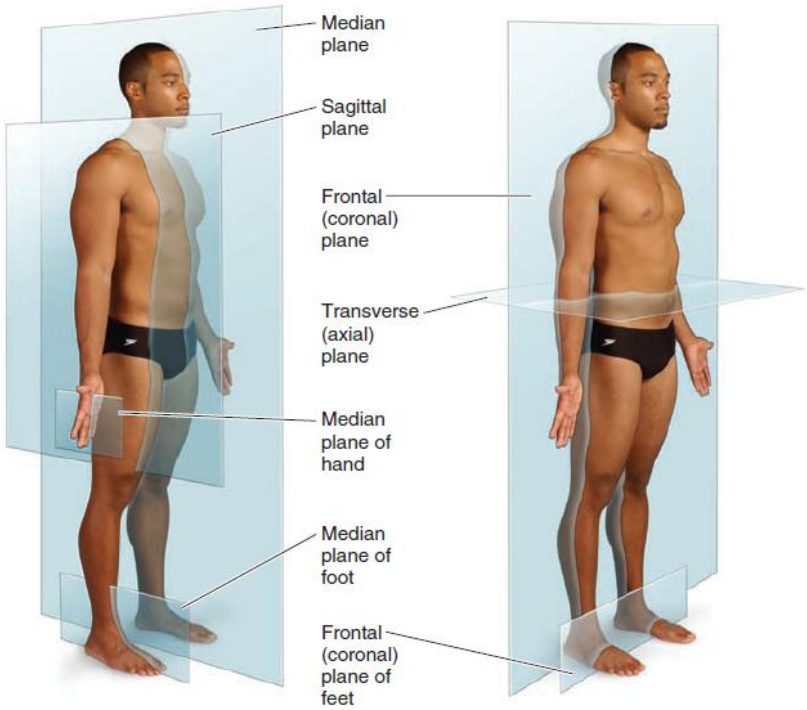
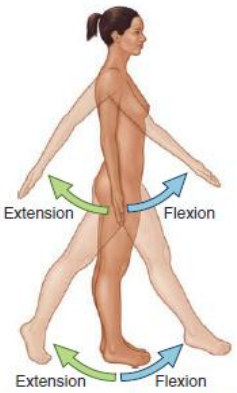
Unit I – Problem 5 – Anatomy: Types of Movements and Joints

- **Anatomical position:**
  - The person is standing erect, with the upper limbs by the sides and the face and palms of the hands directed forward.
- **Imaginary planes of the body:**
  - **Median plane**: passing longitudinally through the center of the body, dividing it into right and left halves. A plane parallel to and near the median plane may be referred to as a paramedian plane.
  - **Sagittal planes**: vertical planes passing through the body parallel to the median plane.
  - **Frontal (coronal) planes**: vertical planes passing through the body at right angles to the median plane, dividing it into anterior (front) and posterior (back) positions.
  - **Transverse planes**: pssing through the body at right angles to the median and frontal planes. A transverse plane divides the body into superior (upper) and inferior (lowr) parts.

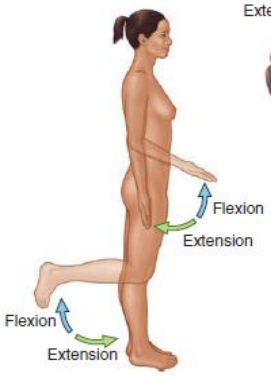


- **Terms of movement:**
  - **Flexion**: means bending of a part.
  - **Extension**: means straightening a part.
  - **Abduction**: means moving away from the median plane of the body in the frontal plane.
  - **Adduction**: means moving toward the median plane of the body in the frontal (coronal) plane.
  - **Rotation**: means moving a part of the body around its long axis (medial or lateral).
  - **Circumduction**: is the circular movement of the limbs.
  - **Pronation**: is a medial rotation of the forearm and hand so that the palm faces posteriorly.
  - **Supination**: is a lateral rotation of the forearm and hand so that the palm faces anteriorly.
  - **Dorsiflexion**: is elevation of the dorsum of the foot at the ankle.
  - **Plantarflexion**: is depression of the sole of the foot at the ankle.
  - **Eversion**: means turning the sole of the foot outward.
  - **Inversion**: means turning the sole of the foot inward.
  - **Protrusion**: means to move the jaw anteriorly.

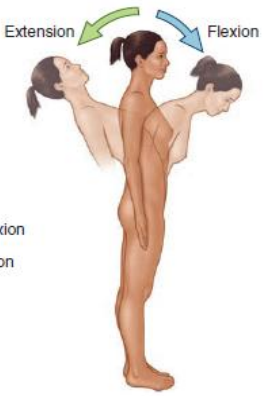
- **Retrusion**: means to move the jaw posteriorly.
- **Elevation**: raises or moves a part superiorly.
- **Depression**: lowers or moves a part inferiorly.



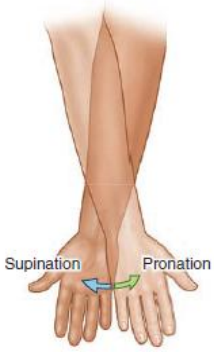
(A) Flexion and extension of upper limb at shoulder joint and lower limb at hip joint



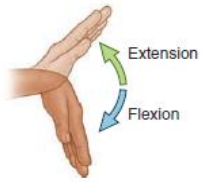
Flexion and extension of forearm at elbow joint and of leg at knee joint



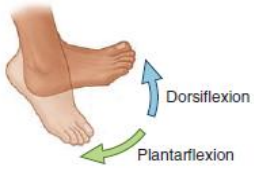
Flexion and extension of vertebral column at intervertebral joints



(B) Pronation and supination of forearm at radio-ulnar joints



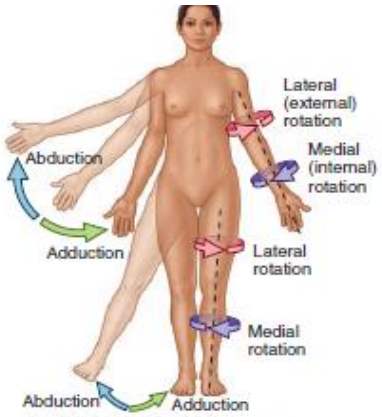
(C) Flexion and extension of hand at wrist joint



(D) Dorsiflexion and plantarflexion of foot at ankle joint

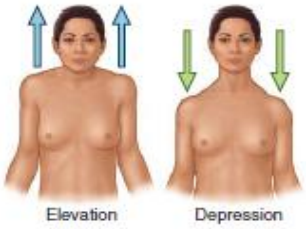
(E) Inversion and eversion of foot at subtalar and transverse tarsal joints

(F) Abduction and adduction of 2nd, 4th, and 5th digits at metacarpo-phalangeal joints

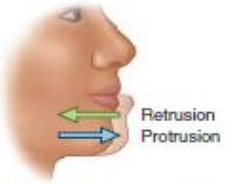


(G) Abduction and adduction of right limbs and rotation of left limbs at glenohumeral and hip joints

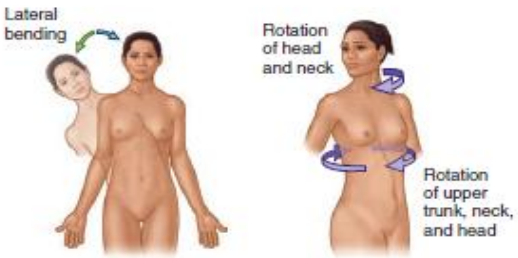
(H) Circumduction (circular movement) of lower limb at hip joint



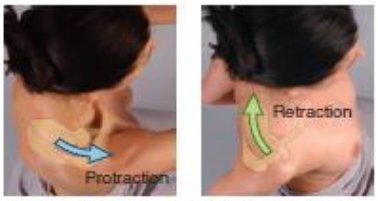
(I) Elevation and depression of shoulders



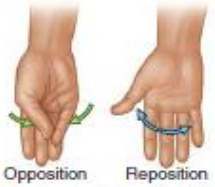
(K) Protrusion and retrusion of mandible (jaw) at temporomandibular joints



(J) Lateral bending (lateral flexion) of trunk and rotation of upper trunk, neck, and head



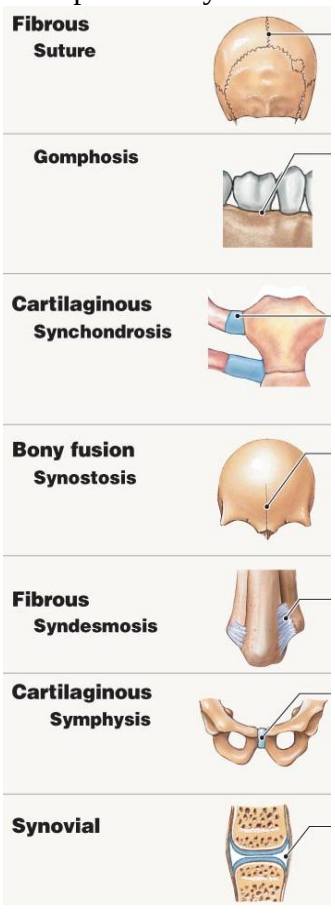
(L) Protraction and retraction of scapula on thoracic wall



(M) Opposition and reposition of thumb and little finger at carpometacarpal joint of thumb combined with flexion at metacarpophalangeal joints

(N) The thumb is rotated 90° relative to other structures. Abduction and adduction at metacarpophalangeal joint occurs in a sagittal plane; flexion and extension at metacarpophalangeal and interphalangeal joints occurs in frontal planes, opposite to these movements at other joints.

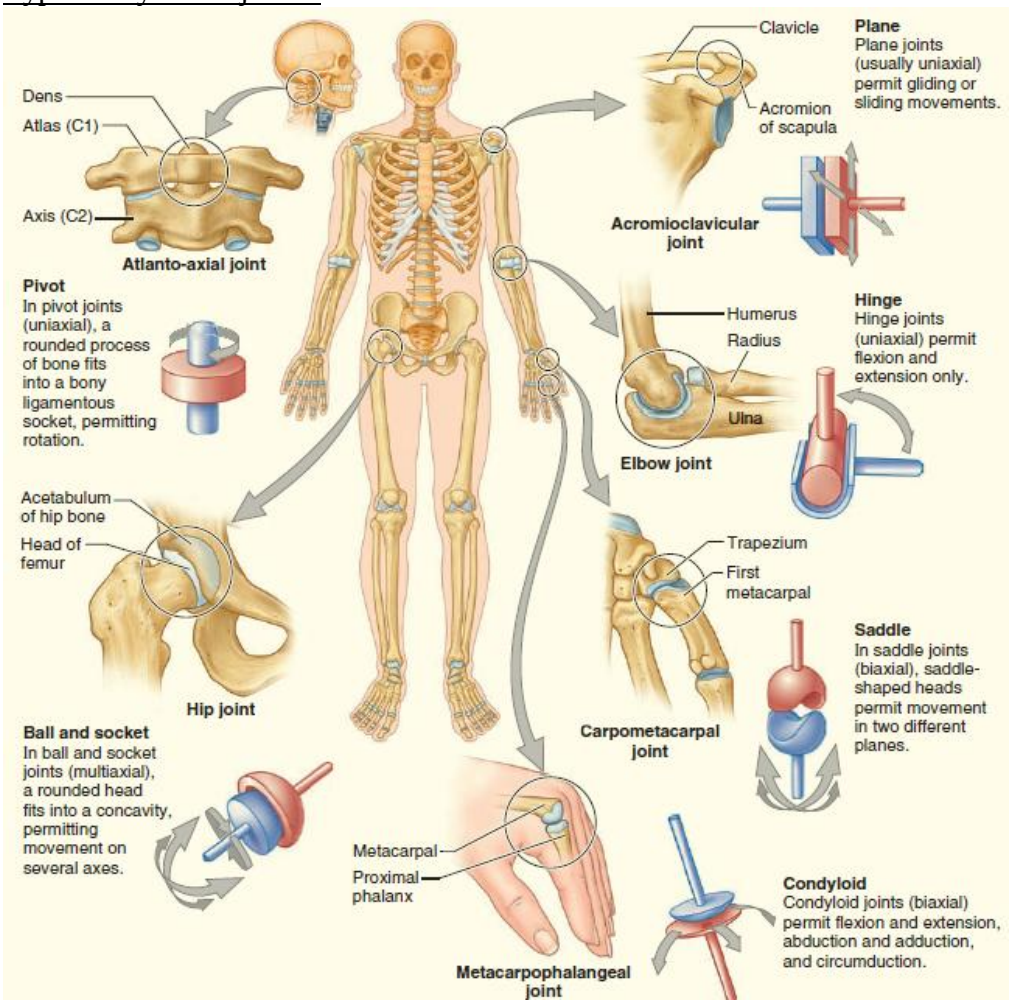
- **The terms anterior and posterior are used to indicate the front and back of the body respectively:**
  - **Anterior**: front.
  - **Posterior**: back.
- **A structure situated nearer to the median plane of the body than another is said to be medial to the other.**
- **A structure that lies farther away from the median plane is said to be lateral to the other.**
- **To describe the hand:**
  - Palmar and dorsal surfaces are used in place of anterior and posterior.
- **To describe the foot:**
  - Terms dorsal and plantar surfaces are used instead of upper and lower surfaces.
- **The terms proximal and distal describe the relative distance from the roots of the limbs:**
  - **Proximal**: nearer.
  - **Distal**: farther.
- **A term and its opposite:**
  - **Superficial vs deep.**
  - **Superior vs inferior.**
  - **Cranial vs caudal.**
  - **Internal vs external.**
  - **Ipsilateral (same side) vs contralateral (opposite side).**
- **Abduction and adduction of fingers and toes:**
  - Abduction of fingers and toes is applied to the spreading of these structures.
  - Adduction is applied to the drawing together of these structures.
- **Flexion and extension of the thumb:**
  - **Flexion of the thumb**: is the movement across the palm maintaining the plane of the thumbnail at right angles to the plane of the other fingernails.
  - **Extension of the thumb**: is the movement in a lateral or coronal plane away from the palm maintaining the plane of the thumbnail at right angles to the plane of the other fingernails.
- **Abduction and adduction of the thumb:**
  - **Abduction of the thumb**: is a movement in an anteroposterior plane away from the palm, the plane of the thumbnail being kept at right angles to the plane of the other fingernails.
  - **Adduction of the thumb**: is a movement in an anteroposterior plane toward the palm, the plane of the thumbnail being kept at right angles to the plane of the other fingernails.
- **Opposition of the thumb**: is a movement across the palm so that the anterior surface of the tip comes into contact with the anterior surface of the tip of any other fingers.



JOINTS

- **What is a joint?**
  - A site where two or more bones come together (articulate).
- **Movements at joints:**
  - In some joints, there is no movement (skull sutures).
  - Some joints have only slight movement (superior tibiofibular joint).
  - Some are freely movable (shoulder joint).

- **Classification of joints:**
  - **Fibrous joints (synarthrosis: non-movable):**
    - ✓ The articulating surfaces of bones are joined by fibrous tissue.
    - ✓ Examples include: skull sutures and inferior tibiofibular joint.
  - **Cartilaginous joints (amphiarthrosis: slightly movable):**
    - ✓ Primary cartilaginous joints: bones are united by a plate or bar of hyaline cartilage. ExamplesL the union between the epiphysis and diaphysis of long bones and the union between the first rib and manubrium sterni.
    - ✓ Secondary cartilaginous joints: the bones are united by a plate or bar of fibrocartilage and the articular surfaces are covered by a thin layer of hyaline cartilage. Examples: pubic symphysis and intervertebral discs.
  - **Synovial joints (diarthrosis: freely movable):**
    - ✓ The articular surfaces of bones are covered by a thin layer of hyaline cartilage separated by a joint cavity. The cavity of the joint is lined by synovial membrane. The synovial membrane is covered by joint capsule. The articular surfaces are lubricated by a synovial fluid.
    - ✓ Types of synovial joints:



MUSCLES

- **Types of muscle:**
  - **Skeletal striated muscle:**

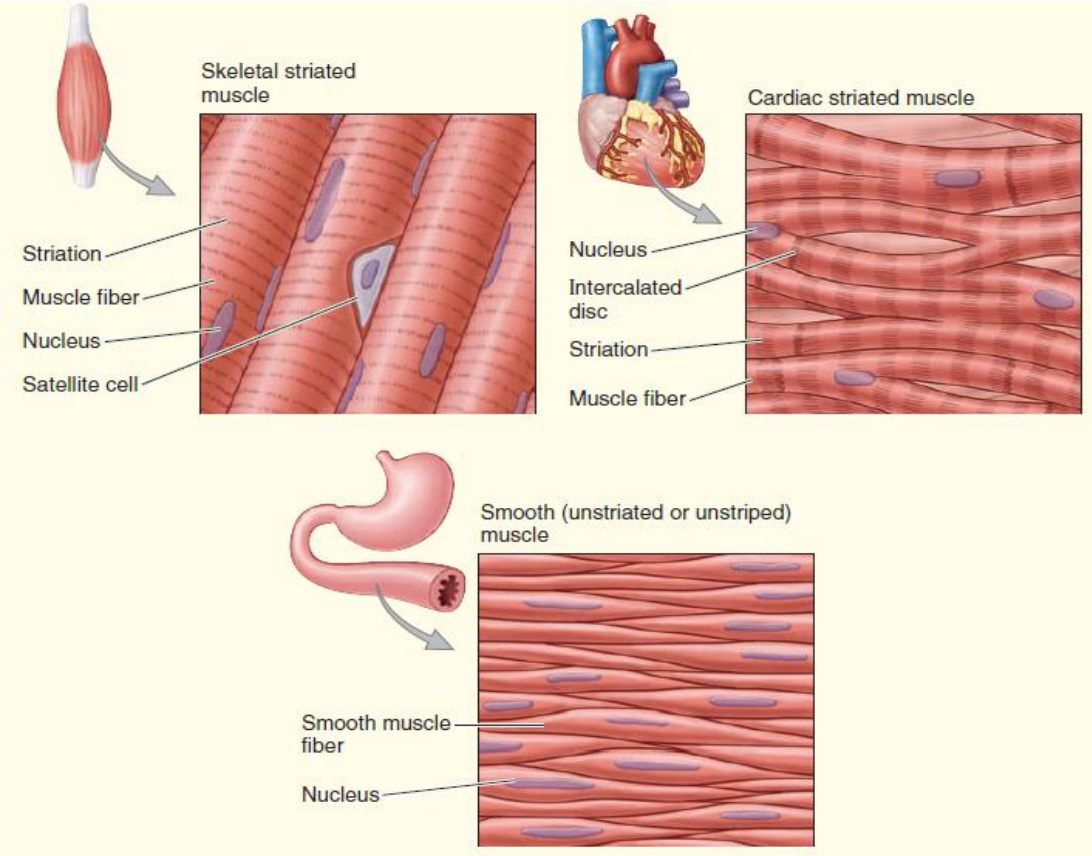
Location	Attached to the skeleton and/or facia of limbs, body wall and head/neck
Appearance	Large, long, cylindrical with striations and multiple peripherally located nuclei
Types of activity	Strong, quick, acts primarily to produce movement or resist gravity
Stimulation	Voluntary (or reflexive)

- **Cardiac striated muscle:**

Location	Myocardium, aorta and vena cava
Appearance	Branching, striations with intercalated discs and a single centrally located nucleus.
Types of activity	Strong, quick, rhythmic, acts to pump blood from the heart
Stimulation	Involuntary (controlled by autonomic nervous system)

- **Smooth unstriated muscle:**

Location	Hollow viscera and blood vessels
Appearance	Small, spindle-shaped with a single centrally located nucleus.
Types of activity	Weak, slow, rhythmic
Stimulation	Involuntary (controlled by autonomic nervous system)



- **<u>Organization of skeletal muscle:</u>**