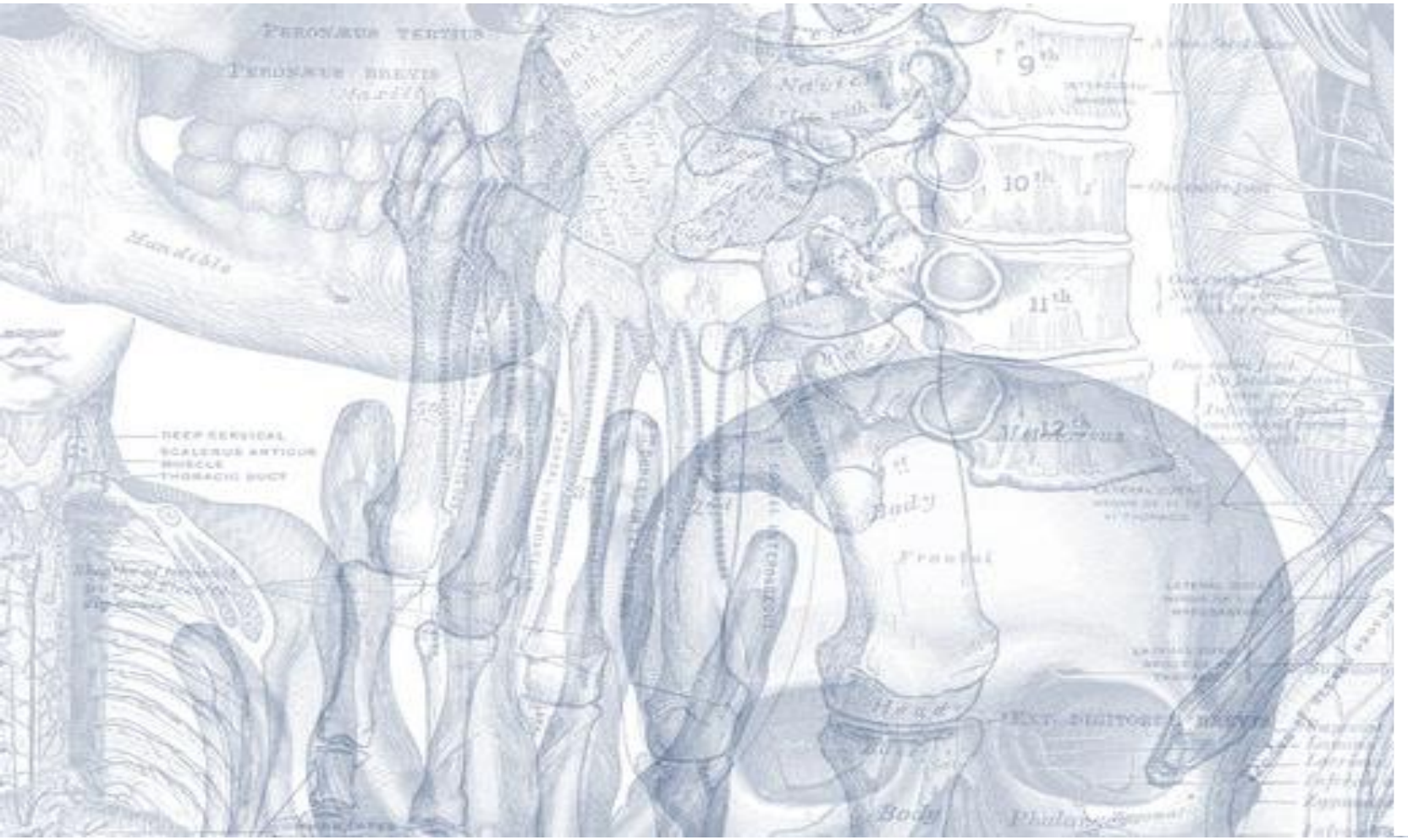


ANATOMY
TEAM 436

436
MEDICINE
KING SAUD UNIVERSITY

Revised by
شوق الأحمري & طراد الوكيل

JOINTS

Editing file

Color Code

- Important
- Doctors Notes
- Notes/Extra explanation

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.

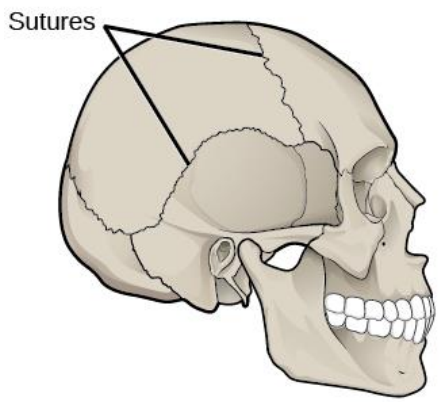
Definition

What is a joint? It is the site where two or more bones meet together.
Another def. : it is the meeting of two or more articulating joints

Classification of joints

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

- A. Fibrous
- B. Cartilaginous
- C. Synovial



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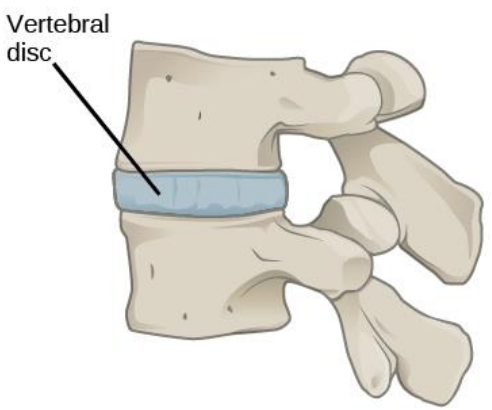

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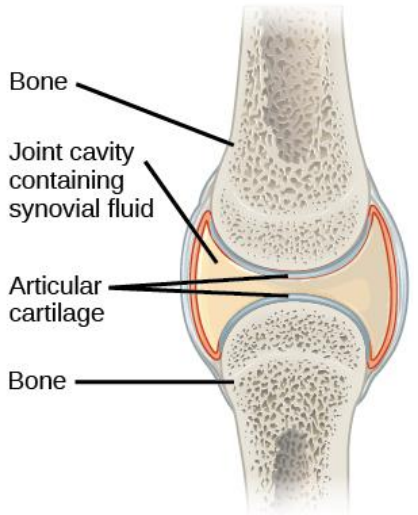


(c)

1) Fibrous Joints

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

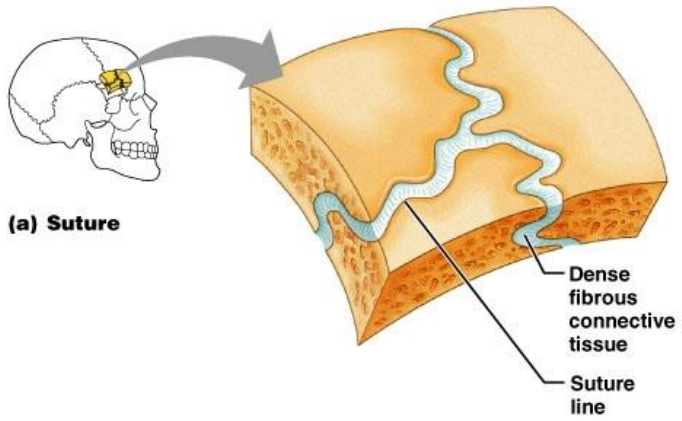
1. Skull sutures: Temporary (as it ossify later)

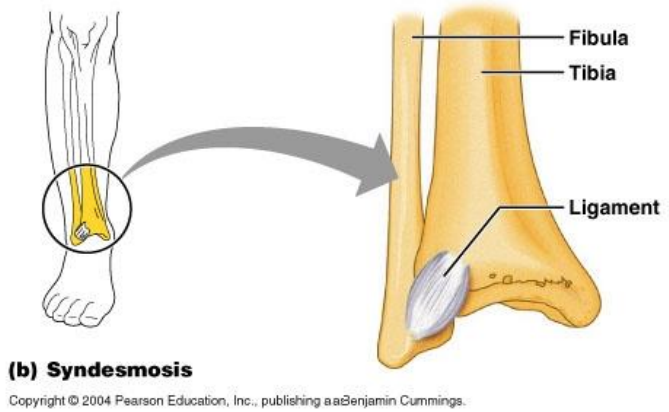
2. Inferior tibiofibular joints (syndesmosis):

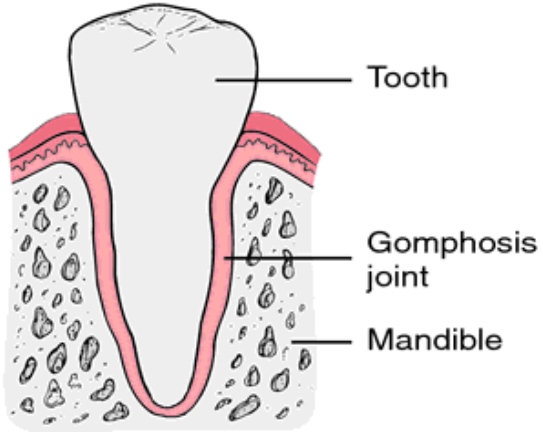
minimal movement, permanent joints.

3. Gomphosis: dental alveolar joints. Articulation between root of the tooth with mandible or maxilla

- مهمة الأمثلة تجي عليها أسئلة (المثال ولأي نوع)





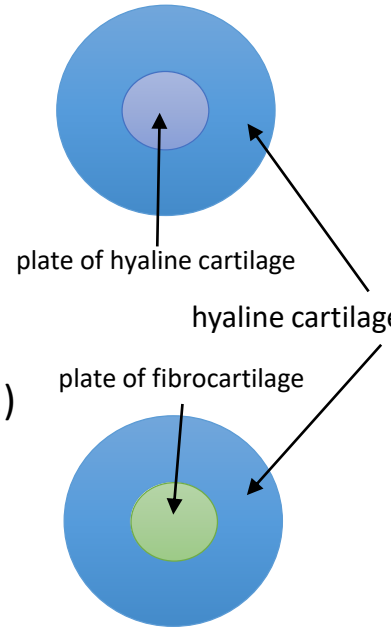


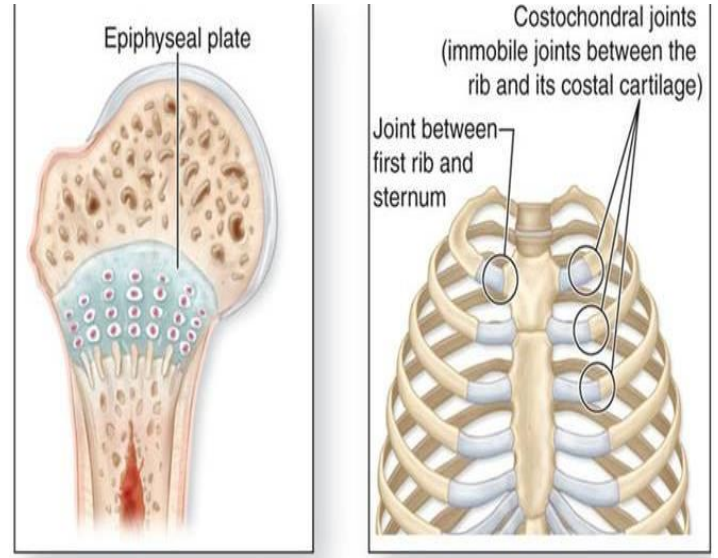
2) Cartilaginous Joints

- ✓ When two bones are joined by cartilage the formed joint is called "cartilaginous joint"
- ✓ and are classified into 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:
      - Between the Epiphysis and the Diaphysis of a growing bone.
      - Between the First Rib and the Sternum (1st sternocostal joint).

        (The rest of the sternocostal joints are synovial **plane** joints.)

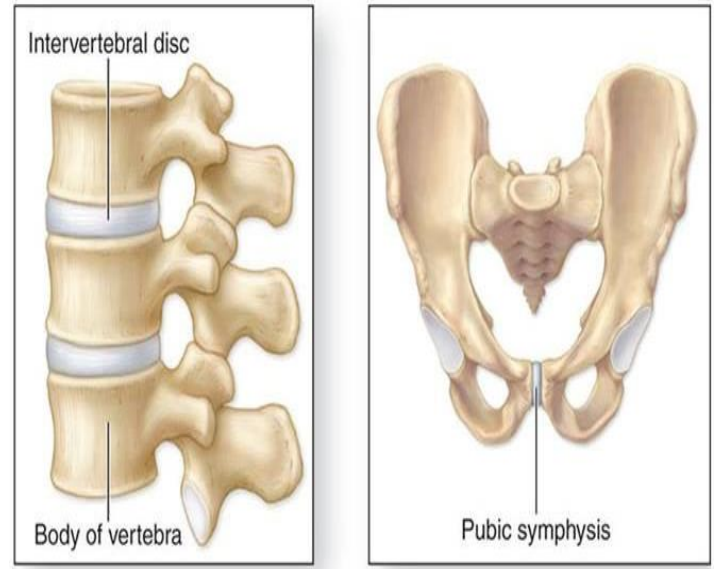
  - Secondary Cartilaginous:
    - The bones are united by a plate of *fibrocartilage*.
    - Their *articulating surfaces* are covered by a thin plate of hyaline cartilage.
    - *Little movement*, permanent joints.
    - The are called Midline joints. Because they are mainly found in the axial skeleton (midline of body)
    - Example: (in axial)
      - Joints between the Vertebral Bodies (intervertebral discs).
      - Symphysis Pubis.





(a) **Synchondroses** (contain hyaline cartilage)

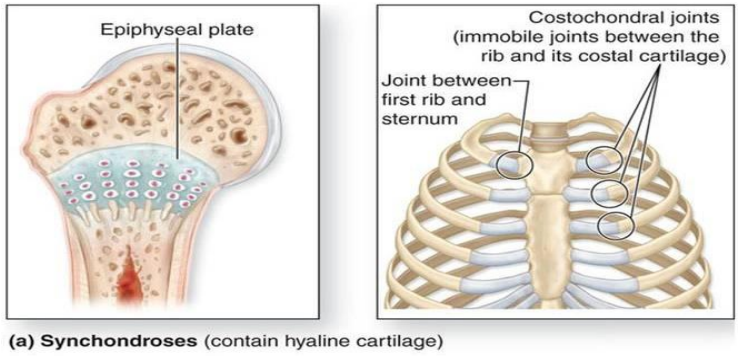
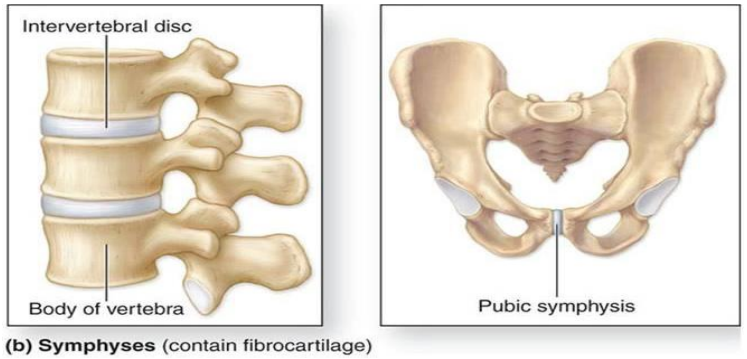
Any articulating surface will has a plate of hyaline cartilage



(b) **Symphyses** (contain fibrocartilage)

2) Cartilaginous Joints :summery

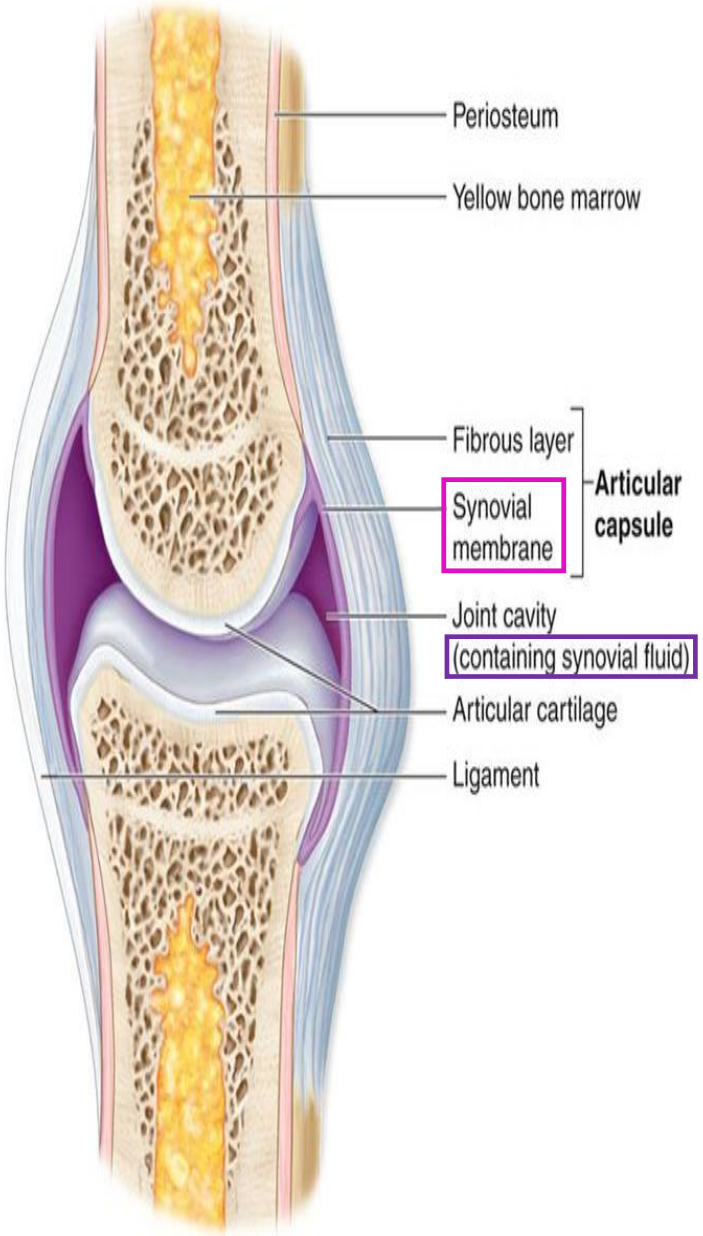
When two bones are joined by cartilage the formed joint is called “cartilaginous joint”

	Primary Cartilaginous (synchondrosis):	Secondary Cartilaginous:
Structure	The bones are united by a plate or a bar of hyaline cartilage.	The bones are united by a plate of fibrocartilage. Their articulating surfaces are covered by a thin plate of hyaline cartilage. They are called Midline joints.
Degree of movement and duration	No movement, temporary joints (ossify later).	Little movement, permanent joints.
Examples	Between the Epiphysis and the Diaphysis of a growing bone. Between the First Rib and the Sternum (1st sternocostal joint). (The rest of the sternocostal joints are synovial plane joints.)	Joints between the Vertebral Bodies (intervertebral discs). Symphysis Pubis.
Pictures	 (a) **Synchondroses** (contain hyaline cartilage)	 (b) **Symphyses** (contain fibrocartilage)

3) 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. The internal surface of it.. is Synovial membrane



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.

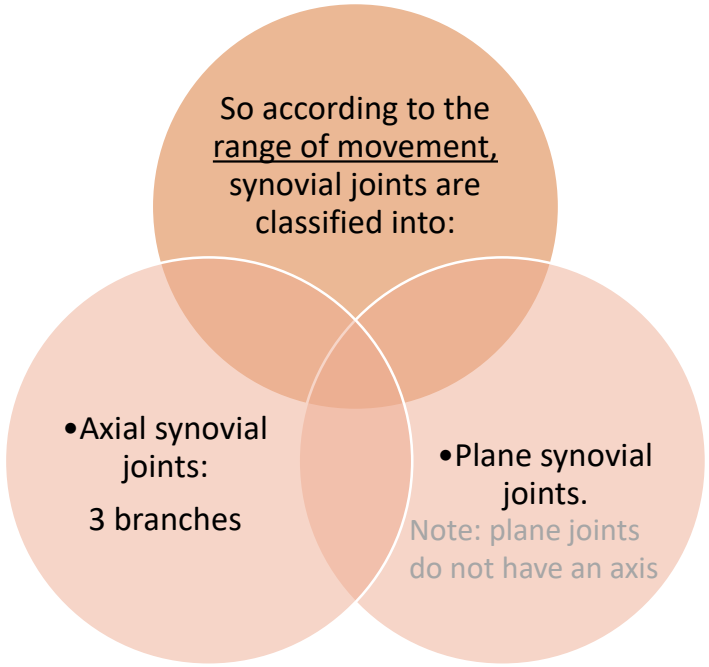
The fluid minimizes the friction between the articular surfaces.

3) Synovial joints

- Classification

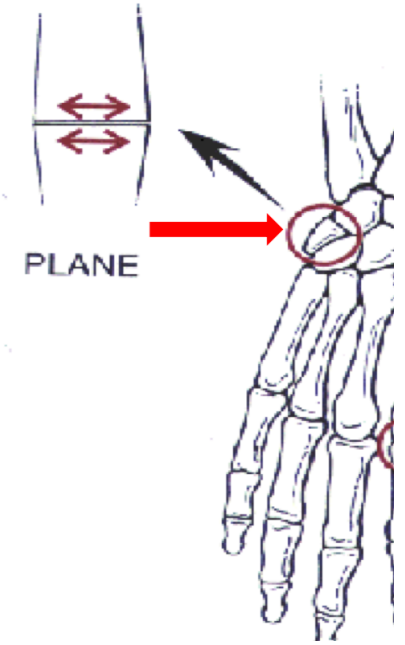
Synovial joints can be classified <u>according</u> to:

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



3) SYNOVIAL JOINTS

I - PLANE SYNOVIAL JOINTS



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

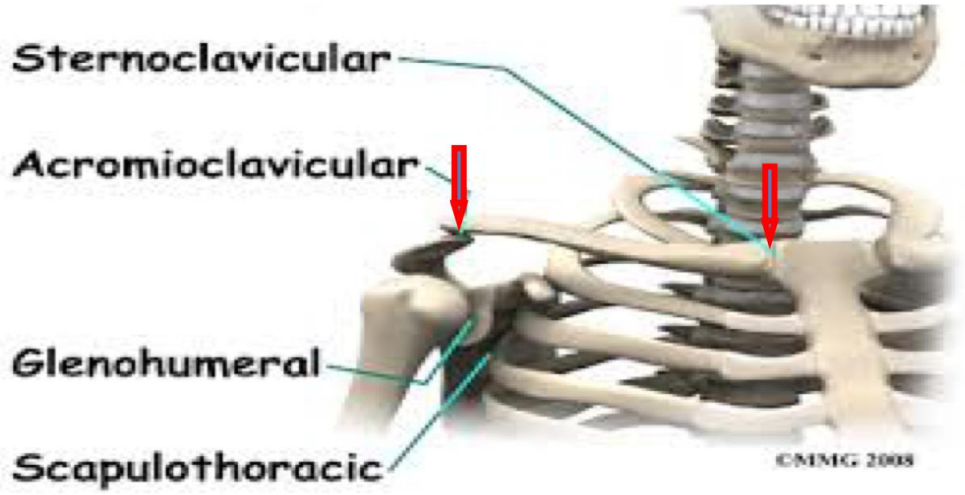
1.Intercarpal Joints.

+ Intertarsal Joints.

2.Sterno**clavicular**

3. Acromio**clavicular** joints.

4.Between the 2nd -7th sternocostals

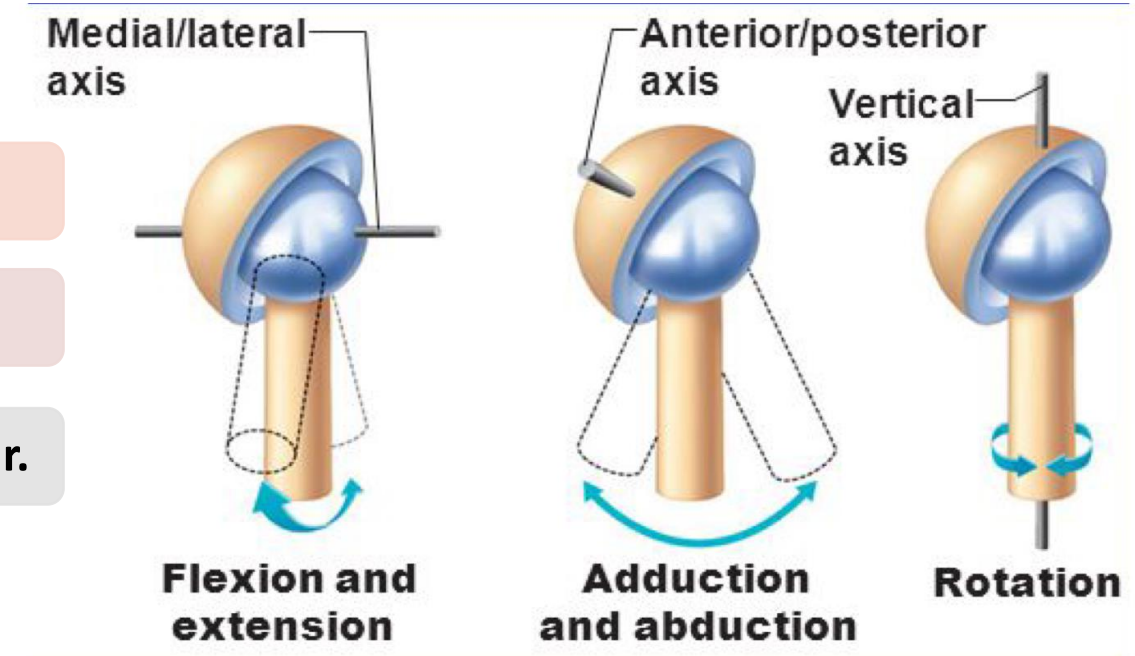


3) SYNOVIAL JOINTS

II - AXIAL SYNOVIAL JOINTS

Movements occur along axes:

1.Transverse(x-axis):	• flexion & extension occur.
2.Longitudinal(y-axis):	• rotation occurs.(M-L)
3.Antero-posterior(z-axis):	• abduction & adduction occur.



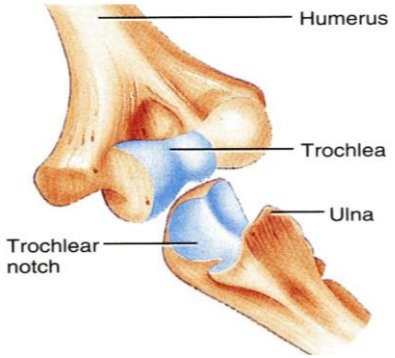
Axial joints are divided into:

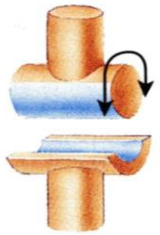
- Uniaxial.
- Biaxial.
- Multi-axial (polyaxial).

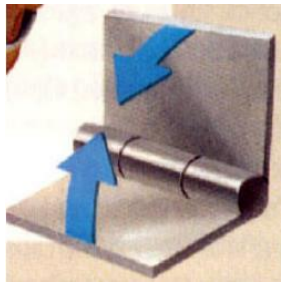
Important always mentioned in exams.

A) UNIAXIAL* SYNOVIAL JOINTS

Type:	Hinge joint	Pivot joint
Axis:	Transverse**	Longitudinal
Movement:	Flexion & extension	Rotation (s-p)
Example:	Elbow and ankle joints	Radio-ulnar joints and atlantoaxial joint

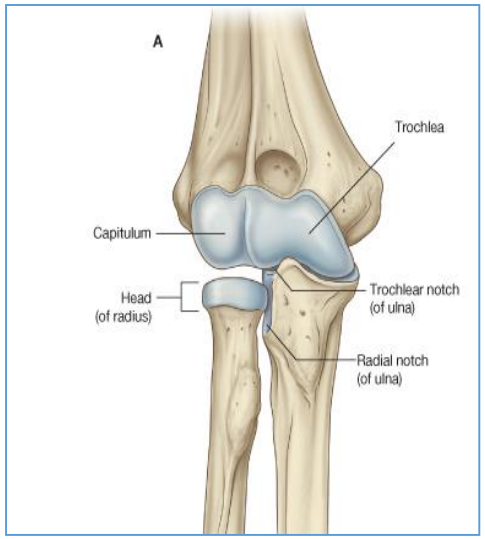




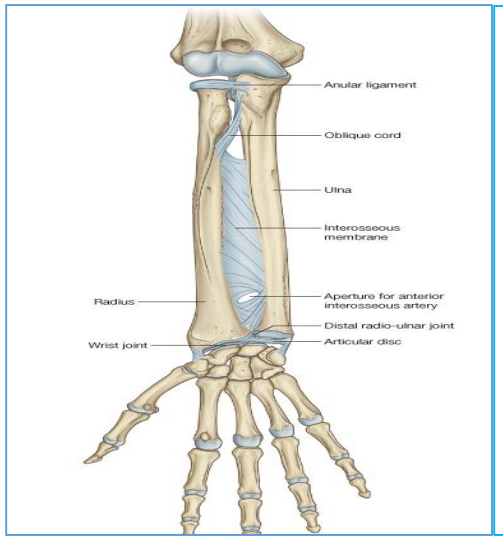


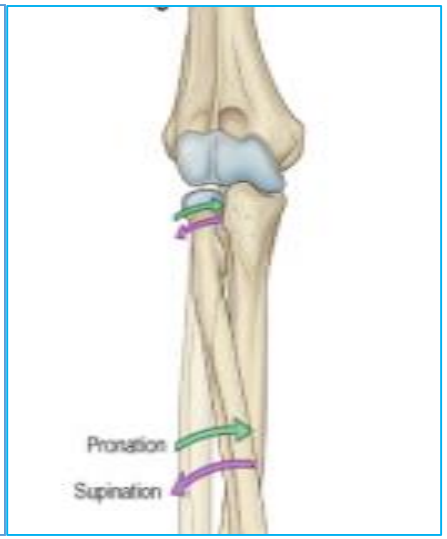
*one axis

**مثل حركة اللابتوب



Elbow



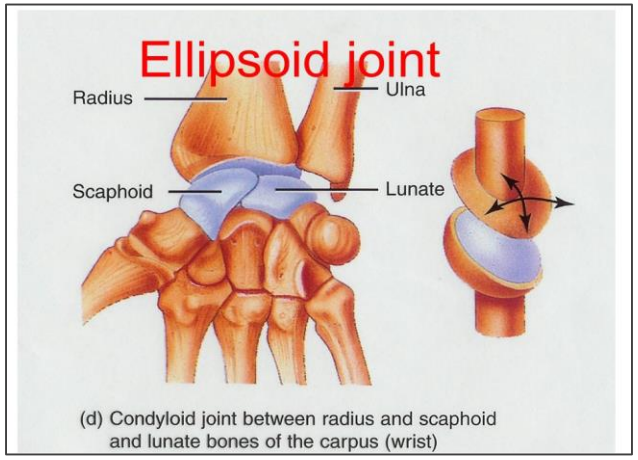


Radio-ulnar

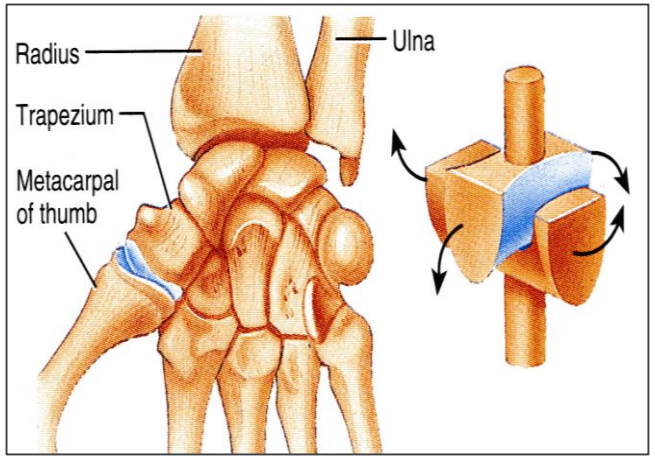
B) BIAXIAL* SYNOVIAL JOINTS

Type:	Ellipsoid** joint	Saddle joint
Axis:	Transverse + antero-posterior	Transverse + antero-posterior + Longitudinal (limited)
Movement:	Flexion & extension + abduction & adduction but rotation is impossible	As ellipsoid joints (Flexion & extension + abduction & adduction) + a small range of rotation***
Example:	Wrist joint	Carpometacarpal joint of the thumb
Further info.:	An elliptical convex^^^ fits into an elliptical concave articular surface.	• The articular surfaces are reciprocally **concavoconvex^**. • They resemble a saddle^^ on a horse's back.

*Two axis.
** بيضاوي.
^ العظمة نفسها فيها جزئين واحد مُحدّب والثاني مُقعّر. فتكون العظمة الثانية المرتبطة فيها وتكوّن المفصل معها شكلها عكس الأولى (مثلًا الأولى بدايتها مُحدّبة الثانية تصير بدايتها مُقعَرة وهكذا.)
^^ سرج الحصان.
^^^ هنا الجزء المُقعّر والجزء المُحدّب يكونون بعظمتين منفصلتين.
*** زي لما نسبّح



(d) Condyloid joint between radius and scaphoid and lunate bones of the carpus (wrist)



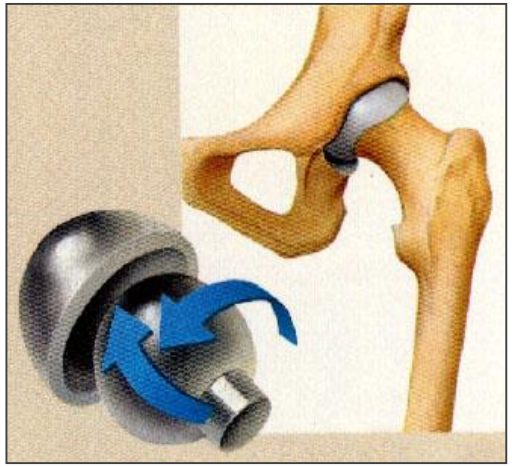
C) POLYAXIAL* SYNOVIAL JOINTS

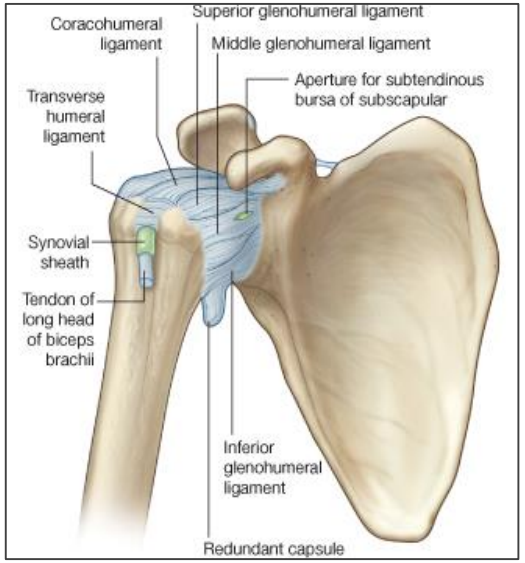
Type:	Ball-and-socket joints
Axis:	All axis
Movement:	Flexion & extension + abduction & adduction + rotation along a separate axis.
Example:	1. Shoulder joint. 2. Hip Joint.
Further info.:	•A ball–shaped* head of a bone fits into a socket-like concavity of another.

*In Shoulder joint, ball is the head of humerus and socket is Glenoid cavity of scapula (shallow سطحي). In Hip joint, ball is the head of femur and socket is acetabulum of hip bone (very deep). For that (shallowness and deepness) the stability is more in acetabulum than Glenoid cavity. *Glenoid cavity is stabilized by ligaments* ^don't be afraid of details will explain later.

**نفس ما قالت دكتورة سناء «كُل ما تشتهيه من الموفمنت هنا».

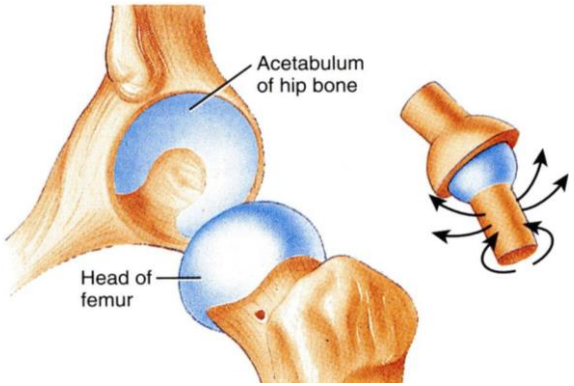
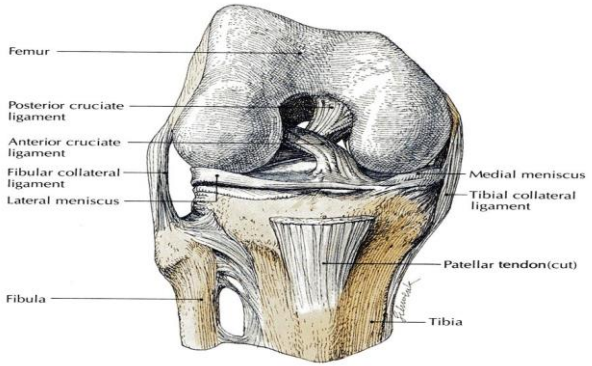
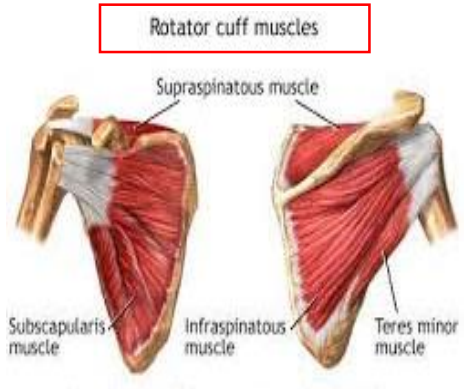
*has all range of movements.





Stability Of Synovial Joints

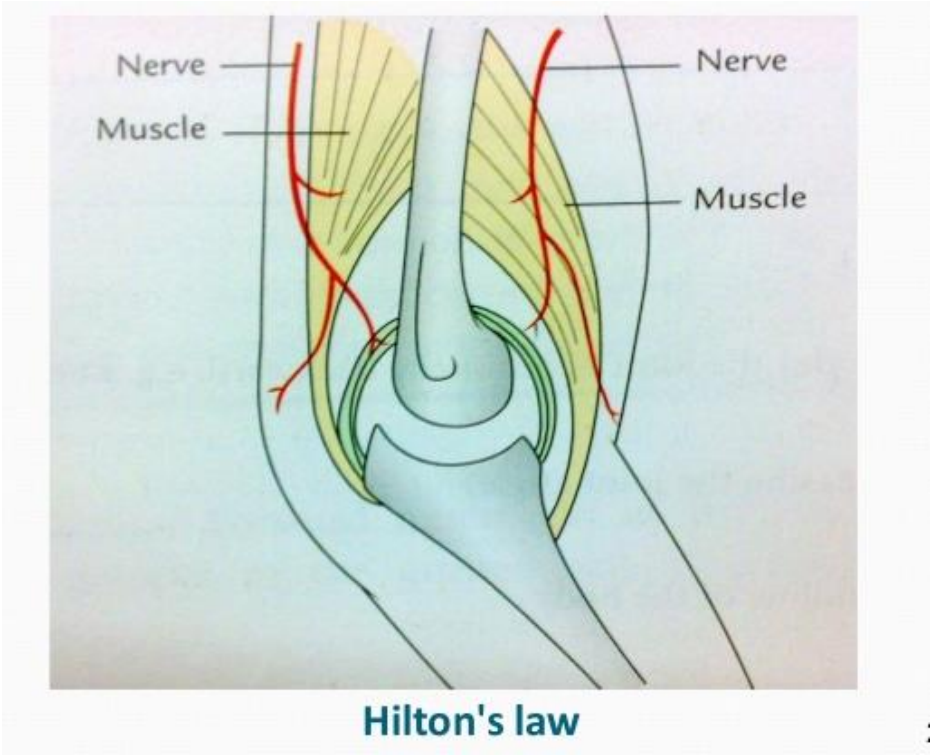
It depends on :

1-The shape of articular surfaces	2-Strength of the ligaments:	3- Tone of the surrounding muscles:
-ex: the ball and socket shape of the Hip joint is a good examples of the importance of bone shape to maintain joint stability. -The hip joint is more stable than the shoulder joint because The hip has Deep concavity that gives more support than The shoulder which is shallowly concave and needs more support into it. -The shape of the bones forming the Knee joint has nothing to do for stability.	-Ex: cruciate ligaments of the knee joint -They prevent excessive movement in a joint.	In most joints, it is the major factor controlling stability. -Ex: The short muscles (rotator cuff muscles) around the shoulder joint -keeps the head of the humerus in the shallow glenoid cavity. Note: the muscle does not have to be contracted the tone is enough to stabilize the joint
		

Nerve supply of joints

- The capsule and ligaments receive an abundant sensory nerve supply. Not with joint cavity!

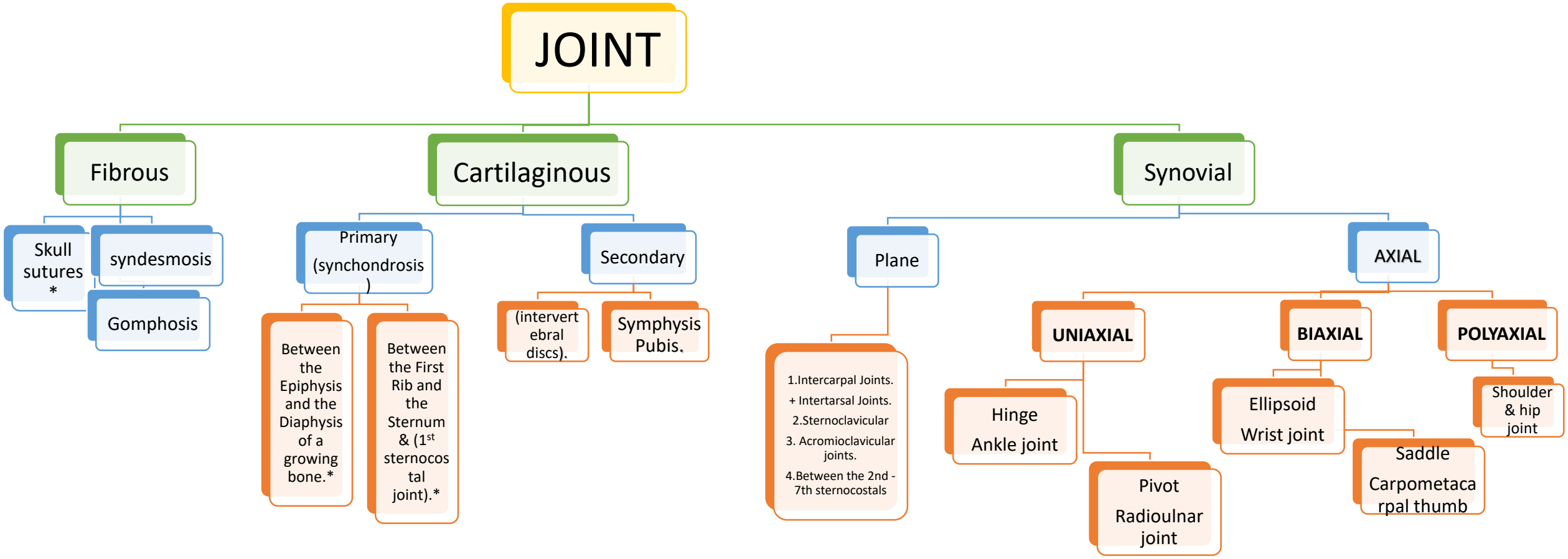
- Hilton's Law: "A nerve supplying a joint also supplies the muscles moving that joint and the skin overlying the insertions of these muscles."



Summary:

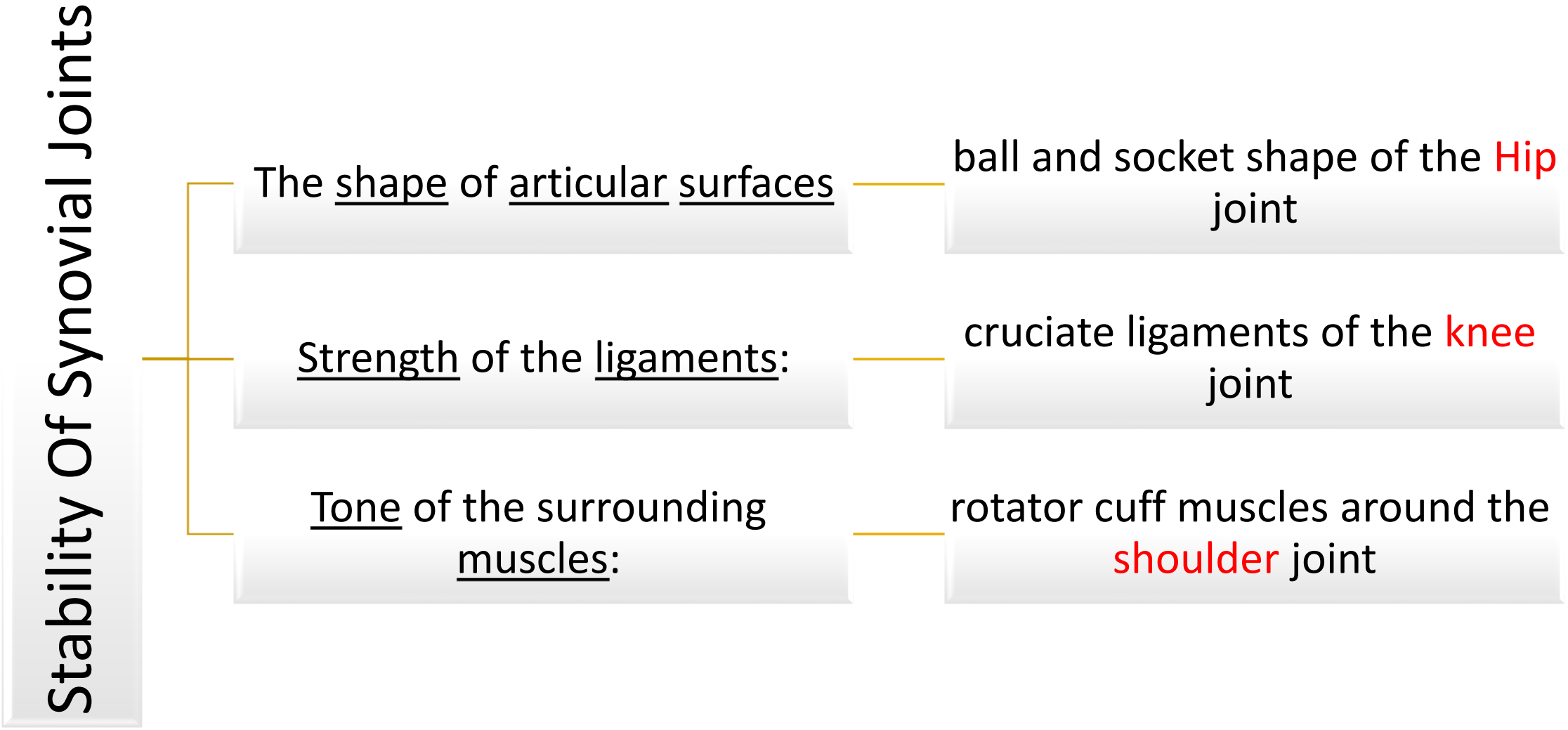
- Joint is the site where two or more bones come together, whether movement occurs or not between them.
- Joints are classified according to the tissues that lie between the bones into 3 types: fibrous, cartilaginous & synovial.
- Synovial joints are freely movable & characterized by the presence of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

Summary:



**No movement,* Temporary (as it ossify later)

Summary:


Stability Of Synovial Joints
The shape of articular surfaces
ball and socket shape of the Hip joint
Strength of the ligaments:
cruciate ligaments of the knee joint
Tone of the surrounding muscles:
rotator cuff muscles around the shoulder joint

sutures in skull

- No movement
- Temporary
- Example of : Fibrous joint

sternoclavicular joint

- Articaulate surface is flat
- Gliding movement
- Ex. Of :Plane Synovial Joint

Radioulnar joint

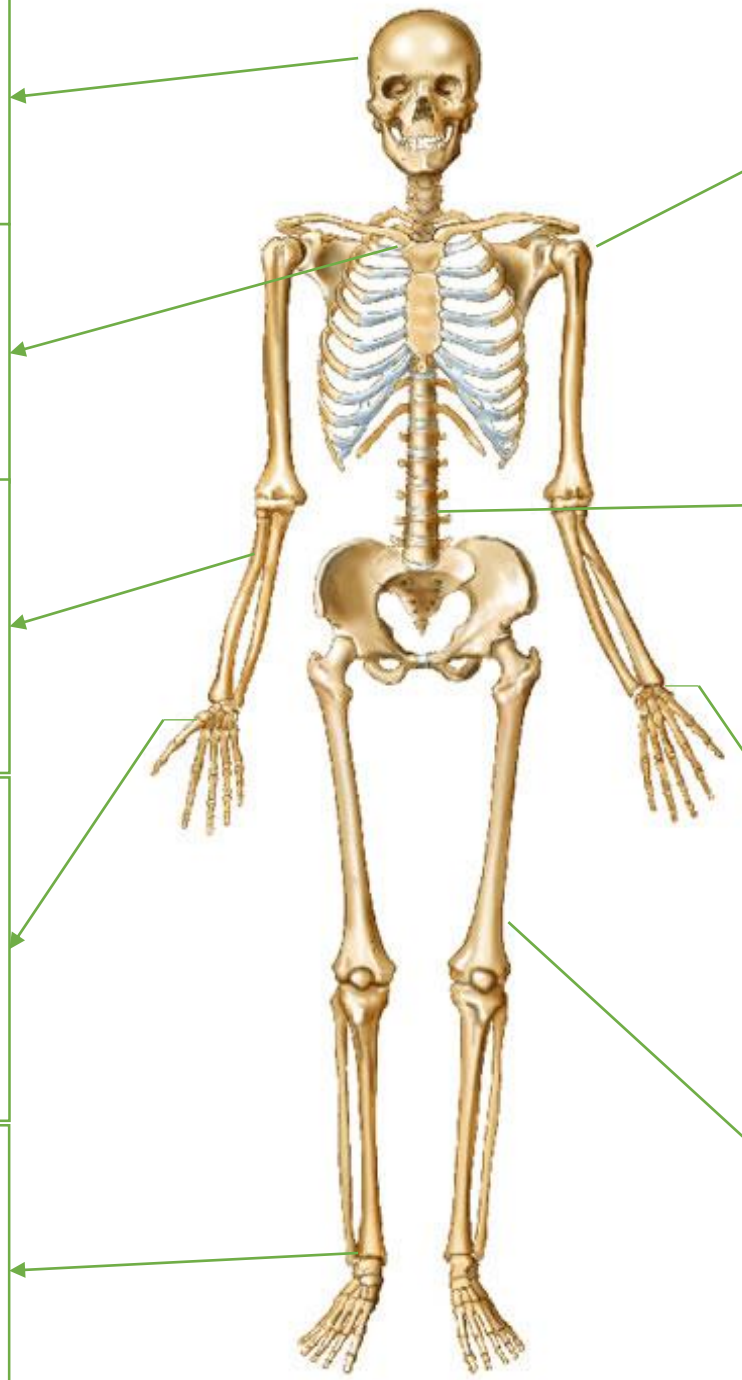
- Pivot
- Longitudinal
- Rotation
- Ex. Of : Uniaxial Synovial joint

Carpometacarpal joint of thumb

- Saddle
- Flexion, extension, adduction, abduction, and limited rotation
- Ex. Of : Biaxial Synovial Joints

Ankle

- Hinge joint
- Transverse movement
- Flexion and extension
- Ex. Of : Uniaxial Synovial Joint



Shoulder

- ball and socket
- Flexion, extension, adduction, abduction, and rotation
- Ex. Of : Polyaxial Synovial Joint

Between vertebrae in column

- Secondary
- Articulate surfaces covered by hyaline cartilage
- Limited movement
- Permanent
- Ex. Of: Cartilaginous joint

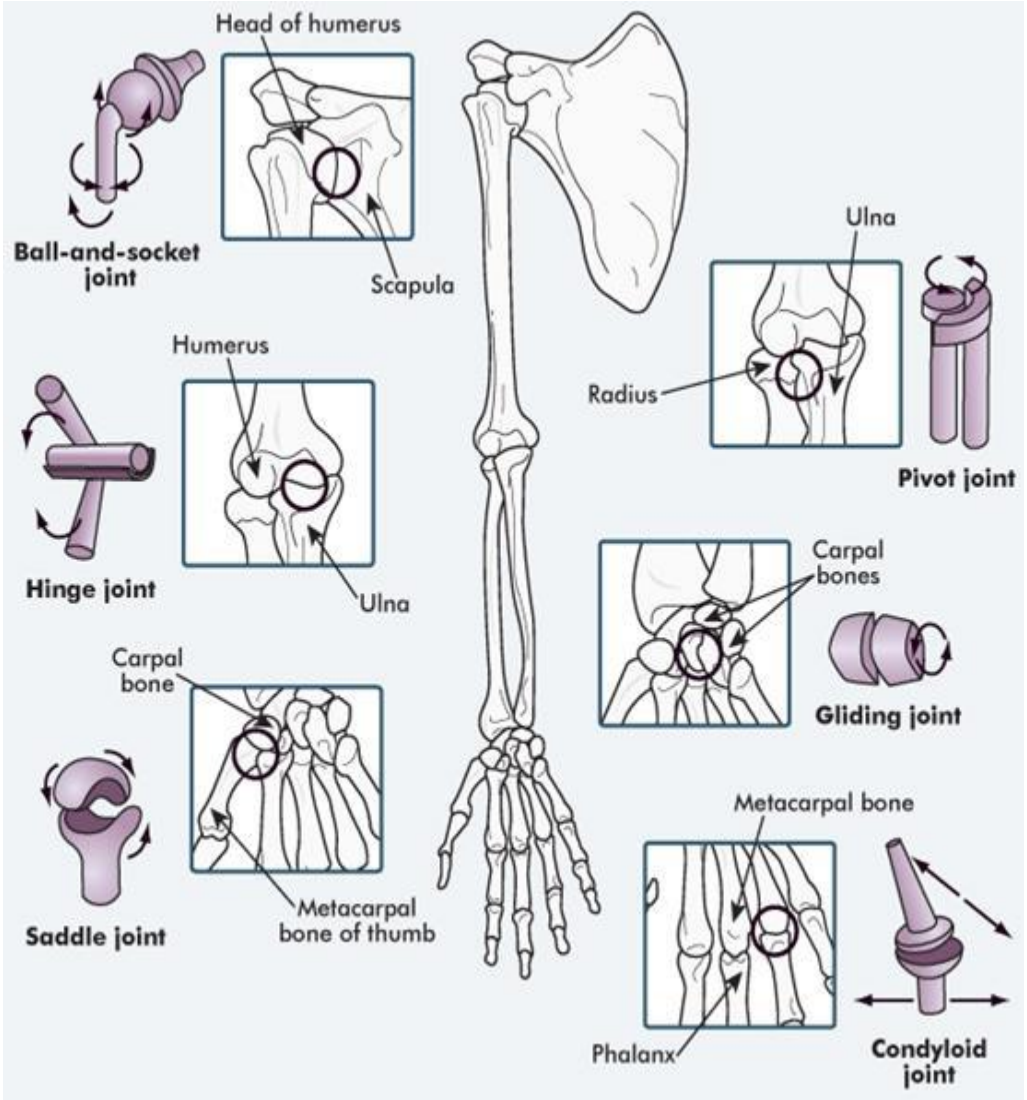
Wrist

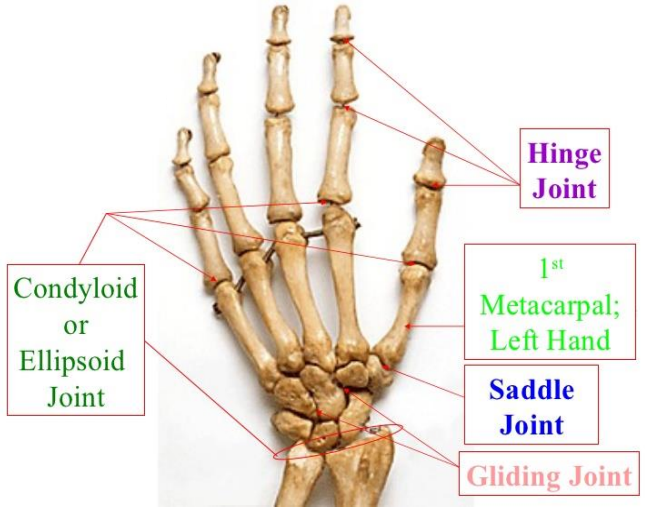
- Ellipsoid
- Flexion, extension, adduction, abduction
- Ex. Of: Biaxial Synovial joint

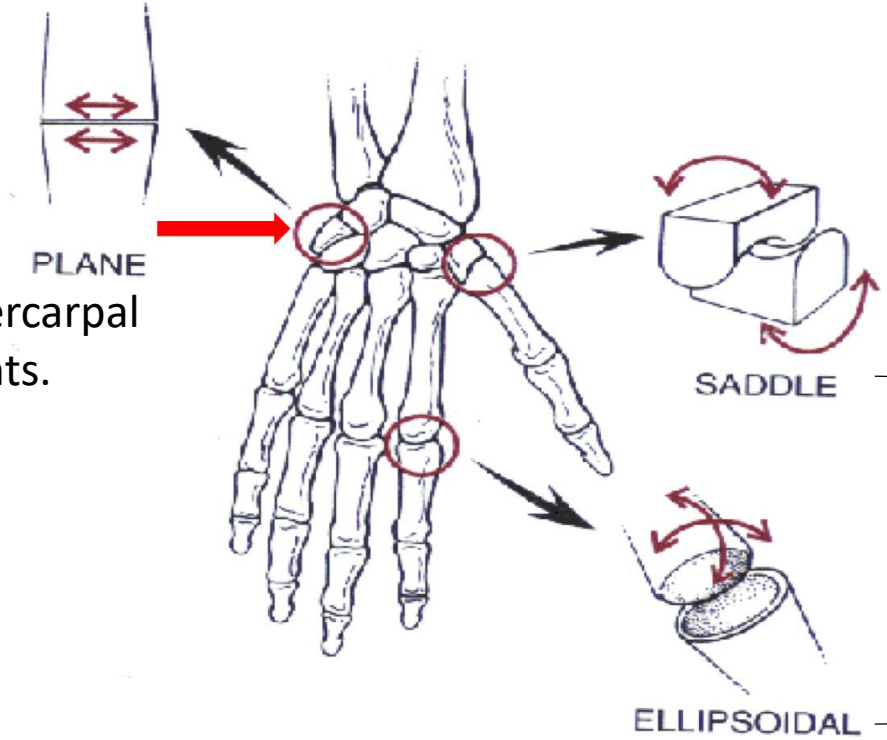
Epiphyseal plate in femur

- Primary Bones are joined through hyaline cartilage
- No movement
- Temporary
- Ex. of: Cartilaginous joint

Summary







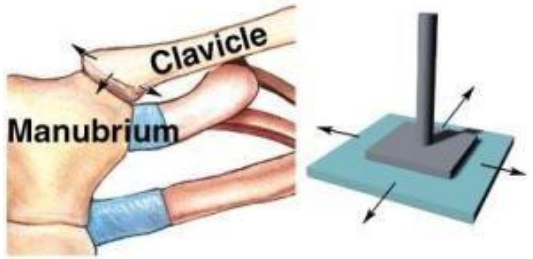
Intercarpal Joints.

Carpometacarpal joint of the thumb

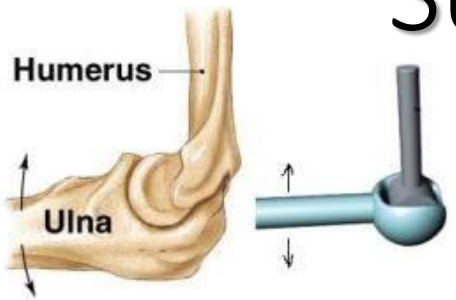
BIAXIAL

+Wrist joint

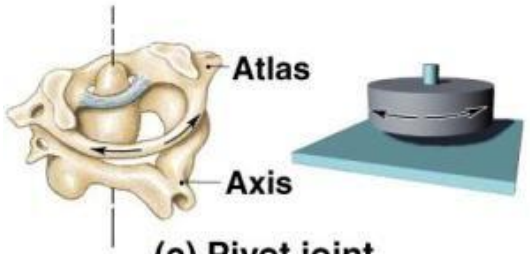
Summary



(a) Gliding joint

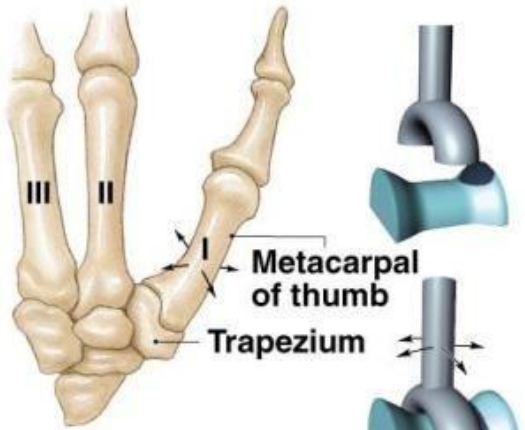


(b) Hinge joint

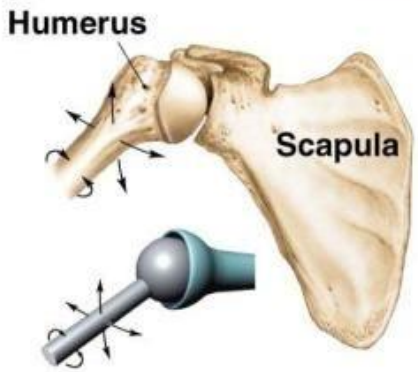


(c) Pivot joint

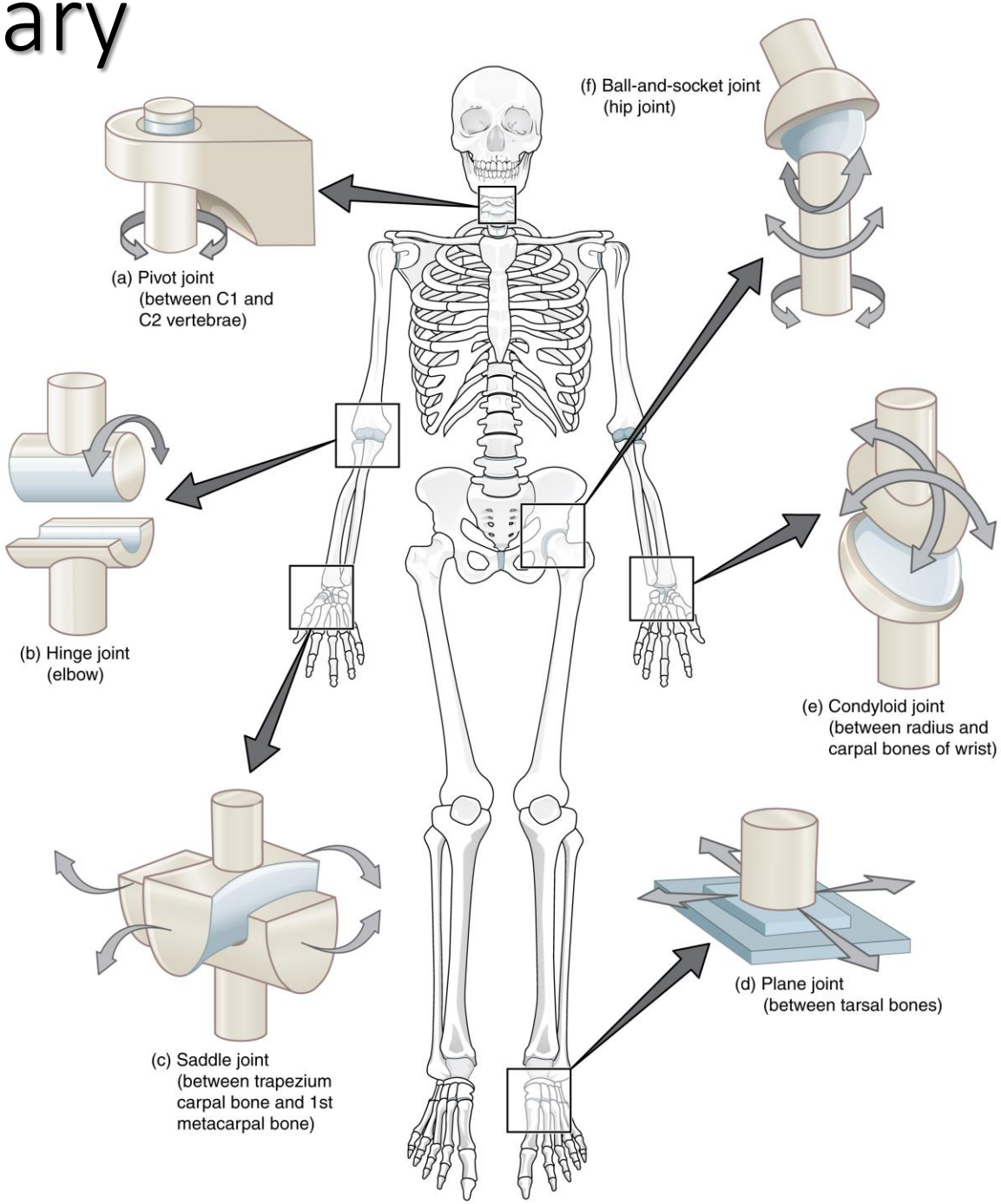
(d) Ellipsoidal joint



(e) Saddle joint



(f) Ball-and-socket joint



Questions

1) What is the classification of gomphosis?

A. Fibrous

B. Cartilaginous

C. Axial Synovial

D. Plane Synovial

2) Which of the following joints has a minimal movement?

A. Skull sutures

B. Inferior tibiofibular joint

C. 1st sternocostal rib

D. Gomphosis

3) Which of the following joints has a free range of movement?

A. Primary cartilaginous joint

B. Secondary cartilaginous joint

C. Synovial joint

4) Primary cartilaginous joint are bones joined by fibrocartilage.

A. True

B. False

5) Articular capsule is a thin vascular membrane lining the inner surface of the capsule.

A. True

B. False

6) According to the range of movement synovial joints are classified into :

A. plane and axial

B. proximal and distal

C. plane and distal

7) Elbow is one of which these joints:

A. Hinge synovial joint

B. Pivot synovial joint

C. Plane synovial joint

1) A
2) B
3) C
4) B
5) B
6) A
7) A
8) C

8) Wrist is one of which these joints:

A. Hinge synovial joint

B. Pivot synovial joint

C. Ellipsoid synovial joint

9) Carpometacarpal joint of the thumb is Saddle joint. It has:

A. All range of movement except rotation

B. All range of movement including a small range of rotation

C. All range of movement including a large range of rotation

10) The main factor of joint stability in most joints is:

A. Shape of articular surfaces

B. Strength of the ligaments

C. Tone of muscles around it

D. Shape of bones of the joint

11) A 40 year old obese woman came to see an orthopedic doctor for her left knee pain, the MRI Showed a tear in the cruciate ligaments. What is expected in her case?

A. muscular atrophy around knee

B. excessive movement of joint

C. ball and socket joint dislocation

D. loss of sensation

12) Which of the following is a primary cartilaginous joint?

A. 1st sternocostal joint

B. 2nd sternocostal joint

C. 8th sternocostal joint

D. 12th sternocostal joint

13) Hiltons law states that the nerve supplying a joint also supplies :

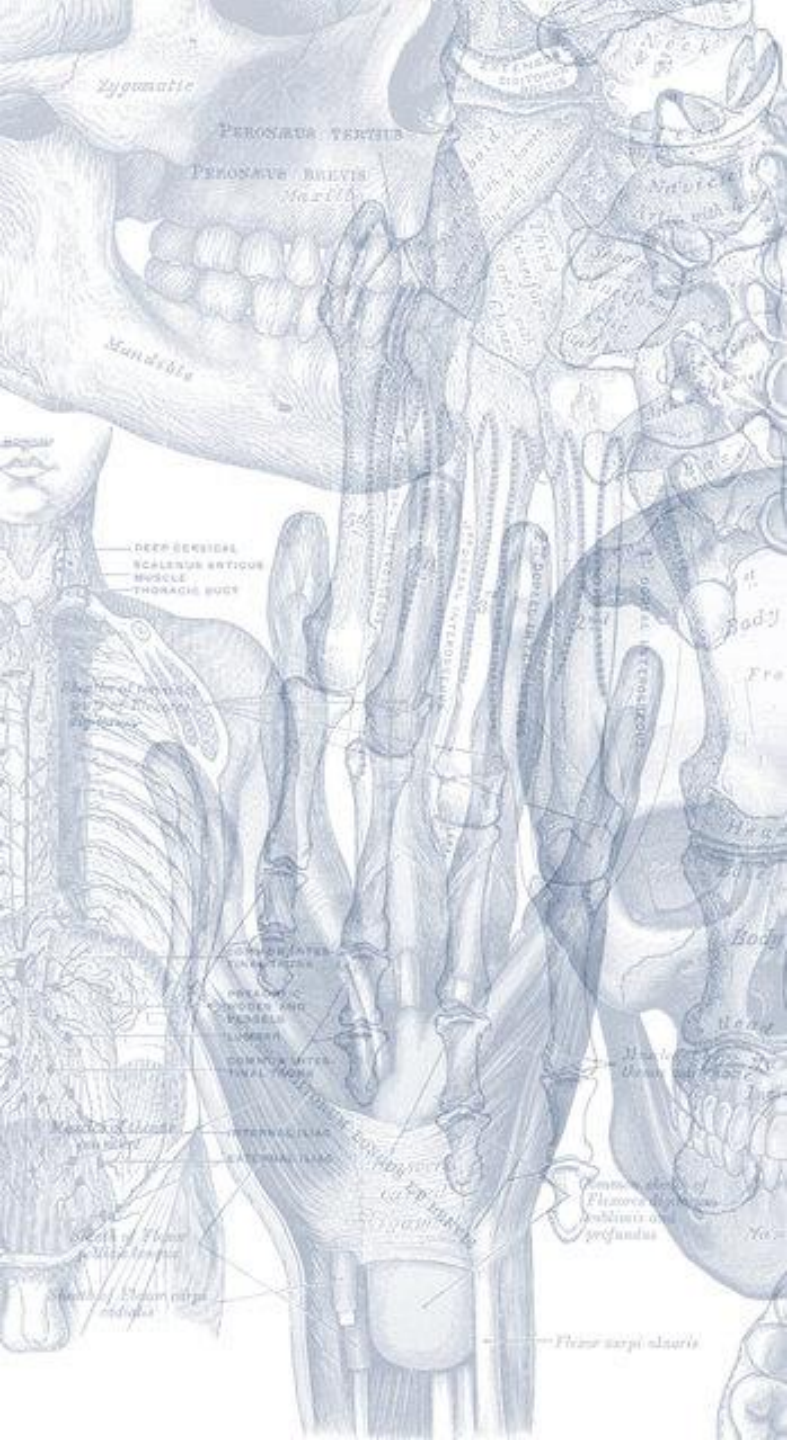
A. The muscles moving the joint

B. The skin overlying the insertion of the muscles

C. The bones

D. A & B

8) C
9) B
10) C
11) B
12) A
13) D



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