MEDICAL EDUCATION RESOURCE

Comparison of Upper and Lower Limbs

General Features

- **Upper Limb:**
  Designed for **mobility** and a wide range of movements. The **thumb**, assisted by palm and fingers, allows **prehension** (holding objects).
  The upper limb bud undergoes **lateral rotation**, causing the **thumb to face laterally**.
  Nerve Supply: Ventral rami of **C5–C8 and T1**.
  - **Flexor aspect:** Supplied by musculocutaneous, median, and ulnar nerves.
  - **Extensor aspect:** Supplied by radial nerve (through posterior interosseous branch) and axillary nerve.
- **Lower Limb:**
  Designed for **support and stability** during standing and walking.
  The lower limb bud undergoes **medial rotation**, so the **great toe faces medially**.
  Nerve Supply: Ventral rami of **L2–L5 and S1–S3**.
  - **Extensors of knee (quadriceps):** Femoral nerve.
  - **Adductors of thigh:** Obturator nerve.
  - **Flexors of leg and foot:** Sciatic nerve and its branch, tibial nerve.
  - **Extensors of ankle:** Deep peroneal nerve.
  - **Peroneal muscles:** Superficial peroneal nerve.

Arm vs. Thigh

- **Upper Limb:**
  - **Bone:** Humerus — longest bone of upper limb.
  - **Joint:** Shoulder joint — multiaxial, highly mobile.
  - **Muscles:**
    - Anterior: Biceps, brachialis, coracobrachialis (musculocutaneous nerve).
    - Posterior: Triceps (radial nerve).
  - **Artery:** Axillary and brachial arteries with profunda brachii branch.
- **Lower Limb:**
  - **Bone:** Femur — longest bone in the body.
  - **Joint:** Hip joint — multiaxial but stable (weight-bearing).
  - **Muscles:**
    - Anterior: Quadriceps femoris (femoral nerve).
    - Posterior: Hamstrings (tibial part of sciatic nerve).
  - **Artery:** Femoral artery (continuation of external iliac).

Forearm vs. Leg

- **Upper Limb:**

- **Bones:**
  - Radius (preaxial).
  - Ulna (postaxial).
- **Joints:** Elbow joint and radioulnar joints (pivot type) permit **pronation and supination**.
- **Muscles:** Flexors, extensors, pronators, supinators.

- **Lower Limb:**
  - **Bones:**
    - Tibia (preaxial).
    - Fibula (postaxial).
  - **Joints:** Knee (hinge type) and tibiofibular joints (slight gliding).
  - **Movements:** Flexion, extension, inversion, eversion, and plantar/dorsiflexion.

Functional Summary

ASPECT	UPPER LIMB	LOWER LIMB
Purpose	Manipulation, dexterity	Support, locomotion
Rotation	Lateral	Medial
Main Nerves	Brachial plexus	Lumbar and sacral plexuses

ASPECT	UPPER LIMB	LOWER LIMB
Extensors located	Posteriorly	Anteriorly
Preaxial bone	Radius	Tibia
Postaxial bone	Ulna	Fibula
Digits orientation	Thumb lateral	Great toe medial
Mobility vs. Stability	Highly mobile, less stable	Highly stable, less mobile

Frequently Asked Questions

1. **What is surface marking?**
   It refers to the method of projecting the position of deep structures (bones, joints, muscles, arteries, nerves) onto the surface of the body to aid clinical localization and surgical procedures.

2. **Name the main arteries of the upper limb with their surface markings.**
   Axillary artery, brachial artery, radial artery, and ulnar artery — each traced using palpable bony landmarks and lines joining key surface points.

3. **How are the major nerves of the upper limb marked on the surface?**
   By joining anatomical landmarks corresponding to their course — for example, the ulnar nerve along the medial epicondyle and the medial border of the forearm.

4. **What are the radiological features of the shoulder joint on an X-ray?**
   The glenoid cavity articulates with the head of the humerus, and the acromion process is seen lateral to it; dislocation can be identified by disruption of this alignment.

5. **How can you distinguish between radius and ulna in a radiograph?**
   The radius is lateral and has a larger distal end, while the ulna is medial and larger proximally.

6. **What are the key points of comparison between upper and lower limbs?**

   - Upper limb ? mobility, manipulation, lateral rotation, prehension.
   - Lower limb ? stability, weight bearing, medial rotation, locomotion.

7. **Which limb undergoes medial rotation in embryonic development and why?**
   The lower limb — it rotates medially so the great toe lies medially, facilitating upright posture and locomotion.

8. **Name the preaxial and postaxial bones of the upper and lower limbs.**

   - Upper limb: Radius (preaxial), Ulna (postaxial)
   - Lower limb: Tibia (preaxial), Fibula (postaxial)

9. **Why are extensors located posteriorly in the upper limb but anteriorly in the lower limb?**
   Due to opposite rotations during development — lateral rotation in the upper limb and medial rotation in the lower limb.

10. **What is the clinical significance of knowing radiological anatomy?**
    It helps identify fractures, dislocations, congenital anomalies, and guides orthopedic interventions.