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Exam Name: United States Medical Licensing Step 1

Version: Demo

step 1

QUESTION 1
A 2-year-old male patient develops progressive generalized weakness and muscle atrophy. The impairment first began with the muscles of the hips, and then progressed to the pelvic area, thigh, and shoulder muscles. The patient is diagnosed with Duchenne's muscular dystrophy, a congenital disorder where the protein dystrophin is deficient. Which of the following describes the role of dystrophin in muscle tissue?

A. anchors actin to the sarcolemma
B. endows the myosin filaments with elastic recoil properties
C. extends from Z disk to Zdisk, forming a supportive network
D. inhibits the binding of myosin to actin
E. protects desmin filaments from stressinduced damage

Correct Answer: A
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
Dystrophin anchors actin to the sarcolemma, reinforcing and stabilizing the latter during muscle contraction. Titin is a large protein which associates with myosin filaments and endows them with elastic recoil properties (choice B). Desmin filaments form a supportive network extending from Z disk to Zdisk (choice C). Troponin I inhibits the binding of myosin to actin (choice D). AlphaB-crystallin protects desmin filaments from stress-induced damage (choice E).

QUESTION 2
The third week of development is characterized by the appearance of the branchial apparatus, the embryonic primordium from which head and neck structures will be derived. The apparatus consists of five branchial arches, numbered 1, 2, 3, 4 and 6. Second arch anomalies represent 95% of all branchial anomalies and are classified into four types with types IIII being the most common. The anomalies manifest as cysts or fistulae in the lateral neck, located anterior and deep to the sternocleidomastoid muscle. Which of the following structures develop from the second branchial arch?

A. anterior digastric muscle
B. posterior cricoarytenoideus muscle
C. posterior digastric muscle
D. stylopharyngeus muscle
E. superior constrictor muscle

Correct Answer: C
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The posterior digastric muscle is derived from the second branchial arch and thus is innervated by its nerve, the facial (Seventh cranial) nerve. The anterior digastric muscle (choice A) is derived from the first branchial arch and is innervated by its nerve, the mandibular division of the trigeminal (fifth cranial) nerve. The posterior cricoarytenoideus muscle (choice B) and the superior constrictor muscle (choice E), derived from a combination of the fourth and sixth branchial arches, are innervated by the vagus (tenth cranial) nerve. The stylopharyngeus (choice D) is derived from the third branchial arch and is the only voluntary muscle innervated by the glossopharyngeal (ninth cranial) nerve.

QUESTION 3
A 10-year boy is examined because his parents noticed that "his eyes never seem to look in the right direction." On examination, the left eye of the child is unable to move laterally (abduction) and when asked to look toward the nose (adduction), the eyeball retracts into the socket and the eye opening narrows. Sometimes, the eye also moves superiorly. The child is diagnosed with Duane syndrome, a congenital ocular motility disorder characterized by limited abduction of the affected eye. This is due to absence of the

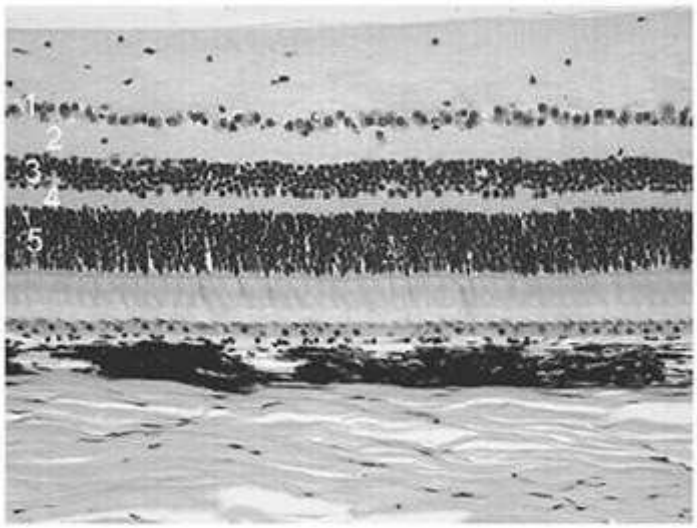
abducens (fifth cranial) nerve with aberrant innervation by the oculomotor (third cranial) nerve. Which of the following muscles is normally innervated by the abducens nerve?

A. inferior oblique
B. lateral rectus
C. medial rectus

Correct Answer:

Explanation/Reference:
Explanation:
The abducens (sixth cranial) nerve normally innervates the lateral rectus muscle. The inferior oblique (choice A), medial rectus (choice C), and superior rectus (choice E) are all innervated by the oculomotor (third cranial) nerve. The superior oblique (choice D) is innervated by the trochlear (fourth cranial) nerve. In Duane syndrome, the absence of lateral rectus innervations by the abducens (sixth cranial) nerve is replaced by an aberrant innervation of the oculomotor (third cranial) nerve. Thus when the patient is asked to adduct the affected eye, there is cocontraction of the lateral and medial recti with globe retraction.

QUESTION 4
Retinitis pigmentosa is a hereditary disorder, which affects the photoreceptors (the rods and the cones) in the retina. These photoreceptors are located in which of the numbered layers in Figure below



A. 1
B. 2
C. 3
D. 4
E. 5

Correct Answer: E
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The retina contains three layers of cells. They are, from top to bottom, the ganglion cells (choice A), the bipolar cells (choice C), and the photoreceptor cells (rods and cones, choice E). The internal plexiform layer (choice B) contains the synapses between the bipolar cells and the ganglion cells. The external plexiform layer (choice D) contains the synapses between the photoreceptors and the bipolar cells.

Remember that light enters from the top and traverses all the layers to reach the photoreceptors in the bottom layer.

QUESTION 5
The structure indicated by arrow 1 in Fig. 1-2 is which of the following vessels?

A. brachiocephalic artery
B. left brachiocephalic vein
C. left common carotid artery
D. right brachiocephalic vein
E. superior vena cava

Correct Answer: D
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
Remember that in viewing axial or transverse CT scans through the body, the right side of the patient is to your left and the left side to your right. In other words, the feet of the patient are toward you and the head away from you. The back of the patient is at the bottom of the image and the front of the patient toward the top. Directional terms are always in reference to the patient. The insert at the bottom right indicates the level of the section. Arrow 1 indicates the right brachiocephalic vein. The left brachiocephalic vein (choice B) is seen as the elongated structure immediately posterior to the manubrium of the sternum and to the left of the right brachiocephalic vein. Immediately posterior to the left brachiocephalic vein is the brachiocephalic artery (choice A, arrow 2). To the left of the latter are the left common carotid artery (choice C) and the left subclavian artery (arrow 3). The superior vena cava (choice E) is not seen at this level because the right and left brachiocephalic veins are still separate.

QUESTION 6
A 4-month-old male infant is brought to the clinic because of excessive noisy respiration. On examination, the infant is within the normal range of growth, appears healthy, and does not show respiratory distress. Phonation is normal, along with head and neck examination findings. However, the child displays stridor (highpitched breathing sound) on inspiration, accentuated in the supine position. The parents report that the same stridor is heard during feeding or when the child is agitated. The attending physician places the child in the prone position and the stridor is relieved. To confirm, she holds the child in a neck extended position, which also relieves the stridor. An endoscopic laryngeal examination reveals bulky arytenoids cartilages and the diagnosis of laryngomalacia is established. During development, the arytenoids cartilages arise from which of the following?

A. first pharyngeal arch
B. second pharyngeal arch
C. third pharyngeal arch
D. fifth pharyngeal arch
E. sixth pharyngeal arch

Correct Answer: E
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The arytenoid cartilages arise as swellings from the sixth pharyngeal (branchial) arch at 32 days of

gestation. They are located between the caudal end of the hypobranchial eminence and the cranial end of the laryngotracheal tube. The swellings will grow cranially to form the arytenoids and corniculate cartilages along with the primitive aryepiglottic folds. In laryngomalacia, the bulky arytenoids cartilages prolapsed anteromedially on inspiration, resulting in stridor. The first (choice A), second (choice B), and third (choice C) pharyngeal arches do not participate in the development of laryngeal cartilages. The fifth (choice D) pharyngeal arch remains rudimentary and does not give rise to any adult structure.

QUESTION 7
A newborn infant suffers from cyanotic heart disease caused by transposition of the great arteries (TGA). In this situation, the aorta arises from which of the following structures?

A. ductus arteriosus

C. left ventricle
D. right atrium
E. right ventricle

Correct Answer: E
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
In TGA, the aorta arises from the right ventricle and the pulmonary trunk arises from the left ventricle (choice C). This is the reverse of the normal situation and gives rise to the cyanotic condition in the newborn. The large arteries arise from the truncus arteriosus in the developing heart and thus could not develop from the atria (choices B and D), which are formed from the sinus venosus. The truncus arteriosus and the sinus venosus are at opposite ends of the heart. The ductus arteriosus (choice A) is the vessel that shunts oxygenated blood from the pulmonary trunk to the arch of the aorta in the fetus. It does not give rise to the aorta.

QUESTION 8
About 75% of the blood supply of the spinal cord is derived from the anterior spinal artery. This artery arises from which of the following?

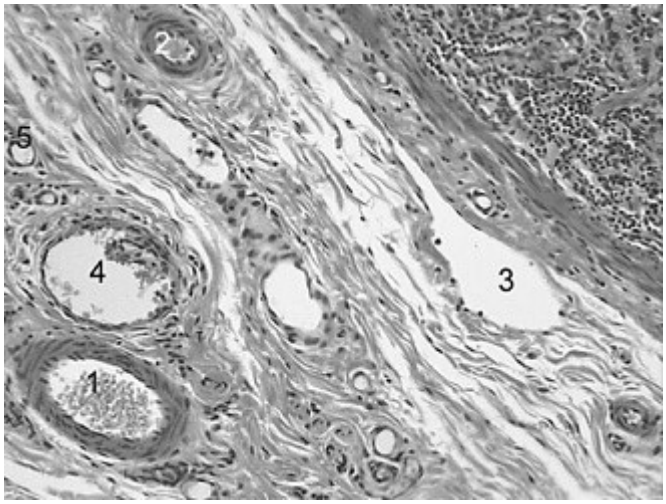
A. artery of Adamkiewicz
B. basilar artery
C. internal carotid artery
D. posterior inferior cerebellar artery
E. vertebral artery

Correct Answer: E
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
At the level of the foramen magnum, the bilateral vertebral arteries supply a medial branch each and they combine to form the anterior spinal artery. As the anterior spinal artery continues caudally, it is supplied by radicular arteries arising from the aorta and its branches. The artery of Adamkiewicz (choice A) is the largest radicular artery (arteria radicularis magna), frequently arising from a segmental branch of the thoracic aorta at the level of T10. The basilar artery (choice B) is formed by the joining of the vertebral arteries superior to the foramen magnum and thus does not provide blood supply to the spinal cord. Its branches supply the brainstem. The internal carotid artery (choice C) supplies the orbit via its ophthalmic branch and the brain by its anterior and middle cerebral branches. The posterior inferior cerebellar artery (choice D) is a branch of the vertebral artery, providing vascular supply to the medulla oblongata and the inferior aspect of the cerebellum.

QUESTION 9
Clinical edema results when lymphatic vessels are blocked or when the volume of extracellular fluid exceeds the drainage capacity of the lymphatic vessels. Which of the following numbered structures in

following figure is a lymphatic vessel?

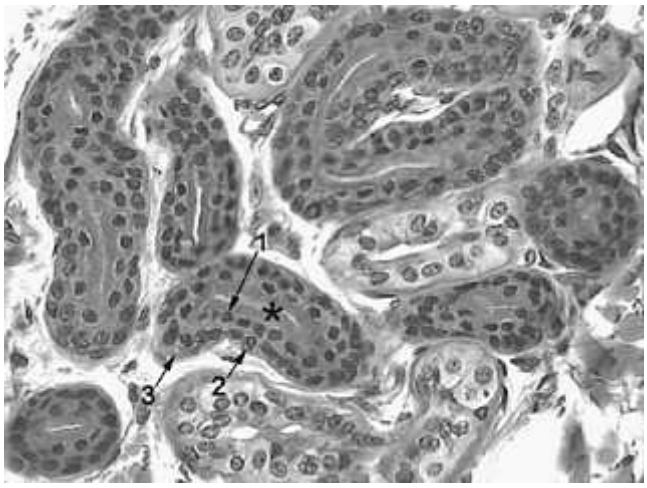


A. 1
B. 2
C. 3
D. 4
E. 5

Correct Answer: C
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
An irregular outline, a thin wall, and the lack of erythrocytes in the lumen characterize lymphatic vessel. Arterioles (choices A and B) have thicker walls and contain erythrocytes. Venules (choice D) are thin-walled but they contain erythrocytes. Capillaries (choice E) are small in diameter and they contain erythrocytes.

QUESTION 10
The histological structure marked by the asterisk in Fig. 1-4 is which of the following structures from the integumentary system?



A. aprocrine sweat gland
B. dermal papilla
C. eccrine sweat gland
D. hair follicle
E. sebaceous gland

Correct Answer: C
Section: Anatomy
Explanation

This is the secretory portion of the eccrine sweat gland, recognizable by its three cell types. The apical dark cells (arrow 1) are closest to the lumen. The clear or basal cells (arrow 2) and the myoepithelial cells (arrow 3) are located against the basal lamina. Characteristically, these cells are large and the lumen is small. The apocrine sweat gland (choice A) is lined with simple cuboidal epithelium and thus has a large lumen. The dermal papilla (choice B) is formed by fibroblasts, not epithelia. The hair follicle (choice D) is formed by three concentric zones of keratinized cells and does not have a lumen. The sebaceous glands (choice E) are appendages of the hair follicle and their lumen is lined by stratified squamous epithelium.

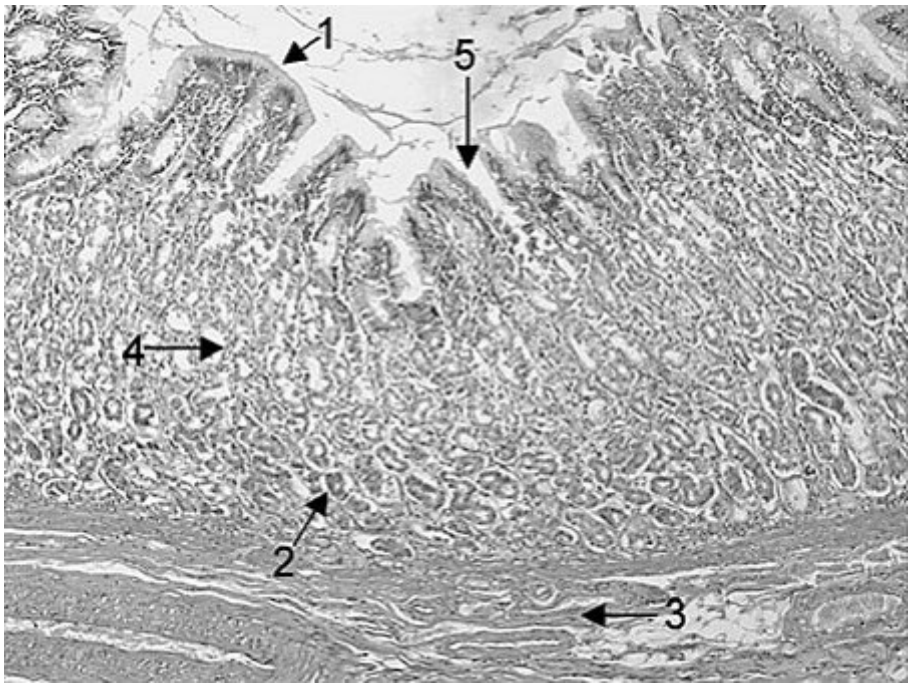
QUESTION 11
Occlusion of which of the following vessels affects the entire dorsolateral part of the rostral medulla (level of the restiform body) and produces the lateral medullary (Wallenberg) syndrome?

A. anterior inferior cerebellar artery
B. anterior spinal artery
C. posterior inferior cerebellar artery
D. posterior spinal artery
E. superior cerebellar artery

Correct Answer: C
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The posterior inferior cerebellar artery supplies the rostral, dorsolateral medulla. The posterior spinal (choice D) and anterior spinal (choice B) arteries supply dorsal and ventral portions, respectively, of the caudal medulla. The anterior inferior cerebellar (choice A) and superior cerebellar (choice E) arteries supply portions of the pons and mesencephalon.

QUESTION 12
The chief or peptic (zymogenic) cells of the gastric glands secrete pepsinogen. The latter is converted to pepsin, a 35-kilodalton (kDa) proteolytic enzyme, when the pH in the stomach falls below 5.0. In Following figure, which of the following arrows point to the location of chief or peptic (zymogenic) cells?



A. 1
B. 2
C. 3
D. 4
E. 5

Correct Answer: B
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
Arrow 2 points to the base of the gastric glands where chief or peptic (zymogenic) cells tend to be clustered. Arrow 1 points to the luminal surface of the stomach where mucus-secreting cells are found. Arrow 3 points to the muscularis mucosae. Arrow 4 points to the middle of the gastric glands where parietal or oxyntic cells tend to be most numerous. Arrow 5 point to the side of a gastric pit where mucus-secreting cells are also found.

QUESTION 13
A 62-year-old patient diagnosed with prostate carcinoma complains of a right-sided headache worsening over 4 days and displays a drooping right upper eyelid. Examination reveals a right third nerve palsy. An MRI reveals a single metastasis of the prostatic carcinoma in the right side of the midbrain, causing Benedikt's syndrome. Which of the following signs would also be seen in this patient?

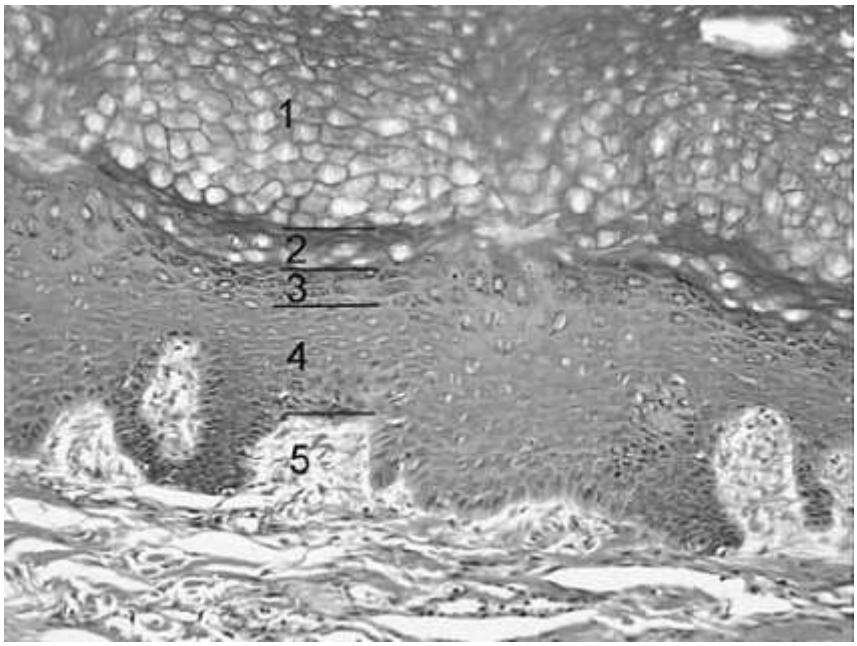
A. complete paralysis of facial expression musculature on the left side
B. deviation of the tongue to the right
C. intention tremor in the left upper and lower extremity
D. ipsilateral hemiplegia
E. vertical gaze palsy

Correct Answer: C
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
Benedikt's syndrome results from a lesion situated in the tegmentum of the midbrain, at the level of the

third cranial nerve (oculomotor) nucleus and its associated tracts, as exemplified by ptosis and third nerve palsy in this patient. The red nucleus is also affected at this level giving rise to motor impairment displayed by the intention tremor. Since the rubrospinal tract crosses at the level of the midbrain to project to the opposite side of the body, the tremor will manifest itself contralateral to the side to the lesion. The seventh cranial nerve (facial) nucleus is located in the pons, and the facial musculature (choice A) in this patient would not be affected. Likewise, the twelfth cranial nerve (hypoglossal) nucleus is located in the medulla, and the innervation of the tongue (choice B) would be spared in this patient. A lesion causing a pure Benedikt's syndrome would be confined to the midbrain tegmentum and not affect the corticospinal tract. Ipsilateral hemiplegia (choice D) would not be present in this patient. Finally, vertical gaze palsy (choice E) results from a lesion or compression of the midbrain tectum and not of the tegmentum.

QUESTION 14
During a routine physical examination, you notice that your patient, a 35-year-old avid surfer, has spots of abnormal pigmentation on two of her fingers. You explain to your patient that long-term exposure to the sun increases the risk of neoplastic changes and that you would like to perform biopsies to verify the nature of the abnormal pigmentation. Referring to following figure, cells from which layer of the epidermis are most vulnerable to neoplastic changes due to long-term exposure to the sun?



A. 1
B. 2
C. 3
D. 4
E. 5

Correct Answer: D
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
Long-term exposure to the sun increases the risk of alteration of the DNA structure by cleavage, ionizing radiation, or recombination of DNA with highly reactive free radicals. These changes can result in neoplastic changes or death in skin cells. In the skin, mitosis occurs only in the malpighian layer formed by the stratum basale and the stratum spinosum of the epidermis. The DNA of dividing cells is more vulnerable to the harmful effects of the sun, and neoplastic changes are usually observed in the Malpighian layer. They are not seen in the stratum corneum (choice A), stratum lucidum (choice B), or stratum granulosum (choice C). Choice E represents the dermis located below the epidermis, which is the only skin layer considered in this question.

QUESTION 15

A female 44-year-old patient suffers from acute bacterial sinusitis localized to the frontal sinus. The patient displays a mucopurulent greenish discharge from the nose bilaterally, with associated fever and malaise. The patient also complains of pain over the forehead with headache.
Which of the following innervates the frontal sinus?

A. anterior ethmoidal nerve

C. nasociliary nerve

Correct Answer:
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The frontal sinus is innervated by the supraorbital and supratrochlear branches of the frontal nerve. All nerves mentioned in this question are branches of ophthalmic division (V1) of the trigeminal (fifth cranial) nerve. The anterior (choice A) and the posterior (choice D) ethmoidal nerves arise from the nasociliary nerve (choice C). They innervate the ethmoid and sphenopalatine sinuses. The lacrimal nerve (choice B) carries in its terminal segment the parasympathetic innervations to the lacrimal gland and provides sensory innervation to the upper eyelid.

QUESTION 16
In a medial medullary syndrome that involves a left-sided branch of the anterior spinal artery, which of the following deficits is seen?

A. deviation of the tongue to the left, hemiplegia of arm and leg on the left
B. deviation of the tongue to the right, hemiplegia of arm and leg on the right
C. loss of conscious proprioception and precise tactile discrimination over the right side of the body exclusive of the face
D. only deviation of the tongue to the left
E. only hemiplegia on the right

Correct Answer: C
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
A vascular lesion affecting the left caudal medulla involves the left medial lemniscus, left hypoglossal nerve fibers, and the left medullary pyramid. Involvement of the left medial lemniscus produces somatosensory deficits involving the right side of the body. Damage to the left hypoglossal nerve would result in deviation of the protruded tongue to the left (and other lower motoneuron signs), and damage to the left pyramid results in right hemiplegia (choices A and B involve incorrect combinations) along with other upper motoneuron signs. Choices D and E are incorrect because they fail to combine involvement of the tongue and contralateral hemiplegia.

QUESTION 17
A neurologist is performing the neurological examination on a patient who recently suffered a head trauma. You note that, as part of the examination, she uses a cotton swab to touch the upper part of the auricle, the external auditory meatus, and the lobule. The external auditory meatus of the ear is innervated by which of the following?

A. vagus (tenth cranial) nerve
B. great auricular nerve
C. auriculotemporal nerve
D. greater occipital nerve
E. facial (seventh cranial) nerve

Correct Answer: A
Section: Anatomy
Explanation

The vagus (tenth cranial) nerve innervates the external auditory meatus of the ear. The great auricular nerve (choice B) innervates the lobule of the auricle and the auriculotemporal nerve (choice C), the superior aspect of the auricle. In fact, a sensory test which includes these three parts of the ear tests the y the auriculotemporal nerve, the vagus (tenth cranial) nerve by its branch innervating the auditory meatus, and spinal nerves C2-3 by their great auricular branch. The test thus covers the upper and lower medulla and the upper spinal cord. The greater occipital nerve (choice D) is a branch of the cervical plexus originating from C2 and innervates the scalp of the back of the head. The facial (seventh cranial) nerve provides only motor innervation to the face and scalp areas.

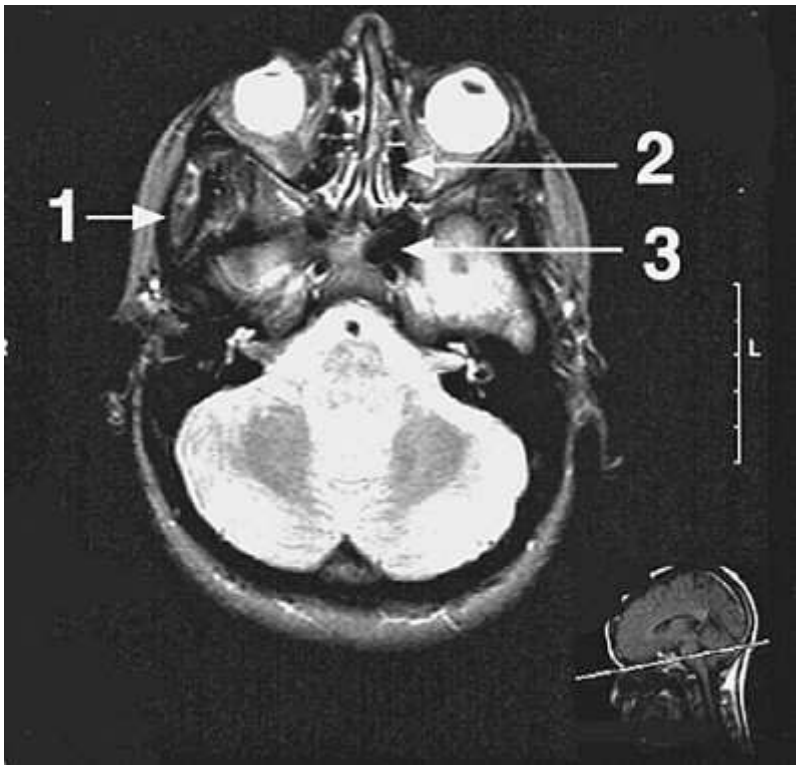
QUESTION 18
A 48-year-old male patients is brought to the emergency room because of intense pain of the right face and neck with transient visual loss of the right eye. On examination, the patient has palsy of the oculomotor nerve on the right side with resulting diplopia, along with a right lateralized painful Horner syndrome. This constellation of signs is suggestive of a cervical carotid dissection, which is a separation of the arterial tunical intima from the subjacent tunica media. Which numbered structure in following figure, is the tunica intima?

A. 1
B. 2
C. 3
D. 4
E. 5

Correct Answer: D
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
Arrow 3 points to the tunica intima. The carotid artery is an elastic artery, which contains the following layers aside from the tunica intima: Tunica externa (arrow 1), and tunica media (arrow 5). In a carotid dissection, the tunica intima can elevate or separate from the tunica media with accompanying hemorrhage of the arterial wall. The most common clinical signs are ophthalmological manifestations including painful Horner syndrome, palsy of the oculomotor nerve, diplopia, and transient monocular visual loss. Arrow 2 points to a vasa vasorum, vessels which nourish the thick wall of the aorta. Arrow 4 points to the adipose tissue in the tunica externa.

QUESTION 19
The structure indicated by arrow 2 in following figure, is which of the following?



A. ethmoidal sinus
B. inferior nasal meatus
C. infratemporal fossa
D. maxillary sinus
E. sphenoidal sinus

Correct Answer: A
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
This axial scan is at the level of the orbits as indicated by the insert at the bottom right and the eyeballs in the orbits. Arrow 2 points to the ethmoidal sinus located medial to the orbits. The sinus is divided into compartments by the air cells. The maxillary sinus (choice D) and the inferior nasal meatus (choice B) are located inferior to the level of this scan and are not seen. The sphenoidal sinus (choice E) is indicated by arrow 3 and the infratemporal fossa (choice C) by arrow 1.

QUESTION 20
A stroke resulting from obstruction of the structure indicated by arrow 1 in following figure, may result in ischemia in which of the following brain regions?

A. Broca's area in the left frontal lobe
B. cerebellum
C. medial aspect of the right frontal lobe
D. pons
E. Wernicke's area in the left frontal lobe

Correct Answer: C
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
Arrow 1 points to the right internal carotid artery which supplies the anterior and middle cerebral arteries in

the brain. The territory of the right anterior cerebral artery includes the rightmedial aspect of the frontal lobe, which will be affected by obstruction of the internal carotid artery. Broca's (choice A) and Wernicke's (choice E) areas are located in the majority of the population in the left cerebral hemisphere and are supplied by the left middle cerebral artery from the left internal carotid artery. They will not be affected in this case. The cerebellum (choice B) and pons (choice D) receive their blood supply from the basilar artery (arrow 2) which is formed from the vertebral arteries.

QUESTION 21
In the brain, the amygdala plays an important role in emotional processing. Patients with lesion of the amygdala display impairment in enhanced perception of emotionally salient events. Which of the following

A. fasciculus arcuatus
B. fasciculus cuneatus
C. fasciculus of Vicq d'Azyr
D. fornix
E. stria terminalis

Correct Answer: E
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The stria terminalis or fasciculus of Foville is one of the major output pathways from the amygdala to the septal, hypothalamic, and thalamic nuclei. Another main amygdaloid output pathway is the ventral amygdalofugal pathway. The fasciculus arcuatus (choice A) or superior longitudinal fasciculus is a bundle of fibers in the cerebrum connecting ipsilateral regions of the frontal, temporal, parietal, and occipital lobes. The fasciculus cuneatus (choice B) carries ascending sensory fibers in the dorsal funiculus of the spinal cord and terminates in the nucleus cuneatus of the medulla oblongata. The fasciculus of Vicq d'Azyr (choice C) or mammillothalamic tract connects the mammillary bodies to the anterior nuclei of the thalamus. This bundle of fibers forms part of Papez circuit, which is also involved in emotional processing. Another part of Papez circuit is the fornix (choice D), a large efferent pathway from the hippocampus.

QUESTION 22
An infant is born anencephalic. He presents without both a forebrain and a cerebrum. The remaining brain tissue is exposed, not covered by bone or skin. The infant is blind, deaf, unconscious, and unable to feel pain. Because the infant has a rudimentary brainstem, reflex actions such as respiration (breathing) and responses to sound or touch occur. However, the lack of a functioning cerebrum permanently rules out the possibility of ever gaining consciousness. Anencephaly is the result of a defect in which of the following?

A. closure of the caudal neuropore
B. closure of the rostral neuropore
C. formation of the first branchial arch
D. formation of the somites
E. fusion of the metopon

Correct Answer: B
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
Malclosure of the rostral neuropore during the fourth week of development results in anencephaly and is lethal in the affected newborn. The condition is better termed meroanencephaly because of the presence of the rudimentary brainstem with some functioning nervous tissues. Defects in the closure of the caudal neuropore (choice A) result in varying conditions of spina bifida at the lower end of the spinal cord. The first branchial arch (choice C) and the somites (choice D) do not play any role in the formation of the brain. Fusion of the metopon or forehead (choice E) occurs after birth and also does not play a role in brain formation.

QUESTION 23
As the consulting physician to the US Open, you are asked to examine a golfer who complains of increased pain with right wrist flexion and pronation activities. The patient also reports discomfort even when simply shaking hands with someone. Examination reveals also decreased sensation in the territory of the ulnar nerve. Your diagnosis is golfer's elbow, affecting mostly the superficial flexor muscles of the forearm. This group of muscles has a common origin from which of the following bony landmarks?

A. head of the radius

C. medial epicondyle of the humerus

Correct Answer: C
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The superficial layer of flexor muscles of the forearm all originate from the medial epicondyle of the humerus. Thus, this condition is also called medial epicondylitis and the most common finding is tenderness with palpation over the anterior aspect of the medial epicondyle. The muscles involved are most often the Pronator Teres, Flexor Carpi Radialis, and Palmaris Longus. The Flexor Digitorum Superficialis and Flexor Carpi Ulnaris may also be affected. There is no muscle attachment to the head of the radius (choice A). The lateral epicondyle of the humerus (choice B) is the attachment point of the common extensor tendon. The olecranon process of the ulna (choice D) is the attachment point for the Triceps Brachii, Flexor Carpi Ulnaris, and Anconeus. The tuberosity of the radius (choice E) receives the distal tendon of the biceps brachii.

QUESTION 24
A professional football player was diving for a touchdown when his face mask was grabbed and wrenched, causing neck hyperextension and rotation to the right. When brought to the sideline, the player complained of a burning sensation radiating down the right upper extremity and neurological examination revealed right lateral weakness of this limb. Movements affected were arm rotation and flexion, elbow flexion, forearm supination, and thumb flexion. The patient is diagnosed with a brachial plexus injury at the level of C6. 29. Which of the following muscles can perform arm and elbow flexion along with forearm supination?

A. biceps brachii
B. brachialis
C. brachioradialis
D. coracobrachialis
E. supinator

Correct Answer: A
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The biceps brachii muscle attaches proximally by its short head to the coracoid process of the scapula and by its long head to the supraglenoid tubercle. Distally it attaches by a strong tendon to the tuberosity of the radius and by an aponeurosis to the ulna. It thus can perform arm and elbow flexion along with forearm supination. The brachialis (choice B) attaches proximally to the anterior aspect of the lower half of the humerus and distally to the coronoid process of the ulna. It can only perform elbow flexion. The brachioradialis (choice C) attaches from the lateral supracondylar ridge of the humerus to the base of the styloid process of the radius. Although innervated by the nerve to the extensor compartment, the radial nerve, it performs elbow flexion and forearm pronation. The coracobrachialis (choice D) attaches from the coracoid process of the scapula to the anterior aspect of the upper half of the humerus. It performs arm flexion and weak adduction. The supinator (choice E) attaches proximally to the lateral epicondyle of the humerus and the annular ligament of the radius. Distally, it covers nearly the upper third of the radius and attaches to its lateral anterior aspect. It supinates the forearm, but is a weaker supinator than the biceps brachii.

QUESTION 25
In cleaning the teeth in a patient, a dental hygienist accidentally cuts the gums of the posterior two molar teeth in the lower jaw on the lateral side. The pain of this injury is registered by which of the following nerves?

A. anterior, middle, and posterior superior alveolar nerves

C. greater palatine nerve

Correct Answer: B
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The gums on the lateral side of the mandibular molar teeth are innervated by the buccal nerve (long buccal nerve). All three superior alveolar nerves (choice A) supply the gums lateral to all maxillary teeth. The greater palatine nerve (choice C) innervates the gums medial to the maxillary premolar and molar teeth. The lingual nerve (choice D) supplies the gums medial to all mandibular teeth. The nasopalatine nerve (choice E) innervates the gums posterior to the maxillary incisors.

QUESTION 26
Recanalization of the bile duct after the 13th week after fertilization allows for bile produced in the liver to reach the duodenum. However, if recanalization fails to occur and this cannot be corrected surgically, the affected infant will need a liver transplant. During development, the liver arises from which of the following?

A. foregut
B. hindgut
C. midgut
D. pleuroperitoneal membrane
E. septum transversum

Correct Answer: A
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The liver arises as a ventral outgrowth from the caudal portion of the foregut. The midgut (choice C) arises past the junction point between the bile duct and the duodenum, distal to the formative outgrowth of the liver. The midgut gives rise to the small intestine and part of the large intestine. The hindgut (choice B) arises further distally and gives rise to the rest of the large intestine, the superior part of the anal canal, the epithelium of the urinary bladder, and most of the urethra. The pleuroperitoneal membrane (choice D) and the septum transversum (choice E) are developmental components of the diaphragm.

?

QUESTION 27
A 48-year-old female patient is brought to the emergency room by her husband. He reports that his wife suffers from hypertension but, as a high-level executive with a lot of pressure at work, she has been neglecting to take her medication. This morning, as he entered the garage to leave for work, he found his wife lying on the ground next to her own car. She was experiencing uncontrolled flailing of the left arm and leg. What is the most likely site of brain lesion in this patient?

A. anterior limb of the left internal capsule
B. anterior limb of the right internal capsule
C. cerebellum

D. left subthalamic nucleus of Luys
E. right subthalamic nucleus of Luys

Correct Answer: E
Section: Anatomy

Hemiballismus is a movement disorder characterized by involuntary large amplitude movements of one or both limbs on one side of the body. It results from infarct damage to the contralateral subthalamic nucleus of Luys, in this case the right one. The left subthalamic nucleus (choice D) controls the limbs on the right side of the body, which are not affected in this case. The anterior limbs of the internal capsule (choices Aand B) contain mainly thalamocortical and corticothalamic fibers and lesions in these areas do not result in hemiballismus. Lesions in the cerebellum (choice C) also do not result in hemiballismus.

QUESTION 28
During a direct inguinal hernia repair operation, the attending surgeon reminds the firstyear surgical resident that an anatomical variation for the origin of the obturator artery exists. This artery normally arises from the internal iliac artery but it may also originate directly from which of the following vessels?

A. common iliac artery
B. external iliac artery
C. inferior epigastric artery
D. inferior vesical artery
E. superior vesical artery

Correct Answer: C
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The obturator artery can originate from the inferior epigastric artery, a location which renders it vulnerable during inguinal hernia surgical repair. The common iliac artery (choice A) only has two branches, the external and internal iliac arteries. Within the pelvis, the external iliac artery (choice B) gives out two branches, the deep circumflex iliac and inferior epigastric arteries. The superior (choice E) and inferior (choice D) vesical arteries are branches of the internal iliac arteries, supplying the bladder.

QUESTION 29
A 37-year-old rural female patient developed pain in the lower abdomen and pelvic regions. Her physician suspects a ruptured ectopic pregnancy. However, because of the isolation of the rural community, no medical imaging or laboratory procedure is available and the physician decides to perform a culdocentesis. In the latter procedure, the needle will aspirate from which of the following spaces?

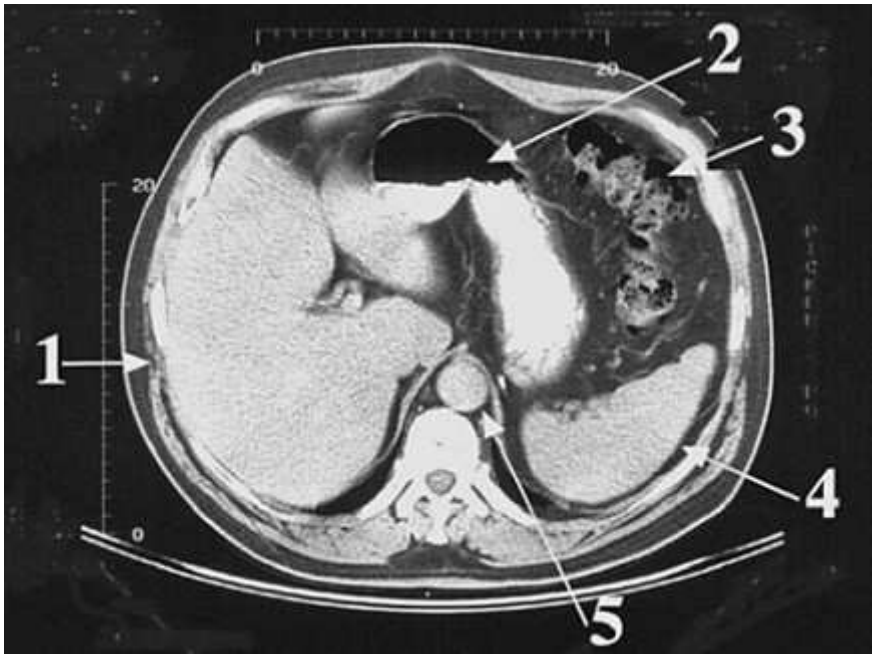
A. ovarian fossa
B. rectouterine pouch
C. uterine body
D. uterine cervix
E. vesicouterine pouchAnswer:

Correct Answer: B
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
In culdocentesis, the needle is inserted through the posterior fornix of the vagina and fluid is aspirated from the rectouterine pouch. If nonclotting blood is collected then the likelihood of a ruptured ectopic pregnancy is high. This procedure is rapid and inexpensive, however, serum progesterone level assay or ultrasonography are preferred methods. The ovarian fossa (choice A) or vesicouterine pouch (choice E)

are not used in culdocentesis. The uterine body (choice C) and cervix (choice D) would not reveal blood from a ruptured ectopic pregnancy and thus are also not used in culdocentesis.

QUESTION 30
Arrow 4 in following figure, is pointing to which of the following structures?



A. abdominal aorta
B. colon
C. liver
D. spleen
E. stomach

Correct Answer: D
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The spleen (arrow 4) lies to the left of the abdominal cavity. It is in contact with the left side of the stomach (arrow 2) and lodges against the left paravertebral gutter. The abdominal aorta (choice A, arrow 5) is seen as the circular structure immediately anterior to the vertebra. The colon (choice B, arrow 3) is the convoluted structure to the left anterior aspect of the abdominal cavity. The large liver (choice C, arrow 1) occupies most of the right side of the abdominal cavity. The stomach (choice E, arrow 2) is located between the colon and the liver, and in this case, contains liquid contrast material.

QUESTION 31
An elderly resident of a nursing home fell down the front steps and subsequently became disoriented and lethargic. He is brought to the emergency room where an emergency MRI reveals that he has developed hydrocephalus due to a small hemorrhage obstructing the foramina of Monro. The foramina of Monro allow for communication between which of the following?

A. fourth ventricle and cerebral aqueduct
B. fourth ventricle and subarachnoid space
C. lateral ventricles and third ventricle
D. third ventricle and cerebral aqueduct
E. third ventricle and fourth ventricle

Correct Answer: C
Section: Anatomy

Explanation

Explanation/Reference:
Explanation:
The foramina of Monro form the communication between the lateral ventricles and the third ventricle. The cerebral aqueduct of Sylvius flows caudally into the fourth ventricle (choice A). The lateral foramina of Luschka and the median foramen of Magendie allow for communication between the fourth ventricle and the subarachnoid space. The third ventricle communicates posteriorly with the cerebral aqueduct of Sylvius (choice D). Thus, the third and fourth ventricle communicate by way of this cerebral aqueduct.

QUESTION 32
Which of the following is the correct sequence of erythroid differentiation?

A. proerythroblast, basophilic erythroblast, polychromatophilic erythroblast, normoblast, reticulocyte, mature erythrocyte
B. proerythroblast, normoblast, reticulocyte, polychromatophilic erythroblast, basophilic erythroblast, mature erythrocyte
C. proerythroblast, polychromatophilic erythroblast, basophilic erythroblast, reticulocyte, normoblast, mature erythrocyte
D. proerythroblast, reticulocyte, normoblast, polychromatophilic erythroblast, basophilic erythroblast, mature erythrocyte
E. proerythroblast, reticulocyte, polychromatophilic erythroblast, normoblast, basophilic erythroblast, mature erythrocyte

Correct Answer: A
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The correct sequence of erythroid differentiation is indicated by choice A. Erythrocyte differentiation in the adult occurs exclusively in the bone marrow and consists of several cellular changes. The cell size decreases: proerythroblast 1419 m in diameter; basophilic erythroblast 1316 m; polychromatophilic erythroblast 1215 m; normoblast, reticulocyte, and mature erythrocyte 810 m. Condensation of the nuclear chromatin and decrease in nuclear diameter occur from the proerythroblast to the normoblast stage with ejection of the nucleus. Subsequent ejection of remaining organelles occurs in the reticulocyte to give rise to the mature erythrocyte. The maturing cells change their staining affinity because the increased hemoglobin in the cytoplasm results in increased acidophilia, whereas the decrease in the ribosome numbers in the cytoplasm results in decreased basophilia.
Choices B, C, D, and E are incorrect sequences.

QUESTION 33
In emphysema, which of the following components of the bronchioles is affected?

A. ciliated cuboidal epithelial cells
B. Clara cells
C. elastic fibers
D. goblet cells
E. squamous type I alveolar epithelial cells

Correct Answer: C
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
Elastic fibers are destroyed in emphysema by elastase. This protease is released by neutrophils recruited by macrophages under abnormal stimulus such as cigarette smoke. The loss of elasticity in the bronchioles and alveolar walls gives rise to emphysema, characterized by chronic airway obstruction. Ciliated cuboidal epithelial (choice A) and Clara (choice B) cells line the terminal bronchioles. Goblet cells (choice D) may be found at the beginning of the bronchioles and squamous type I alveolar epithelial cells line the respiratory

bronchioles.

QUESTION 34
During development, the notochord grows in a cranial direction until it reaches the prechordal plate. This plate is the primordium of the oropharyngeal (or buccopharyngeal) membrane, which, in the embryo, will separate the stomodeum from the foregut. At 26 days of gestation, the oropharyngeal membrane will break down, allowing communication of the foregut with the oral cavity. Of the following structures in the adult, which one lies at the same location as the embryonic oropharyngeal membrane?

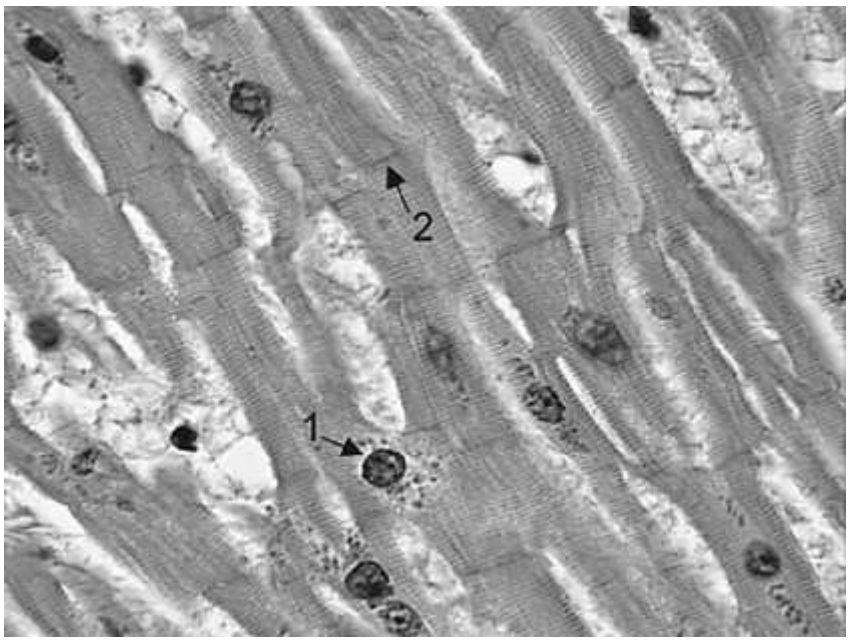
A. buccinators

C. palatopharyngeus
D. stylopharyngeus
E. superior constrictor

Correct Answer: B
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The palatoglossus muscle, which can be observed in the oral cavity to form the palatoglossal arch anterior to the palatine tonsil, lies in the same location as the embryonic oropharyngeal membrane. It lies at the junction line between the stomodeum and the foregut. The buccinator (choice A) is a muscle of the cheek and thus is located in the original stomodeum. The palatopharyngeus (choice C) is located posterior to the palatoglossus and palatine tonsil, forming the palatopharyngeal arch. The palatopharyngeus, stylopharyngeus (choice D), and superior constrictor (choice E) muscles are all pharyngeal muscles and thus are located in the original foregut.

QUESTION 35
Referring to following figure, arrow 2 indicates which of the following structures?



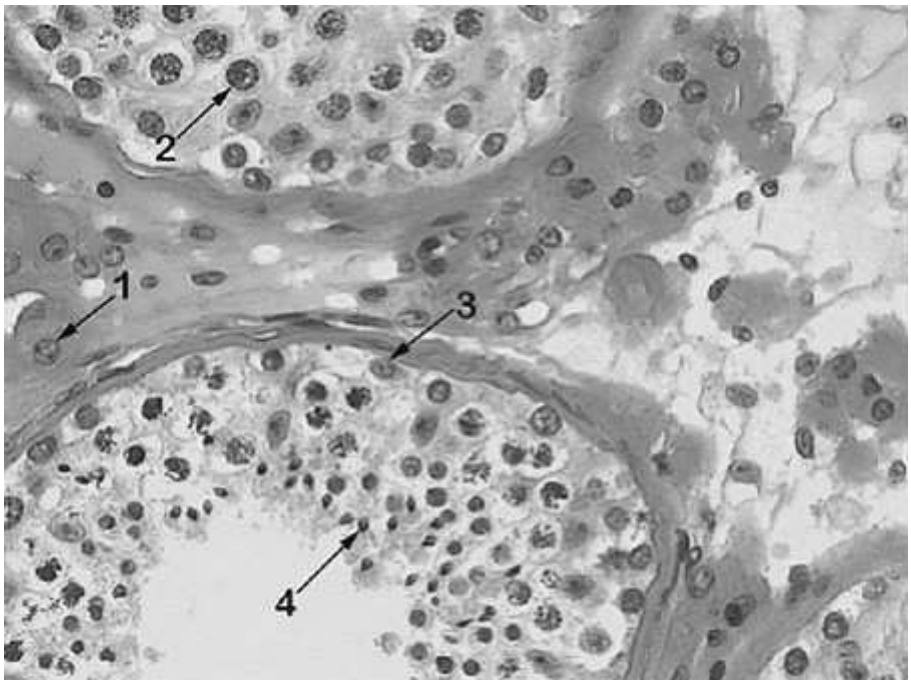
A. intercalated disk
B. motor end-plate
C. sarcoplasmic reticulum
D. tendinous junction
E. transverse tubule or T tubule

Correct Answer: A

Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The intercalated disks are specialized junctional complexes found only in cardiac muscle and they appear as dark lines between the muscle fibers. The motor end-plate (choice B) is a specialized group of synapses between the axon terminals of a motor neuron and the sarcolemma of a skeletal muscle fiber. It is not seen in cardiac muscle. The sarcoplasmic reticulum (choice C) is a specialized modification of the smooth endoplasmic reticulum for sequestering calcium ions. The transverse tubule or T tubule (choice E) is an invagination of the sarcolemma, which penetrates the muscle fiber and overlies the surface of the myofibrils. The sarcoplasmic reticulum and T tubule can only be seen in electron micrographs. There is no tendinous junction (choice D) in cardiac muscle.

QUESTION 36
The most common type of testicular cancer is germ cell carcinoma. However, testicular tumors arising from other cell types in the testis also occur. Arrow 1 in following figure, indicates which of the following structures?



A. Leydig cell
B. Sertoli cell
C. spermatid
D. spermatocyte
E. spermatogonia

Correct Answer: A
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
Arrow 1 indicates an interstitial cell of Leydig. These cells are recognizable by their location in the intertubular space, close to the capillaries and lymph vessels. Sertoli cells (choice B) are columnar cells with a large nucleolus. They span the distance from the seminiferous tubular wall to the lumen. However, their nuclei are located closer to the tubular wall. Spermatids (choice C; arrow 4) have a condensed nucleus, which becomes elongated with further maturation. This cell type is located closest to the lumen of the seminiferous tubule. Spermatocytes (choice D; arrow 2) are seen above the layer spermatogonia (choice E; arrow 3) which are located against the basal lamina.

QUESTION 37
In the skull, a network of thick-walled vessels named dural venous sinuses drains the cerebrospinal fluid and the venous blood from the brain. These vessels are formed by reflections of the dura mater, which also form partitions between major parts of the brain. Which of the following dural venous sinuses is associated with the falx cerebri?

A. cavernous sinus
B. inferior petrosal sinus
C. sigmoid sinus
D. superior sagittal sinus
E. transverse sinus

Correct Answer: D
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The falx cerebri is the dural partition separating the hemispheres of the brain, above the corpus callosum. It has in its superior edge the superior sagittal sinus and in its inferior border, the inferior sagittal sinus. The cavernous sinus (choice A) is a dural pocket in the middle cranial fossa and is located on either side of the sella turcica. It is unusual because it contains the internal carotid artery and cranial nerves III, IV, V1, V2, and VI. The sigmoid sinus (choice C) is located in the posterior cranial fossa, below the level of the tentorium cerebelli, which contains in its posterior border the transverse sinus (choice E).

QUESTION 38
A patient was thrown from a tractor, which partially ran over him and caused injury to the base of the skull. The origin of the internal jugular vein at the jugular foramen was compromised. Which of the following cranial nerves courses through the jugular foramen?

A. abducens (sixth cranial) nerve
B. facial (seventh cranial) nerve
C. hypoglossal (twelfth cranial) nerve
D. spinal accessory nerve (eleventh cranial) nerve
E. vestibulocochlear (eighth cranial) nerve

Correct Answer: D
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The spinal accessory (eleventh cranial) nerve takes its origins in the neck, but then runs cranially into the skull through the foramen magnum to join with its cranial component. They exit as one through the jugular foramen, along with the glossopharyngeal (ninth cranial) and vagus (tenth cranial) nerves. The abducens (sixth cranial) nerve (choice A) runs through the superior orbital fissure to reach the orbit. The facial (seventh cranial; choice B) and vestibulocochlear (eighth cranial; choice E) nerves run together through the internal acoustic meatus into the temporal bone. The facial nerve exits the skull through the stylomastoid foramen. The hypoglossal (twelfth cranial; choice C) nerve exits the skull through the hypoglossal canal.

QUESTION 39
Protein zero (P0) is the predominant protein in myelin in the peripheral nervous system and its function is to stabilize adjacent plasma membranes by interaction with similar P0 molecules. Which of the following cells

manufacture P0?

A. fibrous astrocytes
B. microglia
C. oligodendrocytes

Correct Answer:

Explanation/Reference:
Explanation:
Schwann cells produce myelin in the peripheral nervous system whereas oligodendrocytes produce myelin in the central nervous system. Oligodendrocytes manufacture the proteolipid protein, the functional equivalent to P0 in the central nervous system. Fibrous (choice A) and protoplasmic (choice D) astrocytes are supportive cells which play a role in the regulation of brain metabolism. Microglia (choice B) are mesodermal in origin and have phagocytotic activity in the central nervous system.

QUESTION 40
Aperilunate fracture dislocation is a devastating closed injury of the wrist. It usually results from a fall where the weight of the body is transferred onto the wrist. The hand is caught in the hyperextended and ulnar deviated position. The fracture dislocation involves rupture of interosseous ligaments, joints, and ultimately dislocation/fracture of the lunate bone. In the anatomical position, which carpal bone lies directly distal to the lunate?

A. capitates
B. hamate
C. scaphoid
D. trapezoid
E. triquetrum

Correct Answer: A
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The capitate bone lies directly distal to the lunate. The mechanism of perilunate fracture dislocation involves rupture of the radioscaphocapitate and scapholunate interosseous ligaments, dislocation of the capitolunate joint, rupture of the lunotriquetral interosseous ligament, and finally dislocation/rupture of the lunate. In the anatomical position, the hamate (choice B) is the most medial carpal bone, located just distal to the triquetrum. The scaphoid (choice C) lies lateral to the lunate and proximal to the trapezium (choice D), the carpal bone articulating with the thumb. The trapezoid (choice E) is medial to the trapezoid and distal to the scaphoid. The lunate bone (choice C) lies adjacent to the scaphoid in the proximal row of carpals and with the scaphoid articulates with the radius at the radiocarpal or wrist joint. It is not related to the anatomic snuffbox. The pisiform bone (choice D) is a sesamoid bone in the tendon of the flexor carpi ulnaris on the lateral wrist. It is not related to the anatomic snuffbox.

QUESTION 41
A 19-year-old man was in a barroom brawl and was punched squarely in the right eye. He comes to the emergency room the next day and complains of diplopia. An X-ray reveals fracture of the orbital floor. Neurological examination shows loss of sensation of the skin of the right face below the right eye and the upper gums. Which of the following nerves may be injured?

A. frontal nerve
B. infraorbital nerve
C. nasociliary nerve
D. supraorbital nerve

E. trochlear nerve

Correct Answer: B
Section: Anatomy
Explanation

The infraorbital nerve, a branch of the maxillary (V2) division of the trigeminal (fifth cranial) nerve, courses elow the eye. It provides superior alveolar branches to supply the upper gums and is vulnerable in fractures involving the floor of the orbit and face area. All the nerves mentioned in the other choices will be spared by this type of injury. The frontal nerve (choice A) and nasociliary nerve (choice C) are branches from the ophthalmic division (V1) of the trigeminal (fifth cranial) nerve and course within the orbit. The supraorbital (choice D) nerve is a continuation branch of the frontal nerve onto the forehead, providing sensory innervation for this area. The trochlear (fourth cranial) nerve is also located within the orbit.

QUESTION 42
Cells in the pancreas that secrete glucagon and insulin are which of the following?

A. A and B cells
B. acinar cells
C. D cells
D. pancreatic D1 cells
E. pancreatic polypeptide cells

Correct Answer: A
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
In the human pancreas, A and B cells of the islets of Langerhans secrete glucagon and insulin, respectively. Pancreatic D1 cells (choice D) release a product similar to vasoactive intestinal polypeptide. Pancreatic polypeptide cells (choice E) secrete pancreatic polypeptide and D cells (choice C) release somatostatin. All the aforementioned cells belong to the endocrine pancreas. Acinar cells (choice B) are part of the exocrine pancreas and do not secrete glucagon or insulin.

QUESTION 43
Below figure is a high magnification photomicrograph of the gall bladder. The arrow points to the internal lining that is formed by which of the following?

A. pseudostratified columnar epithelium
B. simple columnar epithelium
C. stratified cuboidal epithelium
D. stratified squamous epithelium
E. transitional epithelium

Correct Answer: B
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The lining of the gallbladder is a simple columnar epithelium identifiable by tall cells with elongated nuclei arranged at the same level. Pseudostratified epithelium (choice A) is distinguishable from the simple columnar epithelium by the cell nuclei being arranged at different levels. Stratified cuboidal epithelium (choice C) is characterized by short cells with nuclei arranged at different levels. Stratified epithelium (choice D) has a characteristic cellular basal layer with flat degenerate cells in its upper layer. Transitional epithelium (choice E) is a type of stratified epithelium exclusively confined to the urinary tract.

QUESTION 44
During surgery at the root of the neck, an attending surgeon cautions her resident to locate important structures which need to be protected. One of these is the phrenic nerve, responsible for the innervation of the diaphragm and thus, respiration. The phrenic nerve can be positively identified by which of the following anatomical relationships?

A. It is found immediately between the common carotid artery and the internal jugular vein.
B. It lies immediately between the esophagus and the trachea.
C. It lies on the scalenus medius muscle.

E. The suprascapular and transverse cervical arteries cross over it anteriorly.

Correct Answer: D
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
At the root of the neck, the phrenic nerve (C3, C4, C5) lies on the scalenus anterior muscle, not the scalenus medius (choice C). The transverse cervical and suprascapular arteries course over it. The vagus (tenth cranial) nerve, not the phrenic nerve is located between the common carotid artery and the internal jugular vein (choice A). The recurrent laryngeal branch from the vagus nerve wraps around the right subclavian artery (choice D), and courses cranially between the esophagus and the trachea (choice B).

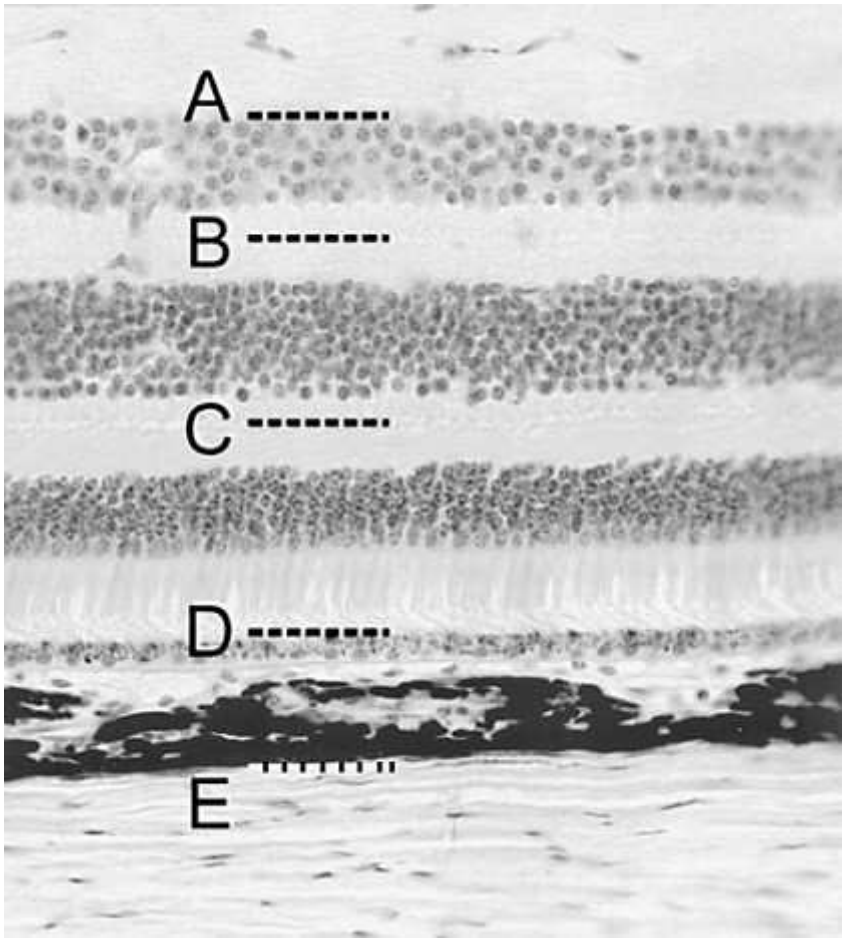
QUESTION 45
A premature female infant is born about 24 weeks after fertilization and develops rapid, labored breathing shortly after birth. She is immediately transferred to intensive care where she is diagnosed with hyaline membrane disease (HMD). Which of the following is most likely deficient in the infant?

A. alveolar ducts
B. lung surfactant
C. terminal saccules
D. type I alveolar cells
E. type II alveolar cells

Correct Answer: D
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
HMD is also known as respiratory distress syndrome, which is most often caused by the lack of lung surfactant, due to a premature birth. Lung surfactant production begins around 20 weeks after fertilization. But it is present only in small amounts until the last 2 weeks before birth when its amount increases significantly. Alveolar ducts (choice A) branch from the respiratory bronchioles during development. Type I alveolar cells (choice D) or pneumocytes are squamous epithelial cells, which participate in gas exchange. These epithelial cells line the terminal saccules (choice C). Type II alveolar cells (choice E) synthesize surfactant.

QUESTION 46
Which label in following figure indicates the typical plane of separation at which retinal detachment occurs?



A. A
B. B
C. C
D. D
E. E

Correct Answer: D
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
Retinal separation typically occurs at the interface between the retinal pigment epithelium and the outer limit of the sensory (neural) retina. The weakness of this plane is attributed to the manner in which the retina develops, a process that involves obliteration of the space between two of the layers of the optic cup--an inner layer from which the sensory retina arises and an outer layer from which the retinal pigment epithelium arises. Other retinal layers are bridged by neuronal processes, and Müller cells (the retina's glial cells) span the entire thickness of the neural retina. Plane A(choice A) marks the boundary between the nerve fiber layer above and the ganglion cell layer below. The nerve fiber layer is composed of axons of the retinal ganglion cells. Plane B (choice B) is within the inner plexiform layer, the site of synaptic contacts between bipolar neurons, retinal ganglion cells, and amacrine cells. Plane C (choice C) is within the outer plexiform layer, the site of synapses among bipolar cells, rods and cones, and horizontal cells. The boundary between the choroid (of the middle vascular tunic or uvea) and the sclera (of the external, fibrous tunic) is marked by plane E (choice E).

QUESTION 47
A 28-year-old male patient suffering from head trauma resulting from a car accident is brought unconscious to the emergency room. In performing the pupillary light reflex, you notice that even though the left pupil constricts when you shine a light directly into the left eye, it does not do so when you shine a light into the right eye. This is best explained by a disconnection between which of the following bilateral structures?

A. Edinger-Westphal nucleus
B. habenula
C. inferior colliculus

Correct Answer:

Explanation/Reference:
Explanation:
The central visual pathway for the papillary light reflex is organized as follows: fibers from the ganglionic layer of the retina project posteriorly to the pretectum, which in turn innervates the Edinger- Westphal nucleus. Preganglionic parasympathetic neurons in the Edinger- Westphal nucleus project to the ciliary ganglion, which sends postganglionic parasympathetic innervation back to the constrictor pupillae of the eye. The Edinger-Westphal nuclei from each side of the midbrain are also connected to each other by projections running through the posterior commissure. Disconnection of these fibers will result in loss of the consensual papillary light reflex on the contralateral side, as happens in this case. The habenula (choice B) is a nucleus of the thalamus, which does not participate in the central visual pathways. The lateral geniculate nucleus (choice D) receives fibers from the ganglionic layer of the retina. However, fibers participating in the papillary light reflex run through this structure without synapsing and terminate in the pretectum. Thus, the lateral geniculate nucleus does not participate in the pupillary light reflex. The inferior colliculus (choice C) and the medial geniculate nucleus (choice E) are components of the auditory system.

QUESTION 48
A 45-year-old female patient presents to the emergency room with a headache and complains of abnormal sensations on the left side of her body. She claims that the sensory changes came on rapidly in the last few hours. Her laboratory reports come back normal, a spinal tap reveals normal cerebrospinal fluid (CSF), and her mental ability seems good. You perform a neurological examination and find she has greatly reduced sensation on the entire left side of her body, including her face. The sensory loss includes all modalities. The motor examination is normal, as is her visual examination and hearing examination. Based on the neurological findings, which of the following thalamic nuclei would be involved?

A. lateral and medial geniculate nuclei
B. lateral dorsal and lateral posterior nuclei
C. pulvinar
D. ventral anterior and ventral lateral nuclei
E. ventral posterior lateral and ventral posterior medial nuclei

Correct Answer: E
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The ventral posterior lateral (VPL) and ventral posterior medial (VPM) nuclei are sensory relay thalamic nuclei. The lateral and medial geniculate nuclei (choice A) are respectively concerned with visual and auditory sensory information. The lateral dorsal (LD) and lateral posterior (LP) nuclei (choice B), and the pulvinar (choice C) are association or multimodal relay nuclei. The ventral anterior (VA) and ventral lateral (VL) are motor relay nuclei.

QUESTION 49
A patient has been admitted for hematemesis (vomiting of blood). Endoscopic examination reveals bleeding esophageal varices resulting from portal obstruction. These varices represent anastomoses between branches of which of the following?

A. inferior vena cava with a patent ductus venosus
B. left gastric, azygos, and hemiazygos veins
C. right gastric vein and the inferior vena cava

D. superior, middle, and inferior rectal veins
E. veins running on the ligamentum teres and the epigastric veins

Correct Answer: B
Section: Anatomy

Obstruction of the portal vein results in an increase in the collateral circulation between veins that normally drain to the portal vein and those that drain to the systemic veins. Choices A, B, D, and E all represent possible collateral venous circulation in case of portal obstruction. Choice Ais rare because the ductus venosus closes after birth. Choice B is correct because varicose veins in this region give rise to esophageal varices. Choice D results in varicose veins in the rectal region. Choice C is incorrect because there is no connection between the right gastric vein and the inferior vena cava. In choice E, enlargement of the epigastric veins results in varicose veins radiating from the umbilicus, the caput medusae.

QUESTION 50
A 15-year-old high school football player is brought to the emergency room. On examination, his right lower limb is deformed and swollen around the knee. At full extension, there is valgus instability, suggestive of knee dislocation. The patient is in great pain and there is a concern for concomitant vascular and nervous injuries. Palpation of the dorsalis pedis artery reveals a normal pulse. However, neurological examination reveals impaired dorsiflexion of the foot with decreased sensation in the space between digits 1 and 2. Which of the following nerves is affected?

A. deep peroneal (fibular) nerve
B. femoral nerve
C. saphenous nerve
D. superficial peroneal (fibular) nerve
E. tibial nerve

Correct Answer: A
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The deep peroneal (fibular) nerve innervates the muscles responsible for dorsiflexion in the anterior compartment of the leg. It also provides for the cutaneous innervation of the space between digits 1 and 2. The femoral nerve (choice B) innervates muscles in the anterior compartment of the thigh and the skin of the medial aspect of the leg by a continuing branch, the saphenous nerve (choice C). The superficial peroneal (fibular) nerve (choice D) innervates the lateral compartment of the leg and muscles responsible for foot eversion. The tibial nerve (choice E) innervates the posterior compartment of the leg and the muscles responsible for plantar flexion.

QUESTION 51
In the central auditory pathways, second-order neurons are located in which of the following?

A. cochlear (spiral) ganglion
B. cochlear nuclei
C. inferior colliculi
D. nuclei of lateral lemniscus
E. superior olivary nuclei

Correct Answer: B
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
Second-order neurons in the central auditory pathways are located in the dorsal and ventral cochlear

nuclei. They receive afferents from the first-order neurons located in the cochlear (spiral) ganglion (choice A). Secondorder fibers from the cochlear nuclei project in turn to the inferior colliculi (choice C), nuclei of lateral lemniscus (choice D), and superior olivary nuclei (choice E).

QUESTION 52
Arrow 2 in following figure points to which of the following structures?

A. glomerulus

C. lacis cells

Correct Answer: D
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The macula densa indicated by arrow 2 is a modified segment of the distal tubule at the site of its passage adjacent to the vascular pole of the renal corpuscle. The name arises from the close spacing of nuclei of the epithelial cells forming this part of the distal tubule. These cells are thought tosense the chloride content in the passing filtrate and generate signals that regulate the caliber of the afferent arteriole. The glomerulus (choice A, arrow 1) is a network of capillaries derived from the afferent arteriole and suspended within Bowman's capsule by its vascular pole. The juxtaglomerular cells (choice B) form a cuff around the afferent arteriole prior to its entrance into the glomerulus and they secrete renin. Lacis cells (choice C, arrow 4) are extraglomerular mesangial cells with an uncertain function. The vascular pole (choice E, arrow 3) feeds blood to the glomerulus and carries blood away from it. As part of the juxtaglomerular apparatus, it is closely apposed to the macula densa.

QUESTION 53
A gang member is rushed to the emergency room suffering from multiple stab wounds made by an ice pick. Athird-year medical student rotating through emergency medicine is puzzled by the sight of a milky white substance exuding from a stab wound just superior to the right sternoclavicular joint. Which of the following structures is possibly injured at this location?

A. the common carotid artery
B. the cupola of the right lung
C. the internal jugular vein
D. the right lymphatic trunk
E. the thoracic duct

Correct Answer: D
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The right lymphatic trunk is ruptured and chyle is exuding from the wound. Blood would flow from a wound involving the common carotid artery (choice A) or internal jugular vein (choice C). Astabbing lesion of the cupola of the right lung (choice B) would result in pneumothorax. The thoracic duct (choice E) does carry chyle. However, the thoracic duct drains into the bifurcation of the internal jugular and subclavian veins on the left side, above the left sternoclavicular joint.

QUESTION 54
A 72-year-old male patient has suffered a cerebral infarct affecting the left cerebral hemisphere. On examination of the patient, it is noticed that his verbal output is fluent and paraphasic. His comprehension of speech is normal but repetition is severely impaired. Naming is also impaired, although when given a list, the patient is able to select the correct name. Special consultation with a neurologist results in a diagnosis of conduction aphasia. Which of the following brain structures is affected?

A. arcuate fasciculus
B. Broca's area
C. nucleus ambiguous
D. red nucleus

Correct Answer:

Explanation:
The arcuate fasciculus connects Wernicke's area to Broca's area, integrating comprehension of speech with motor speech. A lesion in this connecting bundle results in this unusual condition of conduction aphasia, characterized by impairment of repetition and naming. Broca's area (choice B) is the motor speech area and lesion in this area will result in motor speech impairment. However, this patient's verbal output is fluent. Alesion in the nucleus ambiguus (choice C) will result in dysarthria and also loss of a fluent verbal output. The red nucleus (choice D) is a mesencephalic motor nucleus, which does not participate in the central pathways for speech. Wernicke's area (choice E) is the speech comprehension area, which is intact in this patient because he comprehends spoken language.

QUESTION 55
Which of the following is characterized by an absence of lymphoid follicles and germinal centers?

A. axillary lymph node
B. Peyer's patches
C. pharyngeal tonsil
D. spleen
E. thymus

Correct Answer: E
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The thymus provides for development of new T lymphocytes in an environment shielded from foreign antigens. Like bone marrow, the thymus is a primary lymphoid organ, and not a site of reactions to foreign antigens. Lymphoid follicles are sites of B lymphocyte proliferation in response to antigen stimulation. These occur in the lymph nodes (choice A), Peyer's patches (choice B), tonsils (choice C), and white pulp of the spleen (choice D).

QUESTION 56
A 24-year-old student is brought to the emergency room after being found in a ditch where he had lain overnight after being hit by a car. He complains of severe pain in the left arm and examination reveals a broken humerus. Neurological examination reveals that the patient can extend the elbow but displays inability to supinate the elbow when it is extended. The patient also has wrist drop and very weak hand grasp. The neurological lesion is likely localized at which of the following locations?

A. posterior cord of the brachial plexus
B. posterior divisions of the brachial plexus
C. radial nerve at the distal third of the humerus
D. radial nerve at the midforearm
E. radial nerve at the wrist

Correct Answer: C
Section: Anatomy
Explanation

Explanation/Reference:

Explanation:
Wrist drop and weak hand grasp indicate that the patient has a lesion of the radial nerve, most likely at the distal third of the humerus, sparing the innervation of the tríceps brachii but affecting the supinator. Because the patient can extend the elbow, the integrity of the posterior cord (choice A) and posterior divisions (choice B) of the brachial plexus is preserved. Lesion of the radial nerve at the midforearm (choice D) and wrist (choice E) would spare the innervation of the supinator.

QUESTION 57
A 24-year-old student is brought to the emergency room after being found in a ditch where he had lain overnight after being hit by a car. He complains of severe pain in the left arm and examination reveals a broken humerus. Neurological examination reveals that the patient can extend the elbow but displays inability to supinate the elbow when it is extended. The patient also has wrist drop and very weak hand grasp. The neurological lesion is likely localized at which of the following locations? In the above patient, when the elbow is partially flexed, the patient can supinate the left forearm. This is due to the function of which of the following?

A. biceps brachii
B. brachialis muscle
C. brachioradialis
D. pronator teres
E. anconeus

Correct Answer: A
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The biceps brachii is a strong supinator of the forearm through its attachment to the radial tuberosity, but it can only function when the elbow is partially flexed. The supinator by itself is a weaker supinator muscle: prove it to yourself by using a screwdriver with your right elbow flexed (biceps brachii and supinator) and your right elbow extended (supinator only). The brachialis (choice B) and brachioradialis (choice C) muscles are flexors of the forearm. The pronator teres (choice D), as its name indicates, pronates the forearm. The anconeus (choice E) helps in extension of the elbow.

QUESTION 58
Hormone-secreting chromophils in the pars distalis of the adenohypophysis are classified into acidophils and basophils. Which of the following hormones is secreted by the acidophils?

A. adrenocorticotropin
B. follicle-stimulating hormone
C. luteinizing hormone
D. prolactin
E. thryrotropin (thyroid-stimulating hormone)

Correct Answer: D
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
Prolactin is secreted by one of the two types of hormone-secreting acidophils, the mammotrophs. The other types of acidophils are the somatotrophs, which secrete growth hormone (somatotropin). The hormones listed in all the other choices are secreted by the basophils. Adrenocorticotropin (choice A) is secreted by the corticotrophs. The gonadotrophs secrete either follicle-stimulating hormone (choice B) or luteinizing hormone (choice C). Thyrotropin (choice E) is secreted by thyrotrophs.

QUESTION 59
Production of specific granules occurs mainly during which stage of granulocyte development?

A. granulocyte colony-forming unit

B. metamyelocyte
C. myeloblast
D. myelocyte
E. promyelocyte

Correct Answer:

Generation of specific granules occurs during the myelocyte stage. Development of all three types of granulocytes follows a similar sequence of stages. The granulocyte colonyforming unit (choice A) is an undifferentiated progenitor cell of the granulocyte line. Buildup of the protein synthesis machinery occurs during the myeloblast (choice C) and promyelocyte (choice E) stages. The promyelocyte stage is also characterized by production of primary (nonspecific) granules. After the myelocyte stage, further condensation and reshaping of the nucleus occurs during the metamyelocyte stage (choice B).

QUESTION 60
A 1-year-old infant presents with cardiomegaly and congestive heart failure. She has increased intracranial pressure with hydrocephaly and cranial bruit. A vein of Galen aneurysm, revealed by MRI, is shown to compress the aqueduct of Sylvius, the posterior part of the third ventricle, and the splenium of the corpus callosum. Normally, the cerebral vein of Galen joins with which dural venous sinus?

A. inferior sagittal sinus
B. sigmoid sinus
C. superior petrosal sinus
D. superior sagittal sinus
E. transverse sinus

Correct Answer: A
Section: Anatomy
Explanation

Explanation/Reference:
Explanation:
The great cerebral vein of Galen joins with the inferior sagittal sinus to form the straight sinus. The latter drains into the transverse sinus (choice E). The superior sagittal sinus (choice D) drains posteriorly into the transverse sinus. The transverse sinus which runs bilaterally on the posterior wall of the posterior cranial fossa becomes the sigmoid sinus (choice B) which flows into the internal jugular vein. The superior petrosal sinus (choice C) extends from the cavernous sinus to the beginning of the sigmoid sinus.

QUESTION 61
A newborn female infant cannot swallow, exhibits persistent drooling, and aspiration or regurgitation of food after attempted feedings. When the infant strains, coughs, or cries, the stomach inflates, elevating the diaphragm and making respiration more difficult. The patient is diagnosed with congenital esophageal atresia at the cervical levels, necessitating surgical repair. During the surgery, the blood supply of the esophagus must be carefully isolated to protect from injury. Which of the following arteries supplies the esophagus at cervical levels?

A. bronchial artery
B. inferior thyroid artery
C. internal thoracic artery
D. left inferior gastric artery
E. left inferior phrenic artery

Correct Answer: B
Section: Anatomy
Explanation

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