FMGE Anatomy Sample Paper – 4

Duration: 60 Minutes **Maximum Marks: 40**

Instructions

- This paper contains **40 Multiple Choice Questions** modelled on the **Anatomy** section of FMGE.
- Each correct answer carries **+1 mark**. There is **no negative marking** – attempt all questions.
- Questions follow the clinically integrated pattern of the FMGE examination.
- Click a question number in the answer key to navigate to its solution.

FMGE Anatomy – Q1 to Q40

Q1. A 35-year-old athlete complains of anterior knee pain worsened by climbing stairs. X-ray shows a well-corticated bone embedded within the quadriceps tendon just superior to the joint. The orthopedic surgeon explains that this bone develops within a tendon subjected to compressive forces and friction.

Which of the following best describes the characteristic feature of a sesamoid bone?

(A) It always ossifies from a secondary epiphysis

(B) It is always found within joint capsules to distribute load evenly

(C) It develops within tendons at points of friction and changes the angle of pull of the tendon

(D) It is invariably connected to adjacent bones by synovial joints

Q2. During surgical exploration of the axilla for lymph node dissection, the surgeon identifies an anomalous muscle slip arising from the latissimus dorsi and inserting into the pectoralis major. This is later identified as the axillary arch (Langer's axillary arch).

What is the primary clinical significance of recognising accessory muscles like the axillary arch?

(A) They can be mistaken for pathological masses, cause neurovascular compression, and complicate surgical dissection

(B) They invariably cause motor deficits due to compression of adjacent motor nerves

(C) They always require surgical resection to prevent future neurovascular complications

(D) They are embryological remnants with no functional significance and rarely need identification

Q3. A 28-year-old woman is undergoing axillary lymph node dissection. The surgeon must identify the axillary vein to avoid inadvertent injury. The axillary vein begins at the lower border of the teres major and ends at the outer border of the first rib where it becomes the subclavian vein.

Which of the following correctly describes the formation of the axillary vein?

(A) It is formed solely by the basilic vein joining the cephalic vein at the level of the pectoralis minor

(B) It is formed by two brachial venae comitantes alone at the lower border of teres major

(C) It is formed by the cephalic vein and two brachial venae comitantes at the lower border of teres major

(D) It is formed by the union of the basilic vein (continuing as the brachial vein) and the two venae comitantes of the brachial artery at the lower border of teres major

Q4. A 52-year-old woman with early-stage breast cancer (T1N0) is scheduled for surgery. The breast surgeon plans to perform sentinel lymph node biopsy rather than a full axillary clearance to minimise postoperative morbidity including lymphoedema.

Which of the following statements best describes the sentinel lymph node concept?

(A) It is the largest lymph node in a regional basin that drains the tumour

(B) It is the first lymph node(s) that receives lymphatic drainage from the primary tumour; its histological status predicts regional nodal involvement

(C) It is identified purely by its location in the central group of axillary nodes

(D) It is always a single node and its removal eliminates the need for further axillary staging

Q5. A 45-year-old man sustains a urethral rupture below the perineal membrane. Urine extravasates and tracks into the scrotum, penis, and anterior abdominal wall. The spread is limited inferiorly at the perineum by the attachment of a named fascial layer.

The fascial layer whose inferior attachment prevents urine spreading to the thigh is continuous superiorly with Scarpa's fascia of the anterior abdominal wall. What is this fascial layer in the perineum?

(A) Buck's fascia

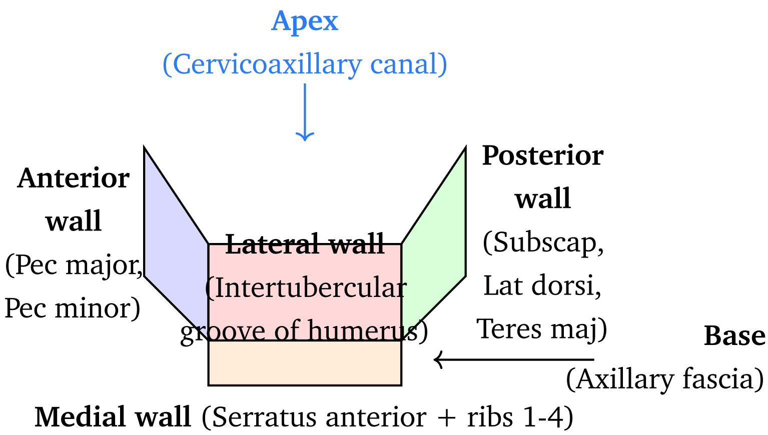
(B) Camper's fascia

(C) Colles' fascia (superficial perineal fascia)

(D) Deep perineal fascia (Gallaudet's fascia)

Q6. A surgical trainee is learning the anatomical boundaries of the axilla before performing axillary dissection. The attending explains that the axilla is a pyramidal space with defined walls and an apex through which neurovascular structures enter from the neck.

The following diagram shows a schematic cross-section of the axilla:



Which of the following correctly identifies the apex of the axilla and the fascia that invests the axillary vessels where they pass through it?

(A) The apex is the cervicoaxillary canal (bounded by the clavicle, 1st rib, and scapula); the clavipectoral fascia invests the axillary vessels at this point

(B) The apex is bounded by the clavicle, coracoid process, and the 1st rib; the axillary fascia forms a sheath here

(C) The apex is the space between pectoralis minor and the chest wall; the clavipectoral fascia forms the lateral boundary

(D) The apex is bounded by the clavicle, 1st costal cartilage, and pectoralis major; it is pierced by the cephalic vein only

Q7. A 22-year-old rugby player falls on his outstretched hand and sustains a mid-shaft clavicle fracture. On examination, the medial fragment is elevated (pulled up by the sternocleidomastoid) and the lateral fragment is depressed and displaced medially by the weight of the arm. The subclavian vessels lie immediately posterior to the clavicle at the junction of the middle and lateral thirds.

At the junction of the middle and lateral third of the clavicle, which structure immediately posterior to the fracture site is at greatest risk of injury?

(A) Internal jugular vein

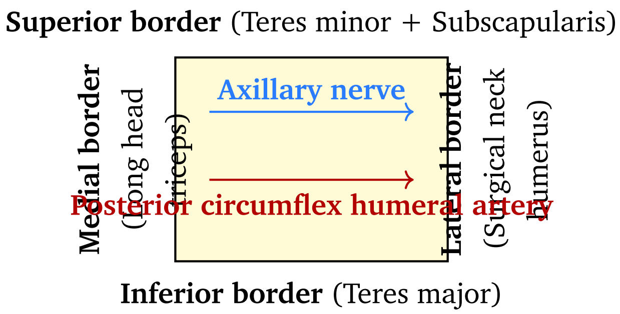
(B) Thoracic duct

(C) Brachial plexus roots (C5, C6)

(D) Subclavian artery and vein (and the brachial plexus trunks)

Q8. A 25-year-old man presents after a fall onto an outstretched, abducted arm. Examination reveals an anterior shoulder dislocation with the humeral head displaced anteriorly and inferiorly. He cannot abduct the arm at the shoulder and has a patch of numbness over the lateral deltoid.

The following diagram shows the quadrilateral (quadrangular) space and its contents:



Which nerve is damaged in this presentation, and what is its root value?

(A) Suprascapular nerve (C5, C6) — unable to initiate abduction

(B) Axillary nerve (C5, C6) — passing through the quadrilateral space

(C) Radial nerve (C5–C8, T1) — damaged in the spiral groove

(D) Musculocutaneous nerve (C5, C6, C7) — in the coracobrachialis

Q9. An anatomy demonstrator asks students to test the flexor digitorum superficialis (FDS) of the middle finger in isolation, separately from flexor digitorum profundus (FDP). The key is to hold the other fingers in full extension, blocking the profundus action.

Which of the following correctly describes the unique testing method for FDS and its anatomical basis?

(A) Hold all fingers extended; patient flexes the MCP joint only; FDS inserts into the base of the middle phalanx and acts solely on the MCP

(B) Test each finger separately by asking the patient to grip a cylinder; FDS is assessed by the force of grip

(C) Hold all fingers (other than the one being tested) in full extension, thereby blocking FDP (whose tendons share a common muscle belly); the patient then flexes the PIP joint, proving FDS integrity at that finger

(D) Block the DIP joint in extension and ask the patient to flex the PIP; FDS is the only flexor of both the PIP and DIP joints

Q10. A 55-year-old office worker presents with tingling and numbness in the little finger and medial half of the ring finger, worse at night and after prolonged elbow flexion. Tapping behind the medial epicondyle reproduces the tingling (positive Tinel's sign at the elbow).

Which nerve passes behind the medial epicondyle in the cubital tunnel, and what movements does this site's anatomy allow the nerve to perform?

(A) Ulnar nerve — it passes behind the medial epicondyle, within the cubital tunnel formed by the aponeurosis of flexor carpi ulnaris; elbow flexion tightens the tunnel and compresses the nerve

(B) Median nerve — it passes through the cubital fossa medial to the brachial artery and is trapped against the medial epicondyle during supination

(C) Radial nerve — its deep branch winds around the medial epicondyle in the spiral groove of the humerus

(D) Anterior interosseous nerve — it passes behind the medial epicondyle and supplies the pronator quadratus

Q11. A 68-year-old woman with peripheral arterial disease is undergoing femoral-popliteal bypass surgery. The surgeon must identify the femoral artery as it passes through the adductor (Hunter's) canal in the middle third of the thigh before entering the popliteal fossa.

Which of the following correctly describes the boundaries of the adductor canal and the structures passing through it?

(A) Bounded by vastus medialis anterolaterally, sartorius medially, and adductor longus posteriorly; contains the femoral artery, femoral vein, and femoral nerve

(B) Bounded anteriorly by the quadriceps, posteriorly by adductor brevis, and medially by sartorius; contains the femoral vessels and obturator nerve

(C) Bounded by sartorius anteriorly, vastus medialis laterally, and adductor magnus posteriorly; contains the femoral artery, femoral vein, and superficial femoral nerve only

(D) Bounded by sartorius (forming the roof), vastus medialis (anterolateral wall), and adductor longus/magnus (posteromedial wall); contains the femoral artery, femoral vein, saphenous nerve, and nerve to vastus medialis

Q12. A 30-year-old footballer sustains an inversion injury to his right ankle during a tackle. X-ray shows no fracture, but there is swelling over the lateral malleolus. The physiotherapist explains the difference between common inversion and less common eversion sprains of the ankle.

Regarding the deltoid (medial collateral) ligament of the ankle, which of the following statements is correct?

(A) The deltoid ligament is a single band from the lateral malleolus to the calcaneus, making it the weakest ankle ligament

(B) Eversion injuries are more common than inversion injuries because the deltoid ligament is inherently weak

(C) The deltoid ligament is a strong, fan-shaped (triangular) ligament from the medial malleolus to the navicular, talus, and calcaneus; eversion sprains are less common because this ligament is very strong

(D) The deltoid ligament is a single band connecting the medial malleolus to the talus only; the anterior talofibular ligament is most commonly torn in eversion

Q13. A 48-year-old overweight woman presents with severe heel pain, worst with the first few steps in the morning after waking. The pain is reproduced by dorsiflexing the toes (windlass test). Ultrasound confirms thickening and degeneration of the proximal plantar fascia.

Which of the following correctly describes the anatomy of the plantar fascia (aponeurosis) and its calcaneal attachment relevant to plantar fasciitis?

(A) The plantar fascia arises from the anterior calcaneal process and inserts into the metatarsal heads; plantar fasciitis affects its distal attachment

(B) The plantar fascia (aponeurosis) is a thick band of deep fascia arising from the medial process of the calcaneal tuberosity; it fans distally into five slips that insert into the bases of the proximal phalanges and the flexor tendon sheaths; the windlass mechanism tightens it on toe dorsiflexion

(C) The plantar fascia is a synovial membrane arising from the posterior calcaneal surface and enclosing the long plantar ligament

(D) The plantar fascia arises from the sustentaculum tali of the calcaneus and inserts into the cuboid bone; pain arises from traction on the cuboid

Q14. A 62-year-old man requires coronary artery bypass grafting. The cardiothoracic surgeon requests harvesting of the long (great) saphenous vein for use as a conduit. The scrub nurse confirms the vein's course from the foot to the groin.

Which of the following correctly describes the course of the great saphenous vein?

(A) It begins at the dorsal venous arch of the foot, passes anterior to the medial malleolus, ascends along the medial aspect of the leg and thigh, and drains into the femoral vein through the saphenous opening (fossa ovalis) about 4 cm inferolateral to the pubic tubercle

(B) It begins behind the lateral malleolus, ascends along the posterior calf, and drains into the popliteal vein at the knee

(C) It begins at the dorsal venous arch and passes posterior to the medial malleolus, then crosses to the lateral thigh to drain into the external iliac vein

(D) It runs along the medial leg from the medial malleolus and drains into the deep femoral vein in the femoral triangle

Q15. A 45-year-old runner complains of burning pain and tingling along the medial heel and plantar foot, reproduced by sustained ankle dorsiflexion. MRI suggests compression of a nerve as it passes posterior to the medial malleolus beneath the flexor retinaculum.

Which nerve is affected, and what is its course through the popliteal fossa before reaching this point?

(A) Common fibular (peroneal) nerve — it descends laterally in the popliteal fossa and then passes posterior to the medial malleolus

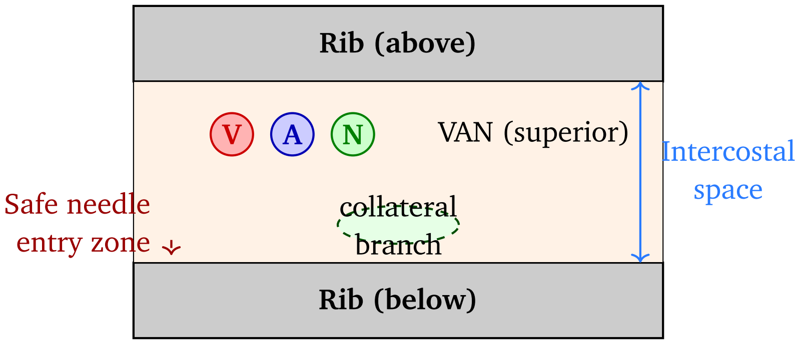
(B) Sural nerve — it is formed in the popliteal fossa and passes posterior to the medial malleolus in the tarsal tunnel

(C) Saphenous nerve — it passes through the popliteal fossa and enters the tarsal tunnel posterior to the medial malleolus

(D) Tibial nerve — it is the larger terminal branch of the sciatic nerve, descends through the popliteal fossa between the popliteal vessels and the posterior capsule, and passes posterior to the medial malleolus in the tarsal tunnel deep to the flexor retinaculum

Q16. A 58-year-old man is in the emergency department with a right-sided pleural effusion causing respiratory distress. The physician plans to perform a pleural tap (thoracocentesis) to drain the fluid. To avoid damage to the neurovascular bundle, the needle must be inserted at the correct border of the rib.

The following diagram shows the arrangement of the intercostal neurovascular bundle:



Where should the needle be inserted to avoid the neurovascular bundle?

(A) At the midpoint of the intercostal space, as the vessels run in the centre

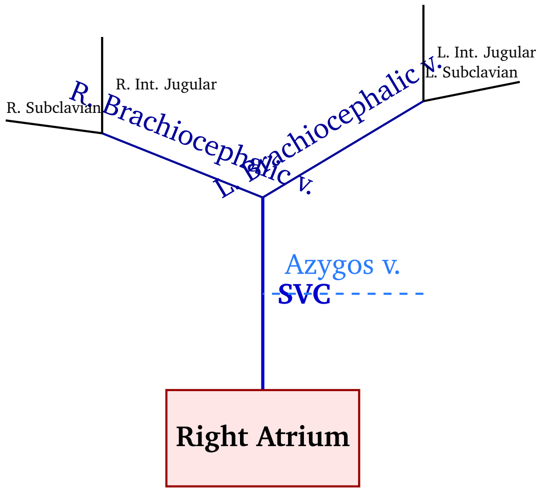
(B) Just below the upper rib, to be close to the artery but avoid the nerve

(C) Just above the upper border of the lower rib (inferior to the intercostal space), avoiding the neurovascular bundle that lies along the inferior border of the upper rib

(D) Along the posterior axillary line, at the inferior border of the upper rib, which is where the bundle is thinnest

Q17. A 65-year-old man with a history of smoking presents with facial and upper limb oedema, dilated neck and chest wall veins, and headache worsened by bending forward. CT chest shows a large right hilar mass compressing the superior vena cava.

The following diagram shows the formation of the SVC:



SVC = union of R + L brachiocephalic veins
at level of right 1st costal cartilage

Which of the following correctly describes the formation of the SVC and the clinical syndrome arising from its obstruction?

(A) The SVC is formed by the union of the right and left brachiocephalic veins at the level of the right 1st costal cartilage; SVC syndrome causes facial oedema, distended neck veins, and dilated chest wall collaterals

(B) The SVC is formed by the right and left subclavian veins joining at the manubriosternal angle; SVC syndrome causes lower limb oedema due to obstruction of venous return

(C) The SVC is formed by the right brachiocephalic vein and the azygos vein at the level of the right 2nd intercostal space; it drains into the left atrium

(D) The SVC is formed by the right and left internal jugular veins meeting at the midline; SVC syndrome is caused by thrombosis of the femoral vein

Q18. During a left pneumonectomy, the thoracic surgeon carefully dissects the structures forming the root (hilum) of the left lung before dividing them. The arrangement of structures at the lung root differs between the right and left sides.

Using the mnemonic RALS (from anterior to posterior: Veins, Artery, Bronchus) and superior to inferior arrangement, which of the following correctly describes the arrangement of structures at the LEFT lung root?

(A) From anterior to posterior: bronchus, pulmonary artery, pulmonary veins

(B) Pulmonary artery is most superior, pulmonary veins are anterior and inferior, bronchus is posterior; on the left the upper lobe bronchus is superior to the artery (unlike the right)

(C) Pulmonary veins are most posterior, pulmonary artery is anterior, and bronchus is in the middle on both sides

(D) On the left, the bronchus lies anterior to the pulmonary artery, while on the right the artery is anterior to the bronchus

Q19. A 55-year-old woman undergoes cardiac surgery and develops right shoulder pain postoperatively. She has no neck pathology, and X-ray shows elevation of the right hemidiaphragm. The anaesthetist suspects referred pain via the phrenic nerve.

Regarding the phrenic nerve, which of the following is correct?

(A) The phrenic nerve arises from C4 only and passes posterior to the subclavian artery into the thorax

(B) The phrenic nerve arises from C3, C4, C5 and passes over the anterior surface of scalenus anterior; it is the sole motor supply to the diaphragm but has no sensory function

(C) The phrenic nerve arises from C4, C5, C6 and runs posterior to the hilum of the lung; referred shoulder pain occurs from irritation of T4 dermatome

(D) The phrenic nerve arises from C3, C4, C5 (C5 keeps the diaphragm alive); it runs anterior to the hilum of the lung on both sides and supplies motor and sensory innervation to the diaphragm; irritation causes referred pain to the shoulder (C4 dermatome)

Q20. A 70-year-old man with congestive cardiac failure presents with dullness to percussion and reduced breath sounds at both lung bases. Chest X-ray shows bilateral blunting of the costophrenic angles. The physician explains that fluid accumulates first in the costodiaphragmatic recess.

Which of the following best describes the costodiaphragmatic recess and its clinical significance?

(A) It is the space between the heart and the diaphragm where pericardial fluid accumulates

(B) It is the space between the two layers of pericardium, relevant in cardiac tamponade

(C) It is the most inferior part of the pleural cavity, situated between the costal pleura and the diaphragmatic pleura; it is not occupied by lung even at full inspiration and is the dependent site where pleural fluid first collects

(D) It is the pleural recess between the mediastinal and costal pleura at the level of the 4th rib, relevant in left-sided effusions

Q21. A 45-year-old man is involved in a road traffic accident and sustains blunt trauma to the right flank. CT scan shows a right renal haematoma with perinephric haematoma contained within the perirenal fat. The radiologist notes the haematoma is limited by the renal fascia.

Which of the following correctly describes the retroperitoneal arrangement of the kidney and its investing fascia?

(A) The kidney lies within Gerota's fascia (renal fascia), which has fused layers superiorly and laterally, is open inferiorly allowing spread of haematoma/pus into the pelvis, and encloses the perinephric fat; it is fused medially around the great vessels

(B) The kidney is enclosed within the visceral peritoneum, which forms Gerota's fascia; infections spread anteriorly into the peritoneal cavity

(C) Gerota's fascia has open superior and lateral compartments but fuses inferiorly, limiting spread of infection into the pelvis; it is not related to the psoas fascia

(D) The kidney lies within the pararenal fat only; Gerota's fascia is found anterior to the ureter and does not enclose the kidney directly

Q22. A 70-year-old man with atrial fibrillation develops sudden severe abdominal pain with bloody diarrhoea. CT angiography reveals occlusion of the superior mesenteric artery (SMA). The colorectal surgeon explains that the SMA and IMA supply distinct territories of the bowel.

Which of the following correctly describes the territory of the superior mesenteric artery (SMA) vs. inferior mesenteric artery (IMA)?

(A) SMA supplies the foregut (stomach to duodenum); IMA supplies midgut and hindgut structures

(B) SMA supplies from the lower oesophagus to the mid-transverse colon; IMA supplies the remainder

(C) SMA supplies from the stomach to the duodenojejunal flexure; IMA supplies from the jejunum to the rectum

(D) SMA supplies from the duodenojejunal flexure to the mid-transverse colon (at the left colic flexure); IMA supplies from the left colic flexure to the upper rectum; the junction is at the Griffith's point (splenic flexure) where collateral flow is poorest

Q23. A 19-year-old student presents with classic features of acute appendicitis. During laparoscopic appendicectomy, the surgeon identifies and ligates the appendicular artery before dividing the appendix. Understanding the blood supply and lymphatic drainage of the appendix is essential to avoid complications.

Which of the following correctly describes the blood supply and lymphatic drainage of the appendix?

(A) The appendix is supplied by the right colic artery, a branch of the superior mesenteric artery; lymphatics drain to the para-aortic nodes

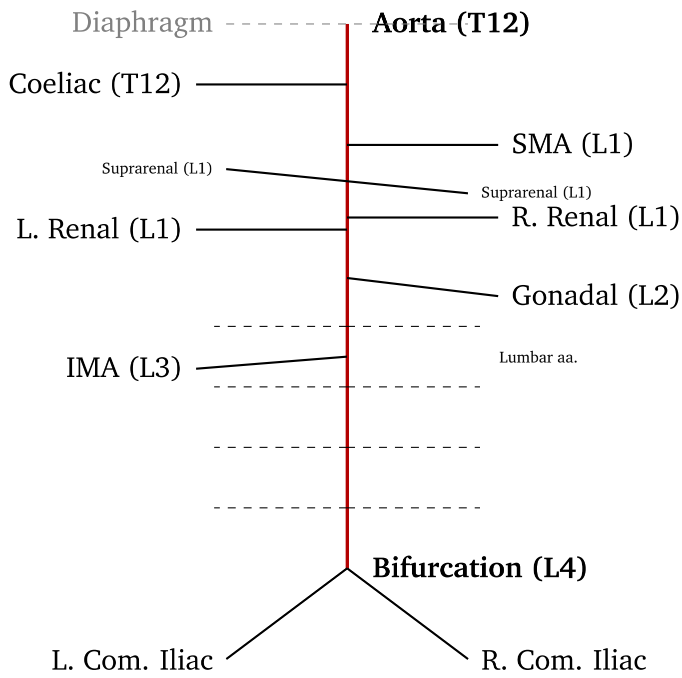
(B) The appendix is supplied by the middle colic artery; lymphatics drain to the mesenteric root nodes via the appendicular lymphatics

(C) The appendix is supplied by the appendicular artery (a branch of the ileocolic artery, itself a branch of the SMA); it runs in the mesoappendix; lymphatics drain to the ileocolic nodes and then to the superior mesenteric nodes

(D) The appendix is supplied by the inferior mesenteric artery via the appendicular branch; lymphatics drain to the left lumbar nodes

Q24. A vascular surgery registrar is asked to describe the sequential branches of the abdominal aorta from its entry through the diaphragm at T12 to its bifurcation at L4.

The following diagram shows the abdominal aorta and its major branches:



Which sequence of unpaired branches of the abdominal aorta (from superior to inferior) is correct?

(A) Coeliac trunk → renal arteries → SMA → IMA → gonadal arteries

(B) Coeliac trunk → superior mesenteric artery → inferior mesenteric artery (with paired renal and gonadal arteries in between)

(C) SMA → coeliac trunk → IMA → renal arteries → gonadal arteries

(D) Coeliac trunk → IMA → SMA → renal arteries → gonadal arteries

Q25. A 35-year-old immigrant presents with low-grade fever, night sweats, and a fluctuant swelling in the right iliac fossa and upper thigh. CT scan reveals a cold (non-inflammatory) abscess tracking from the lumbar spine along the psoas muscle, presenting as a lump below the inguinal ligament. This is a psoas abscess, most commonly due to spinal tuberculosis.

Which of the following correctly describes the origin, insertion, and clinical relevance of psoas major?

(A) Psoas major originates from the transverse processes and bodies of T12–L5 vertebrae and the intervertebral discs; it inserts into the lesser trochanter of the femur via the iliopsoas tendon; a psoas abscess from spinal TB tracks downward within the psoas sheath and presents as a fluctuant swelling below the inguinal ligament in the upper medial thigh (above the lesser trochanter)

(B) Psoas major originates from the iliac fossa and inserts into the greater trochanter; infection tracks to the gluteal region

(C) Psoas major originates from the sacral ala and inserts into the lesser trochanter; abscesses present in the gluteal region

(D) Psoas major originates from the bodies of L1–L5 only and inserts into the iliac fossa; infections therefore track laterally into the retroperitoneal space

Q26. A 32-year-old woman complains of jaw clicking and pain in front of the ear worsened by chewing and yawning. She is diagnosed with temporomandibular joint (TMJ) dysfunction. The dentist explains that the TMJ has a unique articular disc that divides the joint into two compartments allowing two types of movement.

Which of the following correctly describes the movements and articular disc of the TMJ?

(A) The TMJ is a pure hinge joint with one compartment; the articular disc is avascular and absorbs compressive forces; only rotation occurs

(B) The disc divides the joint into upper and lower compartments; only gliding occurs in the lower compartment and only rotation in the upper compartment

(C) The TMJ is a saddle joint with two compartments; both gliding and rotation occur equally in both compartments

(D) The articular disc divides the TMJ into upper (gliding — translation of the condyle and disc together forward) and lower (hinge — rotation of the condyle on the disc) compartments; both compartments are involved in wide mouth opening

Q27. A 68-year-old man presents with sudden unilateral hearing loss, tinnitus, and episodic vertigo. Audiometry confirms sensorineural hearing loss. MRI reveals an acoustic neuroma (vestibular schwannoma) at the internal acoustic meatus compressing CN VIII.

Which of the following correctly distinguishes the cochlea from the semicircular canals in terms of function and their relationship to CN VIII?

(A) The cochlea provides balance via its otolith organs; the semicircular canals detect sound via vibration of the basilar membrane

(B) The cochlea (via the cochlear division of CN VIII) is responsible for hearing; the semicircular canals and otolith organs (via the vestibular division of CN VIII) are responsible for balance and detecting angular/linear acceleration

(C) The cochlea and semicircular canals are both innervated by CN VII (facial nerve); CN VIII plays no role in the inner ear

(D) The semicircular canals detect sound frequency differences; the cochlea detects rotational acceleration; both are part of the same CN VIII division

Q28. An ENT surgeon is planning endoscopic sinus surgery. She reviews the anatomy of the nasal cavity, noting the positions of the conchae (turbinates), the meatuses beneath them, and the critical location of the olfactory nerve fibres.

Where in the nasal cavity do the olfactory nerve fibres (CN I) pass through the cribriform plate, and which concha lies directly above the superior meatus?

(A) The olfactory fibres pass through the foramen ovale; the inferior concha is most superior

(B) The olfactory fibres pass through the jugular foramen; they are located at the base of the nasal septum

(C) The olfactory nerve fibres (CN I) pass through the cribriform plate of the ethmoid bone in the roof of the nasal cavity; the superior concha (part of ethmoid) lies directly above the superior meatus which drains the posterior ethmoidal air cells

(D) The olfactory fibres pass through the foramen rotundum; they are located in the floor of the nasal cavity near the hard palate

Q29. A 4-year-old child is brought to the clinic with a foreign body suspected in the right external ear canal. The ENT registrar explains to medical students that to straighten the external auditory meatus for otoscopy in a child, the pinna should be pulled downward and backward (vs. upward and backward in adults).

Which of the following correctly describes the boundaries of the external auditory meatus (EAM) and the tympanic membrane?

(A) The EAM is entirely cartilaginous in adults; the tympanic membrane is horizontal and lies at a right angle to the long axis of the EAM; it is divided into the pars tensa (most of the membrane) and the pars flaccida (Shrapnell's membrane) superiorly; the light reflex is seen anteroinferiorly

(B) The EAM is entirely bony in adults; the tympanic membrane is vertical and has no landmarks in children

(C) The EAM has a cartilaginous outer third and a bony inner two-thirds in adults; the tympanic membrane lies at a 55° angle to the floor of the canal; its pars flaccida is located superoposteriorly and the light reflex (cone of light) is in the posteroinferior quadrant

(D) The EAM is entirely cartilaginous; the tympanic membrane is formed only by the pars flaccida; the handle of the malleus attaches to its posterior surface

Q30. During submandibular salivary gland excision for a large calculus (sialolithiasis), the surgeon must identify and preserve the lingual nerve to avoid sensory loss to the anterior two-thirds of the tongue. The Wharton's duct and lingual nerve have a characteristic crossing relationship.

Which of the following correctly describes the course of Wharton's duct and its relationship with the lingual nerve?

(A) Wharton's duct runs along the dorsum of the tongue and is crossed superiorly by the hypoglossal nerve; the lingual nerve lies deep to the duct

(B) Wharton's duct runs from the gland superiorly to open at the sublingual papilla beside the frenulum of the tongue; it does not cross the lingual nerve

(C) The duct opens into the parotid papilla opposite the upper 2nd molar tooth; the lingual nerve winds around it once

(D) Wharton's duct (submandibular duct) runs forward on the floor of the mouth between the mylohyoid and hyoglossus muscles, opening at the sublingual papilla (beside the frenulum); the lingual nerve winds around the duct twice (first lateral, then medial, then lateral again — "below, around, and above")

Q31. A 45-year-old man sustains a closed head injury and develops severe anterograde amnesia — he cannot form new long-term memories. MRI reveals bilateral damage to a seahorse-shaped cortical structure in the medial temporal lobe. He also shows emotional blunting and loss of fear responses.

Which combination of structures forms the core of the limbic system, and what are their respective functions?

(A) The putamen and caudate nucleus form the limbic system, primarily regulating motor control

(B) The hippocampus, hypothalamus, and substantia nigra together form the limbic system; the substantia nigra mediates memory consolidation

(C) The hippocampus (memory consolidation and spatial navigation), amygdala (emotional processing, fear, aggression), and cingulate gyrus (attention, emotion regulation) are core limbic components; the fornix connects hippocampus to the mammillary bodies

(D) The thalamus and basal ganglia form the limbic system, mediating emotion and memory directly

Q32. A 30-year-old woman with refractory epilepsy undergoes corpus callosotomy (surgical division of the corpus callosum) to prevent spread of seizures between hemispheres. Post-operatively, she displays 'split-brain' phenomena. An anatomy student is asked to identify the parts of the corpus callosum on a sagittal MRI.

Which of the following correctly lists the parts of the corpus callosum from anterior to posterior, and describes the type of fibres it carries?

(A) Genu → splenium → body → rostrum; it carries projection fibres connecting cortex to thalamus

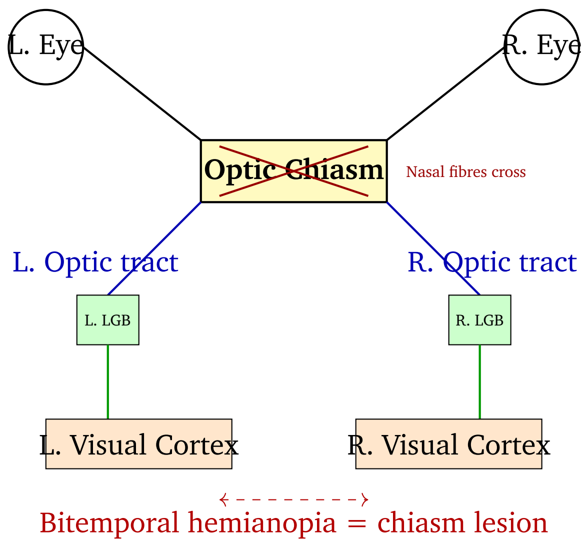
(B) Rostrum → genu → body → splenium (anterior to posterior); the corpus callosum carries commissural fibres connecting homotopic areas of the two cerebral hemispheres; the genu connects prefrontal areas and the splenium connects posterior parieto-occipital areas

(C) The corpus callosum has only two parts (genu and splenium) and carries association fibres within the same hemisphere

(D) Body → genu → splenium → rostrum; it carries both commissural and projection fibres

Q33. A 45-year-old woman presents with progressive visual loss affecting both temporal visual fields (bitemporal hemianopia), like wearing blinkers. MRI brain shows a large pituitary macroadenoma compressing the optic chiasm from below.

The following diagram shows the visual pathway:



Which of the following correctly explains why a pituitary tumour compressing the optic chiasm causes bitemporal hemianopia?

(A) The nasal (medial) retinal fibres from both eyes cross at the optic chiasm; nasal retinal fibres carry temporal visual field information; a chiasm lesion destroys both sets of crossing nasal fibres, causing loss of both temporal fields (bitemporal hemianopia)

(B) The temporal retinal fibres from both eyes cross at the chiasm; temporal fibres carry nasal field information; a chiasm lesion destroys temporal fibres causing nasal field loss

(C) The chiasm lesion destroys uncrossed temporal fibres, causing ipsilateral nasal hemianopia on both sides

(D) A pituitary tumour compresses the optic tract rather than the chiasm, causing homonymous hemianopia contralateral to the lesion

Q34. A 60-year-old man with a stroke involving the posterior thalamus develops a right homonymous hemianopia with macular sparing. A neuroradiology fellow explains that the lateral geniculate body (LGB) is the thalamic relay nucleus for the visual pathway.

Which of the following correctly identifies the location and function of the lateral geniculate body?

(A) The LGB is located in the brainstem (midbrain) and serves as a relay for auditory information before projecting to the primary auditory cortex

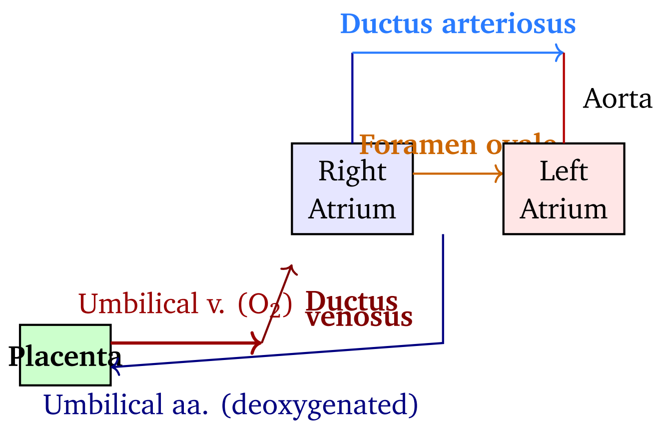
(B) The LGB is located in the pulvinar of the thalamus and relays somatosensory information from the spinothalamic tract

(C) The LGB is part of the basal ganglia and relays motor commands from the cortex to the spinal cord via the internal capsule

(D) The LGB is a metathalamic nucleus (part of the posterior thalamus) that receives fibres from the optic tract and projects via the optic radiation to the primary visual cortex (V1) in the calcarine sulcus of the occipital lobe

Q35. A neonatologist is managing a premature infant born at 28 weeks who fails to close the ductus arteriosus despite indomethacin treatment. She explains the three key fetal shunts that normally close at or after birth.

The following diagram shows the fetal circulation:



Which of the following correctly matches the three fetal shunts with their postnatal remnants?

(A) Ductus arteriosus → ligamentum teres hepatis; foramen ovale → fossa ovalis; ductus venosus → ligamentum venosum

(B) Ductus arteriosus → ligamentum arteriosum; foramen ovale → fossa ovalis; ductus venosus → ligamentum venosum

(C) Ductus venosus → ligamentum arteriosum; ductus arteriosus → ligamentum teres; foramen ovale → oblique vein of left atrium

(D) Ductus arteriosus → ligamentum teres hepatis; ductus venosus → fossa ovalis; foramen ovale → ligamentum venosum

Q36. A developmental biologist is studying a mouse mutant in which the apical ectodermal ridge (AER) is prematurely removed at an early embryonic stage. The limb is truncated and only proximal elements (the stylopod: humerus/femur) form. When the AER is removed later, more distal elements develop.

Which of the following correctly describes the roles of the Apical Ectodermal Ridge (AER) and Zone of Polarizing Activity (ZPA) in limb development?

(A) The AER controls anterior-posterior (thumb–little finger) patterning via BMP signalling; the ZPA controls proximal-distal limb elongation via Wnt signalling

(B) The AER and ZPA both produce FGFs to direct dorsal-ventral patterning of the limb bud; the ZPA is located at the anterior margin of the limb bud

(C) The AER (a ridge of ectoderm at the distal limb bud tip) maintains the underlying progress zone and promotes proximal-to-distal limb outgrowth via FGFs; the ZPA (posterior mesenchyme) controls anterior-posterior (pre-axial to post-axial) digit patterning via Sonic Hedgehog (SHH) signalling

(D) The AER controls dorsal-ventral patterning via Wnt7a; the ZPA is located at the dorsal ectoderm and patterns the proximal-distal axis

Q37. A newborn is noted to have a unilateral cleft lip affecting the left side, extending into the nostril but not the palate. The paediatric surgeon explains that cleft lip results from failure of fusion between specific facial processes during the 4th–8th weeks of embryonic development.

Which facial processes fail to fuse in unilateral cleft lip?

(A) Failure of fusion between the two mandibular processes at the midline

(B) Failure of fusion between the maxillary process and the lateral nasal process on the ipsilateral side

(C) Failure of fusion between the medial nasal processes of both sides (bilateral)

(D) Failure of fusion between the maxillary process and the medial nasal process on the ipsilateral side; the intermaxillary segment (formed by medial nasal processes) fails to merge with the maxillary process, leaving a cleft at the philtrum-alar junction

Q38. A 25-year-old athlete undergoes arthroscopy for a suspected cartilage tear. The surgeon takes biopsies from the articular surface (hyaline cartilage) and the intervertebral disc (fibrocartilage). A pathologist reviews the slides.

Which of the following correctly compares the three types of cartilage?

(A) Hyaline cartilage contains type II collagen in an amorphous matrix; chondrocytes sit in lacunae; it is avascular; fibrocartilage (intervertebral discs, menisci, pubic symphysis) contains type I collagen and withstands compressive and tensile forces; elastic cartilage (auricle, epiglottis) contains elastin and is the most flexible

(B) Hyaline cartilage contains type I collagen and is found in tendons; fibrocartilage contains type II collagen and is found on articular surfaces; elastic cartilage has no collagen

(C) All three cartilage types contain type I collagen; elastic cartilage is found in the tracheal rings; fibrocartilage is found in the auricle of the ear

(D) Hyaline cartilage contains type III collagen; fibrocartilage contains type II collagen; elastic cartilage contains type IV collagen found in the epiphyseal plate

Q39. A premature infant born at 28 weeks develops respiratory distress syndrome (RDS) due to surfactant deficiency. The neonatologist administers exogenous surfactant and explains that type II pneumocytes are responsible for surfactant production and lung repair after injury.

Which of the following correctly distinguishes type I and type II pneumocytes?

(A) Type I pneumocytes are cuboidal cells covering 60% of the alveolar surface and produce surfactant; type II pneumocytes are flat and form the diffusion barrier

(B) Type I and type II pneumocytes both produce surfactant; type I cells are more numerous and undergo mitotic division after injury

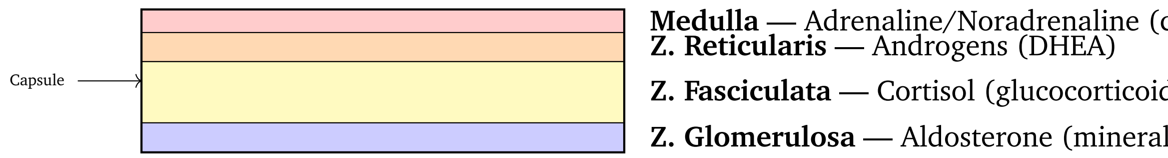
(C) Type I pneumocytes are extremely thin, flat cells covering approximately 95% of the alveolar surface area, forming the thin diffusion barrier (gas exchange); type II pneumocytes are cuboidal, cover about 5% of the surface, produce surfactant (phosphatidylcholine), and are progenitor cells that regenerate alveolar epithelium after injury

(D) Type II pneumocytes are thin squamous cells that form the blood-gas barrier; type I pneumocytes are granular cells containing lamellar bodies that produce surfactant

Q40. A 35-year-old woman presents with a cushingoid appearance (moon face, buffalo hump, purple striae, and hypertension). Biochemistry shows elevated 24-hour urinary free cortisol. CT abdomen reveals a 3 cm adrenal mass.

The following diagram shows the zones of the adrenal gland:

Adrenal Gland (cross-section)



Mnemonic: GFR = Glomerulosa (outside) → Fasciculata → Reticularis → Medulla (inside)

From which zone of the adrenal cortex does cortisol hypersecretion arise in Cushing's syndrome, and what is the correct order of cortical zones from capsule to medulla?

(A) Zona glomerulosa (outermost) → zona reticularis → zona fasciculata → medulla; cortisol is produced in the glomerulosa

(B) Zona glomerulosa (outermost) → zona fasciculata → zona reticularis → medulla; cortisol is produced in the zona fasciculata (the largest zone), and is the source of hypercortisolism in Cushing's syndrome

(C) Zona fasciculata (outermost) → zona glomerulosa → zona reticularis → medulla; cortisol is produced in the zona glomerulosa

(D) Zona reticularis (outermost) → zona fasciculata → zona glomerulosa → medulla; cortisol is produced in the zona reticularis

Detailed Solutions

Q1.

Solution

Concept — Sesamoid bones: Sesamoid bones are small bones that develop within tendons subjected to mechanical stress (friction and compression). They protect the tendon, reduce wear, and alter the direction or angle of the tendon's pull, thereby increasing its mechanical advantage.

Step 1 — Definition and examples: A sesamoid bone forms within the substance of a tendon (not within a joint capsule). The patella is the largest sesamoid bone in the body, developing within the quadriceps femoris tendon. Other examples include the two sesamoid bones under the 1st metatarsophalangeal joint and the pisiform (a sesamoid within the flexor carpi ulnaris tendon).

Step 2 — Function: By changing the angle of approach of the tendon to its insertion, sesamoid bones increase the mechanical advantage (moment arm) of the muscle. They also protect the tendon from compressive forces against bony prominences.

Why other options are wrong:

- Option A: Sesamoid bones do not necessarily ossify from a secondary epiphysis; they are intramembranous ossifications within tendons.
- Option B: Sesamoid bones develop within tendons, not joint capsules; their function is to alter tendon mechanics, not primarily to distribute load within joints.
- Option D: Sesamoid bones are not connected to adjacent bones by synovial joints (though the patella has a synovial joint surface with the femur, the defining feature is their location within tendons).

Final Answer: Sesamoid bones develop within tendons at points of friction and change the angle of pull of the tendon $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 1

Q2.

Solution

Concept — Accessory muscles and anatomical variations: Accessory muscles are supernumerary muscle slips that occur as normal anatomical variants. Their recognition is clinically important in surgery.

Step 1 — Clinical significance: Accessory muscles such as the axillary arch (Langer's arch) can mimic pathological masses (e.g., lymphoma, lipoma) in the axilla. They may also compress adjacent neurovascular structures (brachial plexus, axillary vessels) causing thoracic outlet-like symptoms. Most importantly, they complicate surgical dissection as the surgeon may inadvertently injure the muscle, confuse it with fascia, or miss underlying structures.

Step 2 — Examples: The axillary arch (present in up to 7% of individuals) runs from the latissimus dorsi to the pectoralis major or coracobrachialis. It may compress the brachial plexus. An accessory soleus, accessory peroneus quartus, and palmaris longus are other common variants.

Why other options are wrong:

- Option B: Accessory muscles do not invariably cause motor deficits; compression is variable and often asymptomatic.
- Option C: Asymptomatic accessory muscles do not require resection; surgical removal is only indicated if they cause compression symptoms.
- Option D: Accessory muscles can indeed have functional significance; the axillary arch can adduct the arm and contribute to compression neuropathies.

Final Answer: Accessory muscles can mimic masses, cause neurovascular compression, and complicate surgical dissection $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 2

Q3.

Solution

Concept — Axillary vein formation: The axillary vein is the main venous drainage of the upper limb. Knowledge of its formation is essential for axillary surgery and central venous access.

Step 1 — Formation: At the lower border of teres major, the basilic vein (which has already been joined by the brachial venae comitantes at the mid-arm) continues as the axillary vein. The two venae comitantes of the brachial artery join the basilic vein at approximately this level to form the axillary vein. The cephalic vein joins the axillary vein superiorly (in the deltopectoral groove, draining into the axillary vein below the clavicle through the clavipectoral fascia).

Step 2 — Termination: The axillary vein ends at the outer border of the 1st rib where it becomes the subclavian vein.

Why other options are wrong:

- Option A: The axillary vein is not formed by the basilic and cephalic veins joining at pectoralis minor; the cephalic drains into the axillary but does not form it.
- Option B: The two brachial venae comitantes alone do not form the axillary vein; the basilic vein is the primary contributor.
- Option C: The cephalic vein drains into the axillary vein superiorly (above pectoralis minor) and does not contribute to its formation at the lower border of teres major.

Final Answer: The axillary vein is formed by the union of the basilic vein (continuing as the brachial vein) and the venae comitantes at the lower border of teres major $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 3

Q4.

Solution

Concept — Sentinel lymph node biopsy (SLNB): The sentinel node concept revolutionised oncological surgery by allowing staging of nodal involvement without full nodal clearance.

Step 1 — Definition: The sentinel lymph node is the first node(s) in the regional lymphatic basin to receive lymph from the primary tumour. It is identified intraoperatively using radioactive colloid (technetium-99m) and/or blue dye injected around the tumour. If the sentinel node is histologically negative, the remaining regional nodes are very likely to be negative, sparing the patient from axillary clearance.

Step 2 — Clinical significance: SLNB reduces the risk of lymphoedema, sensory loss, and shoulder dysfunction compared with full axillary node dissection.

Why other options are wrong:

- Option A: The sentinel node is the first-echelon node, not necessarily the largest.

- Option C: The sentinel node is identified by tracer uptake, not anatomical position alone; it is not always in the central group.
- Option D: There may be more than one sentinel node (often 2–3); a negative result predicts nodal status but the concept is about the first node draining the tumour.

Final Answer: The sentinel lymph node is the first node receiving drainage from the primary tumour; its status predicts regional nodal involvement $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 4

Q5.

Solution

Concept — Colles' fascia and urinary extravasation: Understanding the attachments of the superficial perineal fascia (Colles' fascia) explains why urethral injury extravasation spreads in specific directions.

Step 1 — Colles' fascia attachments: Colles' fascia (the membranous layer of the superficial fascia of the perineum) is attached posteriorly to the perineal body and the posterior edge of the perineal membrane (urogenital diaphragm). Laterally, it is attached to the ischiopubic rami. Its anterior continuation is Scarpa's fascia of the anterior abdominal wall. Because it is attached to the ischiopubic rami laterally and the perineal membrane posteriorly, urine from a ruptured urethra (below the perineal membrane) can track anteriorly into the scrotum, penis, and up into the anterior abdominal wall (under Scarpa's fascia) but CANNOT spread to the thigh (because Colles' fascia fuses with the fascia lata of the thigh just below the inguinal ligament).

Step 2 — Superficial vs deep fascia: Camper's fascia is the fatty superficial layer; Scarpa's fascia is the membranous deep layer of the anterior abdominal wall. Colles' fascia is the perineal equivalent of Scarpa's fascia.

Why other options are wrong:

- Option A: Buck's fascia is the deep fascia of the penis; it does not form the boundary that limits thigh spread.
- Option B: Camper's fascia is the fatty layer of the abdominal wall; it is not a membranous layer and does not limit perineal spread.
- Option D: The deep perineal fascia (Gallaudet's fascia) covers the ischiocavernosus and bulbospongiosus; it is not the layer continuous with Scarpa's fascia.

Final Answer: Colles' fascia (superficial perineal fascia) is continuous with Scarpa's fascia and its attachments prevent urinary extravasation from reaching the thigh $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 5

Q6.

Solution

Concept — Axilla: apex and clavipectoral fascia: The axilla is a pyramidal space through which the neurovascular bundle passes between the neck and the upper limb.

Step 1 — Apex (cervicoaxillary canal): The apex of the axilla is the cervicoaxillary canal, bounded by the clavicle (anteriorly), the 1st rib (medially), and the superior border of the scapula (posteriorly). The axillary vessels and brachial plexus pass through this canal.

Step 2 — Clavipectoral fascia: This fascia spans from the clavicle to the floor of the axilla. It invests the subclavius and pectoralis minor muscles. Its upper part (costocoracoid membrane) is pierced by the cephalic vein, lateral pectoral nerve, and thoracoacromial vessels. The sheath of the axillary vessels is derived from the prevertebral fascia and is separate.

Why other options are wrong:

- Option B: The apex is NOT bounded by the coracoid process; it is bounded by the clavicle, 1st rib, and scapula (superior border). The axillary fascia is the base, not the apex.
- Option C: The space between pectoralis minor and the chest wall is the anterior wall, not the apex.
- Option D: The pectoralis major does not form the apex; the cephalic vein pierces the clavipectoral fascia, not the apex.

Final Answer: The apex is the cervicoaxillary canal (clavicle, 1st rib, scapula); clavipectoral fascia invests the axillary vessels as they pass through it $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 6

Q7.

Solution

Concept — Clavicle fracture at the junction of middle and lateral third: The clavicle is the most commonly fractured bone in the body. The junction of the middle and lateral third is the commonest site of fracture.

Step 1 — Anatomy at the fracture site: The subclavian artery and vein pass posterior to the clavicle (behind the medial end, between the clavicle and the 1st rib). The brachial plexus trunks lie posterior to the subclavian artery. At the junction of the middle and lateral thirds of the clavicle, both structures are in close proximity. Posterior displacement of the lateral fragment can lacerate or compress the subclavian vessels and brachial plexus trunks.

Step 2 — Deformity: The medial fragment is pulled superiorly (sternocleidomastoid); the lateral fragment is pulled inferiorly and medially (weight of the arm and pectoralis major). Neurovascular injury is a rare but serious complication, more likely with posteriorly angulated or severely displaced fractures.

Why other options are wrong:

- Option A: The internal jugular vein lies medially; it is not immediately posterior to the clavicle at this fracture site.
- Option B: The thoracic duct is on the left side at the root of the neck; it is not immediately posterior to the right clavicle.
- Option C: The brachial plexus roots (C5, C6) emerge between scalene muscles more medially; at the junction of middle and lateral thirds, the trunks (not roots) may be at risk, along with the subclavian vessels.

Final Answer: The subclavian artery and vein (and brachial plexus trunks) lie immediately posterior to the clavicle at this fracture site and are at greatest risk $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 7

Q8.

Solution

Concept — Shoulder dislocation and axillary nerve injury: Anterior shoulder dislocation is the most common type, and the axillary nerve is the most commonly injured nerve.

Step 1 — Axillary nerve: The axillary nerve (C5, C6) arises from the posterior cord of the brachial plexus. It passes through the quadrilateral (quadrangular) space along with the posterior circumflex humeral artery. The boundaries of the quadrilateral space are: superiorly—teres minor and subscapularis; inferiorly—teres major; medially—long head of triceps; laterally—surgical neck of the humerus.

Step 2 — Clinical features: The axillary nerve supplies the deltoid (abduction) and teres minor (lateral rotation) muscles, and the skin over the regimental badge area (lateral deltoid via the superior lateral cutaneous nerve of the arm). Injury produces inability to abduct the shoulder beyond 15 degrees (after supraspinatus initiates) and a patch of anaesthesia over the lateral deltoid.

Why other options are wrong:

- Option A: The suprascapular nerve (C5, C6) supplies supraspinatus and infraspinatus; damage causes difficulty initiating abduction and weak lateral rotation, but NOT the lateral deltoid numbness (regimental badge area).
- Option C: The radial nerve is damaged in humeral shaft fractures (spiral groove); it does not cause shoulder dislocation symptoms.
- Option D: The musculocutaneous nerve pierces coracobrachialis and supplies elbow flexors; it is not related to quadrilateral space or shoulder dislocation.

Final Answer: The axillary nerve (C5, C6) passes through the quadrilateral space and is damaged in anterior shoulder dislocation $\Rightarrow \boxed{B}$

Answer: (B) **Go Back to Q 8**

Q9.

Solution

Concept — Flexor digitorum superficialis (FDS) testing: FDS and FDP both flex the fingers, but FDS acts on the PIP joint while FDP acts on both PIP and DIP joints.

Step 1 — Anatomy: FDS arises from the medial epicondyle (humeral head), the oblique line of the radius (radial head), and the ulna (ulnar head). It inserts as two slips into the sides of the middle phalanx (after splitting to allow FDP to pass through — Camper's chiasm). FDS flexes the PIP joint independently.

Step 2 — Unique testing: FDP has a common muscle belly for the middle, ring, and little fingers. Holding the adjacent fingers in full extension creates tethering of the FDP via the common belly, preventing it from contracting in the finger being tested. In this position, if the patient can flex the PIP joint, FDS is intact in that finger. This test demonstrates FDS function independently of FDP.

Why other options are wrong:

- Option A: FDS inserts into the middle phalanx and primarily flexes the PIP joint, not the MCP joint.
- Option B: Grip testing assesses overall flexor strength; it does not isolate FDS from FDP.
- Option D: FDS does not flex the DIP joint; the DIP joint is flexed by FDP only. Blocking the DIP does not isolate FDS.

Final Answer: Hold all other fingers in extension (blocking FDP via common belly); ability to flex the PIP joint in the tested finger confirms FDS integrity $\Rightarrow \boxed{C}$

Answer: (C) Go Back to Q 9

Q10.

Solution

Concept — Cubital tunnel syndrome (ulnar nerve at the medial epicondyle): Cubital tunnel syndrome is the second most common nerve entrapment syndrome in the upper limb.

Step 1 — Anatomy: The ulnar nerve passes behind the medial epicondyle in the cubital tunnel (formed by the aponeurotic arch connecting the two heads of flexor carpi ulnaris). On flexion, the volume of the cubital tunnel decreases by up to 55%, increasing pressure on the nerve. The nerve supplies intrinsic hand muscles (hypothenar, interossei, medial two lumbricals) and sensation to the little and medial half of the ring finger (both sides) and the medial palm.

Step 2 — Clinical features: Tingling in the little and medial ring finger, worse with elbow flexion or sustained pressure on the medial elbow. Positive Tinel's sign (tingling reproduced by tapping the ulnar nerve at the medial epicondyle). Late: clawing of the ring and little fingers (ulnar claw).

Why other options are wrong:

- Option B: The median nerve passes through the cubital fossa medial to the brachial artery and then between the heads of pronator teres; it does not pass behind the medial epicondyle.
- Option C: The radial nerve winds around the humerus in the spiral (radial) groove on the posterior surface, not behind the medial epicondyle.
- Option D: The anterior interosseous nerve (AIN) is a branch of the median nerve; it does not pass behind the medial epicondyle.

Final Answer: The ulnar nerve passes behind the medial epicondyle in the cubital tunnel; elbow flexion tightens the tunnel causing ulnar nerve compression $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 10

Q11.

Solution

Concept — Adductor (Hunter's) canal: The adductor canal is a musculoaponeurotic tunnel in the middle third of the thigh that transmits the femoral vessels from the femoral triangle to the popliteal fossa.

Step 1 — Boundaries: The adductor canal is bounded by: anterolateral wall — vastus medialis; posteromedial wall — adductor longus (upper part) and adductor magnus (lower part); roof (anterior) — sartorius (forms a fibrous roof together with the subsartorial fascia).

Step 2 — Contents: The canal transmits the femoral artery, femoral vein (posterior to artery), saphenous nerve (branch of femoral nerve, exits through the subsartorial fascia to descend with the great saphenous vein), and the nerve to vastus medialis. The femoral nerve itself does not enter the canal; it divides into its terminal branches in the femoral triangle.

Why other options are wrong:

- Option A: The femoral nerve does not pass through the adductor canal; it supplies the anterior thigh muscles from the femoral triangle.

- Option B: The obturator nerve does not pass through the adductor canal; it passes through the obturator foramen.
- Option C: "Superficial femoral nerve only" is incorrect; the saphenous nerve (not the entire femoral nerve) passes through. The nerve to vastus medialis also enters.

Final Answer: The adductor canal is bounded by sartorius (roof), vastus medialis (anterolateral), and adductor longus/magnus (posteromedial); it contains femoral artery, vein, saphenous nerve, and nerve to vastus medialis $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 11

Q12.

Solution

Concept — Deltoid (medial collateral) ligament of the ankle: The deltoid ligament resists eversion of the foot, and its strength explains why eversion sprains are less common.

Step 1 — Structure: The deltoid ligament is a strong, triangular (fan-shaped) ligament arising from the medial malleolus. It has superficial and deep components. The superficial part attaches to the navicular (tibiocalcaneonavicular ligament), sustentaculum tali of the calcaneus, and talus. The deep part (tibiotalar) attaches to the medial surface of the talus. Collectively it is very strong.

Step 2 — Clinical relevance: Because the deltoid ligament is much stronger than the lateral ligament complex (anterior talofibular, calcaneofibular, posterior talofibular ligaments), eversion sprains are far less common. Forced eversion is more likely to avulse the medial malleolus (fracture) before tearing the deltoid ligament. The common inversion sprain tears the anterior talofibular ligament first.

Why other options are wrong:

- Option A: The deltoid ligament arises from the medial malleolus (not lateral malleolus) and is not the weakest ankle ligament.
- Option B: Eversion injuries are less common (not more common) due to the strength of the deltoid ligament.
- Option D: The deltoid ligament is not a single band; it is a complex, multi-component ligament. The anterior talofibular ligament is most commonly torn in inversion (not eversion) injury.

Final Answer: The deltoid ligament is a strong, fan-shaped ligament from the medial malleolus; eversion sprains are less common because the deltoid ligament is very strong $\Rightarrow \boxed{C}$

Answer: (C) Go Back to Q 12

Q13.

Solution

Concept — Plantar fascia anatomy and plantar fasciitis: Plantar fasciitis is the most common cause of heel pain; understanding the anatomy explains the pathology and clinical tests.

Step 1 — Anatomy: The plantar fascia (plantar aponeurosis) is a thick band of dense connective tissue that arises from the medial process of the calcaneal tuberosity (the anteromedial part of the inferior calcaneal surface). It fans out distally to form five digital slips that insert into the bases of the proximal phalanges, flexor tendon sheaths, and deep transverse metatarsal ligaments.

Step 2 — Windlass mechanism: Dorsiflexion of the toes winds the plantar fascia around the metatarsal heads (like a windlass winding a rope), tensioning the aponeurosis and raising the medial longitudinal arch. This tightening is reproduced during the windlass test (passive dorsiflexion of the great toe), which reproduces heel pain in plantar fasciitis.

Step 3 — Pathology: Plantar fasciitis results from microtears and degenerative changes at the proximal attachment (medial calcaneal tuberosity), exacerbated by obesity, prolonged standing, and reduced ankle dorsiflexion.

Why other options are wrong:

- Option A: The plantar fascia arises from the medial calcaneal tuberosity, not the anterior calcaneal process; it inserts into the proximal phalanges (not metatarsal heads).
- Option C: The plantar fascia is not a synovial membrane; it is dense connective tissue.
- Option D: The plantar fascia does not arise from the sustentaculum tali; it arises from the medial calcaneal tuberosity.

Final Answer: The plantar fascia arises from the medial process of the calcaneal tuberosity and the windlass mechanism tightens it on toe dorsiflexion $\Rightarrow \boxed{B}$

Answer: (B) Go Back to Q 13

Q14.

Solution

Concept — Great (long) saphenous vein course: The great saphenous vein is the longest vein in the body and is important in varicose vein surgery and coronary artery bypass grafting.

Step 1 — Origin and course: The great saphenous vein begins at the medial end of the dorsal venous arch of the foot. It passes anterior to the medial malleolus (an important landmark) and ascends along the medial aspect of the leg. At the knee, it passes a hand's breadth posterior to the medial aspect of the patella. In the thigh, it ascends along the medial aspect to reach the saphenous opening (fossa ovalis) in the deep fascia about 3–4 cm inferolateral to the pubic tubercle, where it pierces the cribriform fascia to drain into the femoral vein.

Step 2 — Clinical relevance: Its superficial course (anterior to medial malleolus) makes it accessible for cutdown, cannulation, and CABG harvesting. Incompetent perforating veins between the superficial and deep systems cause varicosities.

Why other options are wrong:

- Option B: This describes the small (short) saphenous vein, which begins behind the lateral malleolus and drains into the popliteal vein.
- Option C: The great saphenous vein passes anterior to (not posterior to) the medial malleolus and does not drain into the external iliac vein.
- Option D: The great saphenous vein drains into the femoral vein at the saphenous opening, not into the deep femoral vein.

Final Answer: The great saphenous vein begins at the dorsal venous arch, passes anterior to the medial malleolus, and drains into the femoral vein at the saphenous opening $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 14

Q15.

Solution

Concept — Tibial nerve in the popliteal fossa and tarsal tunnel syndrome: The tibial nerve is the larger terminal branch of the sciatic nerve; its compression in the tarsal tunnel mirrors carpal tunnel syndrome at the wrist.

Step 1 — Course in popliteal fossa: The sciatic nerve typically divides into the tibial and common fibular (peroneal) nerves at the apex of the popliteal fossa (or higher in the thigh). The tibial nerve descends through the popliteal fossa in the midline, deep to the popliteal vessels (tibial nerve is most superficial in the popliteal fossa, lateral to the vessels superiorly, crossing to lie medial inferiorly). It then passes deep to the soleus to enter the posterior compartment of the leg.

Step 2 — Tarsal tunnel: The tarsal tunnel is formed by the flexor retinaculum (laciniate ligament) spanning from the medial malleolus to the calcaneus. Through this tunnel pass (mnemonic: Tom, Dick ANd Harry Nerve): Tibialis posterior tendon, flexor Digitorum longus tendon, posterior tibial Artery and veins, tibial Nerve, flexor Hallucis longus tendon. Compression causes medial heel and plantar foot burning/tingling (tarsal tunnel syndrome).

Why other options are wrong:

- Option A: The common fibular nerve descends laterally through the popliteal fossa and winds around the fibular neck; it does not pass posterior to the medial malleolus.
- Option B: The sural nerve is formed in the popliteal fossa but supplies the lateral foot and heel; it does not pass through the tarsal tunnel.
- Option C: The saphenous nerve is a branch of the femoral nerve; it does not pass through the popliteal fossa or the tarsal tunnel.

Final Answer: The tibial nerve descends through the popliteal fossa and passes posterior to the medial malleolus in the tarsal tunnel $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 15

Q16.

Solution

Concept — Intercostal neurovascular bundle and pleural tap: The intercostal neurovascular bundle (vein, artery, nerve from above downward — VAN) lies in the costal groove along the inferior border of the rib above.

Step 1 — Position of VAN: The intercostal vein, artery, and nerve run in the costal groove on the inferior border of each rib (between the internal intercostal and innermost intercostal muscles). The order from superior to inferior within the groove is: Vein (most superior), Artery, Nerve (most inferior). A collateral branch runs along the superior border of the rib below.

Step 2 — Safe needle placement: To perform a pleural tap safely and avoid damaging the neurovascular bundle, the needle is inserted just superior to the upper border of the lower rib (i.e., at the inferior margin of the intercostal space).

This avoids the VAN bundle tucked against the inferior border of the upper rib, while the collateral branch along the superior border of the lower rib is smaller and less significant.

Step 3 — Preferred site: Thoracocentesis is typically performed in the 5th, 6th, or 7th intercostal spaces in the midaxillary or posterior axillary line (to access the costodiaphragmatic recess where fluid collects).

Why other options are wrong:

- Option A: The neurovascular bundle does NOT run in the centre of the intercostal space; it runs along the inferior border of the upper rib.
- Option B: Inserting just below the upper rib risks injuring the intercostal vessels (artery and vein), causing haemothorax.
- Option D: The correct description should be "just above the upper border of the lower rib" not "at the inferior border of the upper rib" for the needle entry point; the posterior axillary line is a correct site but the border described is wrong.

Final Answer: The needle for pleural tap is inserted just above the upper border of the lower rib to avoid the neurovascular bundle on the inferior border of the upper rib $\Rightarrow \boxed{C}$

Answer: (C) Go Back to Q 16

Q17.

Solution

Concept — SVC formation and SVC syndrome: SVC syndrome results from obstruction of superior venous return, most commonly by bronchogenic carcinoma or mediastinal masses.

Step 1 — Formation of SVC: The SVC is formed by the union of the right and left brachiocephalic (innominate) veins posterior to the right 1st costal cartilage (at the level of the right 1st costal cartilage). The SVC descends to drain into the right atrium at the level of the right 3rd costal cartilage. The azygos vein arches over the right lung root to drain into the SVC at the level of T4 (sternal angle).

Step 2 — SVC syndrome: Obstruction causes raised venous pressure in the upper body: facial oedema (periorbital), oedema and cyanosis of the head, neck, and upper limbs; distended, non-pulsatile neck veins; dilated collateral veins on the chest wall; headache; confusion; and respiratory compromise.

Why other options are wrong:

- Option B: The SVC is formed by brachiocephalic veins (not subclavian veins alone); SVC syndrome causes upper body (not lower limb) oedema.
- Option C: The SVC is not formed by the right brachiocephalic vein and azygos vein; the SVC drains into the right atrium, not the left atrium.
- Option D: The SVC is not formed by internal jugular veins at the midline; femoral vein thrombosis causes lower limb DVT, not SVC syndrome.

Final Answer: The SVC is formed by the union of right and left brachiocephalic veins at the right 1st costal cartilage; SVC syndrome causes facial oedema and dilated neck and chest wall veins $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 17

Q18.

Solution

Concept — Lung root (hilum) structures and arrangement: The arrangement of structures at the lung root differs between the right and left sides, particularly the relationship of the pulmonary artery to the bronchus.

Step 1 — Left lung root arrangement (anterior to posterior): Pulmonary veins (two, upper and lower, most anterior and inferior) — Pulmonary artery (superior) — Bronchus (most posterior). From superior to inferior at the left root: The pulmonary artery is the most superior structure (arching over the left main bronchus before dividing), the bronchus lies behind the artery, and the veins are anterior and inferior.

Step 2 — Key difference LEFT vs RIGHT: On the left, the upper lobe bronchus arises superior to the pulmonary artery (eparterial on the left). On the right, the upper lobe bronchus (eparterial bronchus) arises above the pulmonary artery. Mnemonic RALS: on the right, from anterior to posterior at the root: (R)ight pulmonary veins–(A)rtery–(L)ower lobe bronchus–(S)uperior (upper) bronchus (eparterial above). On the left: veins (anterior/inferior), artery (superior), bronchus (posterior).

Why other options are wrong:

- Option A: The bronchus is the most posterior structure at the lung root, not the most anterior; this ordering is reversed.
- Option C: Pulmonary veins are anterior and inferior, not the most posterior structure; the artery is not anterior to the bronchus on the left.

- Option D: On the left, the bronchus is posterior to the pulmonary artery (not anterior); the right lung root arrangement has the upper lobe bronchus eparterial, but the artery is still anterior to the bronchus.

Final Answer: At the left lung root: pulmonary artery is most superior, veins are anterior and inferior, bronchus is posterior; the left upper lobe bronchus is superior to the artery (eparterial) $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 18

Q19.

Solution

Concept — Phrenic nerve: origin, course, and referred pain: The phrenic nerve is the sole motor supply to the diaphragm. Its sensory component mediates referred shoulder tip pain from diaphragmatic irritation.

Step 1 — Origin: The phrenic nerve arises mainly from C4, with contributions from C3 and C5. Mnemonic: "C3, C4, C5 keeps the diaphragm alive." It originates in the neck from the anterior rami of C3, C4, C5.

Step 2 — Course: Both phrenic nerves descend along the anterior surface of scalenus anterior (under the prevertebral fascia). They enter the thorax by passing anterior to the subclavian artery (between the subclavian artery and vein). In the thorax, both phrenic nerves run anterior to the lung root (hilum) on their respective sides, alongside the fibrous pericardium.

Step 3 — Function and referred pain: Motor: sole motor supply to the diaphragm. Sensory: central diaphragm (C4 dermatome), pericardium, and mediastinal pleura. Irritation of the diaphragm (e.g., subphrenic abscess, blood from a ruptured spleen) causes referred pain to the shoulder tip (C4 dermatome = tip of the shoulder).

Why other options are wrong:

- Option A: The phrenic nerve arises from C3, C4, C5 (not C4 only); it passes anterior to (not posterior to) the subclavian artery.
- Option B: The phrenic nerve does have a sensory function; denying it is incorrect.
- Option C: The phrenic nerve arises from C3, C4, C5 (not C4, C5, C6); it runs anterior to (not posterior to) the hilum; referred pain is due to C4 dermatome (not T4).

Final Answer: The phrenic nerve arises from C3, C4, C5; runs anterior to the lung root; supplies motor and sensory innervation to the diaphragm; diaphragmatic irritation causes referred pain to the shoulder (C4 dermatome) $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 19

Q20.

Solution

Concept — Costodiaphragmatic recess and pleural effusion: The costodiaphragmatic recess is the dependent part of the pleural cavity where fluid first accumulates.

Step 1 — Anatomy: The pleural cavity has two recesses: (i) the costodiaphragmatic recess (between the costal pleura inferiorly and the diaphragmatic pleura); (ii) the costomediastinal recess (between the costal and mediastinal pleura anteriorly). The costodiaphragmatic recess extends approximately 2 rib levels below the lower border of the lung at full inspiration. Even at maximum inspiration, the lung does not fill the costodiaphragmatic recess completely.

Step 2 — Clinical significance: As the most dependent part of the pleural cavity (gravity-dependent), pleural fluid accumulates here first, causing blunting of the costophrenic angle on chest X-ray (at least 200–300 mL required). This is also the site targeted for pleural tap.

Why other options are wrong:

- Option A: The space between the heart and diaphragm is the pericardiophrenic region, not the costodiaphragmatic recess; pericardial fluid (not pleural fluid) collects here.
- Option B: The space between the two pericardial layers (pericardial cavity) is relevant in cardiac tamponade, not pleural effusion.
- Option D: The costomediastinal recess is between mediastinal and costal pleura, not the costodiaphragmatic recess; it is at the anterior margin (behind the sternum), not the inferior pleural cavity.

Final Answer: The costodiaphragmatic recess is the most inferior part of the pleural cavity between costal and diaphragmatic pleura; it is not occupied by lung at full inspiration and is where pleural fluid first collects $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 20

Q21.

Solution

Concept — Gerota's fascia and perirenal space: Gerota's fascia (renal fascia) encloses the kidney and perinephric fat; its anatomical openings explain the spread of perirenal haematomas and infections.

Step 1 — Structure: Gerota's fascia is a condensation of extraperitoneal connective tissue that encloses both the kidney and the perinephric (perirenal) fat. It has anterior (Gerota's anterior layer) and posterior (Zuckerkandl's fascia) layers that fuse superiorly and laterally around the suprarenal gland and kidney.

Step 2 — Key anatomical point: Gerota's fascia is OPEN inferiorly (the two layers do not fuse below the kidney). This means perinephric haematomas and psoas abscesses can track downward into the pelvis and present as fluctuant swellings. Medially, the fascia fuses around the great vessels, limiting medial spread. Laterally it fuses with the peritoneal fat.

Step 3 — Clinical: In blunt renal trauma, contained haematomas within Gerota's fascia may track inferiorly toward the pelvis or thigh via the open inferior compartment.

Why other options are wrong:

- Option B: The kidney is not enclosed within peritoneum; it is a retroperitoneal organ. Gerota's fascia is not formed by visceral peritoneum.
- Option C: Gerota's fascia has an open inferior compartment (not fused inferiorly), allowing inferior spread of infections/haematomas.
- Option D: Gerota's fascia directly encloses the kidney (within the perinephric fat); it is not found only anterior to the ureter.

Final Answer: The kidney lies within Gerota's fascia, which is open inferiorly allowing perinephric haematoma or pus to track into the pelvis $\Rightarrow \boxed{A}$

$\boxed{\text{Answer: (A)}}$ Go Back to Q 21

Q22.

Solution

Concept — SMA vs IMA territory: Understanding the vascular territories of the mesenteric arteries is critical in bowel ischaemia and colorectal surgery.

Step 1 — SMA territory (midgut): The SMA (arising at L1) supplies the midgut: from the duodenojejunal (DJ) flexure (just distal to the duodenum) to the left colic (splenic) flexure, which is approximately two-thirds along the transverse colon. Structures: jejunum, ileum, caecum, ascending colon, and right two-thirds of the transverse colon.

Step 2 — IMA territory (hindgut): The IMA (arising at L3) supplies the hindgut: from the splenic flexure (left colic flexure) to the upper rectum (rectosigmoid junction). Structures: left one-third of transverse colon, descending colon, sigmoid colon, and upper rectum.

Step 3 — Watershed zones: The splenic flexure (Griffith's point) and the rectosigmoid junction (Sudeck's point) are watershed areas with the poorest collateral supply, making them vulnerable to ischaemia.

Why other options are wrong:

- Option A: The SMA supplies the midgut (not the foregut); the foregut is supplied by the coeliac trunk.
- Option B: The SMA does not extend to the mid-transverse colon arbitrarily; it extends to the left colic (splenic) flexure.
- Option C: The SMA begins at the DJ flexure (not the stomach); the IMA supplies only to the upper rectum, not the entire rectum.

Final Answer: SMA supplies from the DJ flexure to the splenic flexure; IMA supplies from the splenic flexure to the upper rectum; Griffith's point at the splenic flexure is the watershed $\Rightarrow \boxed{D}$

$\boxed{\text{Answer: (D)}}$ Go Back to Q 22

Q23.

Solution

Concept — Appendix blood supply and lymphatic drainage: Knowledge of the appendicular artery's course in the mesoappendix is essential during appendicectomy.

Step 1 — Blood supply: The appendix is supplied by the appendicular artery, which is a branch of the posterior caecal artery (itself a branch of the ileocolic artery, a branch of the SMA). The appendicular artery runs in the free edge of the mesoappendix (the small peritoneal fold attached to the appendix). During appendicectomy, this vessel must be identified, ligated, and divided in the mesoappendix before the appendix is removed.

Step 2 — Lymphatic drainage: Lymphatics of the appendix drain to the ileocolic lymph nodes (along the ileocolic artery), then to the superior mesenteric nodes at the root of the SMA, and ultimately to the cisterna chyli.

Why other options are wrong:

- Option A: The appendix is NOT supplied by the right colic artery; it is supplied by the appendicular artery (from ileocolic). Lymphatics drain to ileocolic nodes (not para-aortic directly).
- Option B: The middle colic artery supplies the transverse colon, not the appendix.
- Option D: The inferior mesenteric artery supplies the hindgut; the appendix (midgut origin) is supplied by the SMA via the ileocolic artery.

Final Answer: The appendix is supplied by the appendicular artery (from ileocolic artery of SMA); lymphatics drain to ileocolic nodes then superior mesenteric nodes $\Rightarrow \boxed{C}$

Answer: (C) Go Back to Q 23

Q24.

Solution

Concept — Abdominal aorta branches in sequence: The abdominal aorta gives both unpaired (visceral) and paired (parietal) branches.

Step 1 — Unpaired visceral branches (anterior):

- Coeliac trunk (T12): supplies the foregut (stomach to proximal duodenum)
- Superior mesenteric artery (L1): supplies midgut (DJ flexure to splenic flex-

ure)
- Inferior mesenteric artery (L3): supplies hindgut

Step 2 — Paired branches (lateral):

- Middle suprarenal arteries (L1): to adrenal glands
- Renal arteries (L1–L2): to kidneys
- Gonadal arteries (testicular/ovarian, L2–L3): to gonads

Step 3 — Parietal branches (posterior): Inferior phrenic arteries (T12), four pairs of lumbar arteries, median sacral artery (at bifurcation L4).

Step 4 — Bifurcation: The aorta bifurcates into the two common iliac arteries at L4 (umbilical level).

Why other options are wrong:

- Option A: The renal arteries arise between the SMA and IMA (at L1–L2), not before the SMA.
- Option C: The SMA arises after the coeliac trunk, not before it.
- Option D: The IMA does not arise before the SMA; the correct order is coeliac $\rightarrow$ SMA $\rightarrow$ IMA.

Final Answer: Correct unpaired sequence: coeliac trunk (T12) $\rightarrow$ SMA (L1) $\rightarrow$ IMA (L3), with paired renal and gonadal arteries arising between the SMA and IMA $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 24

Q25.

Solution

Concept — Psoas major: origin, insertion, and psoas abscess: Psoas major is the primary hip flexor; its fascial sheath provides a conduit for tuberculous abscess from the lumbar spine to the thigh.

Step 1 — Origin and insertion: Psoas major originates from: (i) the lateral surfaces of the bodies of T12–L5 vertebrae and the intervertebral discs between them; (ii) the transverse processes of L1–L5. It descends through the posterior abdominal wall, passes beneath the inguinal ligament (in the muscular lacuna), and inserts via the iliopsoas tendon into the lesser trochanter of the femur. The iliacus muscle (from the iliac fossa) joins psoas major to form the iliopsoas.

Step 2 — Psoas abscess: In spinal tuberculosis (Pott's disease), pus from a vertebral body abscess tracks down within the psoas sheath (the fascial sleeve around psoas major). Because the psoas passes under the inguinal ligament, the abscess presents as a fluctuant, cold (non-tender, non-inflammatory) swelling in the upper medial thigh (femoral triangle region), just lateral to the pubic tubercle and above the lesser trochanter. This is called a pointing psoas abscess.

Why other options are wrong:

- Option B: Psoas major does not originate from the iliac fossa (that is iliacus); it does not insert into the greater trochanter (that is gluteus medius/minimus and some short external rotators).
- Option C: Psoas major originates from the vertebral bodies and transverse processes, not the sacral ala; the gluteal region presentation is for pyriformis abscesses.
- Option D: Psoas major does not insert into the iliac fossa; it inserts into the lesser trochanter via the iliopsoas tendon.

Final Answer: Psoas major originates from T12–L5 vertebral bodies and transverse processes, inserts into the lesser trochanter; a psoas abscess from TB tracks below the inguinal ligament to present in the upper medial thigh $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 25

Q26.

Solution

Concept — Temporomandibular joint (TMJ) disc and movements: The TMJ is a synovial joint that combines hinge (rotation) and gliding (translation) movements facilitated by an articular disc.

Step 1 — Articular disc: The TMJ has a fibrocartilaginous articular disc that divides the joint into two compartments:

- Lower compartment (between disc and mandibular condyle): hinge movement (rotation) — responsible for the first 20–25 mm of mouth opening
- Upper compartment (between disc and articular eminence of temporal bone): gliding movement (translation) — the condyle and disc move forward together over the articular eminence for wider mouth opening

Step 2 — Wide mouth opening: Full mouth opening requires both hinge (rotation in lower compartment) and gliding (translation in upper compartment). The lateral pterygoid muscle pulls the condyle and disc forward during opening.

Step 3 — TMJ dysfunction: Clicking occurs when the disc is displaced anteriorly; it reduces (clicks) as the condyle moves back under the disc during closing.

Why other options are wrong:

- Option A: The TMJ is not a pure hinge joint; it has both rotation and gliding, and the disc divides it into two compartments.
- Option B: Gliding occurs in the UPPER compartment and rotation in the LOWER compartment; these are reversed in this option.
- Option C: The TMJ is a condylar (not saddle) type of synovial joint; the movements are not equal in both compartments.

Final Answer: The articular disc divides the TMJ into upper (gliding/translation) and lower (hinge/rotation) compartments; both are used in wide mouth opening $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 26

Q27.

Solution

Concept — Cochlea vs semicircular canals and CN VIII: The inner ear has two functional components: auditory (cochlea) and vestibular (semicircular canals and otolith organs), both served by CN VIII.

Step 1 — Cochlea (hearing): The cochlea is a spiral bony canal filled with perilymph (scala vestibuli and scala tympani) and endolymph (scala media). The organ of Corti sits on the basilar membrane within the scala media. Hair cells in the organ of Corti transduce mechanical vibrations into neural signals transmitted via the cochlear division of CN VIII (vestibulocochlear nerve) to the cochlear nuclei in the brainstem.

Step 2 — Semicircular canals and otolith organs (balance): The three semicircular canals (anterior, posterior, horizontal) detect angular acceleration (rotational head movements). The otolith organs—utricle (linear acceleration and head tilt) and saccule (vertical acceleration)—detect linear forces via otolithic crystals (otoconia). Signals travel via the vestibular division of CN VIII to the vestibular nuclei.

Step 3 — Acoustic neuroma: A vestibular schwannoma (acoustic neuroma) arises from Schwann cells of the vestibular division of CN VIII in the internal acoustic meatus, causing both sensorineural hearing loss (cochlear compression) and vestibular disturbance.

Why other options are wrong:

- Option A: The functions are reversed; the cochlea provides hearing (not balance), and the semicircular canals provide balance (not hearing via basilar membrane vibration).
- Option C: CN VIII (vestibulocochlear nerve) is entirely responsible for inner ear function; CN VII (facial nerve) has no role in the inner ear's sensory function.
- Option D: The functions are completely reversed; semicircular canals do not detect frequency (that is the cochlea) and the cochlea does not detect rotation.

Final Answer: Cochlea (cochlear CN VIII) = hearing; semicircular canals + otolith organs (vestibular CN VIII) = balance and acceleration detection $\Rightarrow \boxed{B}$

Answer: (B) Go Back to Q 27

Q28.

Solution

Concept — Nasal cavity: cribriform plate, conchae, and olfactory nerve: The olfactory nerve (CN I) has a unique intracranial-to-nasal pathway via the cribriform plate.

Step 1 — Cribriform plate and olfactory nerve: The cribriform plate is a horizontal bony plate of the ethmoid bone that forms the roof of the nasal cavity and the floor of the anterior cranial fossa. The olfactory nerve fibres (axons of olfactory receptor cells in the olfactory epithelium of the superior nasal cavity) pass upward through the multiple foramina (about 20) of the cribriform plate to reach the olfactory bulb above.

Step 2 — Conchae (turbinates) and meatuses: The lateral nasal wall has three scroll-like conchae (turbinates): inferior (largest, an independent bone), middle (ethmoid bone), and superior (ethmoid bone). Below each concha is a meatus:

- Superior meatus: drains posterior ethmoidal air cells
- Middle meatus: drains frontal sinus, maxillary sinus, anterior and middle ethmoidal air cells (the most clinically important meatus)
- Inferior meatus: drains the nasolacrimal duct

Why other options are wrong:

- Option A: Olfactory fibres pass through the cribriform plate (not foramen ovale; foramen ovale transmits V3 of the trigeminal nerve).
- Option B: Olfactory fibres do not pass through the jugular foramen (CN IX, X, XI pass there); they are not at the nasal septum base.
- Option D: Olfactory fibres do not pass through foramen rotundum (that transmits V2/maxillary nerve); they are in the superior nasal cavity, not the floor.

Final Answer: Olfactory nerve fibres pass through the cribriform plate of the ethmoid bone in the roof of the nasal cavity; the superior concha lies above the superior meatus (posterior ethmoidal drainage) $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 28

Q29.

Solution

Concept — External auditory meatus (EAM) and tympanic membrane: The EAM transmits sound from the exterior to the tympanic membrane; knowledge of its structure is essential for otoscopy and ear surgery.

Step 1 — Structure of the EAM: In adults, the external auditory meatus is approximately 2.5 cm long. The outer one-third is cartilaginous (lined with skin containing hair follicles, ceruminous glands, and sebaceous glands), and the inner two-thirds is bony (formed by the tympanic and squamous parts of the temporal bone). In children, the meatus is shorter, wider, and more horizontal; to view the tympanic membrane in a child, the pinna is pulled downward and backward (vs. upward and backward in adults to straighten the S-shaped adult canal).

Step 2 — Tympanic membrane: The tympanic membrane is an oblique oval membrane lying at approximately 55 degrees to the floor of the EAM. It has two parts:

- Pars tensa: the main part, tense and glistening; the handle (manubrium) of the malleus is attached to its inner surface; the umbo is the most depressed point at the tip of the malleus handle
- Pars flaccida (Shrapnell's membrane): the small, lax, triangular portion superiorly (between the anterior and posterior malleolar folds)

The cone of light (light reflex) is seen in the anteroinferior quadrant on otoscopy.

Why other options are wrong:

- Option B: The EAM is not entirely bony in adults (outer third is cartilaginous); the tympanic membrane does have important landmarks.
- Option C: The pars flaccida is located superiorly (not superoposteriorly), and the light reflex (cone of light) is in the anteroinferior (not posteroinferior) quadrant; the description of EAM proportions is correct but the other details are wrong.
- Option D: The EAM is not entirely cartilaginous; the tympanic membrane is formed mostly by the pars tensa; the handle of the malleus attaches to its internal (medial) surface, not its posterior surface.

Final Answer: The EAM has cartilaginous outer third and bony inner two-thirds in adults; the tympanic membrane (pars tensa + pars flaccida superiorly) lies at 55°; the light reflex is anteroinferior $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 29

Q30.

Solution

Concept — Wharton's duct and lingual nerve relationship: The Wharton's duct and lingual nerve have a clinically important winding relationship in the floor of the mouth.

Step 1 — Course of Wharton's duct: The submandibular (Wharton's) duct is approximately 5 cm long. It emerges from the deep part of the submandibular gland, passes anteriorly on the floor of the mouth between the mylohyoid muscle (laterally/inferiorly) and the hyoglossus and genioglossus muscles (medially), and opens at the sublingual papilla (sublingual caruncle) adjacent to the frenulum of the tongue, just lateral to the midline.

Step 2 — Lingual nerve relationship: The lingual nerve (a branch of V3) passes medial to the submandibular gland and then loops around the Wharton's duct three times: it begins lateral to the duct → crosses below it → ascends medial to the duct → crosses over it again. This is summarised as "below, around, and above." During submandibular gland excision or Wharton's duct sialolithiasis surgery, the lingual nerve must be identified and protected to preserve taste and sensation to the anterior two-thirds of the tongue.

Why other options are wrong:

- Option A: Wharton's duct runs on the floor of the mouth (not along the dorsum of the tongue); it is crossed by the lingual nerve (not the hypoglossal nerve in this relationship).

- Option B: Wharton's duct does cross the lingual nerve (twice, looping around it); claiming no crossing is incorrect.
- Option C: Wharton's duct opens at the sublingual papilla (not the parotid papilla, which is opposite the upper 2nd molar and drains the parotid gland via Stensen's duct); the lingual nerve winds around it more than once.

Final Answer: Wharton's duct runs on the floor of the mouth opening at the sublingual papilla; the lingual nerve winds around the duct twice (lateral $\to$ below $\to$ medial $\to$ above) $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q 30

Q31.

Solution

Concept — Limbic system: components and functions: The limbic system is a set of cortical and subcortical structures that mediate emotion, memory, and olfaction.

Step 1 — Core components and functions:

- **Hippocampus** (medial temporal lobe): consolidation of declarative (explicit) memory (episodic and semantic); spatial navigation; bilateral hippocampal destruction causes anterograde amnesia (like patient HM)
- **Amygdala** (anterior medial temporal lobe): emotional processing—fear conditioning, aggression, threat recognition; projects to the hypothalamus and brainstem; damage causes Kluver-Bucy syndrome (hyperorality, hypersexuality, loss of fear)
- **Cingulate gyrus** (on the medial surface of the frontal and parietal lobes, above the corpus callosum): attention, emotion regulation, pain processing, autonomic regulation

Step 2 — Papez circuit: Hippocampus $\to$ fornix $\to$ mammillary bodies (hypothalamus) $\to$ anterior thalamic nucleus $\to$ cingulate gyrus $\to$ entorhinal cortex $\to$ hippocampus. This circuit is central to memory consolidation.

Why other options are wrong:

- Option A: The putamen and caudate nucleus form the striatum (basal ganglia), which is primarily involved in motor control and procedural learning, not the classic limbic functions.
- Option B: The hypothalamus is part of the limbic system but the substantia

nigra (dopaminergic) is a basal ganglia component and does not mediate memory consolidation.

- Option D: The thalamus has limbic connections (anterior nucleus) but the basal ganglia are primarily a motor system; they are not the core limbic components.

Final Answer: Core limbic components: hippocampus (memory), amygdala (emotion/fear), and cingulate gyrus (attention/emotion); the fornix connects hippocampus to mammillary bodies $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 31

Q32.

Solution

Concept — Corpus callosum parts and fibre type: The corpus callosum is the largest commissure in the brain, connecting homotopic areas of the two cerebral hemispheres.

Step 1 — Parts of the corpus callosum (anterior to posterior):

- **Rostrum**: the inferior part that bends backward, connecting to the lamina terminalis
- **Genu** (knee): the anterior curved part, connecting the prefrontal cortices of both hemispheres (forceps minor)
- **Body** (trunk): the large middle portion, connecting motor and sensory cortices
- **Splenium**: the posterior, thickest part, connecting the parietal, temporal, and occipital (visual) cortices of both hemispheres (forceps major)

Step 2 — Fibre type: The corpus callosum carries commissural fibres — fibres that cross the midline to connect corresponding (homotopic) areas in the opposite hemisphere. This is distinct from association fibres (same hemisphere) and projection fibres (cortex to subcortical structures).

Step 3 — Split-brain: Section of the corpus callosum prevents interhemispheric transfer, producing a split-brain syndrome where objects presented to one visual field (and thus one hemisphere) cannot be named by the other.

Why other options are wrong:

- Option A: The correct order anterior to posterior is rostrum $\to$ genu $\to$ body $\to$ splenium (not genu $\to$ splenium $\to$ body $\to$ rostrum); the corpus callosum carries commissural (not projection) fibres.

- Option C: The corpus callosum has four parts (not two); it carries commissural fibres (not association fibres, which stay within the same hemisphere).
- Option D: The correct order is not body $\rightarrow$ genu $\rightarrow$ splenium $\rightarrow$ rostrum; the corpus callosum carries primarily commissural (not projection) fibres.

Final Answer: Parts anterior to posterior: rostrum $\rightarrow$ genu $\rightarrow$ body $\rightarrow$ splenium; the corpus callosum carries commissural fibres connecting homotopic areas of both hemispheres $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 32

Q33.

Solution

Concept — Visual pathway and optic chiasm lesion: The site of a visual pathway lesion determines the pattern of visual field defect.

Step 1 — Anatomy of the optic chiasm: At the optic chiasm, fibres from the NASAL (medial) half of each retina cross to the opposite side. Fibres from the TEMPORAL (lateral) half of each retina do NOT cross (remain ipsilateral). The nasal retina receives light from the TEMPORAL visual field.

Step 2 — Bitemporal hemianopia mechanism: A pituitary tumour compresses the optic chiasm from below, damaging the crossing nasal fibres from BOTH eyes. Since nasal retinal fibres carry temporal visual field information, their destruction causes LOSS of BOTH temporal visual fields = bitemporal hemianopia (tunnel vision). This is the classic field defect for chiasm lesions.

Step 3 — Other field defects:

- Optic nerve lesion: ipsilateral monocular blindness
- Optic tract lesion: contralateral homonymous hemianopia
- Optic radiation lesion: contralateral homonymous hemianopia (with macular sparing if occipital cortex involved)
- Lateral chiasm lesion: ipsilateral nasal hemianopia (rare)

Why other options are wrong:

- Option B: Temporal retinal fibres carry nasal field information and do NOT cross at the chiasm; a chiasm lesion destroys nasal (crossing) fibres, not temporal fibres.
- Option C: A chiasm lesion destroys the crossing nasal fibres; destroying uncrossed temporal fibres would cause the opposite result (binasal hemianopia), not the pattern described.

- Option D: A pituitary tumour compresses the optic CHIASM (not the optic tract); optic tract lesion causes contralateral homonymous hemianopia, not bitemporal hemianopia.

Final Answer: Nasal retinal fibres (carrying temporal field) cross at the chiasm; pituitary tumour destroys both sets of crossing fibres causing bitemporal hemianopia $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 33

Q34.

Solution

Concept — Lateral geniculate body (LGB) as visual relay: The LGB is the thalamic relay nucleus specifically for the visual pathway.

Step 1 — Location and connections: The LGB is one of the metathalamic nuclei (along with the medial geniculate body for auditory processing). It is located in the posteroventral thalamus (lateral geniculate body). It receives input from the optic tract (ipsilateral temporal retinal fibres and contralateral nasal retinal fibres). It then projects via the optic radiation (geniculocalcarine tract) through the posterior limb of the internal capsule and then through the parietal and temporal lobes to reach the primary visual cortex (area 17, striate cortex) in the calcarine sulcus of the occipital lobe.

Step 2 — Layers of LGB: The LGB has 6 layers. Layers 1, 2 (magnocellular): receive input from M-ganglion cells (motion, contrast). Layers 3–6 (parvocellular): receive input from P-ganglion cells (colour, detail). Crossed fibres (from nasal retina of contralateral eye) terminate in layers 1, 4, 6; uncrossed fibres (from temporal retina of ipsilateral eye) terminate in layers 2, 3, 5.

Why other options are wrong:

- Option A: The LGB is in the thalamus, NOT the brainstem midbrain. It relays visual (not auditory) information; the medial geniculate body (MGB) relays auditory information.
- Option B: The pulvinar of the thalamus is associated with visual association (not primary relay); the VPL nucleus relays somatosensory information from the spinothalamic tract and dorsal columns.
- Option C: The LGB is not part of the basal ganglia; it is a thalamic nucleus. Basal ganglia relay motor commands, not visual information.

Final Answer: The LGB is a metathalamic nucleus (posterior thalamus) that receives optic tract fibres and projects via the optic radiation to the primary visual cortex (calcarine sulcus) ⇒ $\boxed{\text{D}}$

Answer: (D) Go Back to Q 34

Q35.

Solution

Concept — Fetal circulation: three shunts and their postnatal remnants: The three fetal shunts allow oxygenated placental blood to bypass the lungs and liver and reach the systemic circulation.

Step 1 — Three fetal shunts and their function:

- **Ductus venosus**: connects the umbilical vein (oxygenated placental blood) to the inferior vena cava, bypassing the hepatic sinusoids. Closes at birth → becomes the **ligamentum venosum**
- **Foramen ovale**: an opening in the interatrial septum allowing oxygenated blood from the right atrium to pass directly to the left atrium, bypassing the lungs. Closes at birth when left atrial pressure exceeds right → becomes the **fossa ovalis**
- **Ductus arteriosus**: connects the pulmonary artery to the aortic arch, allowing blood to bypass the fetal lungs (high resistance). Closes within 10–15 hours of birth (mediated by rising oxygen tension and falling prostaglandins) → becomes the **ligamentum arteriosum**

Step 2 — Umbilical vessels: Umbilical vein → ligamentum teres hepatis (round ligament of the liver, in the falciform ligament). Two umbilical arteries → medial umbilical ligaments.

Why other options are wrong:

- Option A: Ductus arteriosus becomes the ligamentum arteriosum (NOT ligamentum teres hepatis, which is the remnant of the umbilical vein).
- Option C: Ductus venosus becomes ligamentum venosum (not ligamentum arteriosum); ductus arteriosus becomes ligamentum arteriosum (not ligamentum teres).
- Option D: All three assignments are incorrect; the foramen ovale does not become the oblique vein of the left atrium.

Final Answer: Ductus arteriosus → ligamentum arteriosum; foramen ovale → fossa ovalis; ductus venosus → ligamentum venosum ⇒ $\boxed{\text{B}}$

Answer: (B) Go Back to Q 35

Q36.

Solution

Concept — Limb development: AER and ZPA: The AER and ZPA are two key signalling centres that coordinate limb axis patterning.

Step 1 — Apical Ectodermal Ridge (AER): The AER is a thickened ridge of ectoderm at the distal tip of the limb bud. It maintains the underlying progress zone mesenchyme in an undifferentiated, proliferating state by secreting Fibroblast Growth Factors (FGF-4, FGF-8, FGF-10). The AER controls the proximal-to-distal axis (shoulder to fingers). Sequential removal of the AER at earlier stages truncates progressively more distal structures:

- Early removal: only stylopod (humerus/femur)
- Mid removal: stylopod + zeugopod (radius-ulna/tibia-fibula)
- Late removal: stylopod + zeugopod + autopod (carpals/tarsals, digits)

Step 2 — Zone of Polarizing Activity (ZPA): The ZPA is a small region of mesenchyme at the POSTERIOR margin of the limb bud. It secretes Sonic Hedgehog (SHH), which controls the anterior-posterior (pre-axial to post-axial = thumb to little finger) digit patterning. Transplanting ZPA to the anterior margin causes mirror-image digit duplication (6-5-4-4-5-6).

Why other options are wrong:

- Option A: The AER controls proximal-distal (not anterior-posterior) patterning; the ZPA uses SHH (not BMP); BMP signalling in the interdigital mesenchyme drives apoptosis (interdigital web regression).
- Option B: Neither AER nor ZPA primarily controls dorsal-ventral patterning; dorsal-ventral patterning is controlled by Wnt7a (dorsal ectoderm) and BMP4/engrailed-1 (ventral ectoderm); the ZPA is posterior (not anterior).
- Option D: Wnt7a controls dorsal (not proximal-distal) patterning; the ZPA is at the POSTERIOR (not dorsal) mesenchyme.

Final Answer: AER (FGF secretion) controls proximal-to-distal limb outgrowth; ZPA (posterior mesenchyme, SHH) controls anterior-to-posterior digit patterning $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 36

Q37.

Solution

Concept — Facial development and cleft lip: The face develops from five facial processes that fuse during the 4th–8th weeks. Failure of fusion causes clefts.

Step 1 — Five facial processes:

- One **frontonasal process** (gives rise to medial and lateral nasal processes)
- Two **maxillary processes** (from pharyngeal arch 1)
- Two **mandibular processes** (from pharyngeal arch 1)

Step 2 — Formation of the upper lip and cleft lip: The upper lip is formed by the fusion of:

- The two **medial nasal processes** (meeting at the midline to form the philtrum and intermaxillary segment/prolabium)
- The **maxillary process** on each side (fusing with the ipsilateral medial nasal process)

Unilateral cleft lip results from failure of fusion between the **maxillary process** and the **medial nasal process** on ONE side (e.g., the left maxillary process fails to fuse with the left medial nasal process). This leaves a cleft at the philtrum-alar junction (the junction between the prolabium and the lateral lip).

Step 3 — Cleft palate vs cleft lip: Cleft lip results from failure of fusion of facial processes (4th–8th weeks). Cleft palate (secondary palate) results from failure of fusion of the palatine processes (8th–12th weeks). They can occur together or independently.

Why other options are wrong:

- Option A: Failure of fusion of the two mandibular processes would cause a midline mandibular cleft (rare); it does not cause the common unilateral upper lip cleft.
- Option B: The lateral nasal process forms the ala of the nose; it does not fuse with the maxillary process to form the upper lip directly—a furrow (naso-lacrimal groove) forms here. Fusion here is for the nasolacrimal duct, not the upper lip.
- Option C: Failure of fusion of BOTH medial nasal processes at the midline would cause bilateral cleft lip (or a median cleft), not a unilateral cleft.

Final Answer: Unilateral cleft lip results from failure of fusion between the maxillary process and the medial nasal process on the ipsilateral side $\Rightarrow \boxed{\text{D}}$

$\boxed{\text{Answer: (D)}}$ Go Back to Q 37

Q38.

Solution

Concept — Three types of cartilage: hyaline, fibrocartilage, elastic: Each type of cartilage has distinct collagen composition, location, and functional properties.

Step 1 — Hyaline cartilage:

- Matrix: **type II collagen** embedded in an amorphous ground substance (chondroitin sulphate proteoglycans); glassy appearance on H&E
- Cells: chondrocytes in lacunae; isogenous groups in the deeper zones
- Avascular, aneural, alymphatic (nutrition by diffusion)
- Location: articular cartilage, costal cartilages, laryngeal cartilages (except epiglottis and corniculate), tracheal rings, nasal septum, epiphyseal (growth) plates

Step 2 — Fibrocartilage:

- Matrix: predominantly **type I collagen** (densely packed, like fibrous tissue) with some type II
- Combines properties of dense connective tissue (tensile strength) and cartilage (compressive resistance)
- Location: intervertebral discs (annulus fibrosus), menisci of the knee, pubic symphysis, glenoid and acetabular labra, temporomandibular joint disc

Step 3 — Elastic cartilage:

- Matrix: type II collagen PLUS abundant **elastin fibres** (gives flexibility and resilience)
- Location: pinna (auricle) of the ear, external auditory meatus, epiglottis, corniculate cartilages, cuneiform cartilages, auditory tube (Eustachian tube)

Why other options are wrong:

- Option B: Hyaline cartilage contains type II collagen (not type I); type I is in tendons and fibrocartilage. Fibrocartilage is not found in articular surfaces (articular cartilage is hyaline).
- Option C: The three types do not all contain type I collagen; tracheal rings are hyaline cartilage (not elastic); the auricle is elastic cartilage (not fibrocartilage).
- Option D: Hyaline cartilage contains type II collagen (not type III); fibrocartilage does contain some type I collagen (not type II exclusively); type IV collagen is a basal lamina component, not found in cartilage matrices.

Final Answer: Hyaline (type II collagen, articular + costal), fibrocartilage (type I collagen, IVD + menisci + pubic symphysis), elastic (type II + elastin, auricle + epiglottis) $\Rightarrow \boxed{A}$

Answer: (A) Go Back to Q 38

Q39.

Solution

Concept — Type I and type II pneumocytes: The alveolar epithelium consists of two cell types with distinct morphological and functional properties.

Step 1 — Type I pneumocytes (type I alveolar cells):

- Morphology: extremely thin, flat (squamous) cells with attenuated cytoplasm
- Coverage: cover approximately **95% of the alveolar surface area** despite being fewer in number
- Function: **gas exchange** — form the thin blood-air barrier together with the capillary endothelium and shared basement membrane
- Cannot divide (terminally differentiated)

Step 2 — Type II pneumocytes (type II alveolar cells / great alveolar cells):

- Morphology: cuboidal, rounded cells with microvilli; cytoplasm contains **lamellar bodies** (osmiophilic inclusions that store and secrete surfactant)
- Coverage: cover approximately **5% of the alveolar surface area** but are more numerous (60% of alveolar cells by number)
- Function: (i) produce and secrete **surfactant** (primarily dipalmitoyl phosphatidylcholine / DPPC) — reduces alveolar surface tension and prevents atelectasis; (ii) **progenitor cells** that regenerate the alveolar epithelium after injury (can divide to replace both type I and type II cells)

Step 3 — Surfactant deficiency (RDS): Premature infants lack adequate surfactant (type II cells mature late, especially without antenatal corticosteroids). Surfactant production begins at 24 weeks; mature levels by 35 weeks.

Why other options are wrong:

- Option A: Type I pneumocytes cover 95% of the surface (not 60%); type I cells do NOT produce surfactant; type II cells are cuboidal (not flat).
- Option B: Only type II pneumocytes produce surfactant; type I cells cannot undergo mitotic division.

- Option D: The descriptions are completely reversed; type II pneumocytes are granular (cuboidal with lamellar bodies) and produce surfactant; type I pneumocytes are thin squamous cells that form the blood-gas barrier.

Final Answer: Type I pneumocytes: thin, flat, cover 95% of alveolar surface, gas exchange; type II pneumocytes: cuboidal, lamellar bodies, produce surfactant, progenitor cells $\Rightarrow \boxed{C}$

Answer: (C) Go Back to Q 39

Q40.

Solution

Concept — Adrenal gland cortical zones, hormones, and medulla: The adrenal cortex has three concentric zones from capsule inward, each producing a distinct class of steroid hormones.

Step 1 — Zones of the adrenal cortex (from capsule inward — mnemonic GFR):

- **Zona glomerulosa** (outermost, ~15%): spherical clusters of cells; secretes **mineralocorticoids** (primarily **aldosterone**); regulated by angiotensin II and potassium; does NOT respond to ACTH for aldosterone production
- **Zona fasciculata** (middle, ~75%): long radial cords of lipid-laden cells (spongiocytes — foamy cytoplasm); secretes **glucocorticoids** (primarily **cortisol**); regulated by ACTH; the largest zone — source of hypercortisolism in **Cushing's syndrome**
- **Zona reticularis** (innermost cortical zone, ~10%): anastomosing network of cells; secretes **adrenal androgens** (DHEA, androstenedione); regulated by ACTH

Step 2 — Medulla: The adrenal medulla is derived from neural crest cells (chromaffin cells / pheochromocytes). It produces **catecholamines**: adrenaline (epinephrine, 80%) and noradrenaline (norepinephrine, 20%). A pheochromocytoma arises from medullary chromaffin cells.

Step 3 — Cushing's syndrome: Cortisol hypersecretion arises from the zona fasciculata (either from an adrenal adenoma producing cortisol autonomously, or from bilateral zona fasciculata hyperplasia driven by excess ACTH from a pituitary adenoma = Cushing's disease).

Why other options are wrong:

- Option A: The zone order is wrong (reticularis cannot come before fasciculata from the capsule); cortisol is NOT produced in the glomerulosa (aldosterone is).
- Option C: The zona fasciculata is not the outermost zone; the zona glomerulosa is outermost. Cortisol is correctly assigned to zona fasciculata but the zone ordering is wrong.
- Option D: The zona reticularis is the innermost cortical zone (not outermost); cortisol is produced in the zona fasciculata (not reticularis, which produces androgens).

Final Answer: Zones capsule to medulla: glomerulosa (aldosterone) $\rightarrow$ fasciculata (cortisol — source of Cushing's) $\rightarrow$ reticularis (androgens) $\rightarrow$ medulla (catecholamines) $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 40

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	C	2	A	3	D	4	B	5	C
6	A	7	D	8	B	9	C	10	A
11	D	12	C	13	B	14	A	15	D
16	C	17	A	18	B	19	D	20	C
21	A	22	D	23	C	24	B	25	A
26	D	27	B	28	C	29	A	30	D
31	C	32	B	33	A	34	D	35	B
36	C	37	D	38	A	39	C	40	B