

# HBS2HAB – HUMAN ANATOMY B

## LESSON NOTES

### TOPIC 1 AND 2: INTRODUCTION TO UPPER LIMB

#### MAJOR PRINCIPLES:

**E3** Because the upper and lower limbs develop from identical patterns in the embryonic limb bud they have homologous components

#### OBJECTIVES:

#### LO1 – PENTADACTYL LIMB AND THE SKELETAL COMPONENTS OF A HUMAN LIMB

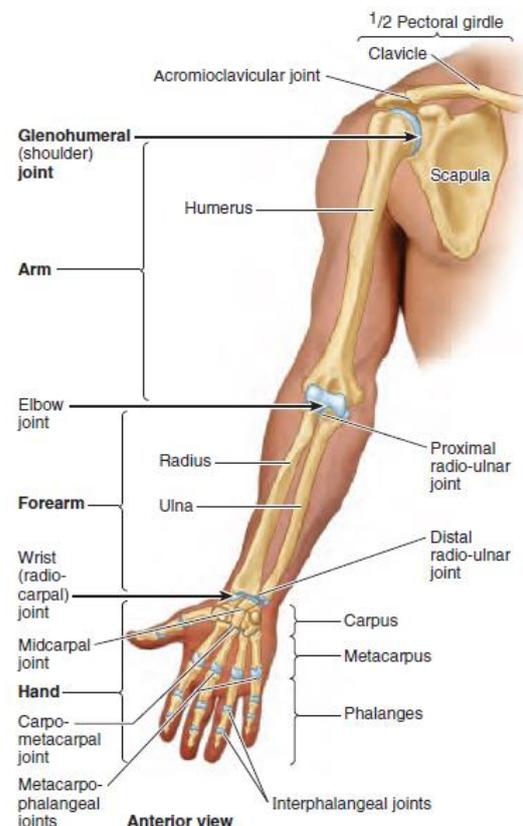
A pentadactyl limb is a limb with 5 digits at the end.

The skeletal components of a typical human limb is as follows:

- Attachment to axial skeleton via 'girdles'
- One bone in proximal segment of limb
- Two bones in distal segment of limb
- Joint complex
- End of limb such as hand/foot with multiple bones

The upper limb conforms to this pattern as it consists of **FOUR** major segments:

- **Shoulder:** Proximal segment of limb that overlaps with parts of the trunk and lower lateral neck. It overlies half of the pectoral girdle.
- **Arm:** First segment of the free upper limb (more mobile and independent of trunk) and longest segment of limb. Extends between and connects shoulder to elbow and consists of anterior and posterior regions of arm, centred around humerus.
- **Forearm:** Second longest segment of limb extending between and connecting elbow and wrist. Also includes anterior and posterior divisions. Consists of 2 bones – radius and ulna.
- **Hand:** Part of upper limb distal to the forearm that is formed around the carpus, metacarpus and phalanges. Multiple bones connecting together to form hand.



**FIGURE 6.1.** Segments and bones of upper limb. The joints divide the

## LO2 – REGIONS OF UPPER LIMB AND HOMOLOGOUS REGIONS IN LOWER LIMB

The **pectoral girdle** consists of the scapulae and clavicles, connected to the manubrium of the sternum. The homologous region of the lower limb is the **pelvic girdle**, consisting of the 2 hip bones connected to the sacrum.

The **arm** consists of the humerus, the largest bone in the upper limb, and articulates with the scapula at the GHJ, and the radius and ulna at the elbow joint. The homologous region of the lower limb is the **femur**, the largest bone in the lower limb, articulating with the pelvis and tibia and fibula at the knee joint.

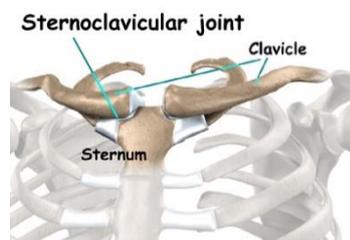
The **hand** consists of the carpals, metacarpals and phalanges, connected by a joint complex. The homologous region of the lower limb is the **foot**, consisting of the tarsals, metatarsals and phalanges.

The **shoulder** consists of the pectoral, scapular, and deltoid regions of the upper limb, and the lateral part of the lateral cervical region, overlying half the pectoral girdle. The homologous region of the lower limb is the **pelvis**.

The **forearm** consists of the radius (shorter bone) and ulna (stabilising bone of forearm) which extend between the elbow and wrist. The homologous region of the lower limb is the **lower leg** consisting of the tibia and fibula, which extend between the knee and ankle joints.

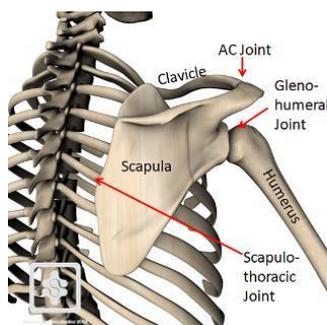
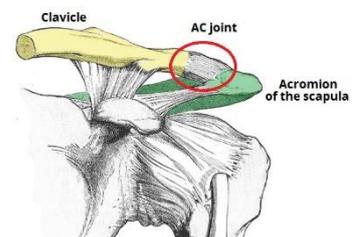
The **palm** is the central region of the anterior of the hand and consists of the area between the 5 phalanges and the carpus. The homologous region of the lower limb is the **sole of the foot**.

## LO3 – UPPER LIMB JOINTS



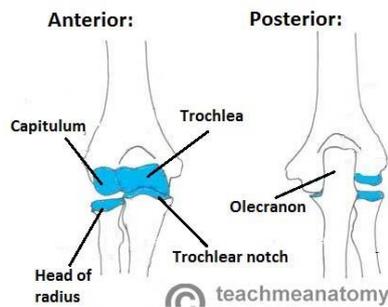
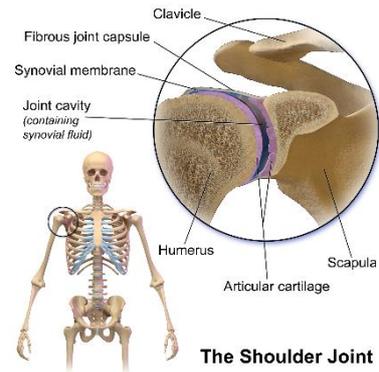
The **sternoclavicular (SC) joint** is a saddle type of synovial joint but functions as a ball and socket joint. It is located between the clavicle and manubrium of the sternum and is the only attachment of the upper limb to the axial skeleton. The SC joint allows for a large degree of mobility and helps with elevation and depression of the shoulders, protraction and retraction of the shoulders, and shoulder rotation.

The **acromioclavicular (AC) joint** is a plane type of synovial joint, located where the lateral end of the clavicle articulates with the acromion of the scapula. It allows for a degree of axial rotation and anteroposterior movement. As no muscles act directly on the joint, all movement is passive, and is initiated by movement at other joints.



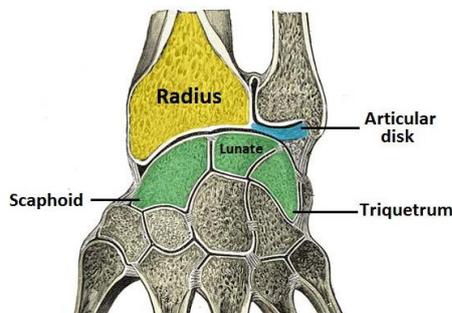
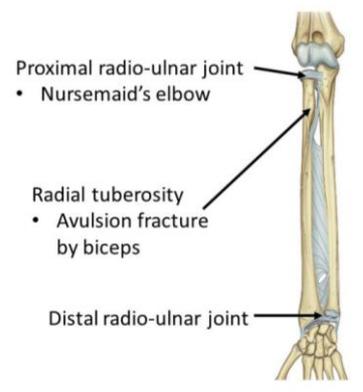
The **scapulothoracic joint** is a physiological joint, in which movement occurs between musculoskeletal structures (between scapula and associated muscles and thoracic wall), rather than an anatomical joint, in which movement occurs between directly articulating skeletal elements. This joint is where the scapular movements of elevation-depression, protraction-retraction, and rotation occur.

The **glenohumeral (shoulder) joint (GHJ)** is a ball and socket joint between the scapula and the humerus. It is the major point connecting the upper limb to the trunk and one of the most mobile joints in the body. As a ball and socket joint, there is a wide range of movement permitted such as flexion-extension, abduction-adduction, and medial-lateral rotation.



The **elbow joint** connects the proper arm to the forearm. It's marked on the upper limb by the medial and lateral epicondyles, and the olecranon process. The joint is classed as a synovial hinge joint. The orientation of the bones forming the elbow joint allows for extension and flexion of the forearm.

The **radioulnar joints** are 2 locations in which the radius and ulna articulate in the forearm. The **proximal (superior) radioulnar joint** is located near the elbow, and is an articulation between the head of the radius, and radial notch of the ulna. The **distal (inferior) radioulnar joint** is located near the wrist, and is an articulation between the ulnar notch of the radius, and the ulnar head. Both of these joints are classified as pivot joints, responsible for pronation and supination of the forearm.



The **wrist (radiocarpal) joint** is a synovial joint marking the area of transition between the forearm and the hand. It is formed by the proximal row of the carpal bones (excl. pisiform) and the distal end of the radius, and the articular disc. All movements of the wrist are performed by the muscles of the forearm. These movements include flexion-extension, and adduction-abduction.

The **metacarpophalangeal joints** are the condyloid type of synovial joint that permit movement in 2 planes; flexion-extension and adduction-abduction. Digits 2-5 allow for flexion-extension, adduction-abduction, and circumduction movement. Movement of the thumb is limited to flexion-extension. The **interphalangeal joints** are the hinge type of synovial joint that permit flexion-extension only.

