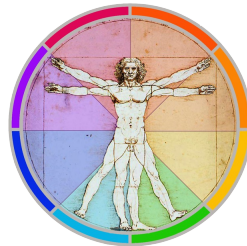
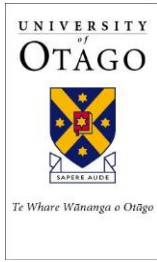


HUBS191 Lecture Material

This pre-lecture material is to help you prepare for the lecture and to assist your note-taking within the lecture, it is NOT a substitute for the lecture !



Please note that although every effort is made to ensure this pre-lecture material corresponds to the live-lecture there may be differences / additions.



HUBS191

Lecture 6: Musculoskeletal system Joint Classifications

Dr Rebecca Bird

Department of Anatomy

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Lecture objectives

- Define the three types of joints in the musculoskeletal system
- Describe the structures of synovial joints and explain how this contributes to movement
- Describe the different shapes and movements of synovial joints

L5 answers

1. Which of the following tissues/structures resists both compression and tension?

- A. Ligament
- B. Tendon
- C. Hyaline cartilage
- D. Fibrocartilage

2. _____ allow bones to grow in length while growth in width occurs via _____.

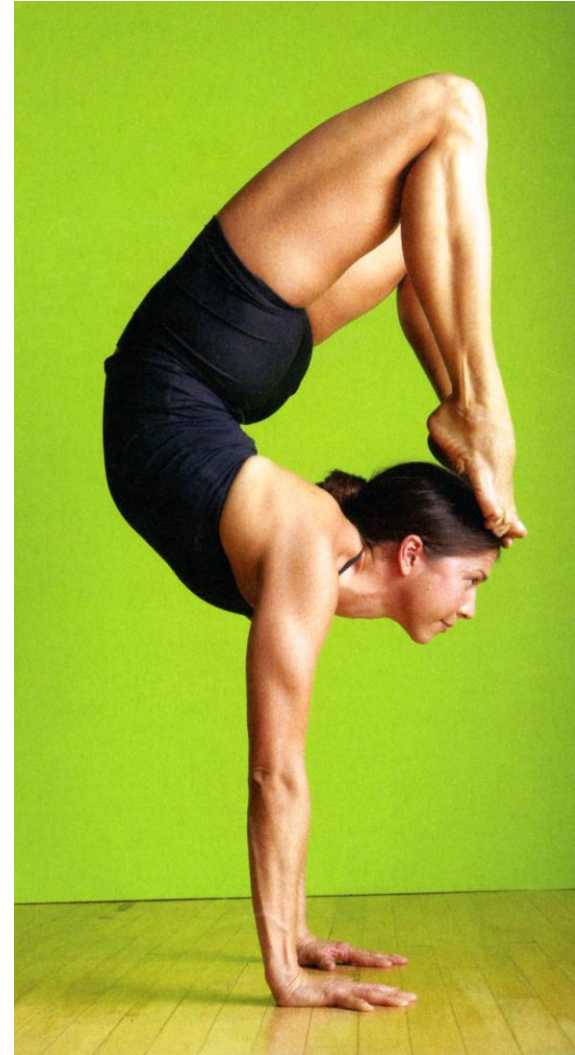
- A. primary ossification centres; secondary ossification centres
- B. growth plates; appositional growth
- C. appositional growth; epiphyseal plates
- D. osteoclasts; osteoblasts

Joint Classifications

- Fibrous = least amount of movement
 - Ligaments hold bones together
 - e.g. cranial sutures
- Cartilaginous = some movement
 - Fibrocartilage holds bones together
 - e.g. pubic symphysis
- Synovial = most amount of movement

Synovial Joints

- Free moving
- Most limb joints
- Amount of, and direction of, movement is determined by joint structure



Why do we need different classes of joints?

What would happen if:

- Your distal tibiofibular joint was synovial?
- Your pubic symphysis or intervertebral discs were fibrous?
- What if your shoulder or hip joints were cartilaginous?

Synovial Joint Features

- Complex association of tissues and structures
- Facilitation of free movement AND control of movement
- Bone ends determine the range of motion at a joint
 - Bony congruence
 - Compare hip vs knee



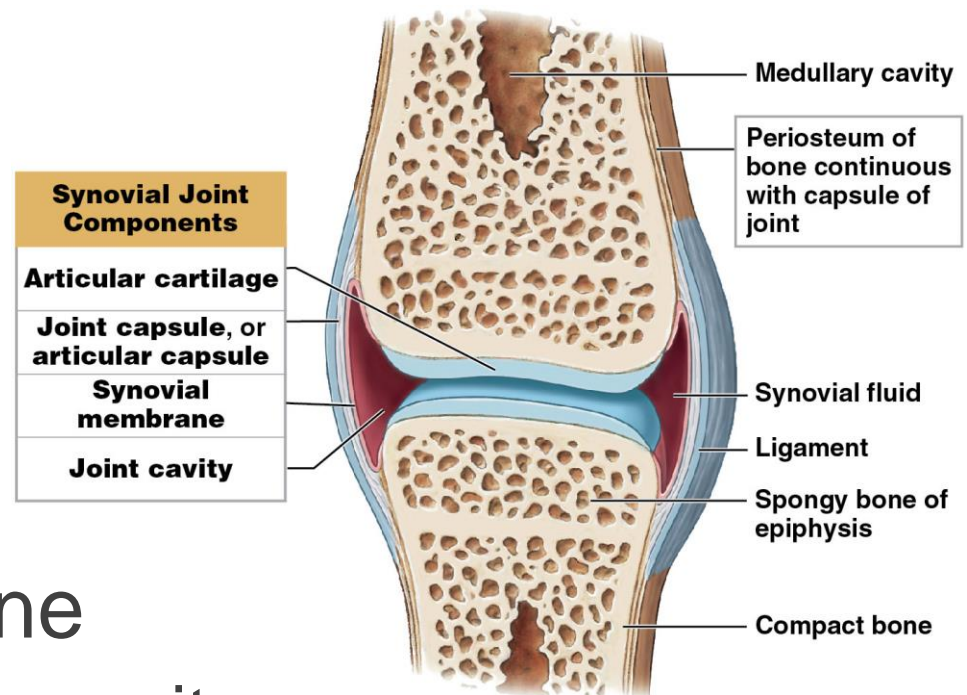
proximal end of femur



distal end of femur

Synovial joint structure

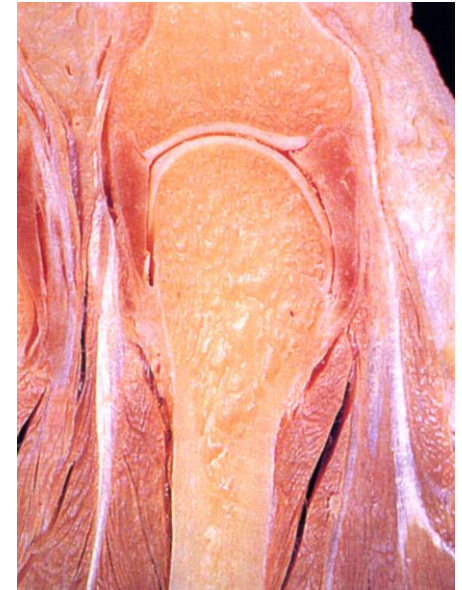
- Bone ends
- Articular cartilage
- Joint capsule
- Joint cavity
 - potential space
- Synovial membrane
 - synovial fluid filling cavity
- Ligaments



Synovial joint structure

Hyaline (articular) cartilage

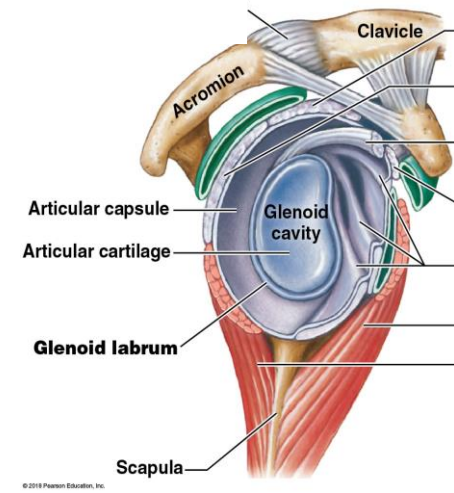
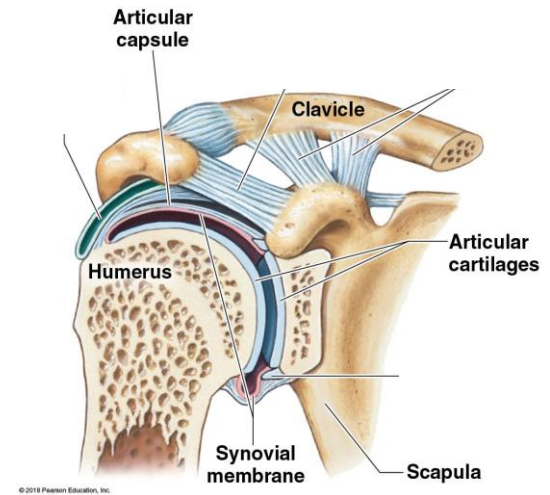
- Covers bone ends where they articulate
 - subchondral bone
- Smooth, frictionless movement



Synovial joint structure

Joint capsule

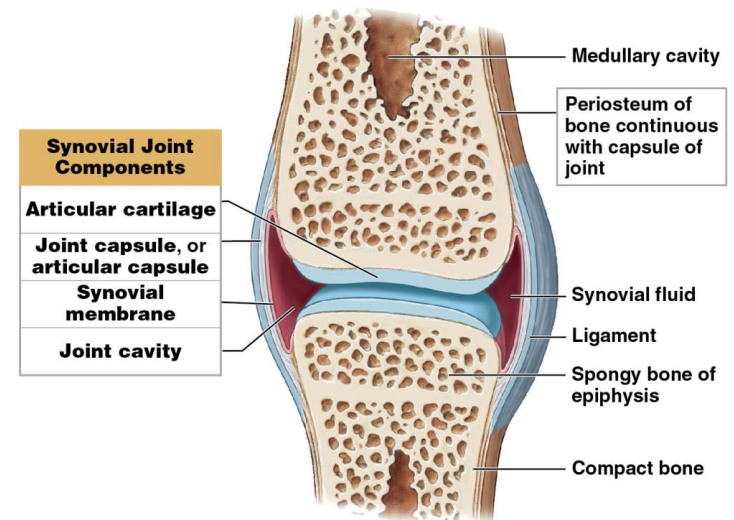
- Outer layer of DFCT
- Inner layer of synovial membrane
 - Secretes synovial fluid
 - Lubrication of joint
 - Nutrients to avascular structures



Synovial joint structure

Joint capsule

- Holds bones together
- Tight and thick where more support is required
- Loose where movement is allowed

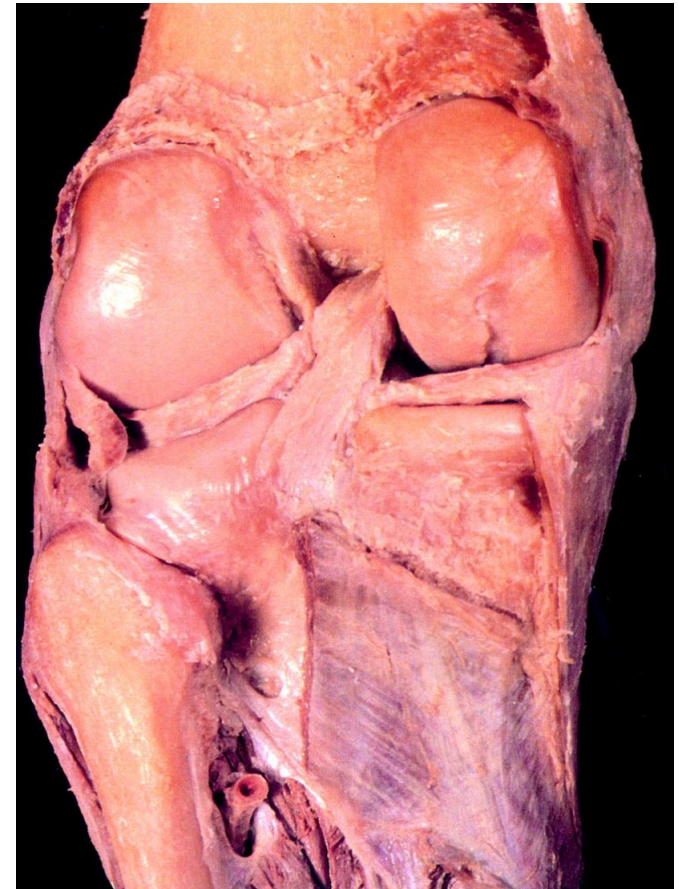


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Synovial joint structure

Capsular ligaments

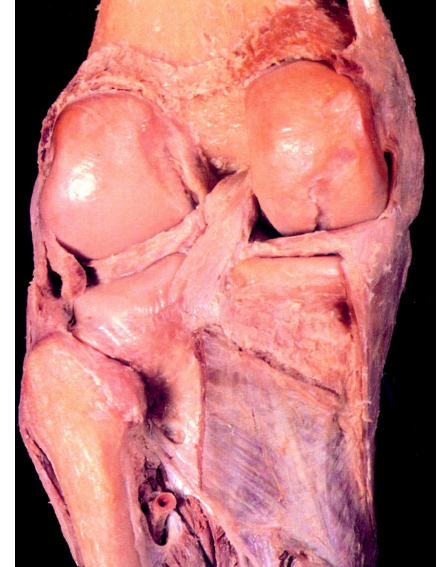
- In some joints, thickenings of capsule are present where more support is needed
- e.g collateral ligaments of knee
 - medial collateral ligament (MCL)
 - Connects femur to tibia
 - Restricts abduction
 - Lateral collateral ligament (LCL)
 - connects femur to fibula
 - restricts adduction



Synovial joint structure

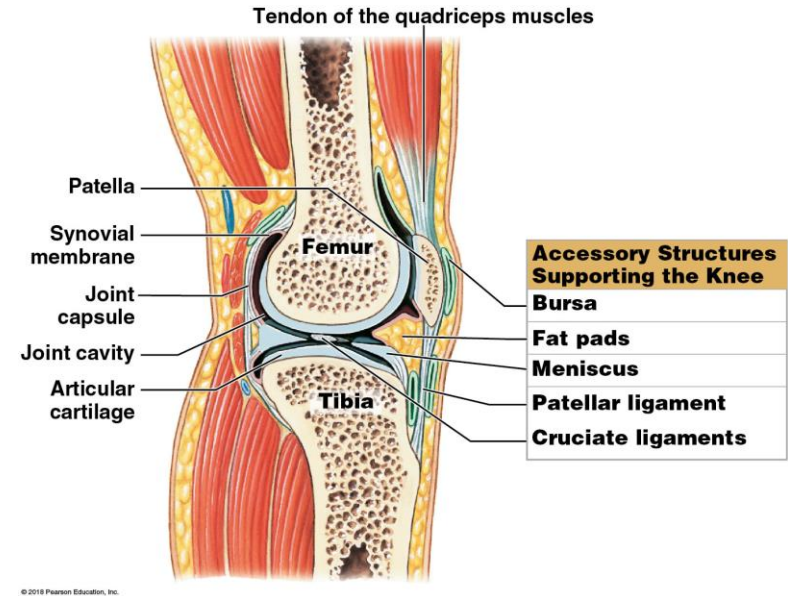
Intracapsular ligaments

- In some joints, additional bands of DFCT located internally to the capsule hold bones together
- e.g cruciate ligaments of knee
 - Anterior cruciate ligament (ACL)
 - ant. of tibia to post. of femur
 - restricts post. displacement of femur
 - Posterior cruciate ligament (PCL)
 - post. of tibia to ant. of femur
 - restricts ant. displacement of femur

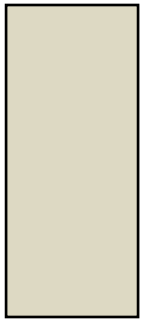


Synovial joint structure

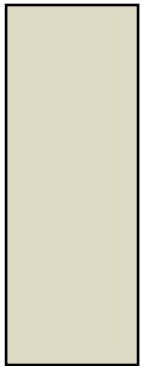
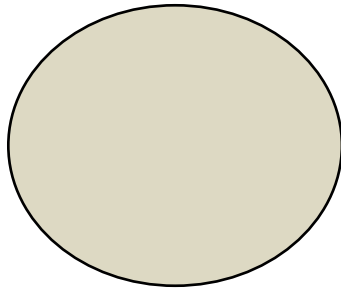
- Fibrocartilaginous pads
- In some joints, small structures made of fibrocartilage
 - fill in space
 - provide cushioning/shock absorption
 - and/or deepen articulations
- E.g. menisci (pl.)/meniscus (sing.) in the knee
 - half-moon shaped structures that sit between femur and tibia



Fibrous and cartilaginous



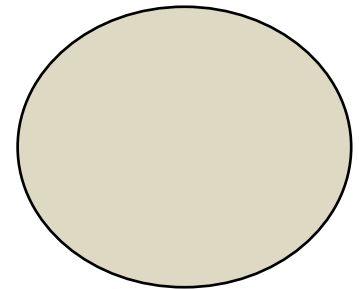
e.g. fibrous
joint



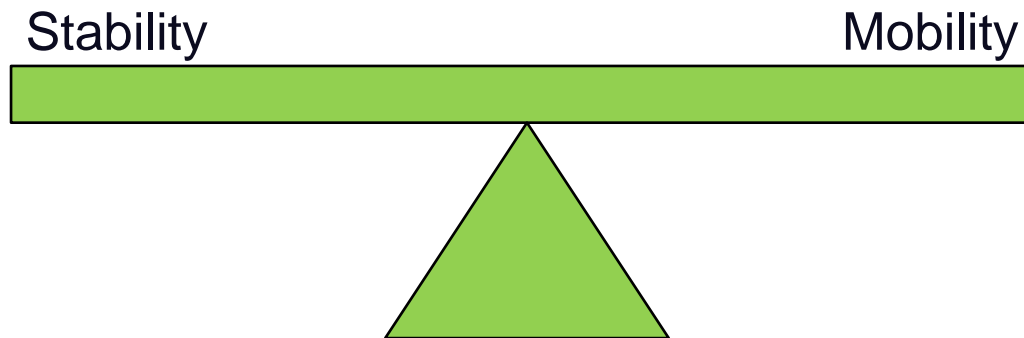
Synovial



e.g. knee
joint

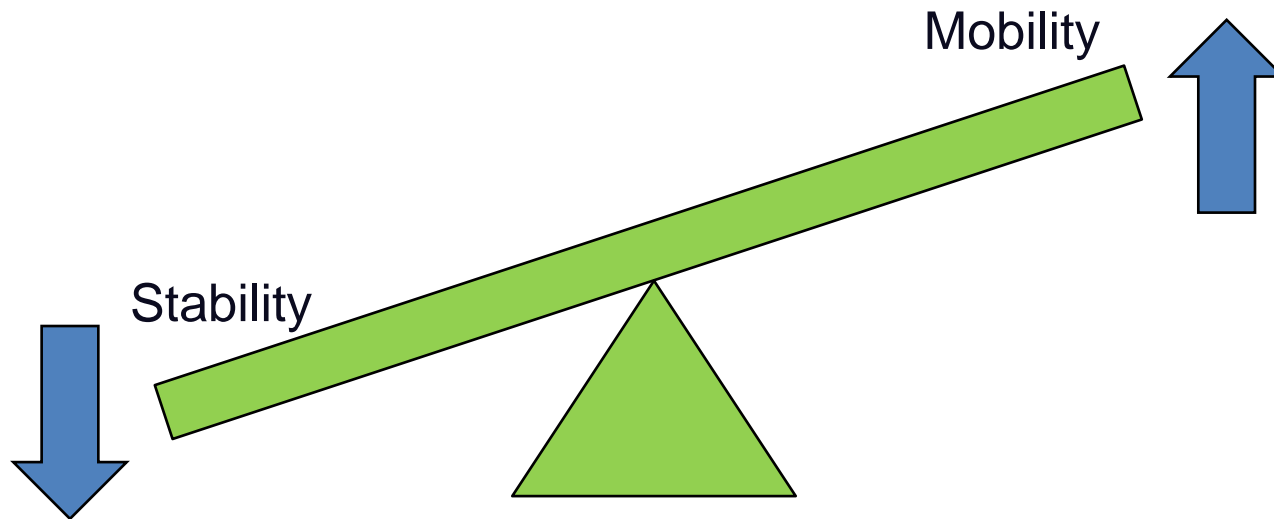


Stability vs Mobility



Trade off between stability and mobility

Stability vs Mobility



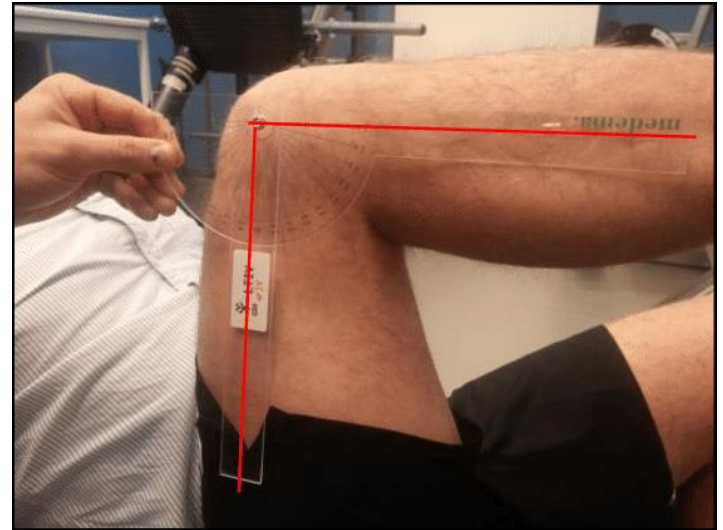
Quiz

Which part(s) of a synovial joint:

- a) ensures smooth, frictionless movement?
- b) holds bones together?
- c) influence the possible movements at a joint?

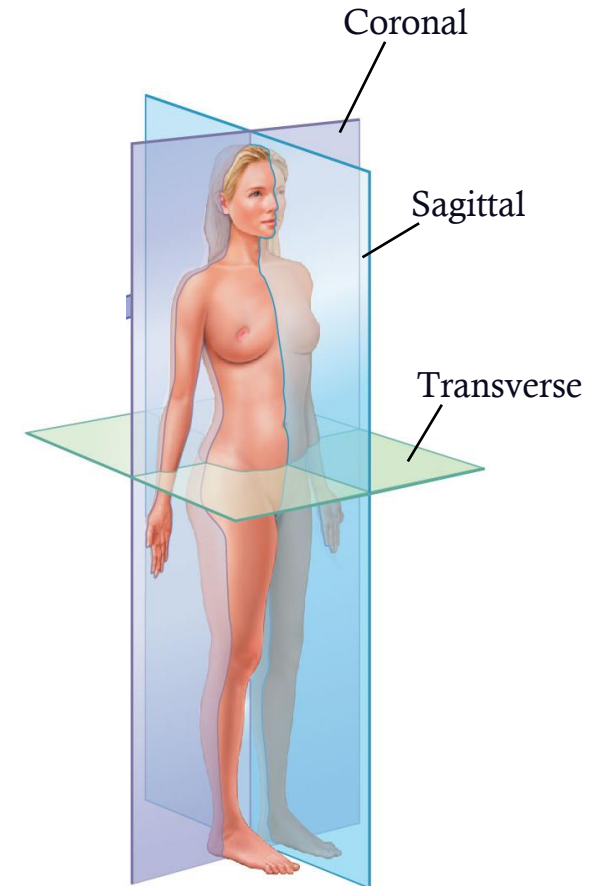
Joint movement

- Range of movement/motion (ROM)
 - type and amount of movement
- Determined by:
 - bone end shape
 - ligament location and length
 - body surface contact
 - muscles (see L10)



Synovial joint movements

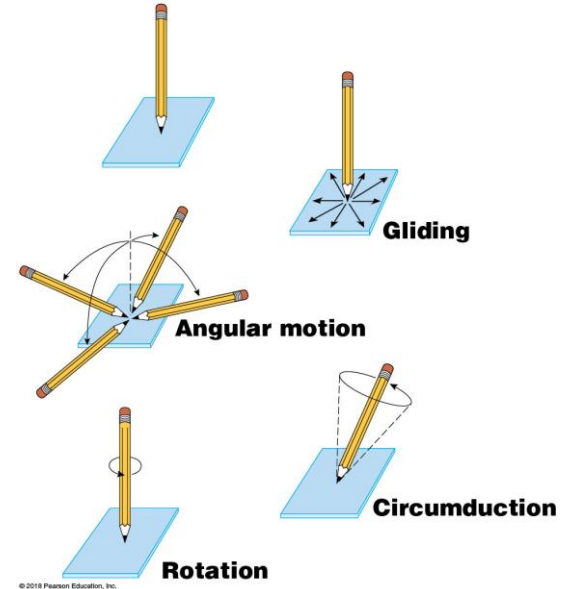
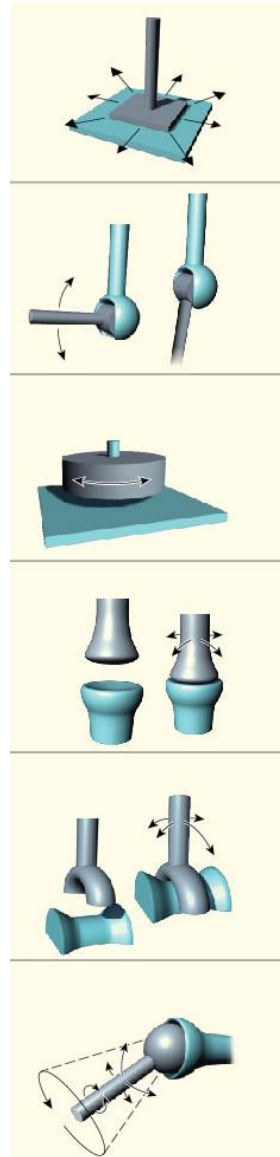
- Planes
- Axis (plural – axes)
 - Uniaxial (one axis)
 - Biaxial (two axes)
 - Multiaxial (many axes)



Types of synovial joints

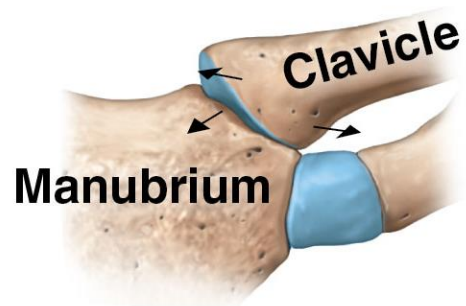
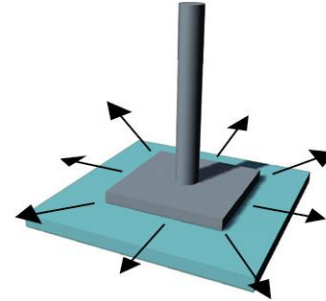
- Plane
- Hinge
- Pivot
- *Condylar
- *Ellipsoid
- Saddle
- Ball & Socket

**Different to your textbook*



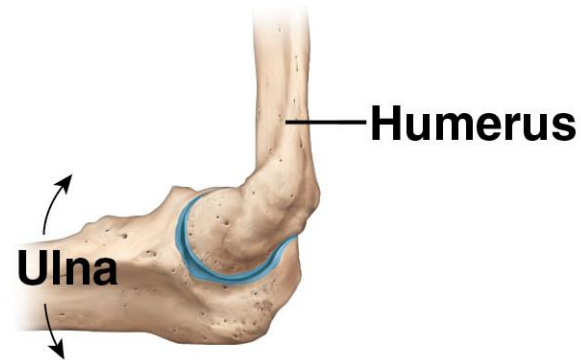
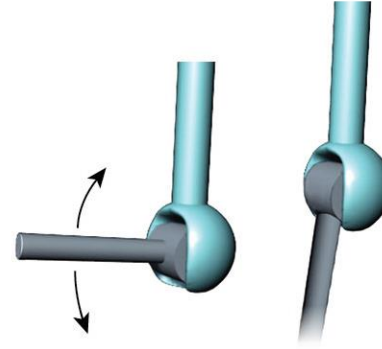
Plane joint

- Multiaxial
- 'Sliding' & 'gliding'
- Flat articular surfaces
- e.g. intercarpal and intertarsal joints



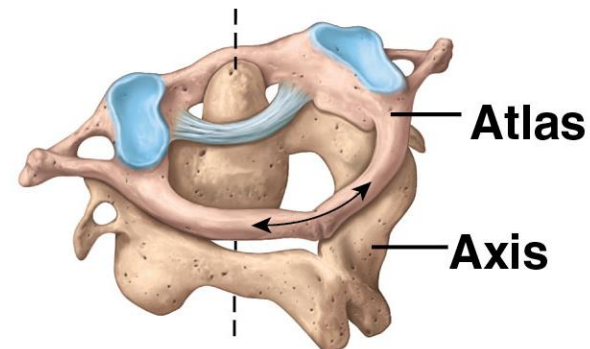
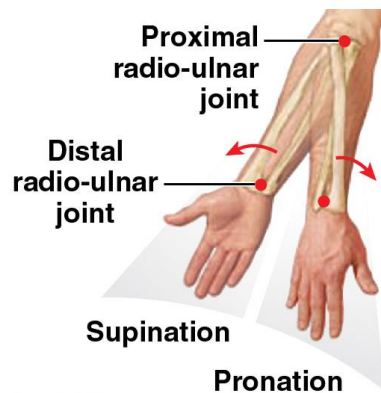
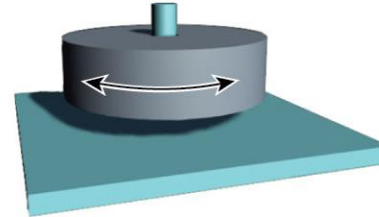
Hinge joint

- Uniaxial
- Movements are flexion and extension
- e.g. ankle, elbow (humerus with ulna), interphalangeal joints



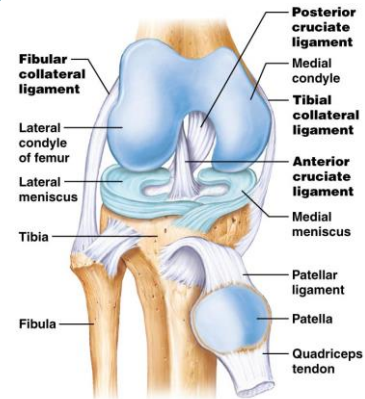
Pivot joint

- Uniaxial
- Movement is rotation
- e.g. radioulnar joints, C1-C2 vertebrae

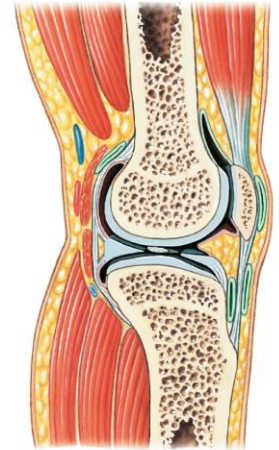


Condylar joint

- Biaxial
- Flexion & extension
- **Rotation** (when flexed)
- e.g. knee, temporomandibular joint (TMJ)

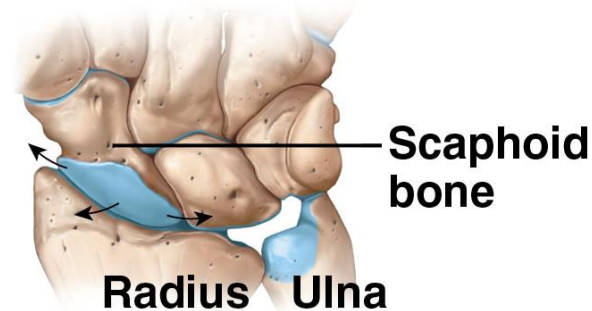
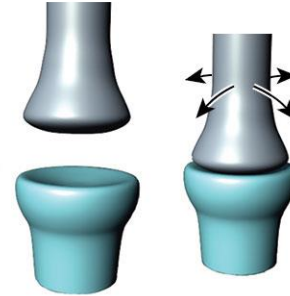


(e) Anterior view of flexed knee, showing the cruciate ligaments (articular capsule removed, and quadriceps tendon cut and reflected distally)



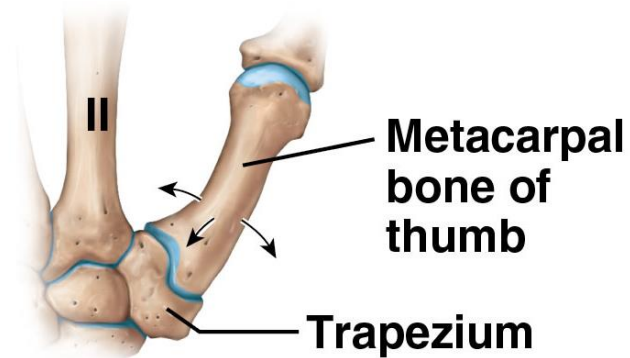
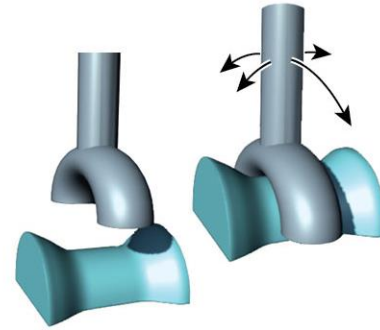
Ellipsoid joint

- Biaxial
- Flexion & extension
- Abduction & adduction
- Therefore also circumduction
- **NO rotation**
- e.g. wrist joint (radiocarpal joint)



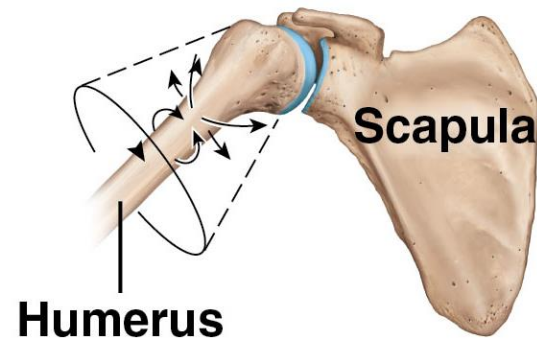
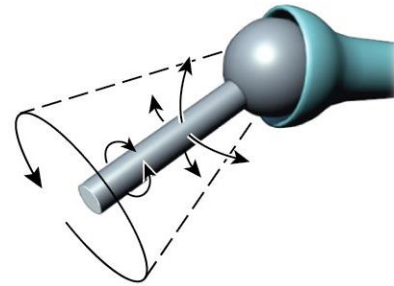
Saddle joint

- Biaxial (+)
- Flexion & extension
- Abduction & adduction
- Therefore also circumduction
- Obligatory rotation – opposition
- e.g. carpometacarpal joint (base of thumb)



Ball & Socket joint

- Multiaxial
- Flexion & extension
- Abduction & adduction
- Therefore also circumduction
- Rotation
- e.g. shoulder & hip



Tips for remembering joints:

- Move around the joints in your upper and lower limbs
- Think- what type of joint is each one?
- What type of movement can you do at each joint? Use the proper terminology!
- What planes do those movements occur in? Around what axes?

Your body is your personal study sheet! So practicing these movements and testing yourself will help prepare you for exams!

Mini-Essay Practice

- Mini-Essays test your knowledge, ability to link ideas/concepts, and ability to communicate
- Sometimes it's a one-page piece of writing (see past exam papers)
- Sometimes we break the essay into smaller questions/smaller spaces (we'll practice this in L9/10)
- Need to write in sentences, using appropriate terminology
- Each takes ~15 mins to brainstorm and write

Compare the structure and function of the three classes of joints. Include a description of the tissues involved, and a specific example of each class of joint.

Lecture summary

- The three classes of joint are defined by the amount of movement they have
- Synovial joints have common structures, plus some joints have additional features
- Synovial joints **move a lot!**
 - there are 7 types of synovial joint
- The amount and direction of movement is determined by joint structure:
 - Bone end shape
 - Capsule & ligaments (location & length)
 - Body surface contact

Practice movements at your joints. Think about what planes they are in, and therefore what axes they are moving around

HUBS191

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