

# CLASSIFICATION OF JOINTS





# DEFINITION

- A **joint** is the location at which two or more **bones** make contact. They are constructed to allow movement and provide mechanical support, and are classified **structurally** and **functionally**.
- **Structural classification** is determined by how the bones connect to each other, while **functional classification** is determined by the degree of movement between the articulating bones





# STRUCTURAL CLASSIFICATION

- **Fibrous/Immovable**

Fibrous/Immovable bones are connected by **dense connective tissue**, consisting mainly of **collagen**. The fibrous joints are further divided into three types



- **Cartilaginous**

Cartilaginous are connected entirely by **cartilage**. Cartilaginous joints allow more movement between bones than a fibrous joint but less than the highly mobile synovial joint.

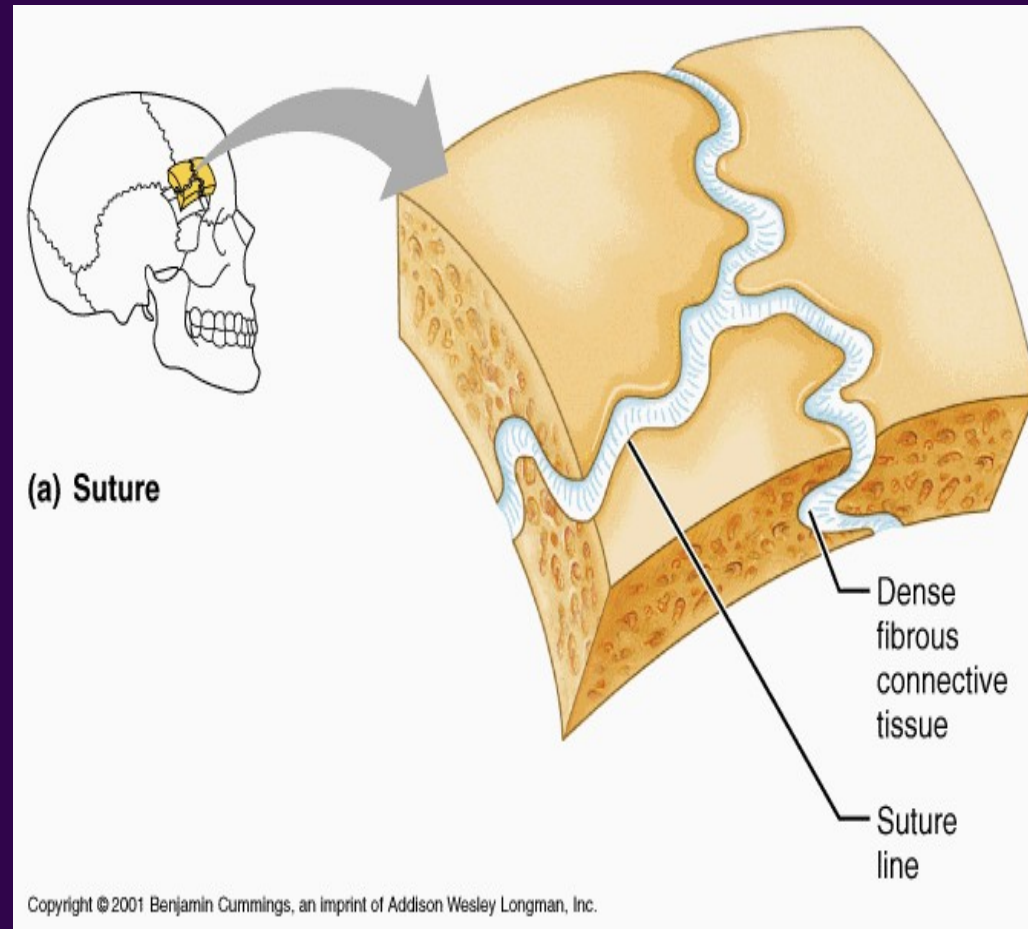


- **Synovial**

Synovial joints have a space between the articulating bones for **synovial fluid**. This classification contains joints that are the most mobile of the three, and includes the **knee** and **shoulder**.

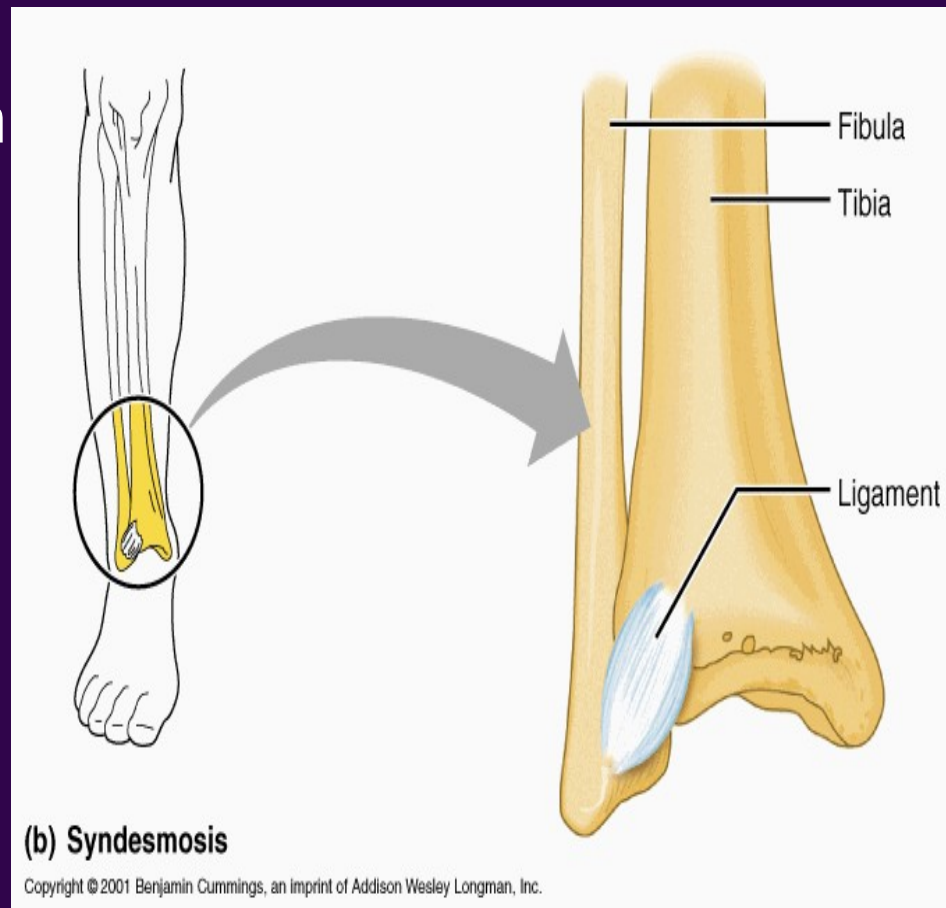
# FIBROUS JOINTS

- **1. Sutures or synostoses** are found between bones of the skull. In fetal skulls the sutures are wide to allow slight movement during birth. They later become rigid (synarthrodial).



# FIBROUS JOINTS

- **2. Syndesmosis** are found between long bones of the body, such as the **radius** and **ulna** in forearm and the **fibula** and **tibia** in leg. Unlike other fibrous joints, syndesmoses are moveable (amphiarthrodial), but not to such degree as synovial joints.

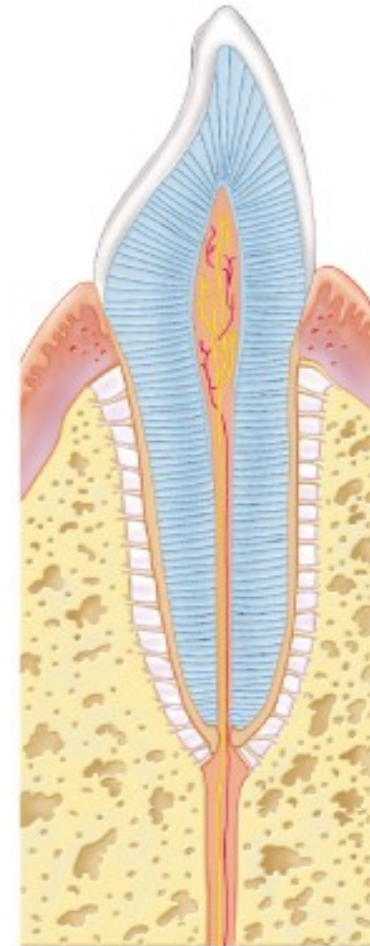






# FIBROUS JOINTS

- 3. **Gomphosis** is a joint between the root of a tooth and the sockets in the maxilla or mandible.



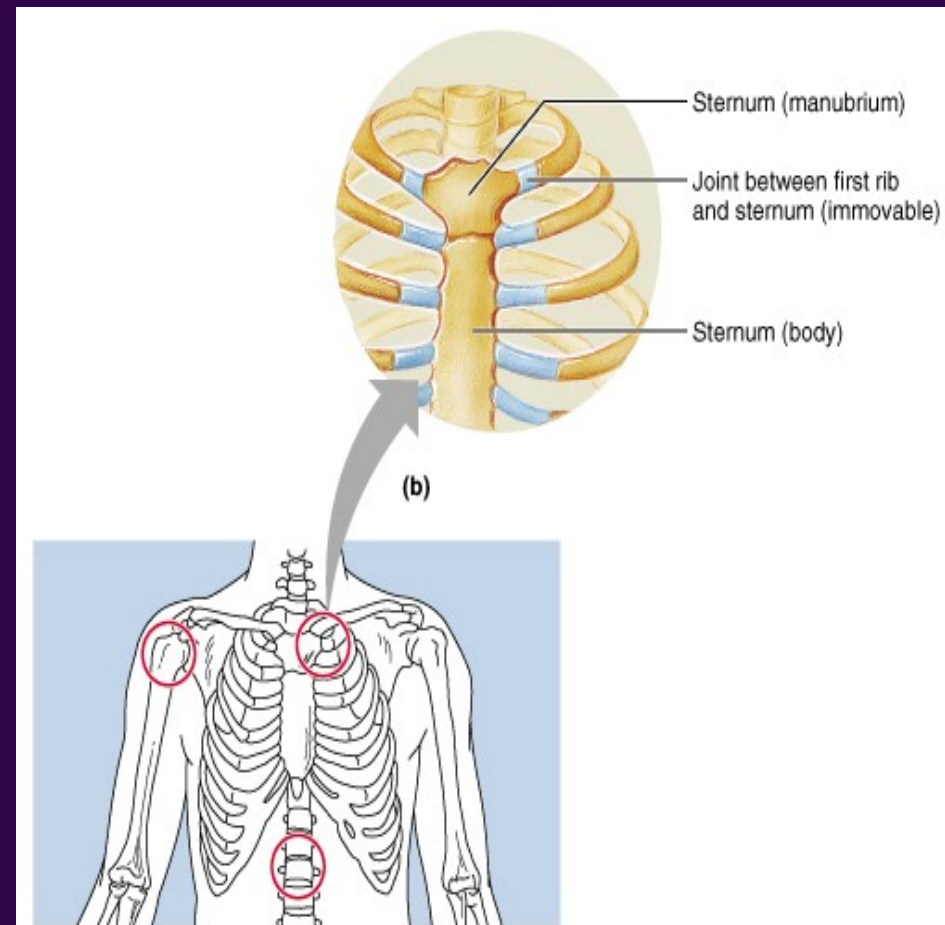


# CARTILAGENOUS JOINTS

- Cartilaginous joints are connected entirely by **cartilage**. Cartilaginous joints allow more movement between bones than a fibrous joint but less than the highly mobile synovial joint. An example would be the joint between the **manubrium** and the **sternum**. Cartilaginous joints also form the **growth regions** of immature long bones and the **intervertebral discs** of the **spinal column**.

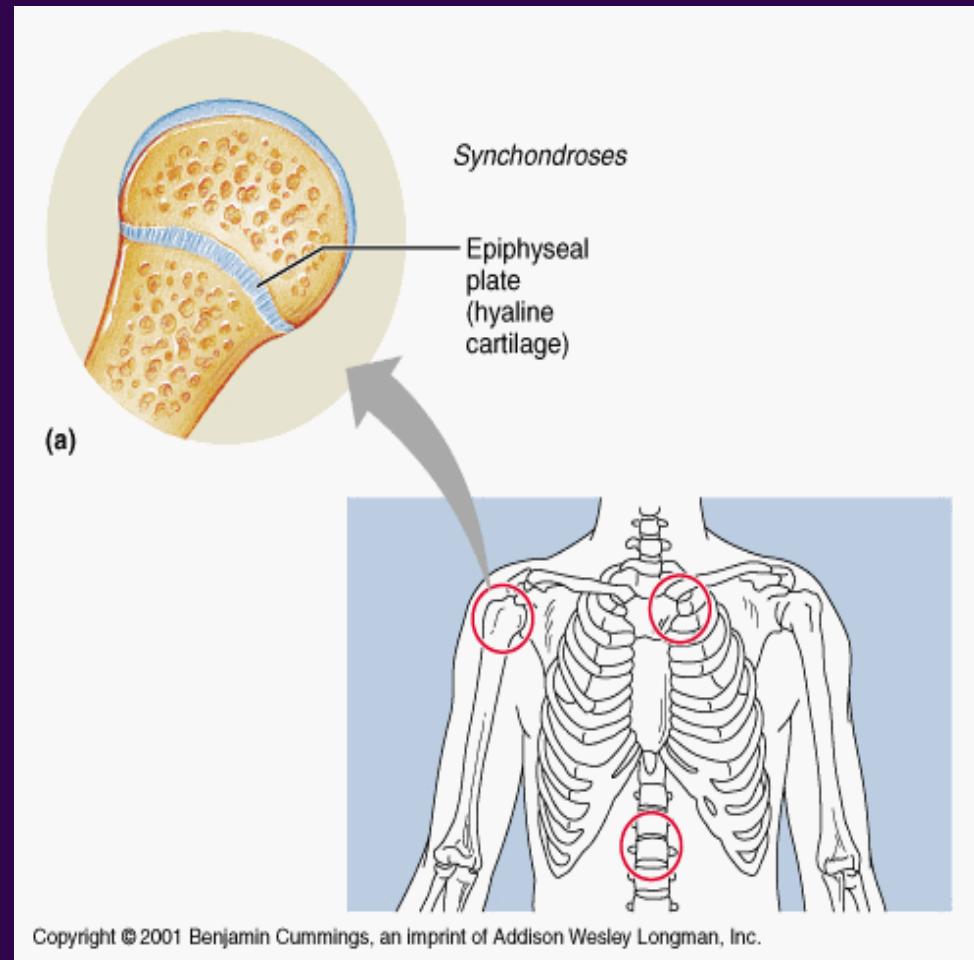
# CARTILAGENOUS JOINTS

- **Primary cartilaginous joints** - Known as "synchondroses". Bones are connected by hyaline cartilage or fibrocartilage, sometimes occurring between ossification centers. This cartilage may ossify with age. These joints usually allow no movement, or minimal movement in the case of the manubriosternal and first manubriocostal joints.



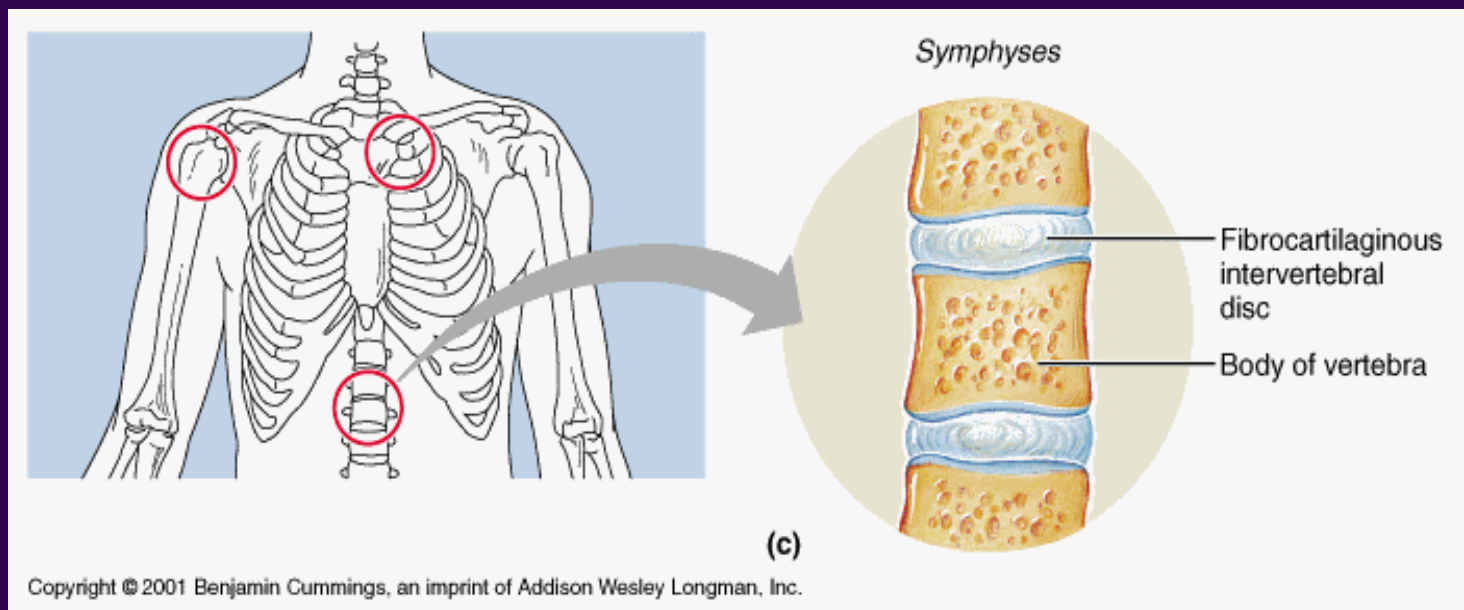
# CARTILAGENOUS JOINTS

- Examples in humans are the joint between the first rib and the manubrium of the sternum, and the "growth plates" between ossification centers in long bones.



# CARTILAGENOUS JOINTS

- **Secondary cartilaginous joints** - Known as "symphyses". Fibrocartilaginous joints, usually occurring in the midline. Examples in human anatomy would be the intervertebral discs, and the pubic symphysis. Articulating bones at a symphysis are covered with hyaline cartilage and have a thick, fairly compressible pad of fibrocartilage between them.





# SYNOVIAL JOINTS



- **Synovial**

*Synovial joint*

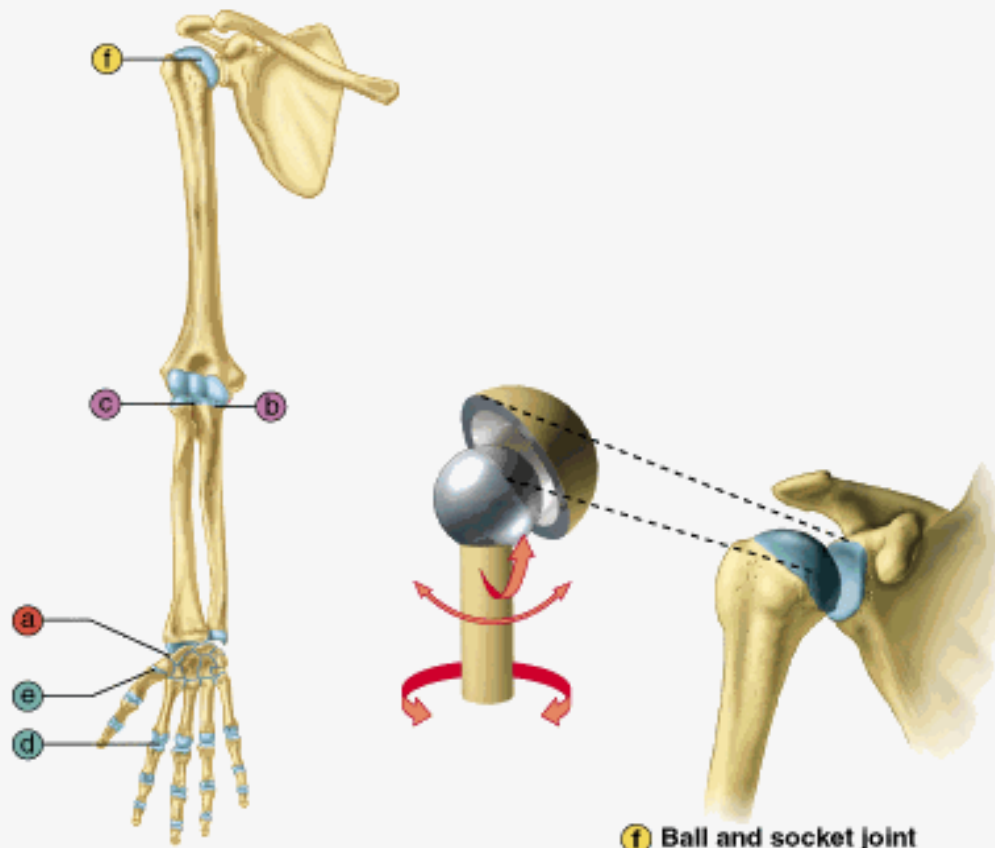
- Synovial joints have a space between the articulating bones for **synovial fluid**. This classification contains joints that are the most mobile of the three, and includes the **knee** and **shoulder**. These are further classified into **ball and socket joints**, **condyloid joints**, **saddle joints**, **hinge joints**, **pivot joints**, and **gliding joints**.



# SYNOVIAL JOINTS

- *Ball and Socket* - such as the shoulder or the hip and femur.
- *Hinge* - such as the elbow.
- *Pivot* - such as the radius and ulna.
- *Condyloid (or ellipsoidal)* - such as the wrist between radius and carpals, or knee
- *Saddle* - such as the joint between carpal thumbs and metacarpals.
- *Gliding* - such as between the carpals.

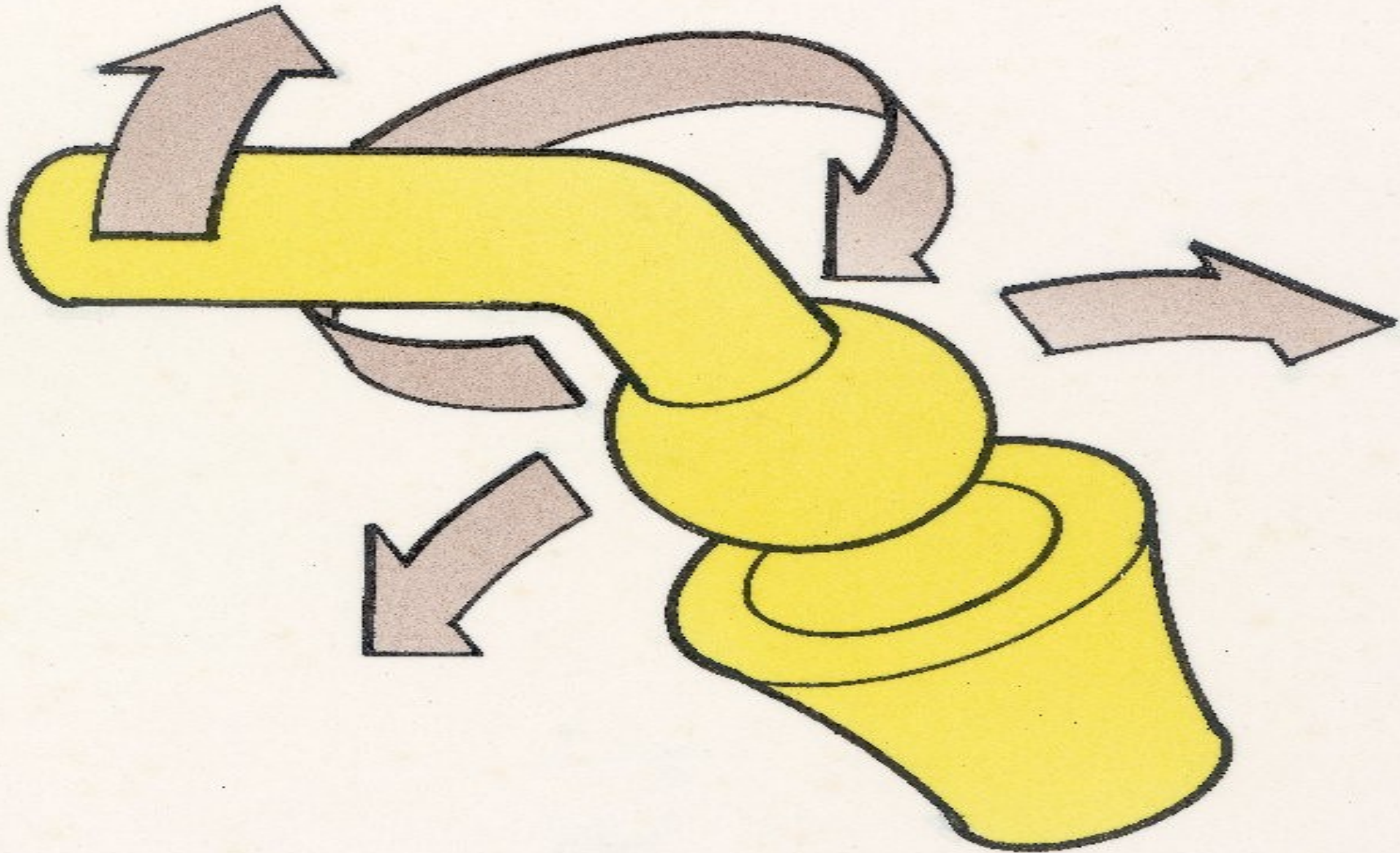
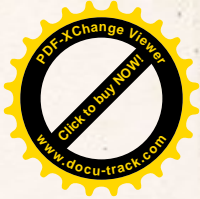
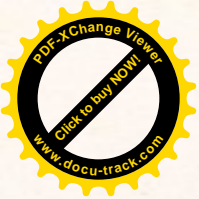
# 1. BALL & SOCKET JOINT



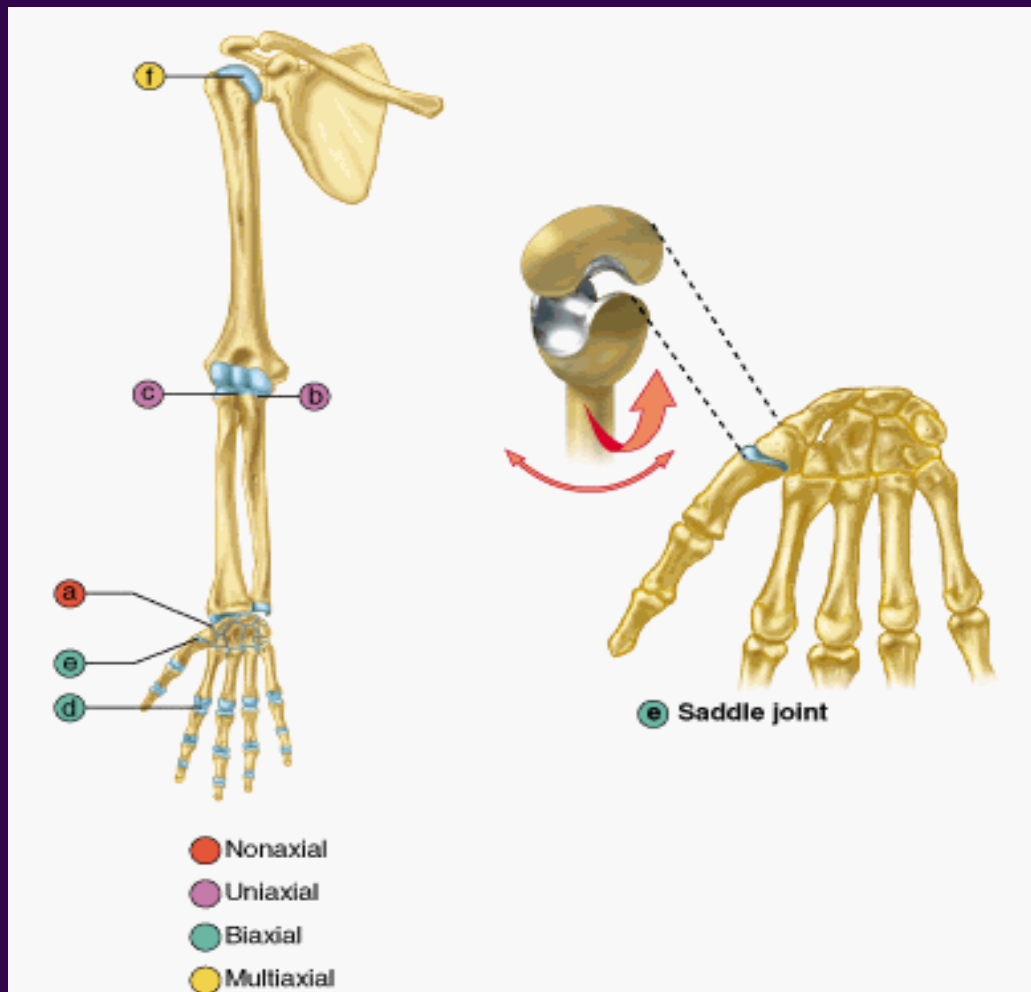
**f** Ball and socket joint

- Nonaxial
- Uniaxial
- Biaxial
- Multiaxial

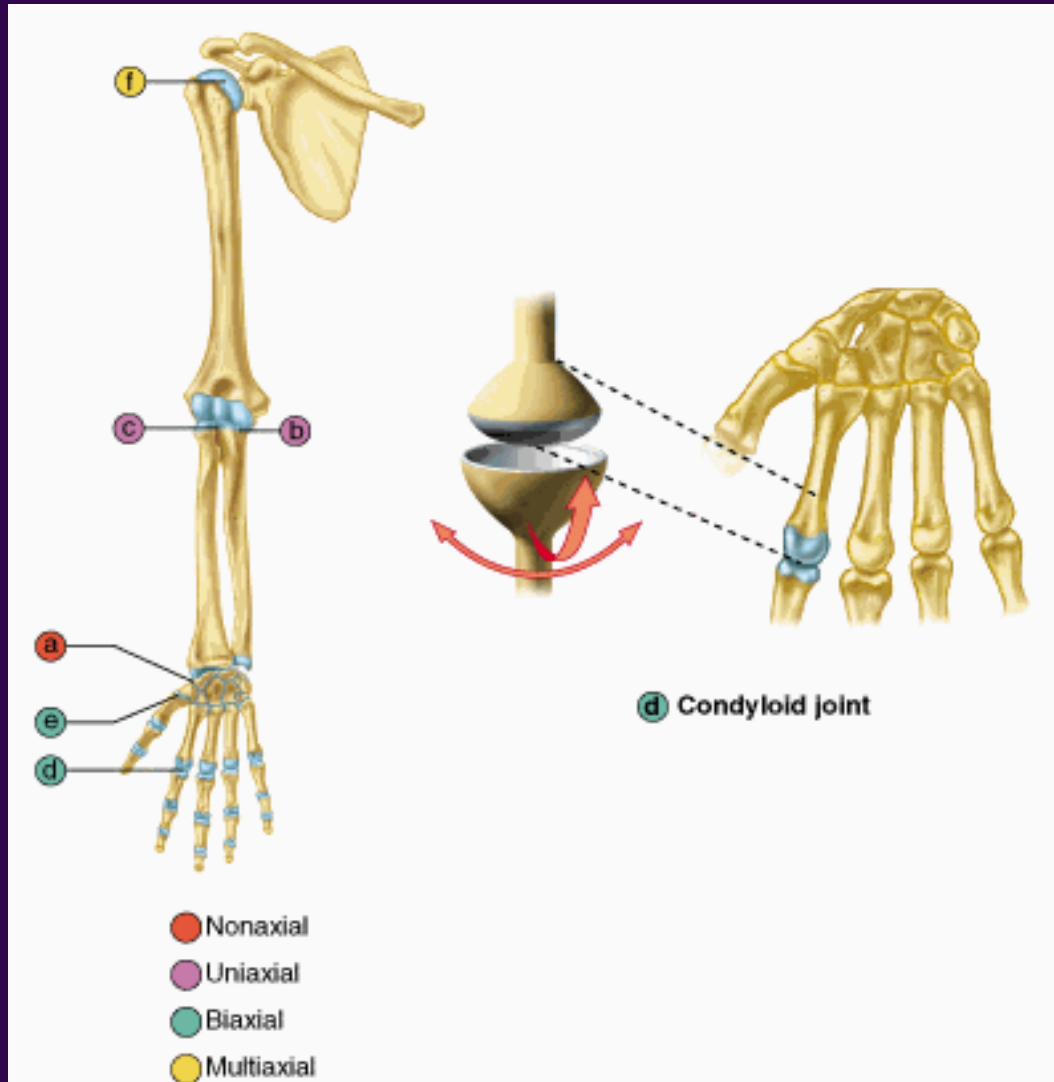




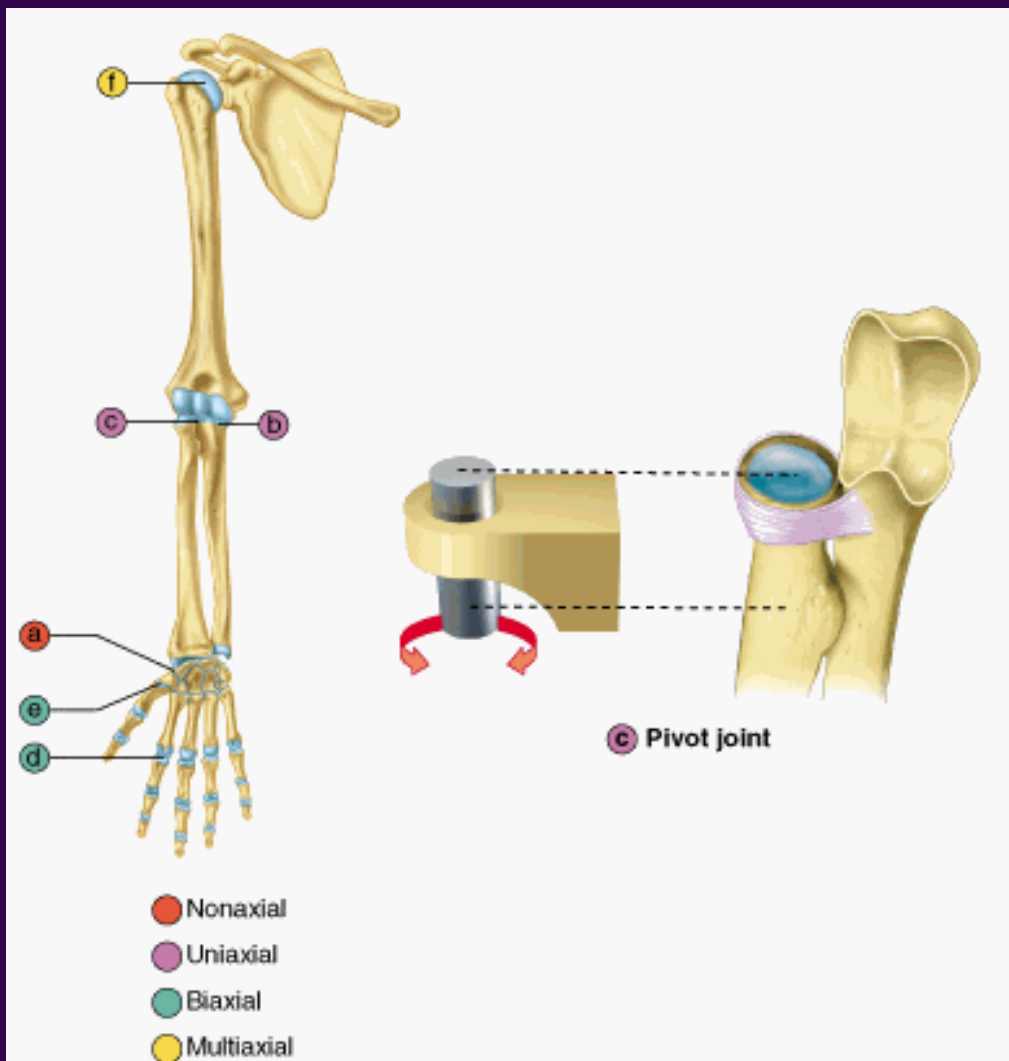
# 2. SADDLE JOINT



# 3. CONDYLOID JOINT

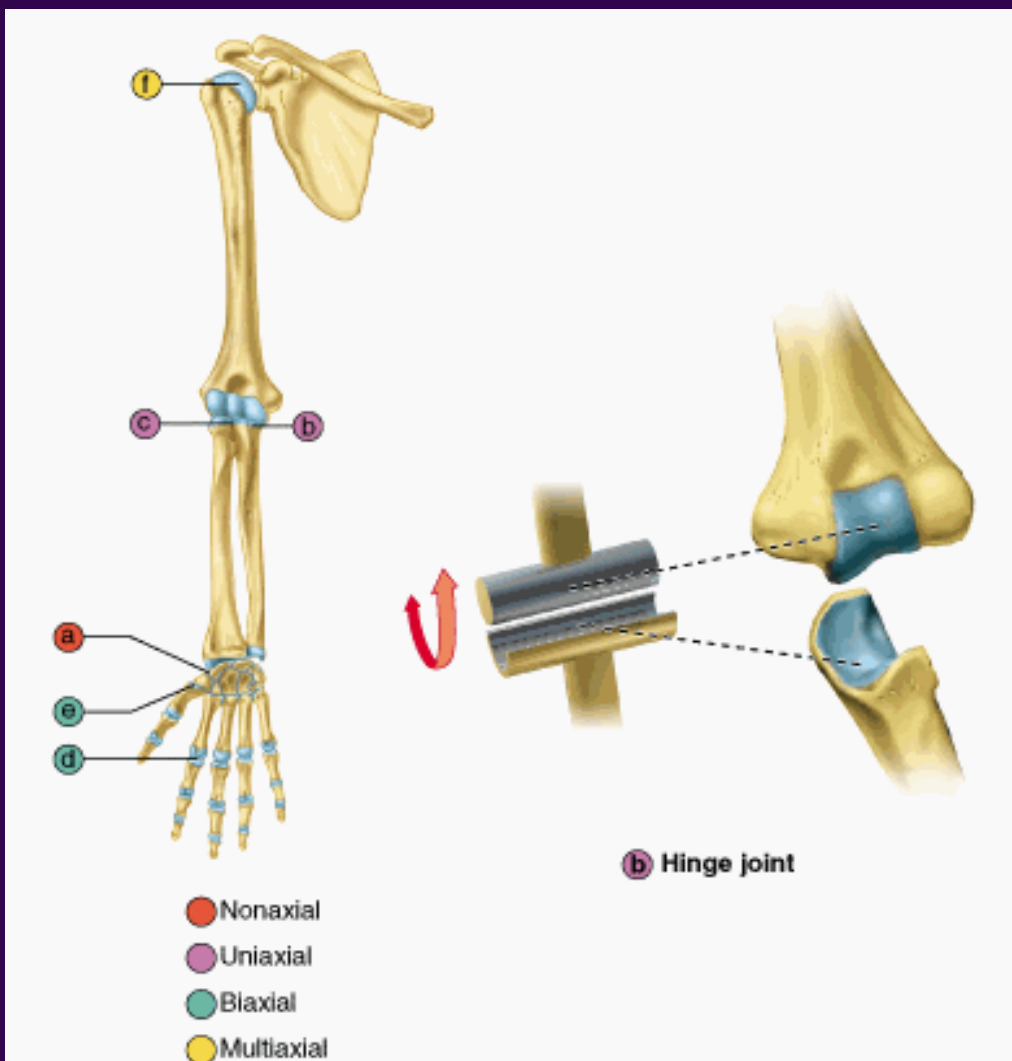


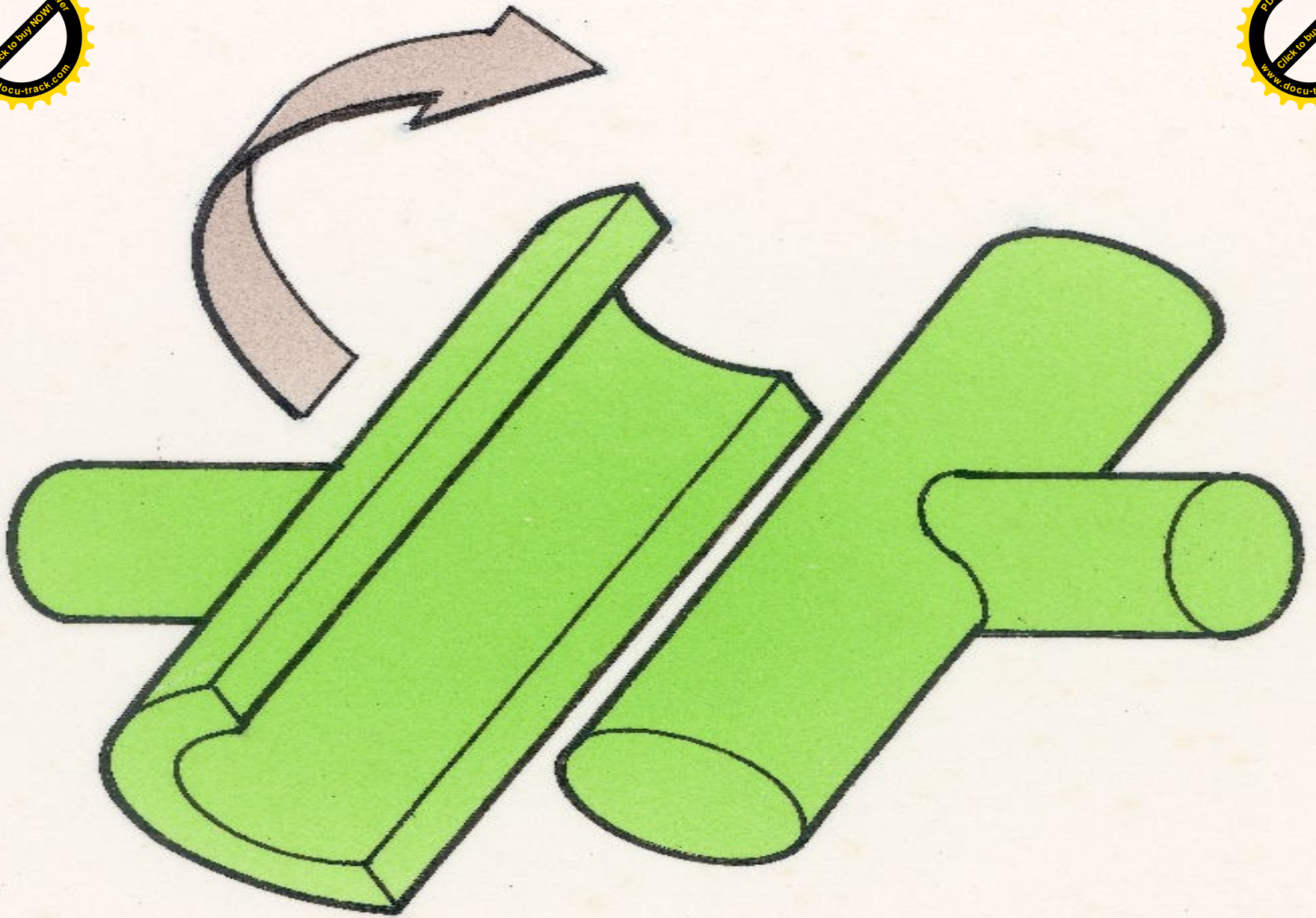
# 4. PIVOT JOINT



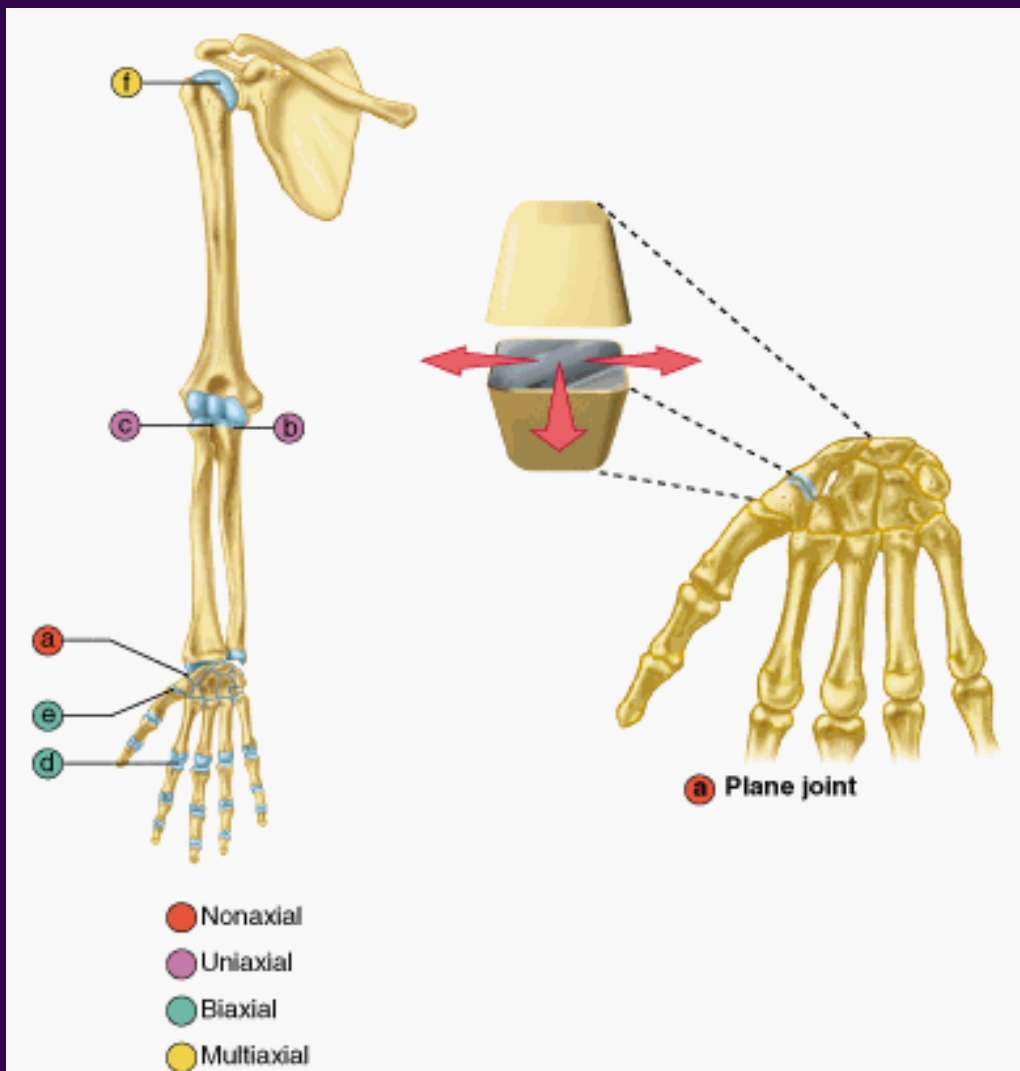
**c** Pivot joint

# 5. HINGE JOINT





# 6. PLANE JOINT



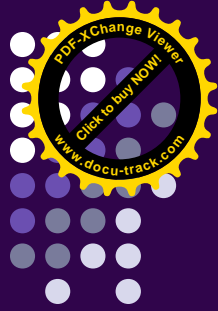


# FUNCTIONAL CLASSIFICATION

- Synarthrosis
- Amphiarthrosis
- Diarthrosis







# FUNCTIONAL CLASSIFICATION

- **1. Synarthrosis**

Synarthroses permit little or no mobility. Most synarthrosis joints are fibrous. They can be categorised by how the two bones are joined together:

- *A. Synchondroses* are joints where the two bones are connected by a piece of cartilage.



# FUNCTIONAL CLASSIFICATION

- *B. Synostoses* are where two bones that are initially separated eventually fuse together, essentially becoming one bone. In humans the plates of the cranium fuse together as a child approaches adulthood. Children whose craniums fuse too early may suffer deformities and brain damage as the skull does not expand properly to accommodate the growing brain, a condition known as **craniostenosis**.



# FUNCTIONAL CLASSIFICATION

- **2. Amphiarthrosis**

Amphiarthroses permit slight mobility. The two bone surfaces at the joint are both covered in hyaline cartilage and joined by strands of **fibrocartilage**. Most amphiarthrosis joints are cartilaginous.



# FUNCTIONAL CLASSIFICATION



- **3. Diarthroses**

Permit a variety of movements (e.g. flexion, adduction, pronation). Only synovial joints are diarthrodial. They can be divided into six classes:

- *Ball and Socket* - such as the shoulder or the hip and femur.
- *Hinge* - such as the elbow.
- *Pivot* - such as the radius and ulna.
- *Condyloid (or ellipsoidal)* - such as the wrist between radius and carpals, or knee
- *Saddle* - such as the joint between carpal thumbs and metacarpals.
- *Gliding* or plane- such as between the carpals.



# BIOMECHANICAL CLASSIFICATION



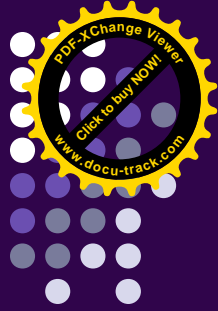
- Joints can also be classified based on their anatomy or on their biomechanical properties. According to the anatomic classification, joints are subdivided into *simple* and *compound*, depending on the number of bones involved, and into *complex* and *combination* joints:



# BIOMECHANICAL CLASSIFICATION



- Simple Joint: 2 articulation surfaces (eg. shoulder joint, hip joint)
- Compound Joint: 3 or more articulation surfaces (eg. radiocarpal joint)
- Complex Joint: 3 or more articulation surfaces and an articular disc or meniscus (eg. knee joint)



# ANATOMICAL CLASSIFICATION

## Anatomical

The joints may be classified anatomically into the following groups:

- articulations of hand
- wrists
- elbows
- axillary articulations
- sternoclavicular joints
- vertebral articulations
- temporomandibular joints
- sacroiliac joints
- hip joints
- knee
- articulations of foot



# TERMS RELATING TO JOINT MOVEMENTS



- **Extension** Increasing the angle. In the anatomical position everything is extended.
- **Hyperextension** To increase the angle beyond the anatomical position.
- **Flexion** Decreasing the angle.
- **Plantar Flexion** To point the toe.
- **Dorsiflexion** Pulls the toes up.
- **Abduction** Moving a limb away from the trunk of the body.





# TERMS RELATING TO JOINT MOVEMENTS



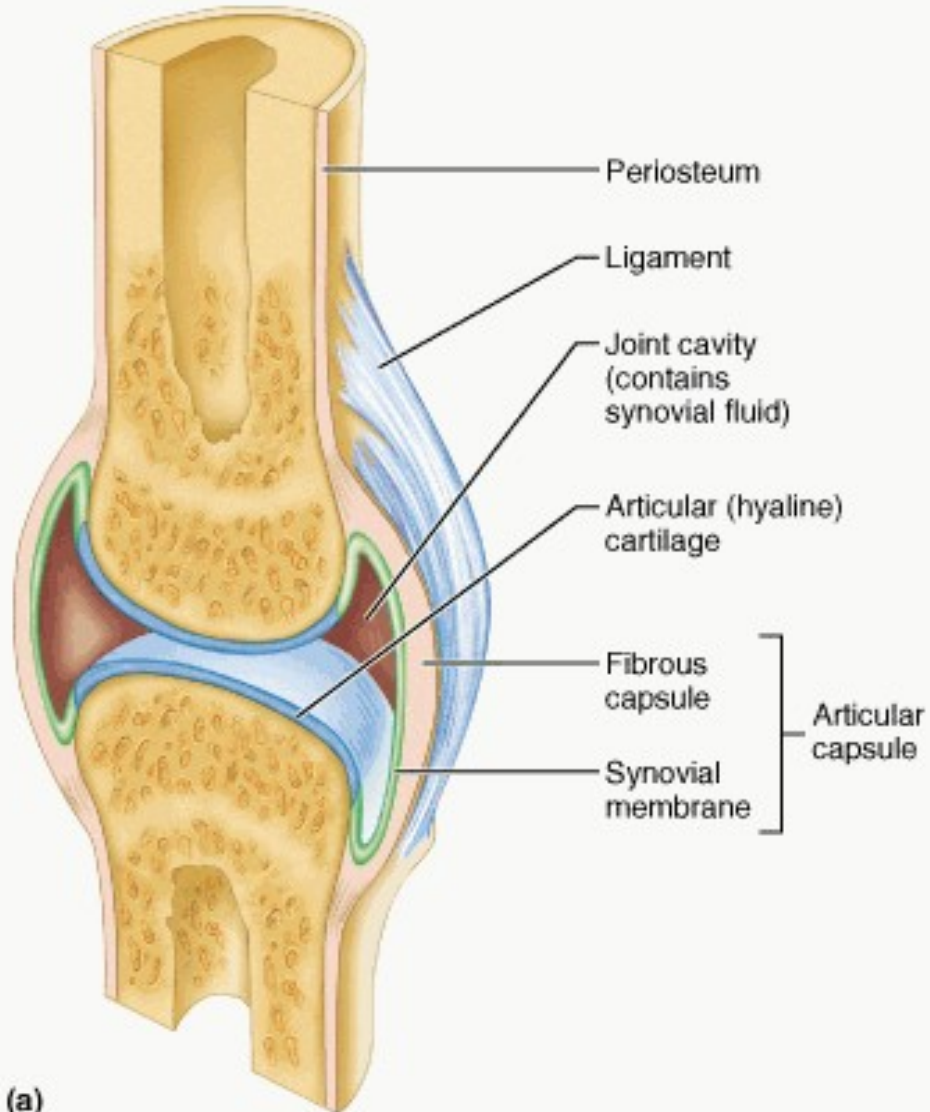
- **Adduction** Moving a limb toward the trunk of the body.
- **Rotation** Movement of a bone around an axis.
- **Circumduction** Circular movement of the distal end of a limb.
- **Supination** The palm in the anatomical position (palms forward).
- **Pronation** Palms backward.
- **Inversion** Turning the sole of the foot inward.
- **Eversion** Turning the sole of the foot outward.



# PARTS OF A JOINT

- **A). Articular Cartilage**
- **B). Synovial (joint) cavity**
- **C). Articular Capsule**
- **D). Synovial Fluid.**
- **E). Reinforcing Ligaments**
- **F). Fatty Pads or Articular Discs**
- **G). Bursae** Flattened sacs that contain synovial fluid.  
Function to reduce friction
- **H). Tendon Sheath** A bursa that wraps around a tendon that is subject to friction.

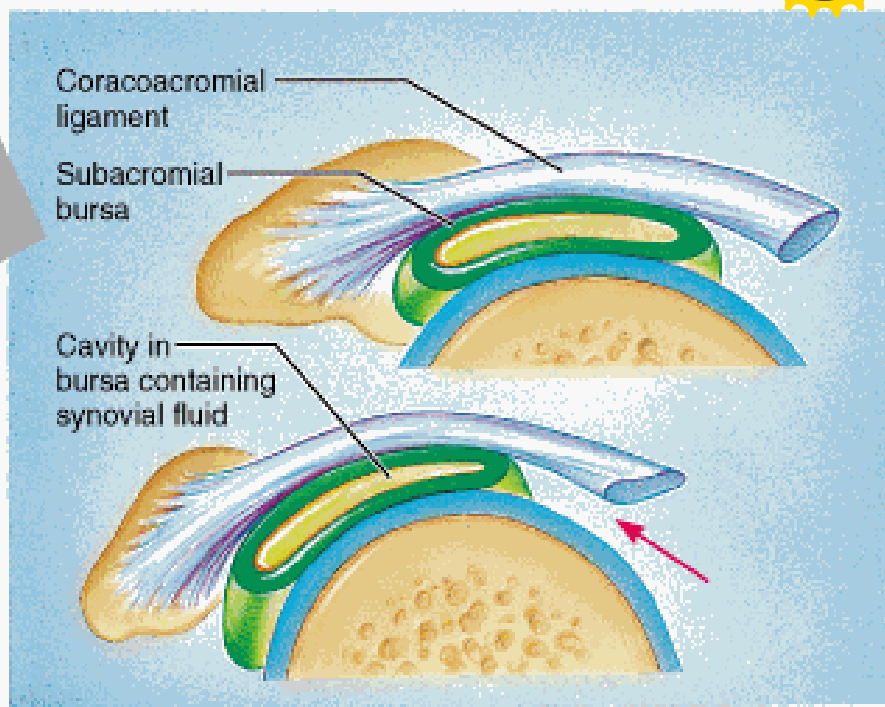
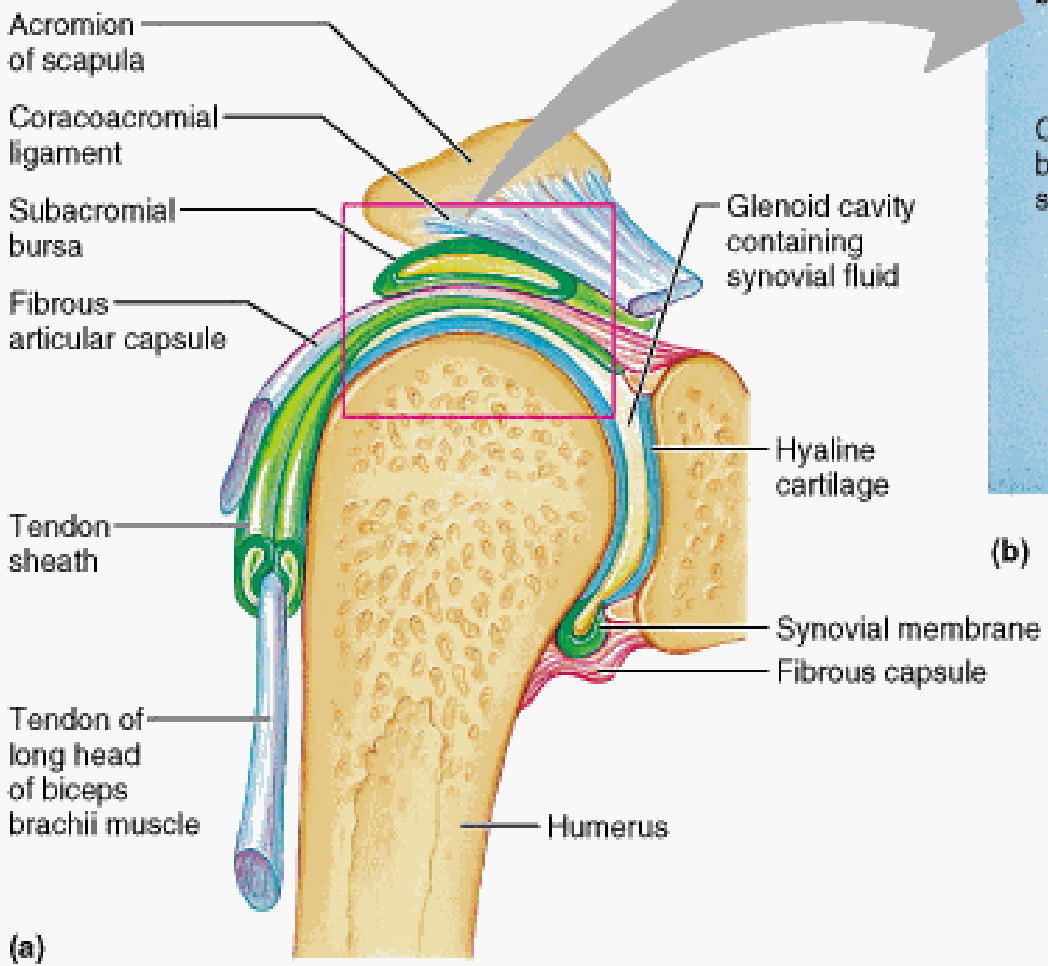
# PARTS OF A JOINT



(a)



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(a)

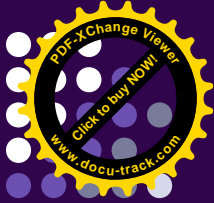
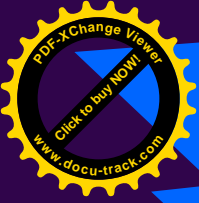
(b)



# FACTORS INFLUENCING JOINT STABILITY



- **A). The shape of articular surfaces.**
- **B). Ligaments**
- **C). Muscle Tone**



THANK YOU

