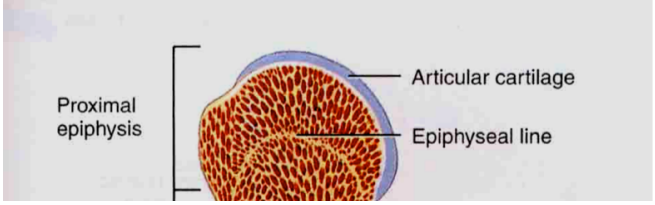
Week 1

- **Discuss the functions of bones**
    - Protection – Certain bones, including the skull, sternum, ribs and pelvis, protect their underlying organs
    - Mineral storage and acid-base homeostasis – Bone is the most important storehouse in the body for minerals such as calcium, phosphorus, and magnesium salts
    - Blood cell formation – Bones house red bone marrow, which is a special form of connective tissue. In this tissue, the process of hematopoiesis, or formation of blood cells, takes place
    - Fat storage – Yellow bone marrow contains fat cells, or adipocytes, with stored triglycerides. Fatty acids from the breakdown of these triglycerides can be released and used as fuel by cells if necessary
    - Movement – Bones serve as sites of attachment for most skeletal muscles. When the muscles contract, they pull on the bones, which generates movement around a joint
    - Support – The skeleton supports the weight of the body and provides its structural framework

- **Define the principal types of bones and cartilage that forms the structure of the bony skeleton**
    - Long bones – Long bones are named for their overall shape, they are longer than they are wide. Examples of long bones include most bones of the arm arms and legs as well as bones of the hands, feet, fingers and toes
    - Short bones – short bones are about as long as they are wide, r roughly cube-shaped. Examples of short bones include the carpals and tarsals
    - Flat bones – Flat bones are thin and broad. Examples include most bones of the skull, the clavicle, ribs, sternum and bones of the pelvis
    - Irregular bones – Irregular bones do not fit into the other classes due to their irregular shape. Examples include the vertebrae and certain skull bones
    - Sesamoid bones – Sesamoid bones are specialized bones located within tendons. Examples include the patella
    - Accessory bones – Accessory bones are bones where a failure of fusion has occurred. Examples include suture lines in the skull

- **Describe and draw the anatomy of a long bone**

  When you look at the outside of a long bone, you'll see that most of its surfaces are covered with a membrane, the periosteum. Each long bone features a long shaft and two rounded ends. The shaft of a long bone is called its diaphysis. At both ends of the bone we find the enlarged rounded ends called epiphyses. Inside a long bone is a hollow cavity called the medullary cavity, where most of the yellow and red bone marrow is housed. The bone has two distinct textures, the hard and dense compact bone, and the loosely packed spongy bone. The bony struts of spongy bone, and all inner surfaces of bone, are lined with a membrane called the endosteum.



- **Describe the processes involved in bone development, growth (both membranous and endochondral) and remodelling**
    - Intramembranous ossification – Many flat bones form during fetal development by the process of intramembranous ossification. Bones formed in this way are primary bone, which is eventually reabsorbed and replaced with secondary bone. Firstly, osteoblasts develop in the primary ossification center, then the osteoblasts secrete organic matrix, which calcifies. This then causes early spongy bone to form, and then early compact bone forms.
    - Endochronal ossification – All the bones in the body below the head, except the clavicles, form by the process of endochronal ossification. Firstly, the chrondoblasts in the perichondium differentiate into osteoblasts. The bone then begins to ossify from the outside: osteoblasts build the bone collar on the external surface of bone, simultaneously, internal cartilage begins to calcify and the chrondocytes die. In the primary ossification center, osteoblasts replace the calcified cartilage with early spongy bone; the secondary ossification centers and medullary

cavity develop. As the medullary cavity enlarges, the remaining cartilage is replaced by bone; the epiphyses finish ossifying
    - Bone remodeling – Bone remodeling has two steps; bone deposition and bone reabsorption. Hematoma > Fibrocartilaginous callus formation > Bony callus formation > Bone remodeling phase

- **Describe examples of things that can go wrong with bones. Commence using the language of anatomy and learning names for bony markings and prominences**
    - Osteoarthritis
    - Excessive and haphazard bone deposits and reabsorption
    - Fractures
    - Rickets – vitamin D deficiency
    - Osteoporosis – bone reabsorption is greater than bone deposition
    - Osteosarcomas – Bone tumors
    - Osteomyelitis – Bone infections

- **Describe the two major divisions of the skeleton**
    - Axial division – Lies around the longitudinal axis: skull, vertebral column, ribs, sternum, sacrum, and coccyx. Supports, protects, provides muscle attachment, stabilizes and positions head, neck and trunk, has vital functions and bears weight
    - Appendicular division – Upper and lower limbs and their girdles. Upper limbs provide movement and manipulation. Lower limbs provide weight bearing and movement in walking, strength and stability

- **Describe the 3 main types of joints found in the body and their functions**
    - Fibrous joints – Fastened together by dense regular collagenous connective tissue. The bones are united by collagen fibers, so no joint space is present. Functionally, fibrous joints are sutures, gomphoses, and syndesmoses
    - Cartilaginous joints – Have cartilage between the articulating bones. Like fibrous joints, no joint space is present. Functionally, cartilaginous joints are epiphyseal plates and symphisis
    - Synovial joints – Have a layer of hyaline cartilage on the surface of each articulating bone. They are the only class to have a joint cavity, filled with fluid, between articulating bones. Other supportive structures surround the bones and enclose the joint cavity. Synovial joints provide the most motion of any joint type

- **Identify and describe examples of the different types of synovial joints**
    - Plane/gliding – The simplest and least mobile synovial joint. Features two bones whose flat surfaces sit next to each other. Non-axial as they allow only side-to-side ‘gliding’ movements. The intercarpal joints of the wrists and intertarsal joints of the ankles are examples
    - Hinge – At a hinge joint, a convex surface of one bone fits into a concave depression of another bone. Movement is restricted to only one plane (uniaxial). Examples include the elbow and knee

- Pivot – Uniaxial joint in which the rounded surface of one bone fits into a groove on the surface of another bone. Joint stability is enhanced by a ring like ligament that surrounds the rounded bone and holds it in the groove of the second bone. Examples include the joint between the first and second cervical vertebrae (moves the head)
- Ellipsoidal or condyloid – A joint in which the oval convex surface of one bone fits into the shallow concave surface of the other bone. Examples include the phalangeal joints (knuckles) of the fingers
- Saddle – The surface of each articulating bone has both convex and concave regions that compliment one another. A saddle joint is biaxial but allows greater motion than ellipsoidal or hinge joints. Examples include the joint between the first metacarpal of the thumb and the trapezium
- Ball and socket – Multi-axial joint in which the articulating surface of one bone is ball-shaped or spherical and fits into a cup or socket formed by the articulating surface of the other bone. Both the shoulder and hip joints are examples

- **Describe the main components of a synovial joint**
  - Joint cavity – Contains a joint capsule, synovial fluid and articular cartilage
  - Joint/articular capsule – Where two bones join, they are enclosed by a double-layered structure composed of connective tissue, called the articular or joint capsule. The delicate inner layer of the capsule is called the synovial membrane
  - Synovial fluid – A thick, colourless, oily liquid that serves three main functions in the joint: lubrication, metabolic functions, and shock absorption
  - Articular cartilage – All exposed bone surfaces within the joint cavity are covered by a thin layer of articular cartilage composed of hyaline cartilage
  - Ligaments and tendons
  - Bursae and tendon sheaths – A bursa is a synovial fluid-filled structure resembling a limp water balloon. Bursae minimize friction between all the moving parts of a synovial joint. Tendon sheaths are long bursae that surround high-stress regions of the human body and provide protection for long tendons

- **Define the terms “loose-packed” and “close-packed”**
  - Close-packed position – Greatest joint contact creating stability. The ligaments in the capsule are taut. Important in body weight transmission
  - Loose-packed position – Minimal joint contact with the ligaments in the capsule slack. In this position you can create free movements with a susceptibility to dislocation

- **Describe the functions of skeletal muscle**
  - Transform chemical energy into mechanical energy
  - Movement and stabilization of position
  - Regulate organ volume
  - Generate heat
  - Propel fluids

    - Propel food matter

- **Define the following terms: origin, insertion, action, prime mover (agonist), antagonist, synergist, fixator, isometric, concentric, and eccentric.**
    - Origin – The point in which the muscle derives
    - Insertion – The part of a muscle by which it is attached to the part to be moved
    - Action – Movement produced by muscle
    - Agonist (prime mover) – Produces the main movement of the muscle
    - Antagonist – Prime movers whose actions oppose that of agonist being considered
    - Synergist – Assists prime mover in action
    - Fixator – Immobilizes the bone of the prime movers origin providing a stable base for the action of the prime mover
    - Isometric – No movement results from muscle contraction
    - Concentric – Muscle length shortens with tension
    - Eccentric – Muscle length increases with tension

- **Describe the roles of fascia and bursae within the musculoskeletal system**
  Fascia is a thick connective tissue that encloses muscles and anchors them to the surrounding tissues and holds muscle groups together. A bursa is a synovial fluid-filled structure that is lined with a synovial membrane on its inner surface, much like an articular capsule. Generally, bursae are found in regions of high stress where bones, tendons, muscles, and skin interact in a small space.

Week 2

- **Correctly apply the anatomical terminology relating to the bones of the pectoral girdle and glenohumeral joints**
    - Acromioclavicular joint – AC Joint
    - Genohumeral joint – Shoulder joint
    - Axilla – Arm pit
    - Brachium – Arm
    - Ante Brachium – Forearm
    - Cubitus – Anterior elbow region
    - Pronation and Supination – Anatomical movements that only occur in the forearm
    - Carpus – Wrist
    - Manus – Hand
    - Pollex – Thumb

- **Identify major bony features of the clavicle, scapula and proximal humerus on both the bony skeleton and on surface anatomy**
    - Clavicle – The clavicle has two distinct ends; the medial sternal end that articulates with the manubrium at the sternum, and the lateral acromial end that articulates with a process of the clavicle called the acromion. Near the acromial end we find the conoid tubercle, which is the site of ligament attachment. The superior surface of the clavicle is smooth, whereas the inferior surface has a slight roughening for ligament and muscle attachment
    - Scapula – The scapula has three borders: The medial lateral and superior borders. It also has an inferior angle. The anterior surface of the scapula features a hook-shaped projection called the coracoid process. The scapula's lateral angle has a glenoid cavity, which helps form the shoulder joint. On the posterior side of the scapula is a ridge of bone called the spine, which terminated in the enlarged acromion. The area superior to the spine of the scapula is the supraspinous fossa; the area inferior is the infraspinous fossa. The subscapula fossa can be found on the anterior surface.
    - Humerus – The proximal epiphysis of the humerus features a ball-shaped head that articulates with the glenoid cavity to create the glenohumeral joint. Surrounding the head is a groove called the anatomical head. Just lateral to the head is a projection called the greater tubercle. On the medial side we find the lesser tubercle. The proximal epiphysis is attached to the diaphysis at a region called the surgical neck. The diaphysis has one major projection called the deltoid tuberosity, and a major groove called the bicipital groove.

- **Classify the types of synovial joints found in the pectoral girdle and glenohumeral joint**
    - Subacromial space – Joins the head of the humerus to the acromion
    - Acromioclavicular joint – Joins the acromion to the clavicle > Plane/gliding
    - Scapulothoracic joint – Joins the scapula to the thoracic spine
    - Sternoclavicular joint – Joins the sternum to the clavicle > Saddle

    - Glenohumeral joint – Joins the glenoid cavity to the head of the humerus > ball and socket

- **Identify and describe the main ligament and joint structures associated with these joints**
    - Acromioclavicular joint – Acromioclavicular ligament reinforces the capsule. The integrity of the joint is maintained by the coracoclavicular ligament
    - Sternoclavicular joint – Sternoclavicular ligament reinforces capsule. Interclavicular ligament strengthens the capsule superiorly
    - Glenohumeral joint – Glenohumeral ligament, coracohumeral ligament, transverse humeral ligament, coracoacromial ligament and the glenoid labrum

- **Describe and demonstrate the main movements of the pectoral girdle and glenohumeral joints**
    - Protraction and retraction – Bringing shoulder blades forward and backward
    - Elevation and depression – Lifting shoulders up and down
    - Medial and lateral rotation – Rotating shoulder blades medially and laterally

- **Identify the major bony features of the humerus and scapula that comprise the glenohumeral joint**
  - Scapula – Medial, lateral and superior borders, inferior angle, spine of the scapula, acromion, coracoid process, glenoid cavity, subscapular fossa, infraspinous fossa, supraspinous fossa

- **Classify the type of synovial joint located at the glenohumeral joint**
  Ball and socket

- **Identify and name the cartilage located within the glenohumeral joint**
  Glenoid Labrum – Fibrocartilage rim that covers the glenoid cavity

- **Describe and demonstrate the main movements of the glenohumeral joint**
    - Flexion and extension – Bringing arms forward and backward
    - Abduction and adduction – Bringing arms up and down
    - Medial and lateral rotation – Rotating arm inwards and outwards
    - Circumduction

- **Identify and describe the main origins, insertions and actions of the 5 main muscles that move the pectoral girdle**
    - Trapezius – Originates in the base of the skull and inserts into the lateral side of the clavicle, acromion and spine of scapula > elevation, retraction and depression
    - Serratus anterior – Originates in the ribs and inserts into the medial border of the scapula > protraction
    - Levator scapulae – Originates in the cervical spine and inserts into the medial border of the scapula > Elevation

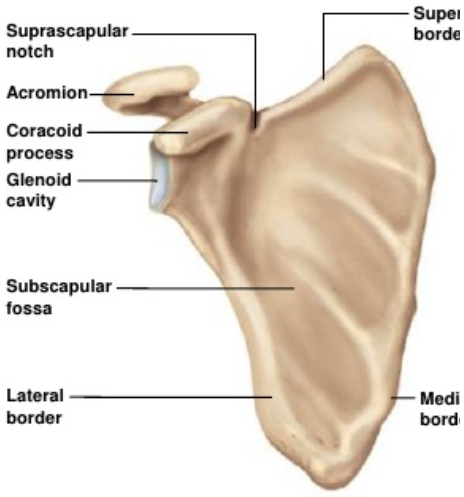
    - Rhomboid (major and minor) – Originates in the cervical and thoracic spine and inserts into the medial border of the scapula – retraction and medial rotation
    - Pectoralis minor – Originates in the ribs and inserts into the coracoid process of the scapula > protraction

- **Locate and describe the origins, insertions (attachments) and actions of the major muscles that produce movement at the glenohumeral joint**
    - Deltoids – Originates in the scapula, scapula spine and acromion, and inserts into the deltoid tuberosity of the humerus – Flexion, lateral rotation, abduction, adduction, extension
    - Teres major – Originates in the scapula and inserts into the lesser tubercle of the humerus – Medial rotation, adduction, extension
    - Latissimus Dorsi – Originates in the thoracic spine, inferior angle of the scapula, and the ribs, and inserts into the lesser tubercle of the humerus > medial rotation, adduction and extension
    - Pectoralis major – Originates in the clavicle and sternum and inserts into the greater tubercle of the humerus > Adduction and medial rotation

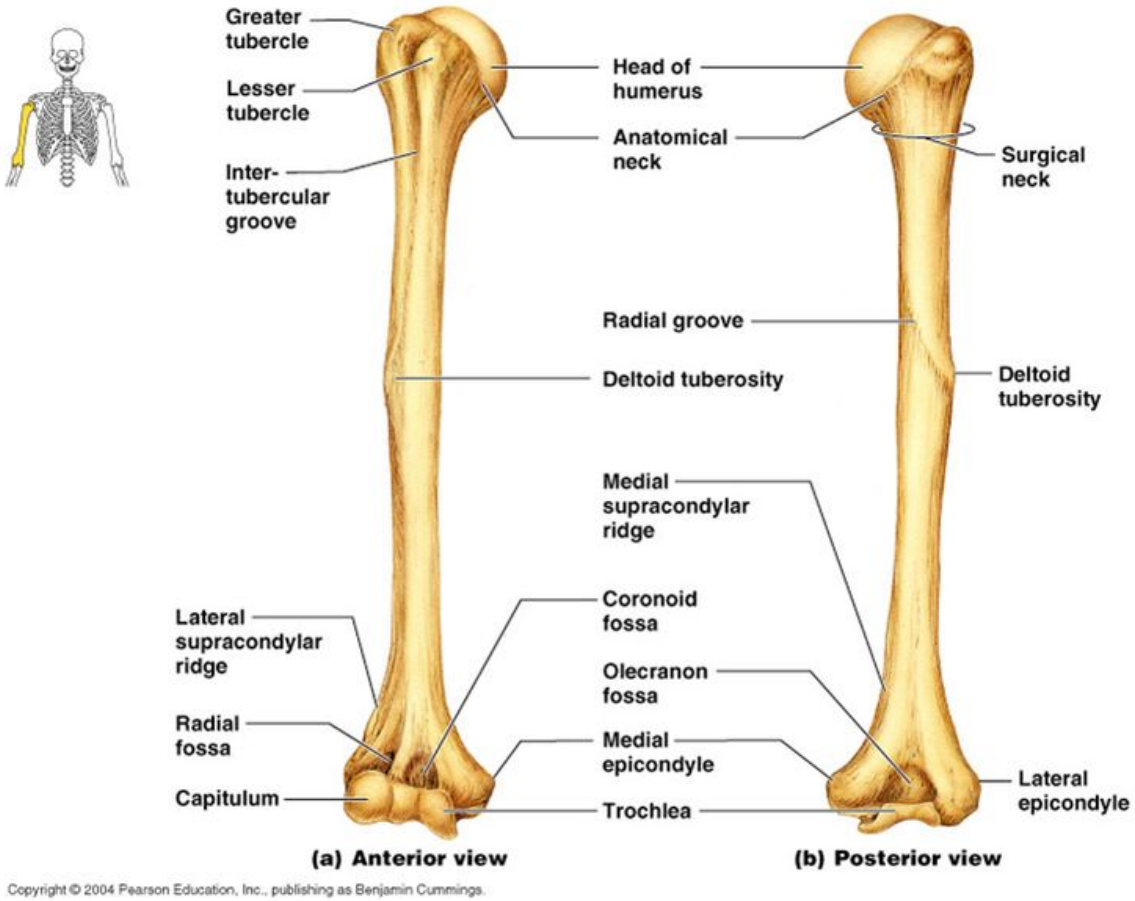
- **Describe the origins, insertions and actions of the 4 rotator cuff muscles and the role that they play in stabilizing the glenohumeral joint**
    - Teres minor – Originates on the lateral border of the scapula and inserts into the greater tubercle of the humerus > lateral rotation and addction
    - Supraspinatus – Originates in the supraspinous fossa of the scapula and inserts into the greater tubercle of humerus - Abduction
    - Infraspinatus – Originates in the infraspinous fossa of the scapula and inserts into the greater tubercle of the humerus > lateral rotation
    - Subscapularis – Originates in the subscapular fossa of the scapula and inserts into the lesser tubercle of the humerus > medial rotation

Week 3

- **Identify the coracoid process and glenoid cavity of the scapula**



- **Identify on the humerus: the shaft, deltoid tuberosity, bicipital groove and radial groove**



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- **Identify and describe the origins and insertions (attachments) and actions of the muscles of the arm**

- **Anterior compartment (elbow flexors): biceps (short & long heads), brachialis; (shoulder flexor) coracobrachialis**

Biceps:
- Origin –LH: Supraglenoid tubercle
  SH: Coracoid process
- Insertion – LH: Bicipital aponeurosis
  SH: Radial tuberosity
- Action – LH: Supination of the forearm
  SH: Flexion of elbow

Brachialis:
- Origin – Lower half of humerus
- Insertion – Ulnar tuberosity
- Action - Flexion

Coracobrachialis:
- Origin – Coracoid process of scapula
- Insertion – Middle of medial shaft of humerus
- Action – Flexion and adduction

- **Posterior compartment (elbow extensors): triceps (3 heads), anconeus**

Triceps:
- Origin – LatH: Post humerus above radial groove
  MH: Post humerus
  Long: Infraglenoid tubercle of scapula
- Insertion – 3 heads join together and insert on olecranon process of ulna
- Action – Extends elbow

Anconeus
- Origin – Lateral epicondyle of humerus
- Insertion – Olecranon and post ulna
- Action - Extension

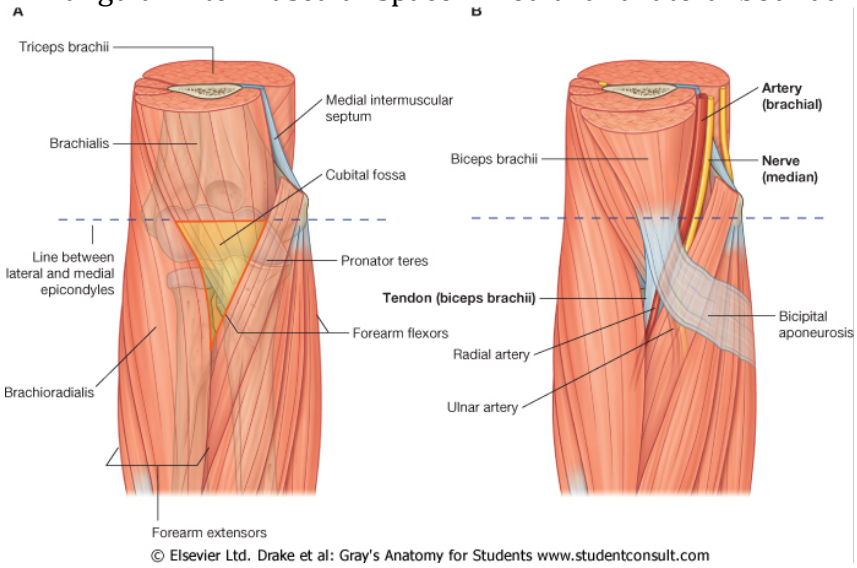
- **Identify main bony radiological features of the shoulder and arm**

- **Correctly use anatomical terminology relating to the elbow region**

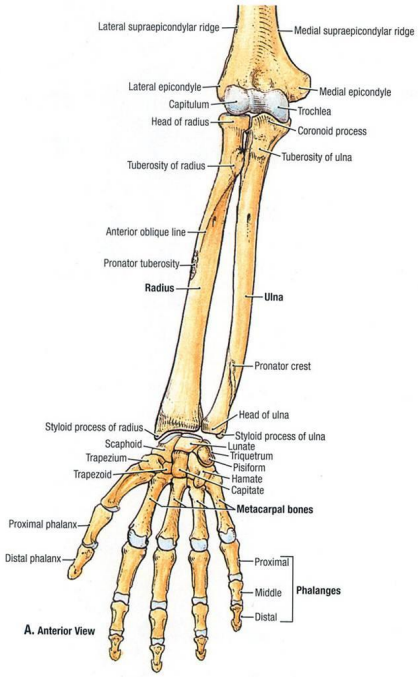
- **Correctly identify main bony features of the:**
  - **Distal humerus**
    - Capitulum
    - Radial fossa
    - Coronoid fossa
    - Medial epicondyle
    - Trochlea
  - **Proximal ulna**
    - Olecranon process
    - Trochlea notch
    - Coronoid process
    - Ulnar tuberosity
  - **Proximal radius**
    - Head of radius – concave
    - Neck of radius

- **Identify radiological features of the elbow region**
  - Radial head
  - Capitulum
  - Olecranon process
  - Radial tuberosity
- **Identify and classify the elbow, superior and middle radioulnar joints**
  - Superior: Proximal, synovial, pivot, anular ligament
  - Intermediate: middle, fibrous, interosseous membrane
- **Describe movements occurring at the elbow and forearm**
  - Flexion and extension – bending and stretching the arm at the elbow joint
  - Pronation and supination – rotation hand upward and downwards
- **Describe factors which maintain stability at the elbow and superior radioulnar joint**
  - Collateral ligaments
  - Muscles
- **Identify and state the attachments & actions of the anterior and posterior compartment of the elbow**
  - Anterior – Biceps brachii > Attaches to the bicipital aponeurosis of the ulna, and the radial tuberosity > Flexion
  - Posterior – Triceps brachii > Attaches to the olecranon process of the ulna > Extension

- **Locate the cubital fossa and describe its boundaries**
  - Triangular intermuscular space – medial and lateral boundaries



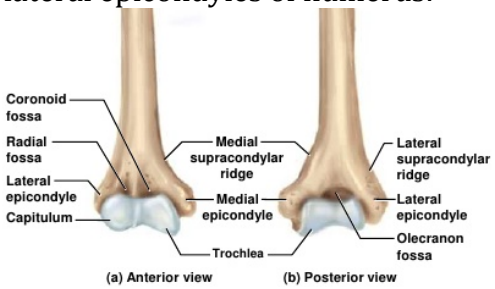
- **Identify and correctly orientate the bones of the forearm and wrist**



- **Provide a joint classification for the three radioulnar and the proximal radio-carpal joint**
    - Superior radio-ulnar joint – Synovial, pivot
    - Intermediate radio-ulnar joint – Fibrous, interosseous membrane
    - Inferior radio-ulnar joint – Synovial, pivot
    - Proximal radio-carpal joint – Synovial, ellipsoidal

- **Describe and perform movements occurring at these joints**
    - Superior radio-ulnar joint – medial and lateral rotation
    - Intermediate radio-ulnar joint – medial and lateral rotation
    - Inferior radio-ulnar joint – medial and lateral rotation
    - Proximal radio-carpal joint – flexion, extension, adduction and abduction

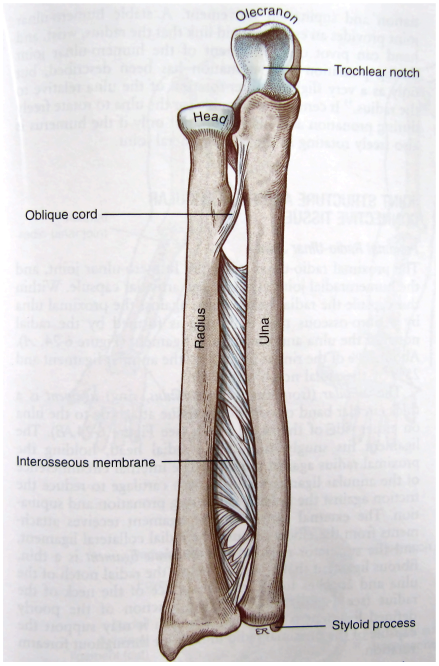
- **Identify medial and lateral epicondyles of the humerus; ulnar and radial styloid processes at the wrist**
    - Medial and lateral epicondyles of humerus:



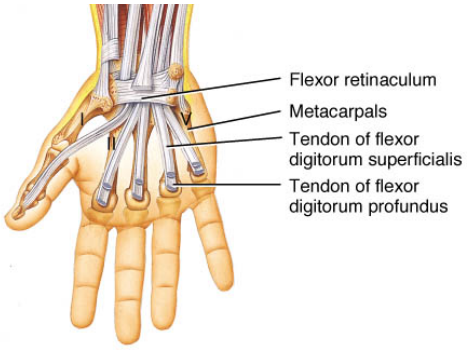
    - Ulnar and radial styloid processes

- **Identify the anular ligament, interosseous membrane, flexor and extensor retinacula located at the wrist.**
  - Annular ligament

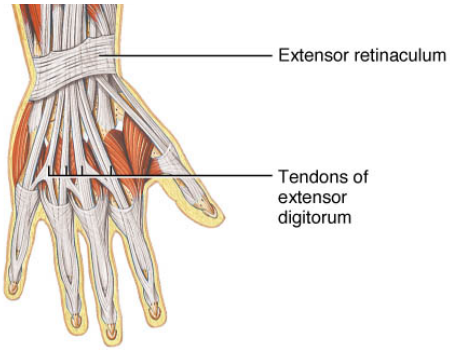
  - Interosseous membrane



  - Flexor and extensor retinacula



(a) Anterior superficial view



(b) Posterior superficial view

- **Identify and describe main actions of the muscle compartments of the forearm**
  - Anterior
    - Flexors

        - Superficial: Flexor carpi radialis, palmaris longus, flexor carpi ulnaris
        - Intermediate: Flexor digitorum superficialis
        - Deep: Flexor digitorum profundus, flexor pollicus longus
    - Pronators
        - Pronator teres, pronator quadratus
- Posterior
    - Extensors
        - Superficial: Extensor carpi radialis longus, extensor carpi radialis brevis, extensor carpi ulnaris, extensor carpi digiti minimi, extensor digitorum
        - Deep: Abductor pollicus longus, extensor pollicus brevis, extensor pollicus longus, extensor indicis
    - Supinators
        - Supinator

- **Describe common origins and main insertions for the forearm muscles**
  Common origin point for the muscles of the forearm is the medial epicondyle of the humerus.
  Main insertion points for the muscles of the forearm include the carpals, metacarpals and phalanges