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SABBIR SHEIKH



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First Professional MBBS — Anatomy

MAGIC VIVA ANATOMY

Complete Viva & Practical Question & Solution

with Anatomical Position & Identifying Points

FIRST EDITION · 2026

WRITTEN & COMPILED BY

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Author's Note

“পরশুদিন থেকে ফাস্ট প্রফের ভাইভা শুরু, আমার অ্যানাটমি প্রথমে। সবচেয়ে বেশি সমস্যা হচ্ছে, মাঝে ফিজিও-বায়ো রিটেন দিয়ে অ্যানাটমির বেশিরভাগই আবার নতুন করে মনে করতে হচ্ছে। একটা বইয়েও আবার কাজ হচ্ছে না। একেক প্রশ্নের উত্তর একেক বইয়ে ভালো, সেগুলোর জন্য ছবি অন্য বইয়ে, ক্লিনিক্যাল পড়তে গেলে আবার আরেকটা। অর্থাৎ, ৪-৫টা বই বের করে বসতে হচ্ছে। প্রতিটা বইয়ে আলাদা করে পেজ উল্টাতে উল্টাতে নাজেহাল। এখন এত বই উল্টানোর টাইম কই? এমন একটা বই পেতাম, যেটাতে কার্ডের প্রশ্নগুলোর উত্তর শুধু মুখস্থ বলার জন্য না, নিজেও একটু ভালো করে বোঝার জন্য ছবি ভিডিও কোনো একটা সোর্সে সবকিছু থাকত, তবে ২০০০ টাকা দাম হলেও বইটা কিনতাম।”

— এটা আমার অ্যানাটমি ভাইবার দুই দিন আগে মনে খুব কষ্ট নিয়ে লিখেছিলাম।

সেদিন প্রথম উপলব্ধি করেছিলাম, প্রফে খারাপ করার কারণ “সারাবছর না পড়া নয়, সীমিত সময়ে রিভিশন দিতে ব্যর্থ হওয়া”। খুব অল্প সময়ে সর্বোচ্চ প্রস্তুতি নেওয়ার জন্য একটা বই তৈরির চিন্তা সেদিনই করেছিলাম। প্রফ শেষে কাজ শুরু করলেও, এ বছরের নতুন সিলেবাস অনুযায়ী **BOARD-II-তে 100 কার্ড-সংবলিত দেশের একমাত্র বই** তোমাদের হাতে তুলে দিতে একটু দেরি হয়ে গেল।

MAGIC VIVA ANATOMY বইয়ে টপিকওয়াইজ ভাইভা কার্ডের প্রশ্ন এবং উত্তর সাজিয়েছি। এতে ইনশাআল্লাহ রিটেনেরও অন্তত 90% কাভার হয়ে যাবে। আর অ্যানাটমি যেহেতু ছবি বা ভিজুয়াল ম্যাটেরিয়াল ছাড়া পড়া সম্ভব না, তাই প্রতিটা টপিকের পাশে QR কোড দিয়েছি। যেটি স্ক্যান করলেই তোমরা দেখতে পারবে আসল ম্যাজিক। শুধুমাত্র তোমাদের জন্য স্পেশালি একটা কাস্টমাইজড ওয়েবসাইট তৈরি করে প্রতিটা প্রশ্নের জন্য প্রয়োজনীয় ছবি, ভিডিও, এক্সট্রা ইনফরমেশন সাজিয়ে দিয়েছি। এতে তোমাদের টাইম যেমন বাঁচবে, তেমন নিজে বিষয়টা ভালো করে বোঝার জন্য **অন্য কোনো বইয়ের পাতা উল্টে টাইম নষ্ট করতে হবে না।**

আরেকটা বড় সুবিধা হলো, ছবি/ভিডিও দেখার জন্য ইউটিউব বা ফেসবুকে ঢুকে ঘণ্টার পর ঘণ্টা টাইম যেহেতু নষ্ট করা লাগছে না, তাই পরীক্ষার আগের এই মহামূল্যবান সময়ে অপ্রয়োজনীয় **সোশ্যাল মিডিয়ার রিস্ক** থেকে তুমি নিজেকে নিরাপদ রাখতে পারছ।

আশা করি, ফাস্ট প্রফে অ্যানাটমির মতো কঠিন পরীক্ষায় এই বই সময় অপচয় ও উদ্ভূত মানসিক চাপ কমিয়ে আত্মবিশ্বাসের সঙ্গে প্রফের ভাইভা বোর্ডে অংশ নিতে সাহায্য করবে। মহান আল্লাহ রাব্বুল আলামিন সকলকে নিশ্চিন্তায় পরীক্ষা দেওয়ার তৌফিক দিয়ে মেডিকেল লাইফটা আরও সহজ করুন।

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BOARD II · SECTION 3

Inferior Extremity

Anatomical Position & Identifying Points

Identify the specimen and state its anatomical position before answering.

Hip Bone

This is the hip bone of right/left side.

1. The anterior superior iliac spine and pubic symphysis lie in the same coronal plane.
2. The acetabulum is a cup-shaped cavity directed laterally, downwards and forwards.
3. The pelvic surface of the body of the pubis is directed backwards and upwards.

Femur

This is the femur of right/left side.

1. The upper end bears a rounded head, directed medially, upwards and slightly forwards.
2. The lower end is expanded to form two large condyles.
3. The shaft is directed obliquely downwards and medially.

Tibia

This is the tibia of right/left side.

1. The upper end is much larger than the lower end.
2. The medial malleolus projects downwards from the medial side of the lower end.
3. The tibial tuberosity lies anteriorly in the upper part of the bone.

Fibula

This is the fibula of right/left side.

1. The upper end (head) is slightly expanded; the lower end (lateral malleolus) is flattened side-to-side.
2. The medial side of the lower end bears a triangular facet anteriorly and a malleolar fossa posteriorly.

Patella

This is the patella of right/left side.

1. The tapering apex is directed downwards.
2. The anterior surface is rough and non-articular.
3. The articular surface is smooth and lies behind.

Articulated Skeleton of Foot

This is the articulated skeleton of right/left foot.

1. The dorsal surface is convex and directed upwards.
2. The 1st metatarsal bone is short, stout and lies medially.
3. The tarsal bones are short and situated posteriorly.

3.1 Gluteal Region



- Hip joint in skeleton: Show articular parts in skeleton & Demonstrate movements / TWO movements / flexion and extension in your own body & Name muscles responsible. Hold a ribbon from origin(s) to insertion(s) of ONE muscle that causes ONE of those movements. (With cross questions)** Tool: Joint in Skeleton

Hip joint is a multi-axial ball and socket synovial joint between head of femur and acetabulum.

Articular Parts (skeleton)

Part	Features
Head of femur	Covered by hyaline cartilage except at fovea (for ligamentum teres femoris)
Acetabulum (hip bone)	Articular part: lunate surface (horse-shoe shaped); Non-articular part: acetabular fossa (fat pad)

Movements (demonstrate + muscles)

Movement	Axis	Muscles
Flexion (thigh forwards)	Transverse axis through head of femur	Prime mover: iliopsoas. Assist: lateral part of pectineus, rectus femoris, sartorius; adductor longus in initial phase
Extension (thigh backwards)	Transverse axis through head of femur	Gluteus maximus and hamstrings

Note: Gluteus maximus acts especially against resistance; hamstrings maintain extension in standing/walking.

Ribbon – Rectus Femoris (assists hip flexion)

Origin

- Anterior inferior iliac spine (AIIS) (straight head)
- Groove above acetabulum + fibrous capsule of hip joint (reflected head)

Insertion

- Base of patella (via quadriceps tendon)

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 177, 226, 229–230

- Sciatic nerve: Mention the area supplied by it.** Tool: Specimen

Sciatic nerve supplies hamstring muscles and gives branches whose loss paralyses all muscles below the knee with sensory loss (except saphenous area).

Motor Supply

- Direct muscular branches to posterior thigh:** Long head of biceps femoris; Semitendinosus; Semimembranosus; Ischial part of adductor magnus
- Through its terminal divisions:** All muscles below the knee

Articular Supply

- Hip joint

Sensory (clinical)

- Complete injury:** Loss of all cutaneous sensations below knee except area supplied by saphenous nerve

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 189

3.2 Front of the Thigh



- Femur in skeleton: Show & Describe gross features (upper end, shaft and lower end). Hold a ribbon from origin(s) to insertion(s) of rectus femoris / THREE vastus muscles / TWO muscles that are attached to upper end of femur. (With cross questions)** Tool: Skeleton (& its component)

Femur is the longest bone with a characteristic upper end, shaft and lower end.

Gross Features (skeleton)

Part	Features
Upper end	Head with fovea (for ligamentum teres); Neck (~125° with shaft); Greater and lesser trochanters; Intertrochanteric line (anterior) and intertrochanteric crest (posterior)
Shaft	3 surfaces and 3 borders; posterior border forms linea aspera
Lower end	Medial & lateral condyles with intercondylar fossa (posterior); Patellar surface (anterior); Epicondyles and adductor tubercle (medial side)

Ribbon – Origins & Insertions

Muscle	Origin	Insertion
Rectus femoris	Anterior Inferior Iliac Spine (straight head) + groove above acetabulum (reflected head)	Base of patella
Vastus medialis	Lower intertrochanteric line / spiral line / medial lip of linea aspera / medial supracondylar line	Medial border of patella
Vastus lateralis	Greater trochanter and lateral lip of linea aspera	Lateral border of patella
Vastus intermedius	Anterior & lateral surfaces of femoral shaft	Base of patella
Gluteus medius	Ilium (between gluteal lines)	Lateral surface of greater trochanter
Gluteus minimus	Ilium (between anterior & inferior gluteal lines)	Anterior surface of greater trochanter

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 138–144, 177–178, 186

2. Femoral nerve: Describe the formation, structures supplied by it & effect of lesion.

Tool: Specimen

Femoral nerve is the largest branch of lumbar plexus and the nerve of the extensor compartment of thigh.

Formation (root value)

From dorsal divisions of ventral rami of L2, L3, L4.

Structures Supplied

Source	Branches & Supply
From trunk	Iliacus; Pectineus; Vascular branches to proximal femoral artery
From anterior division	Sartorius (muscular); Intermediate femoral cutaneous nerve – skin of anterolateral thigh (forms patellar plexus); Medial femoral cutaneous nerve – skin of upper medial thigh and medial side of knee
From posterior division	Quadriceps femoris (+ articularis genu); Saphenous nerve – skin of medial leg and medial side of dorsum of foot up to ball of great toe; Articular branches to hip and knee joints

Effect of Lesion

- Motor:** Paralysis of quadriceps → loss/marked weakness of knee extension; weak hip flexion (iliacus ± pectineus, sartorius)
- Reflex:** Knee jerk diminished/absent
- Sensory:** Loss over anteromedial thigh and medial leg/foot (via saphenous and femoral cutaneous nerves)

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 172–174 | Thorax, Abdomen and Pelvis, 10th Ed., P. No. 141

3. Femoral nerve: Explain which compartment of thigh is supplied.

Tool: Specimen

Femoral nerve is the nerve of the extensor (anterior) compartment of the thigh.

Compartment Supplied

- Extensor (anterior) compartment of thigh

Position of This Compartment

- Lies between the medial and lateral intermuscular septa (from fascia lata)
- Contains quadriceps femoris with its nerve supply, the femoral nerve

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 172, 145, 165

3.3 Popliteal Fossa

- Knee joint in skeleton: Show the articular parts in the skeleton, Mention movements, and Demonstrate them / TWO of them on your body & Name muscles responsible. Hold a ribbon from origin(s) to insertion(s) of ONE muscle that causes ONE of those movements. (With cross questions)**

Tool: Skeleton & Own body

Knee joint is a compound, complex synovial (modified hinge) joint between femur, tibia and patella.

Articular Parts (show on skeleton)

- Femur:** Medial & lateral condyles + patellar surface
- Tibia:** Superior articular surfaces of medial & lateral condyles
- Patella:** Posterior articular surface

Demonstrate (any TWO)

- Extension:** Straighten knee
- Flexion:** Bend knee



Ribbon – Rectus Femoris (for extension)

- a. Origin:** AIIIS + groove above acetabulum / hip capsule
b. Insertion: Base of patella → ligamentum patellae → tibial tuberosity

Movements + Muscles

Movement	Muscles
Extension	Quadriceps femoris (assisted by tensor fasciae latae)
Flexion	Semimembranosus, semitendinosus, biceps femoris (assisted by sartorius, gracilis, gastrocnemius, plantaris; initiated by popliteus)
Medial rotation (flexed knee)	Semimembranosus, semitendinosus, popliteus, sartorius, gracilis
Lateral rotation (flexed knee)	Biceps femoris

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 232–234, 239–240, 177

2. Cruciate ligaments of knee joint: Explain structure-function relationship of attachment of cruciate ligament in knee joint.

Tool: Joint in Skeleton

Cruciate ligaments stabilize the knee because their intercondylar attachments and crossed oblique course check abnormal movements.

General

- a.** Intracapsular, extrasynovial; cross like X
b. Taut at extremes of flexion/extension → end-range stability

Ligament	Attachment	Course & Function
ACL (anterior cruciate)	Tibia: anterior intercondylar area → Femur: posterior part of medial surface of lateral condyle	Runs upward, backward, laterally → taut in extension → prevents forward displacement of tibia; provides pivot for rotation in extension
PCL (posterior cruciate)	Tibia: posterior intercondylar area → Femur: anterior part of lateral surface of medial condyle	Runs upward, forward, medially → taut in flexion → prevents backward displacement of tibia

Together: Prevent side-to-side displacement of femur and tibia.

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 237–238

3. Knee joint: Describe anastomosis around knee joint.

Tool: Figure

Anastomosis around knee is a rich genicular arterial network ensuring collateral flow during knee movements.

Arteries Forming the Network

Source Artery	Contribution
Popliteal artery	Genicular branches (superior medial, superior lateral, inferior medial, inferior lateral)
Femoral artery	Descending genicular artery
Lateral circumflex femoral artery	Descending branch
Anterior tibial artery	Recurrent branches (anterior & posterior tibial recurrent)
Posterior tibial artery	Circumflex fibular branch

Main Anastomotic Links (key sites)

- a.** Superior medial genicular ↔ descending genicular ↔ inferior medial genicular
b. Superior lateral genicular ↔ descending branch of lateral circumflex femoral ↔ inferior lateral genicular
c. Transverse anastomosis: Across lower end of femur (between superior geniculars + descending genicular)
d. Transverse anastomosis: Deep to ligamentum patellae (between inferior geniculars)

Function: During extreme flexion, popliteal artery kinks → collateral flow maintained by this genicular anastomosis.

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 241, 196–197

3.4 Muscles of Leg



- 1. Tibia in skeleton: Show & Describe gross features of upper end & lower ends. Hold a ribbon from origin(s) to insertion(s) of a muscle that is attached with tibia / ONE muscle that arises from tibia / tibialis anterior muscle / TWO muscles that are attached to upper end of tibia. (With cross questions)** Tool: Skeleton

Tibia is identified by its expanded upper end (condyles) and the medial malleolus at the lower end.

Upper End (show)

- Medial condyle:** Large ovoid articular surface; posterior transverse groove
- Lateral condyle:** Smaller circular articular surface; postero-lateral facet for head of fibula
- Intercondylar area/eminence** (medial & lateral tubercles); attachments (before→behind): AH medial meniscus, ACL, AH lateral meniscus, PH lateral meniscus, PH medial meniscus, PCL
- Tibial tuberosity:** Anterior prominence

Lower End (show)

- Inferior articular surface for talus
- Medial malleolus
- Fibular notch (lateral)

Ribbon – Tibialis Anterior (arises from tibia)

- Origin:** Upper 2/3 lateral surface of tibia + interosseous membrane (+ deep fascia)
- Insertion:** Base of 1st metatarsal + medial cuneiform (inferomedial)

Ribbon – TWO Muscles Attached to Upper Medial Tibia

Muscle	Origin → Insertion
Sartorius	ASIS to upper medial tibia (hockey-stick)
Gracilis	Pubis to upper medial tibia (linear)

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 146–149, 216

- 2. Fibula in skeleton: Show & Describe gross features of upper & lower ends. Hold a ribbon from origin(s) to insertion(s) of Peroneus longus & Peroneus brevis muscles & Mention their actions. (With cross questions)** Tool: Skeleton (& its component)

Fibula shows head & neck proximally and lateral malleolus distally.

Upper End (show)

- Head:** Articular facet for lateral tibial condyle
- Styloid process:** Attachment of fibular collateral + arcuate ligaments
- Area in front of styloid:** Insertion of biceps femoris
- Neck:** In contact with common peroneal nerve

Lower End (show)

- Lateral malleolus:** Lateral surface subcutaneous
- Medial surface:** Articular facet for talus + malleolar fossa
- Posterior groove:** Tendons of peroneus brevis (deep) and peroneus longus (superficial)
- Tip:** Attachment of calcaneofibular ligament

Ribbon – Peroneus Longus & Peroneus Brevis

Muscle	Origin	Insertion	Actions
Peroneus longus (Fibularis longus)	Upper 2/3 fibula (peroneal surface) (+ adjacent tibia/septa)	Base of 1st metatarsal + medial cuneiform	Eversion, assists plantarflexion, supports transverse/lateral arch
Peroneus brevis (Fibularis brevis)	Lower 2/3 fibula	Tubercle at base of 5th metatarsal	Eversion, supports lateral longitudinal arch

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 149–151, 220–221, 198

3.5 Bones & Joints



- 1. Articulated pelvis: Show & Describe gross features in articulated pelvis. Identify foramina & Name structures passing through them. (With cross questions)**

Tool: Skeleton / Model

Articulated pelvis is formed by two hip bones, sacrum and coccyx, enclosing a cavity divided into greater and lesser pelvis.

Gross Features (show)

- Bones:** Right hip bone + Left hip bone (anterolateral), Sacrum + Coccyx (posterior)
- Joints:** Sacro-iliac joints (2) and symphysis pubis (1)
- Subdivision:** Plane of pelvic inlet (linea terminalis / pelvic brim) divides into False (greater) pelvis above and True (lesser) pelvis below

Foramina (identify) & Structures Passing

Foramen	Structures Passing
Greater sciatic foramen (greater sciatic notch + sacrospinous + sacrotuberous ligaments)	<i>Above piriformis:</i> Superior gluteal nerve, vessels
	<i>Below piriformis:</i> Sciatic nerve, inferior gluteal nerve, vessels, posterior femoral cutaneous nerve, pudendal nerve, internal pudendal vessels, nerve to obturator internus, nerve to quadratus femoris
Lesser sciatic foramen	Tendon of obturator internus; Pudendal nerve, internal pudendal vessels, nerve to obturator internus
Obturator canal	Obturator nerve, artery and vein

Ref: A.K. Datta: Thorax, Abdomen and Pelvis, 10th Ed., P. No. 322–323, 150 | Superior and Inferior Extremities, 4th Ed., P. No. 132, 135, 137

2. Pelvis in skeleton: Trace the pelvic inlet & outlet. Show formation and boundaries of pelvic inlet and Name structures crossing it. Show FOUR points that determine its sex. (With cross questions)

Tool: Skeleton

Pelvic inlet and outlet are traced on the bony pelvis as the brim and the diamond-shaped outlet respectively.

Pelvic Inlet (pelvic brim) – Boundaries (show ring)

- Sacral promontory
- Ala of sacrum (anterior margin)
- Arcuate line of ilium
- Pecten pubis
- Pubic crest
- Upper border of symphysis pubis

Pelvic Outlet – Tracing (diamond)

- Anterior:** Lower border of symphysis pubis + arcuate pubic ligament
- Anterolateral:** Ischiopubic rami + ischial tuberosities
- Posterolateral:** Sacrotuberous ligaments
- Posterior:** Tip of coccyx

Structures Crossing Pelvic Inlet (behind → forwards)

- Internal iliac vessels (vein behind artery)
- Ureter
- Ovarian vessels (in suspensory ligament of ovary)
- Vas deferens / round ligament of uterus
- Obliterated umbilical artery
- Median umbilical ligament

Four Sex-determining Points (show on pelvis)

Feature	Male	Female
Subpubic angle	Narrow	Wide
Greater sciatic notch	Narrow	Wide
Pelvic inlet shape	Heart-shaped	Round-oval
Ischial spines	Inturned	Out-turned

Ref: A.K. Datta: Thorax, Abdomen and Pelvis, 10th Ed., P. No. 323, 150, 326–327, 111, 327 | Superior and Inferior Extremities, 4th Ed., P. No. 132

3. Articulated pelvis in skeleton: Show boundaries of different pelvic diameter. Identify joints formed / present here & Mention their types. (With cross questions)

Tool: Joint in Skeleton, figure or model

Pelvic diameters are demonstrated by tracing standard AP, transverse and oblique lines at the inlet, cavity and outlet.

Level	Diameter	Boundaries
Pelvic inlet (show on brim)	Antero-posterior (Anatomical conjugate)	Middle of sacral promontory to upper margin of symphysis pubis
	Oblique	Sacro-iliac joint of one side to ilio-pubic eminence of the opposite side
	Transverse	Widest distance across the pelvic brim
Pelvic cavity (mid-cavity)	Antero-posterior	Middle of back of symphysis pubis to centre of pelvic surface of S3
	Oblique	Lower end of sacro-iliac joint to centre of obturator membrane of opposite side
	Transverse	Widest distance across lateral bony walls of pelvic cavity
Pelvic outlet	Antero-posterior	Lower border of symphysis pubis to tip of coccyx
	Transverse	Between medial surfaces of ischial tuberosities
	Oblique	Junction of ischiopubic ramus of one side to middle of sacrotuberous ligament of opposite side

Joints in Articulated Pelvis (identify + type)

Joint	Type
Sacro-iliac joints (right & left)	Plane synovial
Symphysis pubis	Secondary cartilaginous (symphysis)
Lumbo-sacral joint	Intervertebral (secondary cartilaginous) + facet joints (plane synovial)
Sacro-coccygeal joint	Atypical intervertebral (secondary cartilaginous)

Ref: A.K. Datta: Thorax, Abdomen and Pelvis, 10th Ed., P. No. 323–325, 322, 336–337

4. Articulated pelvis in skeleton: Show location of sacral plexus & how sciatic nerve leaves pelvis. Hold a ribbon from origin(s) to insertion(s) of “sartorius”. (With cross questions) Tool: Skeleton & Ribbon

Sacral plexus lies on the piriformis inside pelvis, and sciatic nerve exits via the greater sciatic foramen.

Location of Sacral Plexus (show in articulated pelvis)

- Lies in front of piriformis
- Lies behind pelvic vessels
- Parietal pelvic fascia intervenes between pelvic vessels and sacral plexus

Ribbon – Sartorius

- Origin:** ASIS and notch immediately below it
- Insertion:** Upper part of subcutaneous medial surface of tibial shaft, in front of gracilis and semitendinosus

How Sciatic Nerve Leaves Pelvis (trace)

- Leaves through greater sciatic foramen
- Passes below piriformis
- Lies lateral to pudendal nerve at exit
- In gluteal region: descends deep to gluteus maximus, midway between ischial tuberosity and greater trochanter

Ref: A.K. Datta: Thorax, Abdomen and Pelvis, 10th Ed., P. No. 332–333 | Superior and Inferior Extremities, 4th Ed., P. No. 174–175, 189–190

5. Symphysis pubis in skeleton: Show & identify joint. Mention its type & structure. (With cross questions) Tool: Joint in Skeleton, figure or model

Symphysis pubis is the midline joint uniting the right and left pubic bones.

Type

- Secondary cartilaginous joint (Symphysis)
- Persists throughout life (except when diseased)

Structure

- Each symphyseal surface is covered by a thin plate of hyaline cartilage
- An interpubic disc (fibrocartilage) lies between the two pubic bones
- Sometimes a sagittal cleft appears in the disc; it is not lined by synovial membrane
- Disc acts as a buffer and resists compressive force during standing

Ref: A.K. Datta: Thorax, Abdomen and Pelvis, 10th Ed., P. No. 337

6. Sacrum in skeleton / articulated pelvis: Show & Describe the gross features. Identify foramina & Name structures passing through them / structures passing through sacral foramina. (With cross questions) Tool: Skeleton

Sacrum is a triangular fused bone forming the posterior wall of the pelvis and shows pelvic and dorsal foramina.

Gross Features (show on skeleton / articulated pelvis)

Part	Features
Base (upper end)	Sacral promontory (anterior projecting margin); Alae (wings); Sacral canal (continuation of vertebral canal)
Apex (lower end)	Articulates with coccyx
Pelvic (anterior) surface	Smooth, concave; shows 4 transverse ridges; 4 pairs of pelvic sacral foramina; piriformis arises by digitations from bars between S2–S4 foramina
Dorsal (posterior) surface	Rough, convex; median sacral crest; 4 pairs of dorsal sacral foramina; sacral hiatus with sacral cornua

Sacral Foramina – Structures Passing

Foramen	Structures
Pelvic (anterior) sacral foramina	Ventral rami of S1–S4; Spinal branches of lateral sacral arteries
Dorsal (posterior) sacral foramina	Dorsal rami of S1–S4; Terminal branches of lateral sacral arteries
Sacral hiatus	Filum terminale (externum); 5th sacral nerves (S5); Coccygeal nerves

Ref: A.K. Datta: Thorax, Abdomen and Pelvis, 10th Ed., P. No. 327–329, 333, 336, 121

7. 5th lumbar vertebra in skeleton: Show & Describe gross features. Identify foramina in skeleton & bone, & Name structures passing through them. (With cross questions) Tool: Skeleton

5th lumbar vertebra (L5) is an atypical lumbar vertebra with characteristic transverse processes, facets and wedge-shaped body.

Gross Identifying Features (show on bone)

- Transverse processes:** Very massive, arising near the junction of pedicle and lamina, and encroach on sides of body
- Articular processes:** Distance between two superior articular processes $\approx$ distance between two inferior articular processes
- Body:** Anterior surface more extensive than posterior $\rightarrow$ forms sacro-vertebral angle ($\sim 120^\circ$) with base of sacrum

Foramina (identify) & Structures Passing

Foramen	Structures
Vertebral foramen (in L5)	Cauda equina; Filum terminale; Spinal meninges
Intervertebral foramen (L5–S1) – in articulated skeleton, between adjacent vertebral notches/pedicles	5th lumbar spinal nerve (L5); Spinal branches of iliolumbar artery with accompanying veins

Ref: A.K. Datta: Thorax, Abdomen and Pelvis, 10th Ed., P. No. 121–122, 124, 137

8. Typical lumbar vertebra: Identify in skeleton & Show gross feature in bone. Hold a ribbon from origin(s) to insertion(s) of “psoas major” muscle. (With cross questions) Tool: Skeleton & Ribbon

Typical lumbar vertebra (L1–L4) is identified by a massive reniform body and triangular vertebral foramen with characteristic processes.

Identification & Gross Features (show on bone)

Part	Features
Body	Massive, kidney-shaped (reniform)
Vertebral foramen	Triangular, roomy
Pedicles	Conspicuous superior & inferior vertebral notches
Laminae	Non-overlapping
Spinous process	Quadrangular, thick, horizontally directed
Transverse processes	Project laterally from junction of pedicle and lamina
Articular processes	Superior facets: concave, face backwards and medially; have mamillary process (tubercle). Inferior facets: convex, face forwards and laterally
Accessory process (tubercle)	On postero-inferior part of root of transverse process

Ribbon – Psoas Major (origin to insertion)

- Origin:** Transverse processes of lumbar vertebrae (anterior surfaces & lower borders); Bodies and intervertebral discs (highest slip from T12–L1, lowest from L4–L5); Tendinous arches along sides of lumbar vertebral bodies
- Insertion:** Tendon passes behind inguinal ligament $\rightarrow$ inserted into anterior surface of tip of lesser trochanter of femur

Ref: A.K. Datta: Thorax, Abdomen and Pelvis, 10th Ed., P. No. 123–124, 125, 126–127

9. Hip bone in skeleton: Show & Describe gross features of different parts of the bone. Hold a ribbon from origin(s) to insertion(s) of muscles that are attached to iliac fossa & anterior superior iliac spine. (With cross questions) Tool: Skeleton & Ribbon

Hip bone is an irregular bone formed by ilium, ischium and pubis meeting at the acetabulum.

Gross Features (show different parts)

Part	Features
Ilium	Iliac crest with ends: Anterior Superior Iliac Spine and Posterior Superior Iliac Spine; Anterior border: ASIS, Anterior Inferior Iliac Spine; Posterior border: PSIS, Posterior Inferior Iliac Spine, greater sciatic notch; Surfaces: iliac fossa (medial), gluteal surface (lateral; gluteal lines), sacro-pelvic surface (auricular surface, iliac tuberosity)
Ischium	Body and ramus; Ischial spine between greater and lesser sciatic notches; Ischial tuberosity (weight-bearing in sitting); Ramus joins pubis → ischiopubic ramus
Pubis	Body: pubic crest, pubic tubercle, symphyseal surface; Superior ramus: pecten pubis, meets ilium at ilio-pubic eminence; Inferior ramus: joins ischial ramus
Key hollow / opening	Acetabulum: socket for head of femur; Obturator foramen

Ribbon – Muscles of Iliac Fossa & ASIS

Muscle	Origin	Insertion
Iliacus (iliac fossa)	Upper two-thirds of iliac fossa (up to inner lip of iliac crest) + ventral sacro-iliac ligament + adjoining ala of sacrum	Into psoas tendon and to femur below and in front of lesser trochanter
Sartorius (ASIS)	Anterior Superior Iliac Spine and notch immediately below it	Upper part of subcutaneous medial surface of tibial shaft, in front of gracilis and semitendinosus

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 130–138, 174–175

10. Hip bone in skeleton: Show different parts & Describe gross features of ilium. Hold a ribbon from origin(s) to insertion(s) of ONE muscle that is attached to iliac crest. (With cross questions)

Tool: Skeleton & Ribbon

Ilium is the expanded upper part of hip bone, identified by iliac crest, borders and three surfaces.

Ends

- a. Upper:** Iliac crest (from Anterior Superior Iliac Spine to Posterior Superior Iliac Spine)
- b. Lower:** Joins at acetabulum

Borders

- a. Anterior border:** Anterior Superior Iliac Spine, Anterior Inferior Iliac Spine
- b. Posterior border:** Posterior Superior Iliac Spine, Posterior Inferior Iliac Spine, greater sciatic notch
- c. Medial border:** Forms arcuate line

Surfaces

- a.** Iliac fossa (medial concavity)
- b.** Gluteal surface (gluteal lines)
- c.** Sacro-pelvic surface: auricular surface + iliac tuberosity

Ribbon – Tensor Fasciae Latae (iliac crest)

- a. Origin:** Outer lip of iliac crest from Anterior Superior Iliac Spine to tubercle of iliac crest
- b. Insertion:** Upper part of iliotibial tract

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 130–134, 184

11. Femur in skeleton: Show & Describe different parts of the bone. Hold a ribbon from origin(s) to insertion(s) of any TWO muscles of “hamstrings”. (With cross questions)

Tool: Skeleton & Ribbon

Femur is the longest bone and has an upper end, shaft and lower end.

Different Parts (show)

- a.** Upper end
- b.** Shaft
- c.** Lower end

Ribbon – TWO Hamstring Muscles

Muscle	Origin	Insertion
Semimembranosus	Upper & lateral part of quadrilateral area of ischial tuberosity (flat tendon)	Horizontal groove on posterior surface of medial condyle of tibia (deep to tibial collateral ligament)
Semitendinosus	Lower & medial part of quadrilateral area of ischial tuberosity (with long head of biceps femoris)	Upper part of medial surface of tibia, behind sartorius and gracilis

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 138–142, 191–193

12. Femur in skeleton: Show & Describe gross features of upper end / lower end. Hold a ribbon from origin(s) to insertion(s) of TWO muscles that are attached to upper end of femur / gluteus maximus. (With cross questions)

Tool: Skeleton

Femur is identified by its trochanters above and condyles below.

Upper End (show)

- a. Head (with fovea)
- b. Neck
- c. Greater trochanter (with trochanteric fossa)
- d. Lesser trochanter
- e. Intertrochanteric line (anterior) and intertrochanteric crest (posterior)

Lower End (show)

- a. Medial & lateral condyles with intercondylar fossa (posterior)
- b. Epicondyles; adductor tubercle (medial)
- c. Patellar surface (anterior)

Ribbon – TWO Muscles Attached to Upper End of Femur

Muscle	Origin	Insertion
Gluteus maximus	Ilium behind posterior gluteal line + dorsal segment of iliac crest; dorsal sacrum & coccyx; sacrotuberous ligament	Gluteal tuberosity (deep lower fibres) + iliotibial tract (main bulk)
Gluteus medius	Ilium between posterior and anterior gluteal lines (up to iliac crest)	Greater trochanter (lateral surface along oblique ridge)

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 138–139, 141–142, 183–184, 186–187

13. Femur in skeleton: Show & Describe gross features of shaft. Hold a ribbon from origin(s) to insertion(s) of “quadriceps femoris” muscles. (With cross questions)

Tool: Skeleton & Ribbon

Femoral shaft is best identified by the prominent linea aspera on its posterior border.

Gross Features of Shaft (show)

- a. Shaft is gently convex in front; convexity maximum in middle one-third (narrowest part)
- b. **Three surfaces:** Anterior, medial, lateral
- c. **Three borders:** Medial, lateral, posterior
- d. **Posterior border = linea aspera** (prominent crest)
 - i. Acts as a buttress to resist compressive forces due to anterior bowing
 - ii. Has medial lip, lateral lip and intermediate area
 - iii. Traced above: continues as spiral line (medial) and gluteal tuberosity (lateral)
 - iv. Traced below: becomes medial and lateral supracondylar lines enclosing popliteal surface

Ribbon – Quadriceps Femoris (origins → common insertion)

Part	Origin
Rectus femoris	Upper part of Anterior Inferior Iliac Spine (straight head) + groove above acetabulum (reflected head)
Vastus medialis	Lower part of intertrochanteric line, spiral line, medial lip of linea aspera, upper 2/3 of medial supracondylar line
Vastus lateralis	Discussed above (Front of the Thigh, Q1)
Vastus intermedius	Discussed above (Front of the Thigh, Q1)

Common insertion (all parts): Into patella by quadriceps tendon; continued as ligamentum patellae (patellar ligament) to tibial tuberosity.

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 141–142, 177–178

14. Tibia in skeleton: Identify different types of joints formed by the bone & Mention movements occurring at them. (With cross questions)

Tool: Skeleton & Ribbon

Tibia forms joints at the knee, with the fibula, and at the ankle, each permitting specific movements.

Joint	Type	Movements
Knee joint (tibiofemoral part)	Compound, complex synovial (functionally modified hinge/condylar)	Flexion, extension, medial rotation, lateral rotation
Superior tibiofibular joint	Plane synovial	Slight gliding (especially during dorsiflexion)
Middle tibiofibular joint (interosseous membrane)	Fibrous joint	Practically no independent movement (binding union)
Inferior tibiofibular joint	Fibrous (syndesmosis)	During dorsiflexion ligaments stretch → fibula displaced laterally with slight outward rotation
Ankle (talocrural) joint (with tibiofibular mortise)	Uniaxial synovial (modified hinge)	Dorsiflexion and plantarflexion

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 146, 232, 239–240, 243, 245

15. Tibia in skeleton: Show & Describe gross features of upper end. Hold a ribbon from origin(s) to insertion(s) of “guy ropes” & State why they are called so. (With cross questions)

Tool: Skeleton & Ribbon

Upper end of tibia is expanded with medial and lateral condyles, and it gives insertion to the “guy ropes” (pes anserinus tendons).

Upper End of Tibia – Gross Features (show)

Part	Features
Medial condyle	Superior articular surface: large ovoid, shallow concavity; peripheral part flat for medial meniscus
Lateral condyle	Superior articular surface: smaller circular, shallow concavity; peripheral part flat for lateral meniscus
Intercondylar area	Non-articular; narrow in middle forming intercondylar eminence (medial & lateral tubercles)
Tibial tuberosity	Triangular area anteriorly; for ligamentum patellae (patellar ligament)

Ribbon – “Guy Ropes” to Tibia

Muscle	Origin	Insertion (pes anserinus)
Sartorius	Anterior Superior Iliac Spine and notch below it	Upper part of medial surface of tibia (in front)
Gracilis	Body and inferior ramus of pubis	Upper part of medial surface of tibia (middle)
Semitendinosus	Ischial tuberosity	Upper part of medial surface of tibia (behind)

Why called “guy ropes”: Their tendons converge to tibia from the three constituents of hip bone and act as three guy ropes to stabilise the mobile pelvis on the tibia.

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 146–147, 149, 179

16. Hip joint in skeleton: Outline articular surfaces / Show the articular parts in the skeleton, Mention movements, and Demonstrate them on your body. Hold a ribbon from origin(s) to insertion(s) of ONE muscle that causes ONE of those movements / ONE dorsi-flexor & ONE plantar-flexor / ONE flexor & ONE extensor. (With cross questions)

Tool: Skeleton & Own body

Hip joint is a multi-axial ball-and-socket synovial joint between head of femur and acetabulum.

Articular Surfaces (show on skeleton)

Part	Features
Head of femur	Forms about two-thirds of a sphere; Fovea: non-articular pit for ligament of head of femur
Acetabulum (hip bone)	Lunate surface: horse-shoe shaped articular area (anterior, superior, posterior parts); Acetabular fossa: central non-articular floor (fibro-fatty pad); Acetabular notch: inferior gap (bridged by transverse acetabular ligament)

Movements (mention + demonstrate on body)

- a. **Flexion / Extension:** Thigh forward / backward
- b. **Abduction / Adduction:** Move limb away from / towards midline (crossing midline for adduction)

- c. **Medial / Lateral rotation:** Knee flexed, rotate thigh by moving foot laterally / medially
- d. **Circumduction:** Combination of above movements

Ribbon – ONE Flexor & ONE Extensor

Muscle	Origin	Insertion
Iliacus (flexor)	Upper two-thirds of iliac fossa (up to inner lip of iliac crest) + ventral sacro-iliac ligament + adjoining ala of sacrum	Into psoas tendon and to femur below and in front of lesser trochanter
Gluteus maximus (extensor)	Ilium behind posterior gluteal line + dorsal segment of iliac crest + dorsal sacrum and coccyx + sacrotuberous ligament	Gluteal tuberosity (deep fibres) + iliotibial tract (main bulk)

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 226–229, 175, 183–184, 227–228, 230

17. Hip joint in skeleton: Show articular parts in skeleton & Mention type. Demonstrate flexion and extension movements in your own body & Name muscles responsible. (With cross questions)

Tool: Joint in Skeleton, Own body

In viva, I will show the hip joint surfaces on the skeleton and then demonstrate flexion and extension with muscles.

Articular Parts (show on skeleton)

- a. Head of femur:** Articular surface (about two-third of a sphere); non-articular fovea for ligament of head of femur
- b. Acetabulum (hip bone):** Lunate surface – horse-shoe shaped articular area (anterior, superior, posterior); Acetabular fossa – non-articular floor (fibro-fatty tissue); Acetabular notch (inferior gap)

Type

- a. Multi-axial ball and socket synovial joint**

Movements (demonstrate on body) + Muscles

Movement	Demonstration	Muscles
Flexion	Bring thigh forward and upward	Prime mover: Ilio-psoas. Assist: lateral part of pectineus, rectus femoris, sartorius; adductor longus in initial phase
Extension	Take thigh backward from neutral standing	Gluteus maximus and hamstrings (gluteus maximus mainly in resisted extension; hamstrings maintain extension in standing/walking)

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 226, 228–229

18. Knee joint in skeleton: Show the articular parts / surfaces in the skeleton, Mention movements, and Demonstrate them / any TWO of them on your body. Name muscles producing those movements & Hold a ribbon from origin(s) to insertion(s) of ONE muscle that causes ONE of those movements. (With cross questions) Tool: Skeleton & Own body

Knee joint is a compound, complex synovial joint formed by femur, tibia and patella.

Articular Parts / Surfaces (show on skeleton)

- a. Femur:** Medial and lateral condyles (tibial articular surfaces) + anterior patellar surface
- b. Tibia:** Superior articular surfaces of medial and lateral condyles
- c. Patella:** Posterior articular surface

Ribbon – Rectus Femoris (for extension)

- a. Origin:** Anterior Inferior Iliac Spine (straight head) + groove above acetabulum (reflected head)
- b. Insertion:** Base of patella → continues as patellar ligament (ligamentum patellae) to tibial tuberosity
- c. Movement produced:** Knee extension

Movements (mention + demonstrate any TWO)

Movement	Muscles
Extension (straighten knee)	Quadriceps femoris (assisted by tensor fasciae latae)
Flexion (bend knee)	Prime movers: semimembranosus, semitendinosus, biceps femoris; Initiated by: popliteus; Assisted by: sartorius, gracilis, gastrocnemius, plantaris
Also present (in flexed knee)	Medial and lateral rotation

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 232–234, 239–240, 177

19. Ankle joint in skeleton: Show the articular parts & bones forming ankle joint in the skeleton, Mention movements, and Demonstrate them on your body. Hold a ribbon from origin(s) to insertion(s) of ONE dorsi-flexor & ONE plantar-flexor. (With cross questions) Tool: Skeleton & Own body

Ankle (talo-crural) joint is a uniaxial synovial, modified hinge joint between the tibiofibular mortise and talus.

Articular Parts & Bones (show on skeleton)

- a. Socket (tibiofibular mortise):** Inferior articular surface of tibia + medial malleolus (tibia); Lateral malleolus (fibula)
- b. Tenon (talus):** Trochlear surface of body of talus (trochlea tali) with facets for both malleoli

Movements (mention + demonstrate)

- a. Dorsiflexion:** Pull foot upwards
- b. Plantarflexion:** Point toes downwards

Ribbon – ONE Dorsiflexor & ONE Plantarflexor

Muscle	Origin	Insertion
Tibialis anterior (dorsiflexor)	Upper 2/3 lateral surface of tibia + interosseous membrane (+ deep fascia)	Inferomedial base of 1st metatarsal + medial cuneiform
Gastrocnemius (plantarflexor)	Medial and lateral femoral condyles (two heads)	Via tendo-calcaneus (Achilles tendon) to middle 1/3 posterior surface of calcaneus

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 243–246, 216, 200–201

20. Ankle joint in skeleton: Show & Describe formation & Mention type. Demonstrate movements in your own body mentioning responsible muscles. (With cross questions)

Tool: Joint in Skeleton

Ankle (talo-crural) joint is a uni-axial synovial, modified hinge joint.

Formation (show on skeleton)

Component	Formation
Above (mortise / socket)	Inferior articular surface of tibia with medial malleolus + lateral malleolus of fibula → form tibio-fibular mortise
Below (tenon)	Trochlear upper surface of body of talus (trochlea tali) with comma-shaped facet for tibial malleolus and triangular facet for fibular malleolus

Movements (demonstrate) + Muscles

Movement	Muscles
Dorsiflexion (pull foot up)	Tibialis anterior, extensor digitorum longus, extensor hallucis longus, peroneus tertius
Plantarflexion (stand on toes)	Prime movers: gastrocnemius and soleus (via tendo-calcaneus). Assisted by: tibialis posterior, flexor digitorum longus, flexor hallucis longus; peroneus longus and peroneus brevis in extreme plantarflexion

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 243–246

21. Ankle joint in skeleton: Show articular parts in skeleton & Mention movements. Demonstrate TWO movements in your own body & Name muscles producing them. (With cross questions)

Tool: Joint in Skeleton, Own body

Ankle (talo-crural) joint is a uni-axial synovial (modified hinge) joint between tibiofibular mortise and talus.

Articular Parts (show on skeleton)

- Tibiofibular mortise (socket):** Inferior articular surface of tibia + medial malleolus + lateral malleolus of fibula
- Talus (tenon):** Trochlear surface of body of talus (trochlea tali) with facets for both malleoli

Movements (mention + demonstrate TWO)

Movement	Muscles
Dorsiflexion (pull foot up)	Tibialis anterior, extensor digitorum longus, extensor hallucis longus, peroneus tertius
Plantarflexion (stand on toes)	Prime movers: gastrocnemius and soleus (via tendo-calcaneus). Assisted by: tibialis posterior, flexor digitorum longus, flexor hallucis longus; peroneus longus and peroneus brevis in extreme plantarflexion

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 243–247

22. Talocalcaneonavicular joint in skeleton: Show & Describe formation & Mention type. Demonstrate TWO movements in your own body mentioning their responsible muscles. (With cross questions)

Tool: Joint in Skeleton & Own body

Talocalcaneonavicular joint is a restricted ball-and-socket synovial joint of the medial mid-tarsus.

Formation (show on skeleton)

- Ball:** Head of talus
- Socket formed by:** Posterior concave surface of navicular (anteriorly); Upper surface of plantar calcaneonavicular (spring) ligament (inferiorly); Anterior and middle talar facets on sustentaculum tali of calcaneus (posteriorly)

Type

- Restricted ball-and-socket synovial joint

Two Movements (demonstrate) + Muscles

Movement	Muscles
Inversion	Tibialis anterior, tibialis posterior
Eversion	Peroneus longus, peroneus brevis, peroneus tertius

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 247–249

23. Articulated foot in skeleton: Show sets of bones & Mention their morphological type. Identify arches. (With cross questions)

Tool: Skeleton

In articulated foot, I will show the three sets of bones and then identify the arches.

Sets of Bones (show) + Morphological Type

Set	Bones	Type
Tarsals (7)	Talus, calcaneus, navicular, cuboid, medial / intermediate / lateral cuneiforms	Short bones
Metatarsals (5)	–	Miniature long bones
Phalanges (14)	2 in great toe, 3 in each lateral four toes	Miniature long bones

Arches (identify)

- a. Medial longitudinal arch
 b. Lateral longitudinal arch
 c. Transverse arch

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 151, 154–155, 250–252

24. Articulated foot in skeleton: Identify joints formed by them. Demonstrate movements of subtalar joint / inversion, eversion movements in your own body. Hold a ribbon from origin(s) to insertion(s) of muscle responsible for eversion movement / tibialis anterior muscle. (With cross questions)

Tool: Joint in Skeleton, figure or model

In the articulated foot, I will point out the serial joints and then show inversion–eversion at the subtalar complex.

Joints of Foot (identify; before → backward)

- a. Interphalangeal joints
 b. Metatarso-phalangeal joints
 c. Tarso-metatarsal joints
 d. Intermetatarsal joints
 e. Intertarsal joints
 f. Transverse (mid-tarsal) joint
 g. Subtalar (talo-calcaneal) joint

Subtalar Movements (demonstrate on body)

- a. **Inversion:** Raise medial border of foot – Tibialis anterior, Tibialis posterior
 b. **Eversion:** Raise lateral border of foot – Peroneus longus (Fibularis longus), Peroneus brevis (Fibularis brevis); assisted by Peroneus tertius (Fibularis tertius)

Ribbon – ONE Evertor Muscle (Peroneus longus)

- a. **Origin:** Upper two-thirds of peroneal surface of fibula (also from adjacent lateral condyle of tibia and intermuscular septa)
 b. **Insertion:** Inferolateral base of first metatarsal and adjacent medial cuneiform
 c. **Action shown:** Eversion of foot

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 247, 249, 220

25. Articulated foot: Show different types of joints formed by its different parts. Demonstrate movements at any TWO of them in your own body & Mention muscles responsible for each movement. (With cross questions)

Tool: Skeleton & Own body

Foot and tibia form multiple synovial and fibrous joints permitting characteristic movements.

Articulated Foot – Joints (type)

Joint	Type
Interphalangeal joints	Hinge synovial
Metatarso-phalangeal joints	Ellipsoid synovial
Tarso-metatarsal joints	Plane synovial
Intermetatarsal joints	Plane synovial
Intertarsal joints	Mainly plane synovial
Transverse (mid-tarsal) joint	Two components – talocalcaneonavicular (medial) + calcaneocuboid (lateral)
Subtalar (talo-calcaneal) joint	Synovial; works with mid-tarsal for inversion/eversion

Demonstrate Any TWO Movements (with muscles)

- a. **Inversion** (raise medial border; subtalar + mid-tarsal complex): Tibialis anterior; Tibialis posterior
 b. **Eversion** (raise lateral border; subtalar + mid-tarsal complex): Peroneus longus (Fibularis longus); Peroneus brevis (Fibularis brevis); assisted by Peroneus tertius (Fibularis tertius)

Tibia – Joints Formed (type → movements)

Joint	Type	Movements
Knee joint	Compound, complex synovial (functionally modified hinge/condylar)	Flexion, extension, and medial/lateral rotation
Superior tibiofibular joint	Plane synovial	Slight gliding (with dorsiflexion)
Middle tibiofibular joint (interosseous membrane)	Fibrous	Essentially no movement
Inferior tibiofibular joint	Fibrous (syndesmosis)	In dorsiflexion: slight lateral displacement and outward rotation of fibula
Ankle (talocrural) joint (tibiofibular mortise with talus)	Uniaxial synovial (modified hinge)	Dorsiflexion and plantarflexion

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 247, 249, 251–253, 256, 210, 223, 146, 232, 239–240, 243, 245

26. Articulated foot in skeleton: Show ONE important joint involved during walking & Outline its articular surfaces in skeleton. Demonstrate movement of that joint in your own body mentioning muscles producing movements. (With cross questions) Tool: Joint in Skeleton & Own body

Talocalcaneonavicular joint is a key mid-tarsal joint allowing inversion–eversion adjustments during walking.

Joint Shown (important in walking)

- a. Talocalcaneonavicular joint

Type

- a. Restricted ball-and-socket synovial joint

Articular Surfaces (outline on skeleton)

- a. **Ball:** Head of talus
 b. **Socket formed by:** Concave posterior surface of navicular bone; Upper surface of plantar calcaneonavicular (spring) ligament; Anterior and middle talar facets on sustentaculum tali of calcaneus

Movements to Demonstrate (on your body) + Muscles

Movement	Muscles
Inversion (raise medial border of foot)	Tibialis anterior; Tibialis posterior
Eversion (raise lateral border of foot)	Peroneus longus (Fibularis longus); Peroneus brevis (Fibularis brevis); assisted by Peroneus tertius (Fibularis tertius)

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 247–249

3.6 Arches of Foot

1. Club foot: Define the condition & Explain how it develops. Tool: Skeleton



Club foot (talipes) is a deformity in which the foot is fixed in an abnormal position.

Definition + Types

Type	Position of foot
Talipes equinus	Foot fixed in plantarflexion
Talipes calcaneus	Foot fixed in dorsiflexion
Talipes varus	Foot fixed in inversion + adduction (mainly at subtalar and talocalcaneonavicular joints)
Talipes valgus	Foot fixed in eversion + abduction

How It Develops

- a. Primary deformities may combine → talipes equinovarus (most common; patient walks on lateral border of forefoot)
 b. Congenital talipes may be associated with spina bifida
 c. **Developmental factors:** Failure of muscle growth to keep pace with skeletal growth; imbalance in growth of different muscles/tendons

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 255

2. Genu vara & valga: Define & Explain the anomalies. Tool: Specimen

Genu varum and genu valgum are deviations from the normal femur–tibia alignment at the knee.

Normal alignment (physiological valgus): Long axes of femur and tibia meet at about 170°, open laterally.

Anomaly	Definition	Appearance
Genu valgum (Knock-knee)	The lateral opening angle becomes less than normal (more "valgus")	Knees approximate/overlap with relatively separated ankles
Genu varum (Bow-leg)	The normal lateral opening is reduced/converted, so the angulation appears open medially (varus)	Knees remain separated with relatively approximated ankles

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 233

3. Flat foot: Explain the clinical disorder & its underlying cause. Tool: Skeleton

Flat foot (pes planus) is the commonest foot trouble due to collapse/disappearance of foot arches.

Clinical Disorder

- Disappearance of arches of foot
- May cause metatarsalgia: compression of plantar nerves → pain in metatarsal region radiating to toes

Underlying Cause

- Permanent stretching of plantar calcaneonavicular (spring) ligament → allows downward displacement of head of talus → fall of medial longitudinal arch
- Predisposing factors:** Prolonged standing immobile, especially overweight (stress duration important); loss of muscle tone/fatigue or rapid increase of body weight; faulty footwear, bad walking, long slender rapidly growing foot in adolescents

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 248, 250, 253, 255

3.7 Veins of Lower Limb



1. Lower limb: Show & Describe venous drainage. Tool: Figure

Venous drainage of lower limb is through superficial, deep, and perforating veins.

Superficial Veins

Vein	Course & Termination
Great saphenous vein (Long saphenous vein)	From medial end of dorsal venous arch → in front of medial malleolus → medial leg & thigh → through saphenous opening → femoral vein
Small saphenous vein (Short saphenous vein)	From lateral end of dorsal venous arch → behind lateral malleolus → back of leg → pierces deep fascia → popliteal vein

Deep Veins

Level	Vein
Below knee	Paired venae comitantes of anterior tibial, posterior tibial and peroneal (fibular) arteries
Popliteal vein	Union of anterior + posterior tibial veins (at lower border of popliteus)
Femoral vein	Continuation of popliteal vein (at adductor magnus opening) → becomes external iliac vein deep to inguinal ligament

Perforators: Connect superficial with deep; valves direct blood superficial → deep.

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 158–162, 195, 204

2. Great saphenous vein: Show its origin / Mention formation, course and termination. Tool: Figure

Great saphenous vein is the main superficial (pre-axial) vein of the lower limb.

Origin / Formation

- Continuation of medial end of dorsal venous arch of foot
- Supplemented by medial marginal vein

Termination

- Passes through saphenous opening piercing cribriform fascia
- Pierces femoral sheath → ends in femoral vein

Course

- In front of medial malleolus → medial leg (behind medial border of tibia) → postero-medial knee → medial thigh → saphenous opening (~3 cm below & lateral to pubic tubercle)

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 159–160

3. Varicose vein / Venous varicosity: Explain the basis of its formation.

Tool: Specimen

Varicose veins are dilated, tortuous superficial veins of the lower limb due to raised venous pressure and valve failure.

Basis of Formation (causes)

- Deep vein thrombosis → obstruction to deep return
- Persistent raised intra-abdominal pressure (e.g., abdominal tumour, multiple pregnancies)
- Valve incompetence in perforating veins / superficial veins (commonest)

Key Mechanism

- Absence of protective valve in external iliac vein (about 20%) → high pressure at saphenofemoral junction → varicosity starts there
- Incompetent saphenofemoral valve → strain on distal valves → great saphenous vein becomes varicose
- Incompetent perforators → high-pressure leak deep → superficial → superficial varicosity

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 161

4. Deep vein thrombosis: Define the condition & Explain how it develops.

Tool: Specimen

Deep vein thrombosis (DVT) is formation of a thrombus in deep veins of the lower limb, and it may lead to pulmonary embolism.

How It Develops (basis)

- Soleus venous plexus/sinuses are rich and valveless → blood flow becomes sluggish at rest
- Normal calf muscles act as a peripheral heart: contraction squeezes blood centripetally
- Prolonged immobilization/bed rest → loss of calf pump → venous stasis → thrombus formation
- Thrombus may detach → pulmonary embolism

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 159, 201

5. Vascular grafting: Mention the preferred vessel & anatomical basis of choice.

Tool: Specimen

For vascular grafting (e.g., coronary bypass), the preferred autografts are internal thoracic artery and great saphenous vein.

Preferred Vessel	Anatomical Basis of Choice
Internal thoracic (internal mammary) artery – considered more ideal	Can be anastomosed to a coronary artery distal to obstruction to improve coronary circulation
Great saphenous vein (with tributaries) – conventionally used	Used as aorto-coronary bypass graft; has venous valves → graft must be reversed so valves do not obstruct arterial flow

Ref: A.K. Datta: Thorax, Abdomen and Pelvis, 10th Ed., P. No. 22, 79 | Superior and Inferior Extremities, 4th Ed., P. No. 162

3.8 Lymphatic Drainage of Lower Limb

1. Lymphatic drainage of lower limb: Show & Describe drainage areas of different groups of lymph nodes.

Tool: Specimen



Lymph from the lower limb drains mainly to popliteal and inguinal lymph nodes with specific drainage territories.

Node Group	Location	Drainage Area
Popliteal lymph nodes (in popliteal fat)	At termination of small saphenous vein	Lateral margin of foot (including little toe) and adjacent back of leg
	Between knee joint and popliteal artery	Knee joint (deep lymphatics with genicular vessels)
	Along popliteal vessels	Deep lymphatics of leg with anterior and posterior tibial vessels
Superficial inguinal lymph nodes	Lower (vertical) group – along terminal great saphenous vein	All superficial lymphatics of lower limb except lateral foot and back of leg
	Upper (horizontal) group – below inguinal ligament	Lateral members: gluteal region + adjacent anterior abdominal wall below umbilicus. Medial members: anterior abdominal wall below umbilicus, perineum, anal canal below pectinate line, external genitalia; also a few uterine lymphatics along round ligament
Deep inguinal lymph nodes	Medial to femoral vein	Deep lymphatics of limb with femoral vessels; glans penis / glans clitoridis; efferents of superficial inguinal nodes

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 162–163, 198

2. Inguinal lymph node: Mention its types & Show their location. Show & Describe drainage area of different groups of lymph nodes. Tool: Figure

Inguinal lymph nodes are superficial and deep, with upper and lower superficial groups.

Type	Location (show)	Drainage Area
Superficial inguinal nodes (subcutaneous)	Upper (horizontal) group: just below inguinal ligament	Lateral: gluteal region + lower anterior abdominal wall. Medial: lower abdominal wall, perineum, anal canal below pectinate line, external genitalia (+ few along round ligament)
	Lower (vertical) group: along terminal great saphenous vein	Most superficial lymph of lower limb (except small saphenous area)
Deep inguinal nodes (deep to fascia lata)	1–3 nodes medial to femoral vein; Cloquet's node in femoral canal	Deep limb lymph with femoral vessels + glans penis / glans clitoridis + efferents from superficial nodes

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 162–163

3. Superficial & deep inguinal lymph nodes: Show their location / site & Describe area of drainage / Describe locations of different groups of superficial inguinal lymph node & Mention their areas of drainage. Tool: Figure

Inguinal lymph nodes are superficial (subcutaneous) and deep (deep to fascia lata).

Superficial Inguinal Nodes

- Upper (horizontal) group:** Just below inguinal ligament – Lateral: gluteal region + lower anterior abdominal wall; Medial: lower abdominal wall, perineum, anal canal below pectinate line, external genitalia (+ few along round ligament)
- Lower (vertical) group:** Along termination of great saphenous vein – drains most superficial lymph of lower limb (except small saphenous area)

Deep Inguinal Nodes

- 1–3 nodes medial to femoral vein; Cloquet's node in femoral canal
- Drain:** Deep lower limb (with femoral vessels) + glans penis / clitoridis + efferents from superficial nodes

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 162–163

3.9 Nerves & Nerve Plexus



1. Lumbar plexus: Describe / Mention its formation & Show / Mention branches & supply of motor branches. Tool: Figure

Lumbar plexus is a nerve network in psoas major supplying the abdominal wall and lower limb.

Formation

- Formed within psoas major by union of ventral rami of L1–L3 and larger upper part of L4
- L1 is supplemented by a twig from T12

Branches (with root value)

- Direct muscular branches:** To quadratus lumborum (T12–L4); to psoas major (L2–L4); to psoas minor (L1); to iliacus (L2–L3)
- Iliohypogastric nerve (L1)
- Ilioinguinal nerve (L1)
- Genitofemoral nerve (L1–L2)
- Lateral femoral cutaneous nerve (L2–L3)
- Femoral nerve (L2–L4; dorsal divisions)
- Obturator nerve (L2–L4; ventral divisions)
- Accessory obturator nerve (L3–L4; inconstant)

Motor Supply (motor branches)

- Iliohypogastric and ilioinguinal:** Internal oblique and transversus abdominis
- Genital branch of genitofemoral:** Cremaster (male)
- Femoral nerve:** Iliacus, pectineus (lateral part), sartorius, quadriceps femoris (+ articularis genu)
- Obturator nerve:** Adductor longus, gracilis, pectineus (medial part), adductor brevis, obturator externus, adductor part of adductor magnus
- Accessory obturator nerve** (if present): Pectineus

Ref: A.K. Datta: Thorax, Abdomen and Pelvis, 10th Ed., P. No. 139–141 | Superior and Inferior Extremities, 4th Ed., P. No. 174, 181

2. Sciatic nerve: Show its formation, Mention branches & their motor supply. Tool: Figure

Sciatic nerve is the thickest nerve of the body, formed in pelvis and supplies mainly the hamstrings and all muscles below knee through its terminal branches.

Formation (show)

- Root value:** L4, L5, S1, S2, S3

- b. Components:** Tibial component – from ventral divisions of L4–S3; Common peroneal component – from dorsal divisions of L4–S2

- c.** Leaves pelvis through greater sciatic foramen below piriformis

Branches from Main Trunk (thigh)

Muscle	Component
Semimembranosus	Tibial component
Semitendinosus	Tibial component
Long head of biceps femoris	Tibial component
Ischial (hamstring) part of adductor magnus	Tibial component
Short head of biceps femoris	Common peroneal component

Terminal Branches (usually near upper angle of popliteal fossa)

Terminal Branch	Region	Motor Supply
Tibial nerve	Popliteal fossa	Gastrocnemius, soleus, plantaris, popliteus
	Back of leg	Tibialis posterior, flexor digitorum longus, flexor hallucis longus (+ soleus deep surface)
	Sole	All intrinsic muscles via medial and lateral plantar nerves
Common peroneal (fibular) nerve	Via superficial peroneal nerve	Peroneus longus, peroneus brevis
	Via deep peroneal nerve	Tibialis anterior, extensor digitorum longus, extensor hallucis longus, peroneus tertius, extensor digitorum brevis

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 188–189, 193, 197, 204–205, 213–214, 217–218, 220–221, 223

3. Sciatic nerve: Show & Describe supply areas by root values.

Tool: Figure

Sciatic nerve supplies the limb through its tibial and common peroneal (fibular) components with distinct root values and territories.

Component	Root Value	Motor	Sensory
Tibial component	L4, L5, S1, S2, S3 (ventral divisions)	Hamstrings (except short head of biceps), posterior compartment of leg, all intrinsic muscles of sole	Heel and sole of foot; also posterolateral leg and lateral margin of foot via sural nerve
Common peroneal (fibular) component	L4, L5, S1, S2 (dorsal divisions)	Short head of biceps femoris, anterior compartment of leg (dorsiflexors/extensors), lateral compartment (evertors), extensor digitorum brevis	Anterolateral leg and most dorsum of foot (superficial peroneal); first interdigital cleft (deep peroneal)

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 188–189, 193, 197–198, 204–205, 213–214, 217–218, 221

4. Femoral nerve: Show formation & Describe motor supply by root values.

Tool: Figure

Femoral nerve is the largest branch of lumbar plexus and supplies the extensor compartment of thigh.

Formation (show)

- Root value: L2, L3, L4
- Formed by dorsal divisions of ventral rami of L2–L4 within psoas major

Motor Supply (by root values: L2–L4)

- From trunk: Iliacus; Pectineus (mainly lateral part)
- From anterior division: Sartorius
- From posterior division: Quadriceps femoris – rectus femoris, vastus medialis, vastus lateralis, vastus intermedius; Articularis genu

Ref: A.K. Datta: Thorax, Abdomen and Pelvis, 10th Ed., P. No. 139–141 | Superior and Inferior Extremities, 4th Ed., P. No. 174

5. Common peroneal nerve: Mention divisions and supplied parts / structures.

Tool: Specimen

Common peroneal (fibular) nerve divides around the neck of fibula into superficial and deep branches with distinct supplies.

Divisions

- Superficial peroneal (fibular) nerve
- Deep peroneal (fibular) nerve

Supplied Parts / Structures

Source	Branch / Supply
Branches from main trunk (before division)	Lateral sural cutaneous nerve – skin of upper lateral leg; Sural communicating branch – joins sural nerve; Articular branches – superior & inferior lateral genicular nerves, recurrent genicular nerve to knee joint and superior tibiofibular joint
Superficial peroneal nerve	<i>Motor:</i> Peroneus longus, peroneus brevis. <i>Sensory:</i> Lower lateral leg and most dorsum of foot
Deep peroneal nerve	<i>Motor:</i> Tibialis anterior, extensor digitorum longus, extensor hallucis longus, peroneus tertius, extensor digitorum brevis. <i>Sensory:</i> First interdigital cleft (between great and 2nd toes). <i>Articular:</i> Ankle, tarsal/metatarsal/metatarso-phalangeal joints (middle toes)

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 198, 217–219, 221–223, 225

6. Common peroneal nerve: Mention origin, termination & area supplied.

Tool: Figure

Common peroneal (fibular) nerve is the smaller terminal branch of the sciatic nerve.

Origin

- From sciatic nerve
- Root value:** L4, L5, S1, S2 (from dorsal divisions)

Termination

- Winds around neck of fibula deep to peroneus longus
- Divides into superficial peroneal nerve and deep peroneal nerve

Area supplied: Discussed above (Q5)

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 189, 193, 198

7. Lower limb / Dermatome: Define dermatome & Show dermatomes of lower limb.

Tool: Figure

A dermatome is the skin area supplied by one spinal cord segment through the sensory component of a spinal nerve.

Definition – Dermatome: area of skin supplied by a single spinal segment via the corresponding spinal nerve.

Lower Limb Dermatomes (key areas)

Segment	Area of Skin
L1	Groin and upper medial front of thigh
L2	Upper anterior thigh
L3	Lower anterior/medial thigh up to knee
L4	Medial leg and medial side of dorsum of foot up to ball of great toe
L5	Anterolateral leg and dorsum of foot (including first web space)
S1	Lateral margin of foot and little toe
S2	Posterior thigh and back of leg
S3	Perineum (lower medial gluteal fold area)

Ref: A.K. Datta: Thorax, Abdomen and Pelvis, 10th Ed., P. No. 116 | Superior and Inferior Extremities, 4th Ed., P. No. 31, 258–259

8. Coxa vara & valga: Define & Explain the anomalies.

Tool: Specimen

Coxa vara and coxa valga are anomalies of the neck–shaft angle of femur.

Normal neck–shaft angle: Adult about 125°; Child about 160°.

Anomaly	Definition	Explanation	Effects
Coxa vara	Diminished neck–shaft angle (below normal)	Weak/soft femoral neck bends under body weight (e.g., rickets, delayed diaphyseal spur)	Weak abductor mechanism → pelvic drop; abduction limited (early impingement of greater trochanter on ilium)
Coxa valga	Increased neck–shaft angle (above normal)	Seen in congenital dislocation of hip	Abduction more free, but adduction limited

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 139, 144, 228–229

9. Genu vara & valga: Define & Explain the anomalies.

Tool: Specimen

Genu varum and genu valgum are alignment anomalies due to deviation from the normal femur–tibia angle at the knee.

Normal (physiological valgus): Long axes of femur and tibia meet at about 170°, open laterally.

Anomaly	Definition	Explanation
Genu valgum (Knock-knee / Genu valga)	Increased valgus; the 170° angle decreases (more acute)	Knees incline medially → knees touch, medial malleoli remain apart
Genu varum (Bow-leg / Genu vara)	Varus deformity; angulation appears open medially	Knees bow laterally → knees apart, medial malleoli approximate

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 233

10. Neck of fibula: Show & Explain why fracture at this site may lead to foot drop. Tool: Skeleton

Neck of fibula fracture may cause foot drop due to injury of the common peroneal nerve.

Key Anatomical Relation (show)

- Neck of fibula is in direct contact with common peroneal nerve on its lateral side
- Here the nerve winds forward deep to peroneus longus and divides into deep and superficial peroneal nerves

Why Foot Drop Occurs

Compartment paralysed	Muscles	Loss
Anterior (extensor) compartment	Tibialis anterior, extensor digitorum longus, extensor hallucis longus, peroneus tertius	Loss of dorsiflexion
Lateral (peroneal) compartment	Peroneus longus, peroneus brevis	Loss of eversion

Unopposed plantarflexors and invertors act → ankle becomes plantarflexed and foot inverted/adducted = foot drop.

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 149–150, 198, 217–218, 221

11. Sciatica: Define the condition and Explain it on an anatomical basis. Tool: Specimen

Sciatica is radiating pain along the sciatic nerve distribution due to irritation/compression of its root nerves.

Anatomical Basis (how it occurs)

- Lower lumbar nerves are more vulnerable in intervertebral foramina → compression from disc derangement, vertebral collapse or facet disease
- Postero-lateral prolapse of nucleus pulposus → stretches/ruptures posterior longitudinal ligament and may involve spinal nerves → root pain
- Sacralisation of L5 → affects intervertebral foramen for L5 nerve → compression → pain along sciatic distribution
- Sciatic nerve may be injured in gluteal/hip region in penetrating wounds or posterior dislocation / fracture-dislocation of hip

Ref: A.K. Datta: Thorax, Abdomen and Pelvis, 10th Ed., P. No. 122–124, 136 | Superior and Inferior Extremities, 4th Ed., P. No. 189

12. Common peroneal nerve: Show its origin & Explain its effect of injury at the level of neck of fibula. Tool: Figure

Common peroneal nerve (lateral popliteal nerve) is the lateral terminal branch of sciatic nerve and is commonly injured at the neck of fibula causing foot drop.

Origin

- Root value:** L4, L5, S1, S2 (from dorsal divisions of ventral rami)
- Formation:** Terminal branch of sciatic nerve (division beneath biceps femoris, at variable level above popliteal fossa)

Effect of Injury at Neck of Fibula

Aspect	Effect
Cause	Fracture of neck of fibula / pressure of plaster cast
Motor loss	Paralysis of all muscles of extensor and peroneal compartments (including extensor digitorum brevis)
Deformity	Foot drop – ankle plantar-flexed with foot held in inversion and adduction
Sensory loss	Most of dorsum of foot + outer surface of lower 1/3 of front of leg

Note: Dorsiflexion of middle and terminal phalanges of lateral four toes is retained (by interossei and lumbricals).

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 189, 193, 198

13. Foot drop: Explain causes of its features. Tool: Skeleton

Foot drop is the deformity of a plantar-flexed, inverted and adducted foot due to paralysis of dorsiflexors and evertors.

Main Lesions Causing Foot Drop

- Common peroneal nerve injury (classically at neck of fibula)
- Complete sciatic nerve injury (all muscles below knee paralysed)

Features with Anatomical Cause

Feature	Anatomical Cause
Ankle plantar-flexion	Paralysis of anterior (extensor) compartment dorsiflexors + unopposed posterior compartment plantar-flexors
Inversion	Paralysis of peroneal compartment evertors (peroneus longus, peroneus brevis) + unopposed tibialis posterior
Adduction of forefoot	Unopposed action of tibialis posterior (invertor and adductor of forefoot)
Retained extension of middle & terminal phalanges of lateral 4 toes	By interossei and lumbricals (intrinsic muscles of sole)

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 189, 198, 201–203, 213–214, 217, 221

14. Trendelenburg sign: Define the condition & Explain it on an anatomical basis.

Tool: Specimen

Trendelenburg sign indicates weakness of hip abductors causing pelvic drop on the unsupported side during single-leg stance.

Definition – Positive Trendelenburg sign: on standing on one limb, pelvis drops on the opposite (unsupported) side.

Anatomical Basis

- Normally gluteus medius and gluteus minimus of the weight-bearing side contract and maintain pelvis horizontal
- If these muscles are weak/paralysed (e.g., superior gluteal nerve lesion) → they fail to prevent pelvic sag → pelvis sinks on unsupported side
- Also occurs when the bony lever is defective (e.g., coxa vara) → ineffective action of gluteus medius → pelvic drop

Ref: A.K. Datta: Superior and Inferior Extremities, 4th Ed., P. No. 144, 186–187 | Thorax, Abdomen and Pelvis, 10th Ed., P. No. 254

4 General Embryology



1. Embryonic stem cells: Explain why they are considered as pluripotent.

Tool: Specimen

Embryonic stem cells are called pluripotent because they can form all body cell types derived from the three germ layers.

Basis

- a. **Source:** Derived from inner cell mass (embryoblast) of blastocyst
- b. **Capacity:** Can differentiate into derivatives of ectoderm, mesoderm and endoderm

Key Distinction

- a. **Pluripotent:** Forms embryo proper derivatives (3 germ layers)
- b. **Not totipotent:** Does not form extraembryonic tissues (e.g. placenta)

Ref: Langman's Medical Embryology, 14th Ed., Ch. 3, P. 64 | Moore's The Developing Human, 10th Ed., Ch. 21, P. 499

2. Mesenchyme: Evaluate 'mesenchyme' as a source of different types of tissues.

Tool: Specimen

Mesenchyme is a multipotent embryonic connective tissue that gives rise to most supporting and connective tissues of the body.

What It Is (evaluation point)

- a. Loosely arranged cells in abundant extracellular matrix (ECM)

Sources

- a. Mainly from mesoderm
- b. Also from neural crest in head & neck

Major Derivatives (why it is an important source)

- a. Connective tissue proper
- b. Cartilage
- c. Bone
- d. Smooth muscle
- e. Blood vessels

Functional Significance in Development

- a. Essential for epithelial–mesenchymal interactions (provides support and inductive signals for organ development)

Ref: Langman's Medical Embryology, 14th Ed., P. No. 25, 31 | Moore's The Developing Human, 10th Ed., P. No. 337, 355

3. Organ formation: Explain how interaction between cells and tissues form organ.

Tool: Specimen

Organs form by induction – a controlled interaction between tissues / cell populations that changes the fate of the responding tissue.

Core Mechanism: Induction

- a. Interaction between two or more tissues → causes change in developmental fate of the responding tissue

Common Pattern: Epithelial–Mesenchymal Interaction

- a. Epithelium (sheet / tube) + mesenchyme (dispersed cells in ECM) interact
- b. Produces organogenesis by reciprocal signalling (crosstalk)

Ref: Langman's Medical Embryology, 14th Ed., P. No. 25

5.1 Connective Tissue



1. Connective tissue: Mention characteristic features & compositions.

Tool: Specimen

Connective tissue is a supporting/binding tissue in which extracellular matrix predominates.

Characteristic Features

- Derived mainly from mesenchyme (mesoderm)
- Cells are widely separated; abundant extracellular matrix (ECM)
- Provides support, packing and stroma for organs

Composition

- Cells:** See below in Question 2
- Fibres:** Collagen fibres; Reticular fibres; Elastic fibres
- Ground substance:** GAGs + proteoglycans; Multiadhesive glycoproteins (e.g., fibronectin/laminin); Tissue (interstitial) fluid

Ref: Junqueira: Basic Histology, 15th Ed., P. No. 96–121

2. Cells: Mention the cells of connective tissue / Mention their name & sites.

Tool: Specimen

Connective tissue contains resident cells and wandering (transient) cells.

Resident (Fixed) Cells

- Fibroblasts (fibrocytes)
- Adipocytes
- Macrophages
- Mast cells

Wandering (Transient) Cells

- Plasma cells
- Leukocytes: lymphocytes, neutrophils, eosinophils, basophils (and monocytes in transit)

Ref: Junqueira: Basic Histology, 15th Ed., P. No. 96–103

3. Connective tissue cells: Justify presence of wandering (mobile) connective tissue cells / in loose connective tissue.

Tool: Specimen

Wandering cells are abundant in loose connective tissue mainly for defence and repair in a tissue that permits easy cell migration.

- Defence at vulnerable sites:** Loose CT houses leukocytes, macrophages, mast cells → rapid response to infection/injury
- Inflammation & immune reactions:** Mast cells release mediators (e.g., histamine) → help initiate inflammatory response; Plasma cells provide antibodies locally
- Mobility & repair advantage:** Loose arrangement of fibres + abundant ground substance → permits easy migration of wandering cells

Ref: Junqueira: Basic Histology, 15th Ed., P. No. 96–103, 114–115

4. Fibroblast: Describe structure / Mention TWO important structural features & ONE function.

Tool: Specimen

A fibroblast is the principal connective tissue cell specialized for ECM synthesis.

Two Important Structural Features

- Spindle/stellate cell with tapering cytoplasmic processes
- Large oval euchromatic nucleus with cytoplasm rich in RER + Golgi (basophilic in active cell)

One Function

- Synthesis of extracellular matrix – mainly collagen (also other matrix components)

Ref: Junqueira: Basic Histology, 15th Ed., P. No. 96–97

6.1 Osteology



1. Bone: Classify according to morphology. Tool: Skeleton

The bones are morphologically classified according to their shape and structure as follows.

Type	Features	Examples
Long bones	Length exceeds breadth; consist of shaft (diaphysis) and two ends (epiphyses). Function: act as levers and are weight-bearing	Typical – two epiphyses: humerus, femur Miniature – single epiphysis: metacarpals, metatarsals, phalanges Modified – clavicle (membranous ossification, no medullary cavity), vertebral body (weight-bearing)
Short bones	Cubical in shape; four surfaces articular, two non-articular for muscle or ligament attachment, pierced by vessels	Carpus and tarsus
Flat bones	Two plates of compact bone with spongy bone (diploë) in between. Function: protection and boundary formation of cavities	Skull vault, ribs, sternum, scapula
Irregular bones	Irregular shape, not fitting in other types; spongy bone and marrow enclosed by compact layer	Base of skull, vertebrae, hip bone
Pneumatic bones	Contain air-filled spaces (sinuses) lined by mucous membrane; located near nasal cavity, formed by evagination of mucous lining	Maxilla, sphenoid, ethmoid, frontal
Sesamoid bones	Develop within tendons exposed to friction; act as pulleys, directing force of muscles	Patella, pisiform, fabella
Accessory (supernumerary) bones	Not regularly present; due to separate ossification centres failing to fuse; commonest in skull	Wormian (sutural) bones, interparietal bone

Ref: A.K. Datta: Principles of General Anatomy, 8th Ed., P. No. 65–71

2. Long bone: Mention the features of typical & atypical long bone. Tool: Skeleton

A long bone is characterized by length exceeding breadth, mainly found in the limbs, acting as levers and weight-bearing structures. It ossifies in cartilage and shows a shaft (diaphysis) with two ends (epiphyses).

Feature	Typical Long Bone	Modified (Atypical) Long Bone
Parts	Central shaft (diaphysis) and two ends (epiphyses)	–
Medullary cavity	Present in shaft, filled with bone marrow	Absent
Structure	Shaft – tube of compact bone; ends – enlarged, articular, capped with articular cartilage	–
Ossification	Endochondral	Membranous, not cartilaginous
Function	Act as levers for muscles; weight-bearing	Classified as long bone functionally because it transmits weight
Examples	Humerus, femur, and other limb bones	Clavicle, body of vertebra

Miniature Long Bones

- Single epiphysis at one end only
- Examples:** Metacarpals, metatarsals, phalanges

Ref: A.K. Datta: Principles of General Anatomy, 8th Ed., P. No. 66, 69

7 Practical



Board-II Practical. Topic-wise frequency (questions only); figure-reading is in the Special Figures section.

OSPE

OSPE: 15 stations as per supplied format (15×2 = 30 marks).

Dissected Cadaver – Regional (7 marks)

Topic	Freq.
Femoral triangle	16
Front of thigh	14
Popliteal fossa	10
Gluteal region	10
Front of leg	7
Axilla	7
Front of forearm	5
Anterior abdominal wall	5
Inguinal region	5
Back of leg	5
Cubital fossa	4
Pectoral region (with mammary gland)	4
Front of arm	3
Back of thigh	3
Lateral side of leg	2

Dissected Cadaver – Overall (6 marks)

Identify two structures and give points in favour.

Surface Anatomy – Drawing (6 marks)

Topic	Freq.
Liver	19
Kidney (from back / left)	13
Stomach	11
Brachial artery	9
Radial artery	6
Arteria dorsalis pedis	6
Transpyloric plane	4
Ulnar artery	4
Regions of abdomen	4
Duodenum	4
Tibial nerve (back of leg)	4
Median nerve (forearm)	4
Common peroneal nerve	4
Pancreas	4
Great saphenous vein	2
Transverse colon / Abdominal aorta	2

Surface Anatomy – Pointing (4 marks)

Topic	Freq.
McBurney's point	15
Medial malleolus	12
Medial humeral epicondyle	12
Fundus of gall bladder	12
Adductor tubercle	10
Lateral malleolus	7
Anterior superior iliac spine	7
Radial pulse / artery	5
Superficial palmar arch	4
Tibial tuberosity	3
Anatomical snuff box	3
Median cubital vein	3
Dorsalis pedis artery pulse	3
Deep inguinal ring	2
Inferior angle of scapula	2

Radiology – Normal X-ray (5 marks)

Topic	Freq.
X-ray Pelvis	19
Shoulder joint	13
Hand	13
Foot	11
Knee joint	10
KUB region	10
Wrist joint	6
Leg	4
Hip joint	4
Elbow joint	4
Ankle joint	4
Abdomen / Arm	2

Radiology – CT / MRI / USG (5 marks)

Topic	Freq.
CT Abdomen – L2 level	83
MRI Hip joint	9
MRI Shoulder joint	5
MRI Knee joint	3

Assignment on Integrated Teaching

Assignment on integrated teaching (5 marks).

8 Special Figures



For every figure below: read the figure and explain what special understanding it offers. 7 marks each. Figures are grouped by topic; repeated figures are listed once.

Abdomen

- | | |
|---|--|
| 1. Transverse section through stomach, liver & spleen (omental bursa) | 8. Development of collecting part of kidney |
| 2. Development of stomach with rotation | 9. Development of metanephric excretory part of kidney |
| 3. Rotation of midgut | 10. Genital ducts |
| 4. Urorectal & rectovaginal fistulas | 11. Maturation of ovarian follicle |
| 5. Imperforate anus | 12. Development of gonads (cortical & medullary cords) |
| 6. Annular pancreas | 13. Development of ovary |
| 7. Veins of abdomen | 14. Ovary TS – medullary sex cords & cortical cords |

Superior Extremity

- | | |
|--|-------------------------|
| 15. Developing muscle cells move into the limb | 16. Development of limb |
|--|-------------------------|

Inferior Extremity

- | |
|-------------------------------------|
| 17. Development of vertebral column |
|-------------------------------------|

General Embryology

- | | |
|--|---|
| 18. Development of small intestine with rotation | 24. Trilaminar germ disc |
| 19. Gut tube & body cavities | 25. Somite differentiation |
| 20. Gametogenesis | 26. Structure of a villus at various stages |
| 21. Ovulation | 27. Interrelations of fetal membranes (monozygotic twins) |
| 22. Phases of fertilization | 28. 13-day human blastocyst |
| 23. Events during 1st week of development | |

General Histology – Connective Tissue

- | | |
|--|---|
| 29. Distribution of three types of cartilage | 32. Haversian system |
| 30. Loose connective tissue | 33. Stages of bone healing process |
| 31. Cells associated with bone | 34. Immature & mature compact & spongy bone |

General Histology – Muscular Tissue

- | | |
|---|---|
| 35. Organization of a skeletal muscle fibre | 36. Shortening of sarcomere in muscle contraction |
|---|---|

General Anatomy – Osteology, Arthrology & Myology

- | | |
|----------------------------------|--------------------------------|
| 37. Movement of vertebral column | 38. Examples of synovial joint |
|----------------------------------|--------------------------------|

Practical – Figure-Reading (frequently asked)

- | | | |
|---|--|---------------------------------------|
| 39. Sertoli cell | 45. Absorptive surface of small intestine | 51. M cell of intestine |
| 40. Uterine tubes & uterus | 46. Three models of liver organization | 52. Intestinal villi |
| 41. Organization of skeletal muscle fibre | 47. Glomerular filtration barrier | 53. Lymph flow (schematic) |
| 42. Follicle development & changes within ovary | 48. Sarcomere shortening in contraction | 54. Blood & biliary flow in the liver |
| 43. 3D hepatic sinusoid | 49. General organization of alimentary canal | 55. Renal corpuscles |
| 44. Haversian system in compact bone | 50. Organization & blood supply of adrenal gland | 56. Loose connective tissue |