Joints of the Human Body

- Joint is a point of connection between two bones
- Strands of connective tissue, ligaments, hold the bones together and ensure the stability of joints

Joint Classification

- are classified according to their motion capabilities
  - Synarthroses (Immovable)
  - Amphiarthroses (Slightly Movable)
  - Diarthroses (Allow the greatest amount of motion)

- Joints are further classified by the material that joins them:
  - Fibrous Joint (Allow no movement)
  - Cartilaginous Joints (Allow limited movement)
  - Synovial Joints (Allow large range of movements)

  - Sutures of the Skull
  - Intervertebral Discs
  - Hip Joint

Characteristics of Synovial Joints

- Hyaline cartilage
  - A protective layer of dense white connective tissue that covers the ends of the articulating bones

- Joint cavity

- Synovial membrane
  - Covers joint cavity, except over the surfaces of the articular cartilages
  - Secretes the lubrication fluid

- Synovial fluid
  - Lubricates the joint

- Capsule
  - May or may not have thickenings called intrinsic ligaments

- Extrinsic ligaments
  - Support the joint and connect the articulating bones of the joint
Types of Synovial Joints

- There are three basic types of synovial joints:
  - unilateral (rotation only about one axis)
  - biaxial joints (movement about two perpendicular axes)
  - multiaxial joints (movement about all three perpendicular axes)
- Synovial are further classified into:
  - Hinge Joint
  - Pivot Joint
  - Condyloid (Elipsoid) Joint
  - Saddle Shaped Joint
  - Ball and Socket Joint
  - Plane (Gliding) Joint

**Hinge (Ginglymus) Joint** - Unilateral

A convex projection on one bone fits into a concave depression in another permitting only flexion and extension as in the elbow and knee joints.
**Pivot Joint**  
- Unilateral

Rounded or conical surfaces of one bone fit into a ring of one or tendon allowing rotation.

**Condyloid Joint**  
- Biaxial (Flexion Extension Abduction Adduction)

Oval shaped condyle fits into elliptical cavity of another allowing angular motion but not rotation.

This occurs between the metacarpals (bones in the palm of the hand) and phalanges (fingers) and between the metatarsals (foot bones excluding heel) and phalanges (toes).
**Saddle Joint**

- Biaxial (Flexion Extension Abduction Adduction)

This type of joint occurs when the touching surfaces of two bones have both concave and convex regions with the shapes of the two bones complementing one other and allowing a wide range of movement.

The only saddle joint in the body is in the thumb.

![Saddle Joint Image](image)

**Ball & Socket Joint**

- Multiaxial (rotation in all planes)

The ball-shaped end of one bone fits into a cup shaped socket on the other bone allowing the widest range of motion including rotation. (i.e. shoulder and hip.)

![Ball & Socket Joint Image](image)

**Plane (Gliding) Joint**

- Unilateral (permits gliding movements)

Flat or slightly flat surfaces move against each other allowing sliding or twisting without any circular movement.  (i.e. intercarpal jts and acromioclavicular jt)
Types of Joints

- Ball and socket joint
- Pivot joint
- Saddle joint
- Hinge joint
- Ellipsoid joint
- Plane joint
Joints of the Pelvic Girdle

Sternoclavicular Joint

- Connects the sternum to the clavicle
- the only joint connecting the pectoral girdle to the axial skeleton
- true synovial joint strengthened by an intracapsular disc and extrinsic ligaments

Aromioclavicular Joint

- unites the lateral end of the clavicle with the acromion process of the scapula
- where shoulder separations often occur in sports such as hockey, baseball, and football

Glenohumeral Joint

- Connects the upper limb and the scapula
- A typical multiaxial joint
- has a wide range of movement at this joint
- compromise = relative lack of stability

Upper Limb Joints

Elbow Joint

There are three joints at the elbow:

humero-ulnar joint
- medial (with respect to anatomical position)
- between the trochlea of the humerus and the olecranon process of the ulna

humeroradial joint
- lateral
- between the capitulum of the humerus and the head of the radius

radio-ulnar joint
- between the radius and the ulna

Joints of the Wrist

radio-carpal joint
- between distal end of the radius and the carpals
- movements - Flexion-extension and abduction-adduction
Joints of the Hand

Intercarpal joints
- between the bones of the carpus
- gliding joints

Carpometacarpal joint
- between carpals and metacarpals
- the characteristics of carpometacarpal joint of the thumb allows the range of movement necessary for opposition

Metacarpophalangeal joints
- joint between metacarpals and carpals
- the knuckles
- movements Flexion-extension, and abduction-adduction

Interphalangeal joints
- joints between the phalanges
- permit flexion-extension.

Joints of the Pelvic Girdle
- Between the head of the femur and the cup (acetabulum) of the hip bone (os coxae)
- Like shoulder joint, hip joint is:
  - ball and socket joint
  - multiaxial joint that allows flexion-extension, abduction-adduction and circumduction
- Unlike shoulder joint, hip joint is very stable
- In fact it is the body's most stable synovial joint due to:
  - deepened socketed (via lip or fibrocartilaginous labrum)
  - an intrinsic and very strong extrinsic ligaments
  - dislocation in sports is not common, but can occur in car collisions
  - dislocate the head posteriorly or drive it through the posterior lip of the acetabulum
Lower Limb Joints

Knee joint (Tibiofemoral)

• incredible range of movement (flexion – extension)
• however, the knee joint is relatively stable due to additional structural supports from:
  - menisci
    shock-absorbing fibrocartilaginous discs
  - Anterior and Posterior cruciate ligaments
    in the centre of the joint
  - Lateral and Medial collateral ligaments
    extending from the sides of the femur to the tibia and fibula
  - The musculature that surrounds it

Movements:
  - primary action is flexion-extension (e.g. squat or jump)
  - when flexed, medial and lateral rotation can also occur

Ankle Joint (Talocrural)

• involves several bones:
  - medial and lateral malleoli of the tibia and fibula
  - head of the talus
  - calcaneus (heel bone)

Foot and Toe Joints

• Intertarsal joints
  - Between tarsals
  - transverse tarsal joint
    - between the proximal and distal row of tarsal bones
    - movement - inversion-eversion of the sole of the foot
    - This action enables you to adjust to uneven ground when walking or running

• As in the hand, there are joints between the tarsal bones, metatarsals and phalanges:
  - Tarsometatarsal
  - Metatarsophalangeal
  - Interphalangeal

• They are strengthened by plantar ligaments which aid in maintaining the arch of the foot