INTRODUCTION

This book, published by the National Board of Medical Examiners (NBME), consists of test items that have been retired from the Part I (basic sciences) item library of the NBME. These items are no longer secure and will not be used in future examinations developed by the NBME. They are published as illustrations of the principles, concepts, and specific information included in previously administered Part I examinations. This collection of retired items is not intended to be representative of upcoming Part I or Step 1 examinations in terms of content coverage, proportionate use of various item types, or other respects.

The items in this book are grouped by discipline and arranged by item type within discipline. An answer key is provided for the items.

Applicants for NBME Part I (last administration September 1991) or Step 1 of the United States Medical Licensing Examination (USMLE - first administration June 1992) are encouraged to consult the appropriate *Bulletin of Information* and *Guidelines and Sample Items* publications for information about the content coverage of the basic medical sciences for the Part I or Step 1 licensing examinations.

DIRECTIONS (ITEMS 1-60): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case and fill in the circle containing the corresponding letter on the answer sheet.

1. Damage to the radial nerve in the spiral groove causes

(A) numbness over the medial side of the forearm
(B) inability to oppose the thumb
(C) weakness in pronating the forearm
(D) weakness in abducting the arm
(E) wrist drop

2. The axillary nerve enters the quadrangular space with the

(A) radial nerve
(B) axillary artery
(C) anterior circumflex humeral artery
(D) posterior circumflex humeral artery
(E) scapular circumflex artery

3. Which of the following courses through the jugular foramen?

(A) The facial (VII) nerve
(B) The inferior sagittal sinus
(C) The middle meningeal artery
(D) The straight sinus
(E) The vagus (X) nerve

4. The structure that forms the posterior boundary of the epiploic foramen is the

(A) aorta
(B) hepatic artery
(C) inferior vena cava
(D) right celiac ganglion
(E) right suprarenal artery

5. The chorda tympani branch of the facial (VII) nerve carries

(A) motor fibers to the stapedius muscle
(B) parasympathetic fibers to the parotid gland
(C) sensation from the tympanic membrane
(D) taste from the anterior two-thirds of the tongue
(E) taste from the posterior one-third of the tongue

6. In a patient with an aneurysm of the aortic arch associated with hoarseness, one would immediately examine for paralysis of the left

(A) anterior belly of the digastric muscle
(B) cricothyroid muscle
(C) posterior belly of the digastric muscle
(D) posterior cricoarytenoid muscle
(E) omohyoid muscle

7. Sensory innervation of the larynx is by branches from the

(A) trigeminal (V) nerve
(B) facial (VII) nerve
(C) vestibulocochlear (VIII) nerve
(D) glossopharyngeal (IX) nerve
(E) vagus (X) nerve

8. During childbirth, a major bony landmark used for a pudendal nerve block is the

(A) greater sciatic notch
(B) ischial spine
(C) lesser sciatic notch
(D) obturator foramen
(E) pubic tubercle

9. Most of the blood flow through the coronary arteries of the left ventricle occurs during the period when

(A) both the aortic and mitral valves are closed
(B) both the aortic and mitral valves are open
(C) the aortic valve is closed and mitral valve is open
(D) the aortic valve is open and mitral valve is closed
(E) none of the above occurs, because coronary flow is constant

10. During a mastectomy, a surgeon removes lymph nodes from the axillary fat. Some time thereafter, winging of the patient's scapula occurs. Branches of which nerve were traumatized?

(A) Axillary nerve
(B) Dorsal scapular nerve
(C) Lateral pectoral nerve
(D) Long thoracic nerve to the serratus anterior muscle
(E) Nerve to the subclavius muscle

11. Following a blow to the side of the head, extradural hemorrhage is usually caused by bleeding from the

(A) cavernous sinus
(B) emissary veins (connections between intracranial sinuses and external veins)
(C) middle cerebral artery
(D) middle meningeal vessels
(E) superior sagittal sinus

12. A patient with Bell palsy [paralysis of the facial (VII) nerve] experiences food collecting in his oral vestibule. Paralysis of which of the following muscles would most likely cause this problem?

(A) Buccinator
(B) Masseter
(C) Mentalis
(D) Orbicularis oris
(E) Zygomaticus major

13. Pain impulses from the tip of the tongue would most likely be carried to neurons in which of the following ganglia?

(A) Geniculate
(B) Otic
(C) Pterygopalatine
(D) Superior vagal
(E) Trigeminal

14. Structural features of the middle ear cavity include each of the following EXCEPT

(A) anterior - auditory (eustachian) tube
(B) inferior - cochlea
(C) lateral - external acoustic meatus
(D) posterior - mastoid antrum
(E) superior - tegmen tympani

15. A cut in the palm causes absence of flexion of the distal interphalangeal joint of the index finger and weakness in flexion of the proximal interphalangeal joint of the same finger. No other abnormalities are noted. The damaged structure is

(A) the median nerve
(B) the radial nerve
(C) the ulnar nerve
(D) a tendon of the flexor digitorum profundus muscle
(E) a tendon of the flexor digitorum superficialis muscle

16. A fracture of the surgical neck of the humerus causes weakness in abduction and lateral rotation of the arm. The damage is to the

(A) axillary nerve
(B) long thoracic nerve
(C) musculocutaneous nerve
(D) radial nerve
(E) suprascapular nerves

17. After a football injury, the femur can be pulled anteriorly in relation to the tibia. No other abnormalities are seen. The damaged structure is the

(A) anterior cruciate ligament
(B) lateral collateral ligament
(C) medial collateral ligament
(D) medial meniscus
(E) posterior cruciate ligament

18. If the nerve that passes over the neck of the fibula were damaged, one would expect a loss of each of the following EXCEPT

(A) ability to dorsiflex the foot
(B) ability to evert the foot
(C) sensation between the first and second toes
(D) sensation over the lateral leg and dorsum of the foot
(E) sensation over the medial leg

19. A person with a limp caused by injury to the superior gluteal nerve would most likely have paralysis of which of the following muscles?

(A) Gluteus maximus
(B) Gluteus medius
(C) Obturator internus
(D) Piriformis
(E) Quadratus femoris

20. A patient with a nerve injury to the gluteal region has difficulty rising from the seated position and straightening his trunk, but he has no difficulty flexing his leg. This nerve injury affects the

(A) gluteus maximus muscle
(B) gluteus minimus muscle
(C) hamstring muscles
(D) iliopsoas muscle
(E) obturator internus muscle

21. A needle correctly inserted for a lumbar puncture would penetrate each of the following EXCEPT the

(A) arachnoid mater
(B) dura mater
(C) interspinous ligament
(D) ligamentum flavum
(E) pia mater

22. After opening the pericardial sac, a surgeon can freely pass a ligature around the aorta and the

(A) inferior vena cava
(B) left pulmonary artery
(C) left pulmonary vein
(D) pulmonary trunk
(E) superior vena cava

23. If the axillary artery is ligated proximally as it passes over the first rib, blood will be supplied to the distal axillary artery through the

(A) brachial artery
(B) internal thoracic artery
(C) subclavian artery
(D) subscapular artery
(E) vertebral artery

24. The vermiform appendix is not usually in the position depicted in most textbooks. In which of the following positions is it most commonly located?

(A) Along the ascending colon
(B) Anterior to the terminal ileum
(C) Pelvic
(D) Retrocecal
(E) Retrocolic

25. In a cell, a drug that acts as an H^+ ionophore would be expected to

(A) activate protein synthesis
(B) cause the secretion of lysosomes
(C) increase the acidity of endosomes
(D) stimulate secretion
(E) uncouple oxidative phosphorylation

26. If the amount of DNA in a cell during the G2 phase is 3, what is the amount of DNA in the cell during metaphase?

(A) 1.5
(B) 2
(C) 3
(D) 6
(E) 12

27. Of the following cell types, which would NOT be affected by inhibitors of transcription?

(A) Cardiac muscle cells
(B) Erythroblasts
(C) Erythrocytes
(D) Fibrocytes
(E) Osteoclasts

28. Proteins synthesized on membrane-bound polyribosomes normally may undergo each of the following EXCEPT

(A) intracellular transport
(B) release from polyribosomes into cytosol
(C) secretion
(D) sequestration in lysosomes
(E) transfer to the cisternal space

29. The Purkinje cells of the cardiac impulse-conducting system are a modification of which of the following cells of the heart?

(A) Nerve cells
(B) Endothelial cells
(C) Cardiac muscle cells
(D) Fibroblasts
(E) Schwann cells

30. The function of mast cells is related to their

(A) secretion of immunoglobulins
(B) content of lysosomes
(C) secretion and storage of norepinephrine
(D) surface attachment of specific antibodies
(E) afferent innervation

31. Each of the following cells is innervated by sympathetic postganglionic nerve fibers EXCEPT

(A) brown adipocytes
(B) cells of the sinoatrial node
(C) enteric neurons
(D) muscle of distributing arteries
(E) striated muscle of the esophagus

32. A patient develops pernicious anemia (deficiency of vitamin B_{12}) following an operation. The procedure most likely was

(A) anastomosis of the stomach and jejunum
(B) removal of the gallbladder
(C) removal of the gastric antrum
(D) removal of the terminal ileum
(E) vagotomy

33. Lymph has the highest protein concentration in the

(A) brain
(B) heart
(C) liver
(D) lung
(E) thymus

34. Each of the following nerves supplies muscles derived from the branchial arches EXCEPT the

(A) facial (VII)
(B) glossopharyngeal (IX)
(C) hypoglossal (XII)
(D) trigeminal (V)
(E) vagus (X)

35. A developmental abnormality of midline endoderm is

(A) cysts of Rathke's pouch
(B) dermoid cyst
(C) pilonidal sinus or cyst
(D) spina bifida
(E) thyroglossal cyst (craniopharyngeal canal)

36. Congenital absence of the parathyroids is most likely to be accompanied by absence or poor development of the

(A) lungs
(B) anterior portion of the pituitary gland
(C) thyroid gland
(D) nasopharyngeal portions of the eustachian tubes
(E) thymus

37. Each of the following is characteristic of the testicular feminization syndrome EXCEPT

(A) a female phenotype
(B) lack of oviducts and a uterus
(C) testes
(D) an absence of spermatogenesis
(E) ovaries

38. Which of the following structures is derived from the midgut?

(A) The descending colon
(B) The liver
(C) The pancreas
(D) The stomach
(E) The vermiform appendix

39. Endoderm contributes to the formation of each of the following EXCEPT the

(A) auditory (eustachian) tube
(B) liver
(C) parathyroid glands
(D) tooth enamel
(E) trachea

40. Each of the following structures is derived from the endoderm of the embryonic foregut and its associated splanchnic mesoderm EXCEPT the

(A) esophagus
(B) liver
(C) pancreas
(D) spleen
(E) stomach

41. Addition of new granule cells to the human cerebellar cortex normally continues until which month?

(A) The 4th embryonic
(B) The 6th embryonic
(C) The 8th embryonic
(D) Birth
(E) The 12th postnatal

42. Transplantation of the dorsal lip of an amphibian gastrula to a different region of another amphibian embryo of the same stage results in the formation of a second embryonic axis in the host. This classical experiment demonstrates

(A) cavitation
(B) cellular dedifferentiation
(C) cellular determination
(D) compartmentalization
(E) primary induction

Items 43-44

A patient has a right spastic hemiparesis and diminished proprioception and two-point discrimination of the right arm and leg. The tongue deviates to the left when protruded, and the left half of the tongue is atrophied. There are no other abnormalities.

43. The diminished two-point discrimination is most likely due to a lesion of the

(A) dorsal columns of the right cervical spinal cord
(B) left cerebral cortex
(C) left medial lemniscus
(D) right spinocerebellar tract
(E) right ventrobasal thalamus

44. The spastic hemiparesis is associated with a lesion that involves the

(A) left cerebral peduncle
(B) left medullary pyramid
(C) left motor cortex
(D) right internal capsule
(E) right red nucleus

45. In a newborn, an obstruction of the pharynx caused by a large mass in the posterior third of the tongue is most likely a result of

(A) a branchial cyst
(B) ectopic parathyroid tissue
(C) ectopic thymic tissue
(D) ectopic thyroid tissue
(E) hypertrophied lymphoid tissue

46. The blood-brain barrier depends on the intercellular junctions between

(A) astrocyte end-feet and endothelial cells
(B) endothelial cells and endothelial cells
(C) endothelial cells and neurons
(D) microglia and endothelial cells
(E) pericytes and endothelial cells

47. A patient has sudden paralysis of facial expression on the entire left side of his face with inability to move his left eye laterally. The remainder of the physical examination is unremarkable. This patient most likely has

(A) a lower motor neuron (LMN) lesion involving the abducens (VI) nerve and an upper motor neuron (UMN) lesion involving the facial (VII) nerve
(B) an LMN lesion involving both the abducens (VI) and trigeminal (V) nerves
(C) an LMN lesion involving the facial (VII) nerve and a UMN lesion involving the abducens (VI) nerve
(D) an LMN lesion involving both the facial (VII) and the abducens (VI) nerves
(E) a UMN lesion involving the abducens (VI) and facial (VII) nerves

48. Which of the following structures does NOT make contact on the medial surface of the left lung?

(A) Arch of the aorta
(B) Heart
(C) Left subclavian artery
(D) Lymph nodes of the hilus
(E) Thoracic duct

49. A child has sensory difficulties on the inner (medial) side of the right forearm and hand, atrophy of the thenar and interosseus muscles and difficulty in opposing the thumb. On moving the head to the left, the right radial pulse disappears. The likely diagnosis is

(A) hydrocephalus
(B) a congenital cyst of the spinal cord
(C) aortic stenosis
(D) a cervical rib
(E) incomplete development of the median nerve

50. Each of the following sensory pathways to the cerebral cortex relays in the thalamus EXCEPT that for

(A) pain and temperature
(B) audition
(C) vision
(D) olfaction
(E) two-point discrimination

51. The anterior cerebral artery supplies the

(A) auditory association cortex
(B) face area of the primary sensory cortex
(C) foot area of the primary motor cortex
(D) frontal cortical eye fields
(E) primary visual cortex

52. The sequence of amino acids at the amino terminal part of secretory proteins as first synthesized serves to

(A) enhance enzymatic activity
(B) protect against proteolytic digestion
(C) facilitate passage through membranes
(D) speed transport through the ducts of glands
(E) receive the addition of glucose in the Golgi complex

53. In tetralogy of Fallot, the developmental event that best describes its formation at an early stage is:

(A) The bulbar septum divides the bulbus cordis in such a way that the aorta is too wide and the pulmonary artery too narrow
(B) The fourth and fifth branchial arch arteries fail to develop correctly
(C) The great vessels are transposed
(D) There is an abnormal rotation of the bulbar septum
(E) The septum primum fails to develop

54. Dizygotic (fraternal) twins have

(A) one placenta, one chorionic sac and one amniotic sac
(B) one placenta, two chorionic sacs and two amniotic sacs
(C) two placentae, one chorionic sac and one amniotic sac
(D) two placentae, two chorionic sacs and one amniotic sac
(E) two placentae, two chorionic sacs and two amniotic sacs

5. A patient has severe periumbilical pain. An operation discloses an ulcerated diverticulum projecting from the ileum, 45 cm from the ileocecal junction. When examined microscopically, the diverticulum contains gastric mucosa. The diverticulum is

(A) a remnant of the proximal portion of the yolk stalk
(B) a split mesogastrium
(C) an omphalocele (hernia of the gut into a persistent umbilical cord covered by amnion)
(D) the proctodeum
(E) the result of rotation of the gut

6. Muscle spindles are

(A) specialized sensory organs in tendons that function as strain gauges
(B) specialized sensory receptors located within a portion of a striated muscle fiber
(C) smooth muscle cells of fusiform shape
(D) encapsulated groups of small specialized muscle fibers with special motor and sensory innervation
(E) specially innervated spindle-shaped dilations of striated muscle fibers

7. The utricle is a specialized part of the labyrinth that

(A) responds primarily to angular acceleration
(B) is concerned with perception of vibratory stimuli
(C) is a slow-adapting receptor responding to movements of the endolymphatic fluid
(D) responds primarily to linear acceleration
(E) mediates nystagmus when warm water is flushed through the external auditory canal

58. A 47-year-old man had a cordotomy in which the white matter of the anterior right quadrant of the spinal cord was cut at the level of the second cervical segment. The primary purpose of this procedure was to

(A) reduce involuntary movement in the right arm
(B) relieve intractable pain on the left side of the body
(C) bring about a loss of sense of touch on the right side of the body
(D) relieve intractable pain on the right side of the body
(E) restore control over the heart beat

Items 59-60

A clone of cells is grown on a tissue culture plate. It is known that the diploid amount of DNA in this species is 2 units. The amount of DNA measured in a cell sorter for four cells from this culture is:

Cell I	-	2
Cell II	-	2.5
Cell III	-	4
Cell IV	-	4

59. Cell I

(A) has just completed telophase
(B) has just completed the S phase
(C) is in mitosis
(D) is in the same stage of the cell cycle as Cell II
(E) will incorporate tritiated thymidine into its nucleus

60. Cell II

(A) has just divided
(B) is about to enter the S phase
(C) is in anaphase
(D) is polyploid
(E) will incorporate tritiated thymidine into its nucleus

DIRECTIONS (ITEMS 61-82): Each group of items in this section consists of lettered options followed by a set of numbered items. For each item, select the ONE lettered option that is most closely associated with it and fill in the circle containing the corresponding letter on the answer sheet. Each lettered option may be selected once, more than once, or not at all.

Items 61-63

Mechanisms involved in swallowing:

(A) Closure of the nasopharynx from the oropharynx
(B) Depression (lowering) of the larynx and hypopharynx to produce "negative" pressure in the pharynx
(C) Elevation of the larynx and the hypopharynx
(D) Movement of a bolus of food posteriorly into the oropharynx
(E) Protection of the airway

61. Styloglossus muscles

62. Tensor veli palatini and superior constrictor muscles

63. Stylohyoid and digastric muscles

Items 64-65

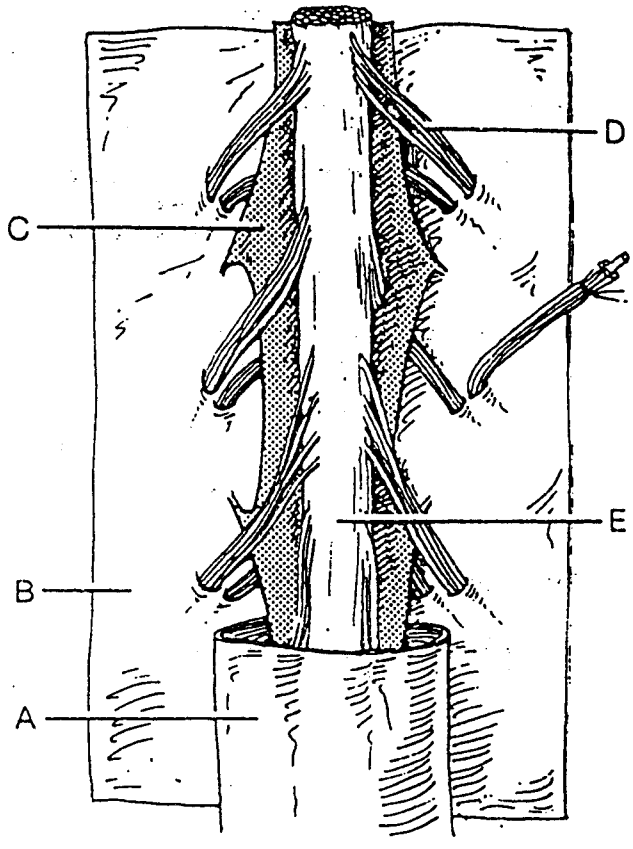
Meningeal derivatives:

(A) Arachnoid
(B) Dura mater, inner layer
(C) Dura mater, outer layer
(D) Pia mater

64. Close association with blood vessels passing into the cerebral cortex

65. Contributes to the formation of the choroid plexuses

Items 66-67



66. Continuous with the meningeal layer of cranial dura mater

67. Ligament composed of pia mater

Items 68-70

Tissue source:

(A) Ectoderm
(B) Endoderm
(C) Mesoderm
(D) Yolk sac
(E) Neural crest

In the adult, produces the:

68. Hepatocytes

69. Renal proximal convoluted tubule

70. Primordial germ cells

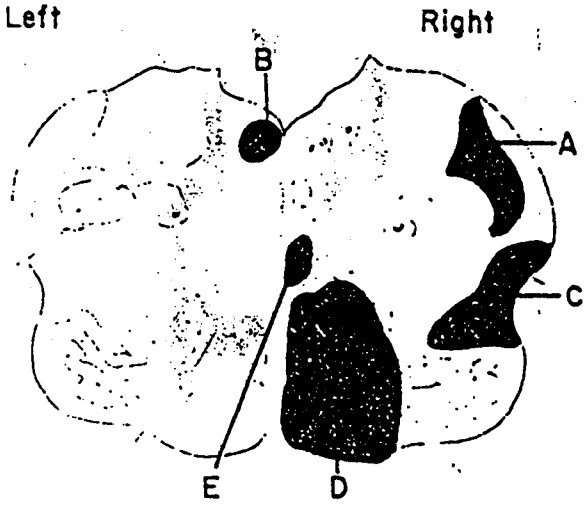
Items 71-72

(A) Archicortex
(B) Cerebellum
(C) Neocortex
(D) Retina
(E) Spinal cord

71. Target of axons arising from neural crest cells

72. Cell migration results in six layers of neurons.

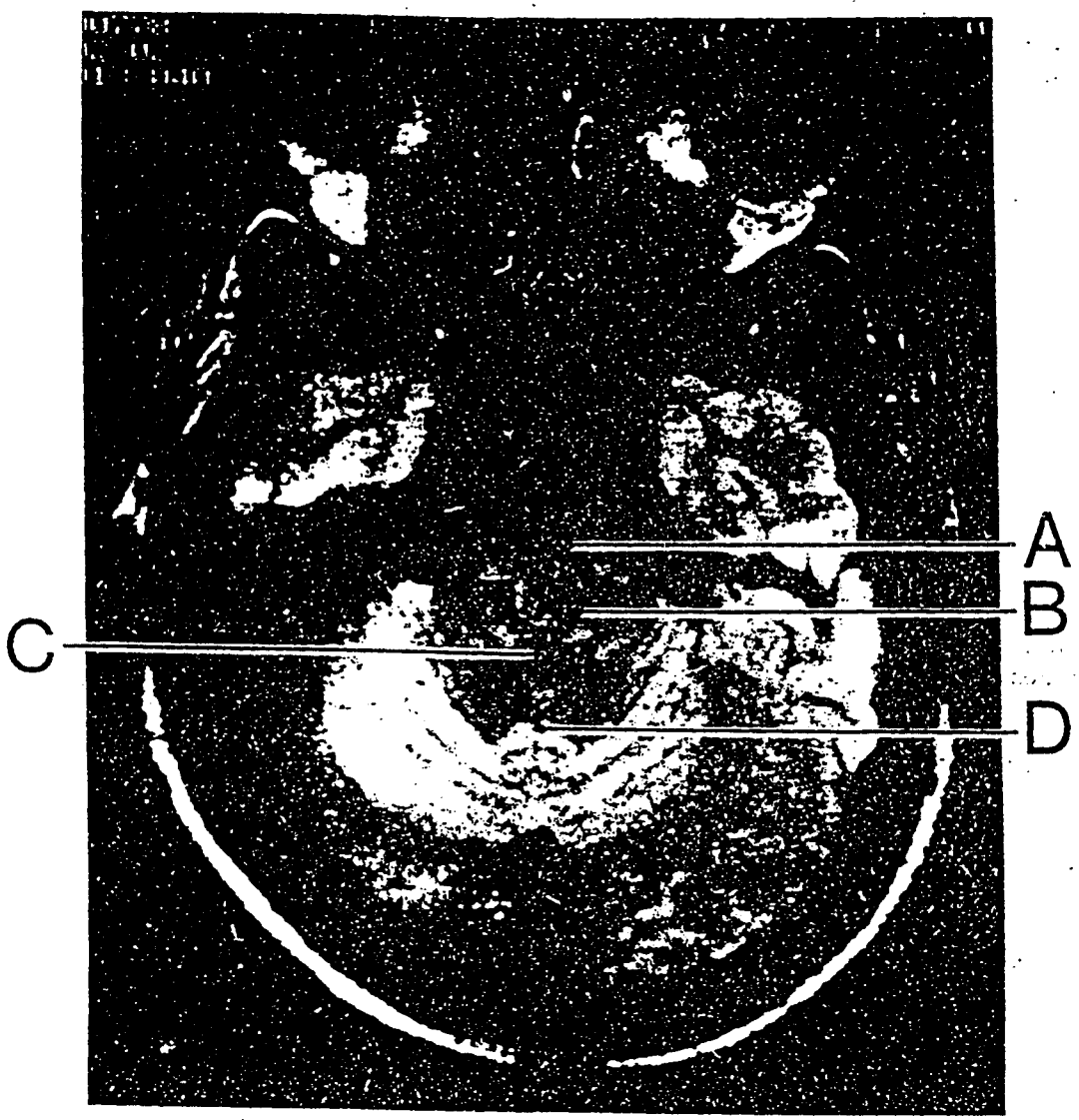
Items 73-74



73. Loss of pain and temperature in the left extremities

74. Loss of pain and temperature on the right side of the face

Items 75-76



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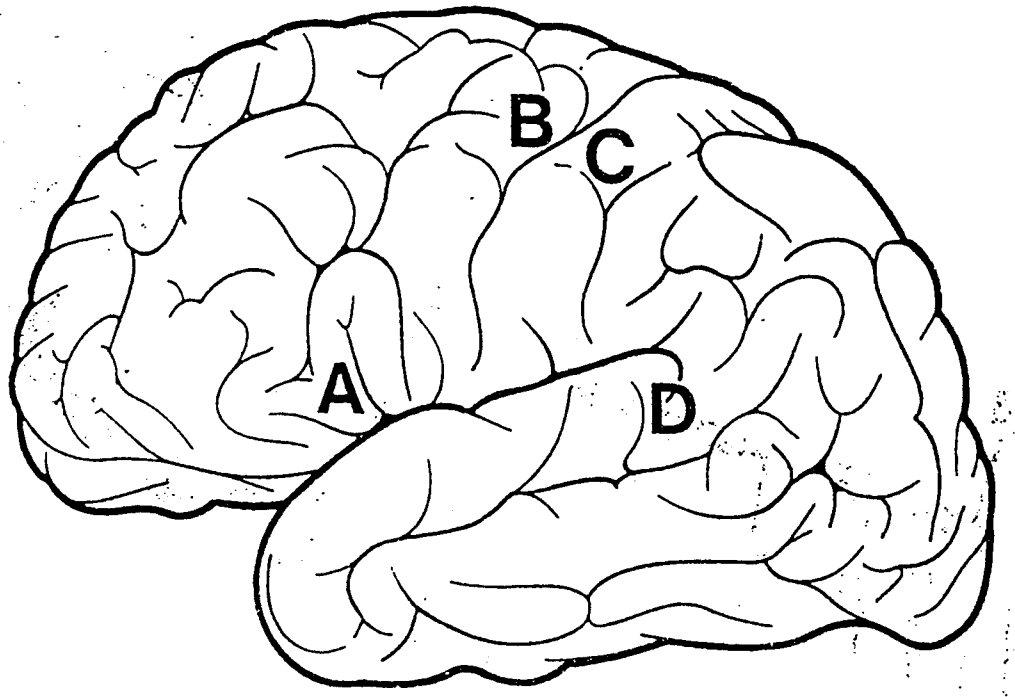
letterpress half-tone plate

On the labeled magnetic resonance image (MRI) at the level of the pons, identify:

75. Pontine gray matter

76. Medial lemniscus

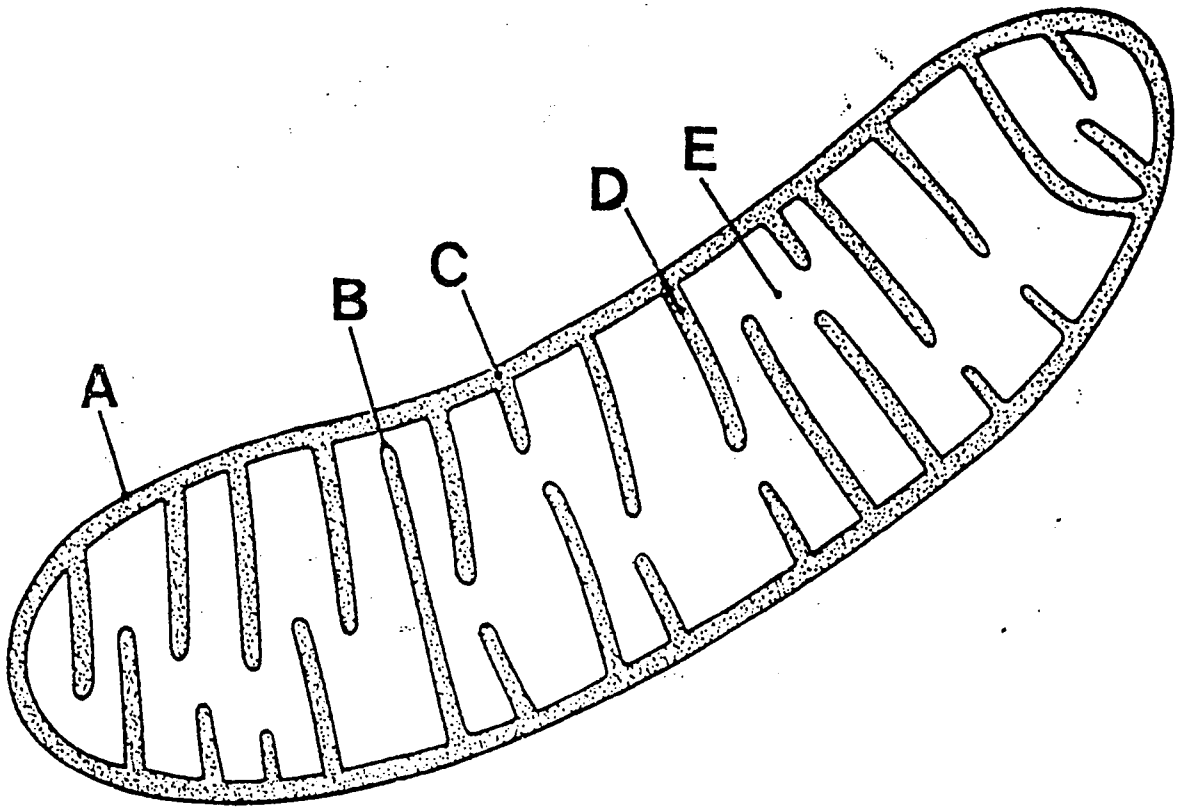
Items 77-78



In the diagram of the cerebral cortex, lettered areas represent lesions. In a person with left hemisphere dominance, select the lesion that would cause an inability to:

77. Speak and write fluently

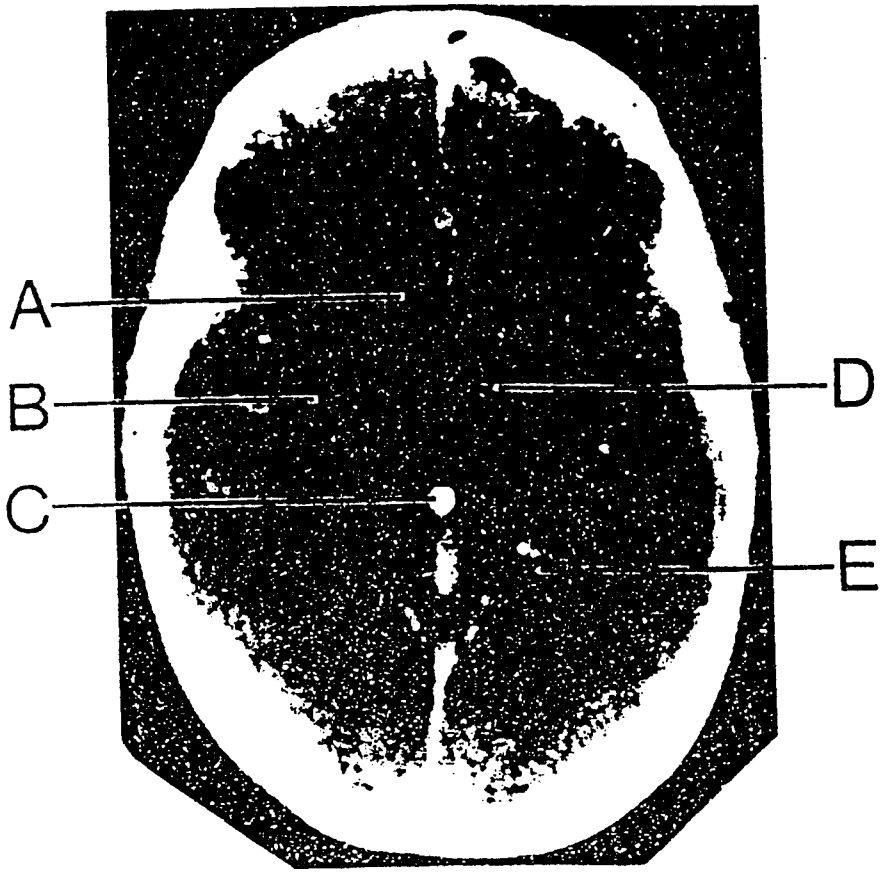
78. Understand spoken words



From the diagram of a mitochondrion, identify:

79. Mitochondrial ribosomes

80. Electron transport



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The photograph is of a magnetic resonance image (MRI) of the brain.

81. Internal capsule, posterior limb

82. Caudate nucleus

DIRECTIONS (ITEMS 83-96): Each group of items in this section consists of lettered headings followed by a set of numbered words or phrases. For each numbered word or phrase, fill in the circle on the answer sheet containing

A if the item is associated with (A) *only*
B if the item is associated with (B) *only*
C if the item is associated with *both* (A) *and* (B)
D if the item is associated with *neither* (A) *nor* (B)

Items 83-84

(A) Femoral nerve
(B) Obturator nerve
(C) Both
(D) Neither

Innervation of the:

83. Quadriceps femoris muscle

84. Gracilis muscle

Items 85-86

(A) Rough endoplasmic reticulum
(B) Smooth endoplasmic reticulum
(C) Both
(D) Neither

85. Associated with hepatic metabolism of bilirubin and drugs (e.g., alcohol and barbiturates)

86. Prominent in cells of the zona fasciculata of the adrenal cortex

Items 87-89

Proteins synthesized on:

(A) Attached polyribosomes
(B) Free polyribosomes
(C) Both
(D) Neither

87. Secreted by exocytosis

88. May become a lysosomal enzyme

89. Eventually become a cytoskeletal protein

Items 90-91

(A) Type I pneumocyte (simple squamous)
(B) Type II pneumocyte (great alveolar)
(C) Both
(D) Neither

90. Cytosomes (multilaminar bodies)

91. Phagocytosis

Items 92-94

Neurotransmitters that are:

(A) Polypeptides
(B) Small organic molecules (e.g., acetylcholine)
(C) Both
(D) Neither

92. Released by exocytosis

93. Synthesized primarily in perikarya from large precursors

94. Found exclusively at peripheral nervous system synapses

Items 95-96

(A) Mast cell
(B) Tissue eosinophil
(C) Both
(D) Neither

95. Possess(es) IgE receptors

96. Cytoplasmic granules contain histamine and heparin.

DIRECTIONS (ITEMS 97-135): For each of the items in this section, ONE or MORE of the numbered options is correct. On the answer sheet fill in the circle containing

A if only *1, 2, and 3* are correct,
B if only *1 and 3* are correct,
C if only *2 and 4* are correct,
D if only *4* is correct,
E if all are correct.

FOR EACH ITEM FILL IN ONLY ONE CIRCLE ON YOUR ANSWER SHEET

DIRECTIONS SUMMARIZED

A	B	C	D	E
1, 2, 3 only	1, 3 only	2, 4 only	4 only	All are correct

97. Tritiated amino acids may be incorporated into proteins by neurons and the radioactive proteins transported to the axon terminals of these neurons. If tritiated amino acids were injected into the ventrobasal thalamus (nuclei VPL and VPM) on the left, one would find radioactive axon terminals in the left

(1) spinal gray matter
(2) dorsal column nuclei
(3) dentate nucleus of the cerebellum
(4) somatosensory cortex

98. A researcher wants to investigate the effectiveness of a new method of casting fractures in young children. Randomly assigning the children to the new and old methods of preparing casts

(1) reduces the need for blind evaluation of the outcome
(2) eliminates bias in the assignment of casting methods
(3) eliminates any placebo effect in the children treated with the new method
(4) tends to make the two groups comparable on factors other than the casting methods

99. If the left index finger is inserted into the epiploic foramen with the thumb in front of the free edge of the lesser omentum, the structures found between them include the

(1) common bile duct
(2) hepatic artery
(3) portal vein
(4) inferior vena cava

100. In a successful lumbar puncture, cerebrospinal fluid is withdrawn through a needle that has penetrated the

(1) dura mater
(2) pia mater
(3) arachnoid
(4) anulus fibrosus

101. In a surgical opening of the ankle joint from the lateral side, structures passing behind the lateral malleolus that should be preserved include the

(1) tendon of the peroneus longus
(2) great saphenous vein
(3) tendon of the peroneus brevis
(4) tendon of the peroneus tertius

2. Structures that pass through the aortic hiatus include the

(1) aorta
(2) esophagus
(3) thoracic duct
(4) greater splanchnic nerve

3. Important anastomoses between hepatic portal and caval veins include the

(1) left gastric and esophageal veins
(2) left testicular and left renal veins
(3) superior and inferior rectal veins
(4) splenic and superior mesenteric veins

4. Muscles that contract during forced inspiration include the

(1) scalenus medius
(2) scalenus anterior
(3) sternocleidomastoid
(4) diaphragm

5. In the male, the urogenital diaphragm contains the

(1) ejaculatory ducts
(2) bulbourethral gland
(3) deep dorsal vein of the penis
(4) sphincter urethrae muscle

6. A fracture of the cribriform plates that tears the meninges is likely to result in

(1) loss of the sense of smell
(2) rupture of the nasolacrimal duct
(3) leakage of cerebrospinal fluid into the nasal cavity
(4) injury to the maxillary division of the trigeminal (V) nerve

7. Nerves that must be intact to elicit a corneal blink reflex include the

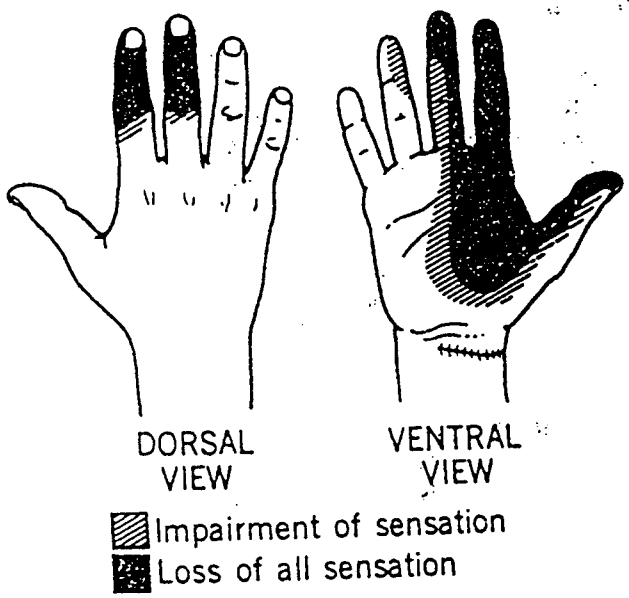
(1) ophthalmic division of the trigeminal (V)
(2) oculomotor (III)
(3) facial (VII)
(4) nasociliary branch of the trigeminal (V)

108. Muscles whose tendons pass through the carpal tunnel include the

(1) flexor digitorum profundus
(2) flexor digitorum superficialis
(3) flexor pollicis longus
(4) palmaris longus

109. Receptor cells of taste buds

(1) are replaced after injury
(2) are specially adapted epithelial cells
(3) contain presynaptic vesicles
(4) are primary neurons with the cell body in the geniculate ganglion



110. In the diagram, the shaded areas indicate the anesthetized areas after a nerve injury caused by a cut on the ventral wrist as shown. Muscles that would be paralyzed by this nerve injury include the

(1) abductor pollicis brevis
(2) flexor carpi ulnaris
(3) opponens pollicis
(4) pronator teres

FOR EACH ITEM FILL IN ONLY ONE CIRCLE ON YOUR ANSWER SHEET

DIRECTIONS SUMMARIZED				
A	B	C	D	E
1, 2, 3 only	1, 3 only	2, 4 only	4 only	All are correct

111. The major muscles that invert the foot are innervated by the

(1) saphenous nerve
(2) tibial nerve
(3) superficial peroneal nerve
(4) deep peroneal nerve

112. Helpful landmarks that a surgeon can use to determine the probable location of the base of the vermiform appendix include the

(1) linea alba
(2) umbilicus
(3) pelvic brim
(4) anterior superior iliac spine

113. Constituents of the thin filaments of a relaxed skeletal muscle cell include

(1) actin
(2) tropomyosin
(3) troponin
(4) S1 fragments of myosin (heavy meromyosin)

114. Affinity for basic stains (basophilia) is a characteristic of the

(1) Golgi complex
(2) nucleolus
(3) mitochondria
(4) ribosomes

115. Exocrine secretion might be expected following an increase in intracellular

(1) pH
(2) Ca^{2+}
(3) ATP
(4) cyclic AMP

116. Actin is found in

(1) neurons
(2) platelets
(3) erythrocytes
(4) neutrophils

117. After hypophysectomy in mammals, cells that would show histologic changes include

(1) chief cells in the parathyroid gland
(2) follicular cells in the thyroid gland
(3) chromaffin cells in the adrenal medulla
(4) Leydig cells in the interstitium of the testis

118. Calcium concentrations in the blood are regulated by hormones from

(1) thyroid follicular cells
(2) thyroid parafollicular cells
(3) parathyroid oxyphil cells
(4) parathyroid chief cells

119. Components of the cornea include

(1) adrenergic sympathetic nerves
(2) collagenous fibers
(3) blood vessels
(4) sensory nerves

120. Plasma cells are characterized by

(1) plentiful rough endoplasmic reticulum
(2) a rudimentary Golgi complex
(3) eccentric nuclei with a radial pattern of heterochromatin
(4) numerous mitotic figures

121. Conditions necessary for proper function of the lungs at birth include

(1) establishment of a substantial pulmonary circulation
(2) adequate stores of pulmonary surfactant
(3) reabsorption of intra-alveolar fluid by the pulmonary circulation
(4) flattening of type I pulmonary epithelial cells

122. Testicular feminization results in

(1) the development of female para-mesonephric (müllerian) duct derivatives
(2) an absence of prostatic development
(3) male external genitalia
(4) an absence of male mesonephric (wolffian) duct derivatives

123. The nerve supply of the tongue is derived, in part, from the nerve of the

(1) first branchial arch (mandibular division of V)
(2) second branchial arch (VII)
(3) third branchial arch (IX)
(4) fourth branchial arch (X)

124. In males, the mesonephric (wolffian) duct gives rise to the

(1) ejaculatory duct
(2) ductus deferens
(3) seminal vesicle
(4) ductus epididymis

125. The first branchial arch (pharyngeal arch) contributes to the formation of the

(1) malleus and incus
(2) maxilla and mandible
(3) muscles of mastication
(4) muscles of facial expression

126. Most of the well-oxygenated blood leaving the inferior vena cava of the fetus passes through the

(1) right atrium
(2) foramen ovale
(3) ductus arteriosus
(4) ductus venosus

127. The internal capsule contains

(1) ascending axons of thalamic neurons
(2) descending axons to the corpus striatum
(3) descending axons to the pons and spinal cord
(4) descending axons to the midbrain and medulla oblongata

128. In the ear, sensory receptive hair cells are found in the

(1) organ of Corti
(2) maculae of the saccule and utricle
(3) cristae ampullares of the semicircular ducts
(4) striae vasculares of the cochlear duct

129. A patient has spastic paralysis of his left extremities. His tongue deviates to the right when protruded and is atrophied on the right side. There are no other neurologic abnormalities. Structures likely to be damaged by the lesion include the

(1) right corticobulbar tract
(2) right hypoglossal (XII) nerve
(3) left medullary pyramid
(4) right medullary pyramid

130. The nucleus solitarius receives taste inputs from the

(1) tongue through the facial (VII) nerve
(2) epiglottis through the vagus (X) nerve
(3) tongue through the glossopharyngeal (IX) nerve
(4) tongue through the hypoglossal (XII) nerve

FOR EACH ITEM FILL IN ONLY ONE CIRCLE ON YOUR ANSWER SHEET

DIRECTIONS SUMMARIZED				
A 1, 2, 3 only	B 1, 3 only	C 2, 4 only	D 4 only	E All are correct

131. Regeneration of axons in the peripheral nervous system is associated with

(1) trophic factors
(2) appropriate extracellular matrix
(3) Schwann cell tubes
(4) active microglia

132. Upper motor neurons that influence the activity of spinal motor neurons are found in the

(1) brain stem reticular formation
(2) red nucleus
(3) vestibular nuclei
(4) motor cortex

133. The intermaxillary segment of the developing upper jaw contributes to the formation of the

(1) philtrum of the lip
(2) primary or anterior palate
(3) premaxillary part of the maxilla
(4) posterior or secondary palate

134. Processes that play a major role in the formation of a trilaminar embryo include the

(1) migration of cells from the ectoderm (epiblast) to a position between the endoderm and ectoderm
(2) juxtaposition of the neurenteric canal and the allantois
(3) formation of the primitive streak
(4) expansion of the extraembryonic mesoderm

135. Large-diameter axons that enter the spinal cord via the L5 dorsal root may terminate in the ipsilateral

(1) nucleus gracilis
(2) nucleus cuneatus
(3) nucleus dorsalis (of Clarke)
(4) lamina I (marginal layer) of the dorsal horn

DIRECTIONS (ITEMS 1-58): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case and fill in the circle containing the corresponding letter on the answer sheet.

1. In atrial fibrillation, the ventricular rate depends on

(A) conduction velocity through atrial specialized tissue
(B) conduction velocity from the ventricular endocardium to the epicardium
(C) the discharge rate of the Purkinje fibers
(D) the discharge rate of the sinoatrial node
(E) the refractory period of the atrioventricular junction

2. For the intact cardiac ventricle, the initial myocardial fiber length on a length-tension curve is best represented by the

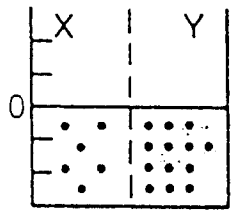
(A) ejection fraction
(B) right atrial volume
(C) stroke volume
(D) ventricular end-diastolic volume
(E) ventricular end-systolic volume

3. The most important factor that maintains the outputs of the right and left sides of the heart is

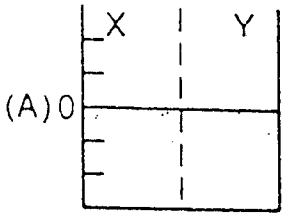
(A) parasympathetic nervous activity
(B) Bainbridge reflex
(C) baroreceptor reflexes
(D) length-tension relationship of cardiac muscle
(E) the renin-angiotensin system

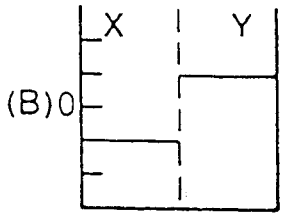
4. In a renal efferent arteriole, the average hydrostatic pressure is

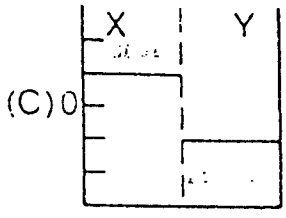
(A) higher than glomerular capillary pressure
(B) less than that in the afferent arteriole
(C) less than peritubular capillary pressure
(D) equal to glomerular capillary pressure
(E) equal to that in the afferent arteriole

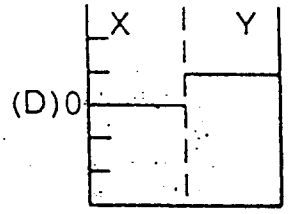


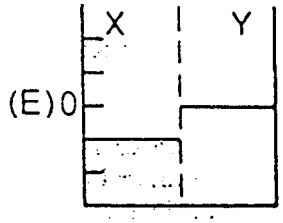
5. Solutions X and Y are separated by a semipermeable membrane. The concentration of solutes at time zero is shown. At equilibrium, the volumes of compartments X and Y will be











6. In patients with metabolic acidosis, the most common pattern of response by the kidney, as compared to normal, is:

	Urinary excretion of:			
	pH	HCO_3^-	NH_4^+	Titratable acid
(A)	↑	↑	↑	↑
(B)	↓	↑	↑	↑
(C)	↓	↓	↑	↑
(D)	↓	↓	↓	↑
(E)	↓	↓	↓	↓

7. Which of the following plasma values are most consistent with combined metabolic alkalosis and respiratory acidosis?

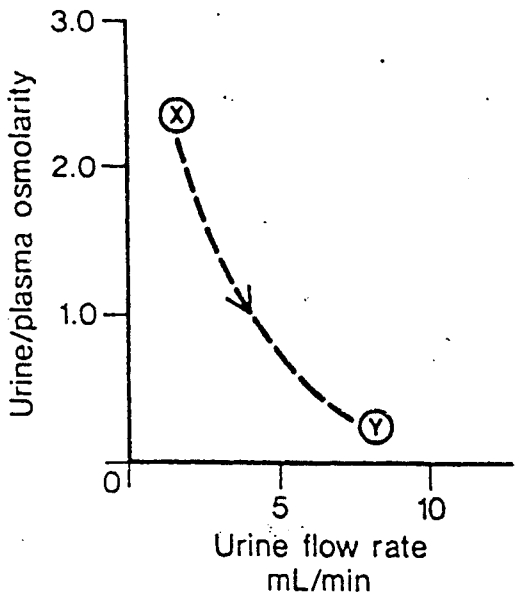
	P_{O_2} (mm Hg)	P_{CO_2} (mm Hg)	pH	HCO_3^- (mEq/L)
(A)	50	50	7.45	31
(B)	80	30	7.56	27
(C)	80	50	7.23	20
(D)	55	60	7.30	25
(E)	90	45	7.37	24

8. Which of the following does NOT increase the secretion of potassium by the distal renal tubule?

(A) High-potassium diet
(B) Hyperaldosteronism
(C) Osmotic diuresis
(D) Respiratory acidosis
(E) Thiazide diuretics

9. The primary source of urinary ammonia (NH_3 or NH_4^+) is

(A) catabolism of glutamine within renal cells
(B) filtered alanine
(C) filtered ammonia
(D) filtered glutamine
(E) synthesis of alanine within renal cells



10. The graph shows urine/plasma osmolarity versus urinary flow rate in a normal human subject. Which of the following most likely produced the change from X to Y?

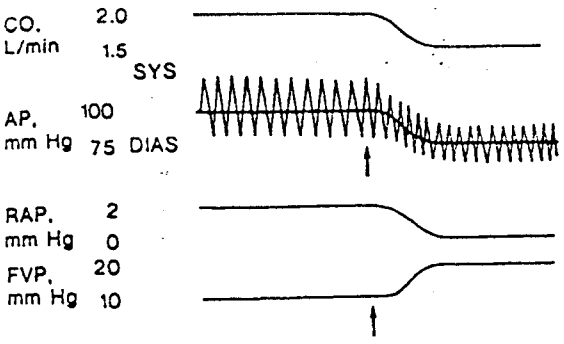
(A) Oral ingestion of 1 L of water
(B) Oral ingestion of 200 mL of an isotonic sodium chloride solution
(C) Oral ingestion of 200 mL of a hypertonic glucose solution
(D) Oral ingestion of 200 mL of a hypertonic sodium chloride solution
(E) Subcutaneous injection of ADH (vasopressin)

11. Conduction velocity is slowest in the

(A) atrial muscle
(B) ventricular muscle
(C) bundle of His
(D) atrioventricular node
(E) Purkinje network

12. Which of the following organs has the lowest resistance to blood flow?

(A) The brain
(B) The kidney
(C) The liver
(D) The lung
(E) The skin



13. In an anesthetized dog, cardiac output (CO), systolic, diastolic and mean arterial pressure (AP), right atrial pressure (RAP) and femoral venous pressure (FVP) are monitored as shown in the graph. At the arrow, the most likely experimental maneuver performed was one that produced

(A) abdominal vena caval obstruction
(B) aortic valve stenosis
(C) coronary artery obstruction
(D) mitral valve regurgitation
(E) pulmonary artery constriction

14. Pulmonary circulation most closely resembles systemic circulation in

(A) mean arterial pressure
(B) pulse pressure
(C) resistance
(D) flow
(E) blood volume

15. Under resting conditions, the arteriovenous O_2 difference is greatest in the

(A) brain
(B) heart muscle
(C) kidney
(D) skeletal muscle
(E) skin

16. The plateau phase (phase 2) of the ventricular action potential is associated with each of the following EXCEPT

(A) decreased K^+ permeability
(B) inactivated Na^+ channels
(C) increased Ca^{2+} permeability
(D) the Q wave on the electrocardiogram
(E) the ST interval on the electrocardiogram

17. Both the radius and length of a tube are doubled. According to Poiseuille's law, the resistance will

(A) fall to a quarter of its previous value
(B) fall to an eighth of its previous value
(C) remain unchanged
(D) double
(E) quadruple

18.
1. Re-esterification
2. Micelles
3. Lacteal
4. Cholecystokinin-pancreozymin
5. Chylomicron

Normally, the sequence in which the items listed above are involved in lipid absorption is

(A) 1-2-3-4-5
(B) 2-4-3-1-5
(C) 4-5-2-1-3
(D) 4-2-1-5-3
(E) 4-1-5-2-3

19. Which of the following accurately describes conditions associated with capillary exchange?

(A) A change in interstitial fluid hydrostatic pressure from a negative to positive value increases capillary filtration
(B) Arteriolar and precapillary sphincter constriction increases mean capillary hydrostatic pressure
(C) Decreased venous pressure following hemorrhage increases capillary filtration
(D) Hypoalbuminemia increases capillary filtration
(E) Increased venous pressure increases blood flow through the capillaries

20. The most important cause of increased blood flow through a working skeletal muscle during exercise is

(A) increased cardiac output
(B) products of local metabolism
(C) release of epinephrine from the adrenal medulla
(D) stimulation of sympathetic vasodilator nerves to the muscle
(E) vasoconstriction in the viscera

21. An increase in ventricular contractility is indicated by

(A) a decrease in cardiac output and an increase in ventricular end-diastolic volume
(B) an increase in cardiac output and a decrease in mean arterial pressure
(C) an increase in cardiac output and a decrease in ventricular end-diastolic volume
(D) an increase in cardiac output and an increase in ventricular end-diastolic volume
(E) an increase in the amplitude of the QRS complex of the electrocardiogram

22. A patient with severe vomiting because of complete pyloric obstruction would be expected to develop

(A) a rise in the plasma concentration of chloride
(B) a rise in the plasma concentration of bicarbonate
(C) increased alveolar ventilation
(D) increased cerebrospinal fluid pressure
(E) a fall in arterial pH

23. In a resting individual, the metabolic rate per kg of body weight decreases during

(A) intravenous injection of epinephrine
(B) ingestion of food
(C) exposure to low ambient temperature
(D) prolonged fasting
(E) intravenous injection of glucagon

24. Oxidation of glucose in muscle is reduced when mobilization of fatty acids is increased because:

(A) Utilization of fatty acid increases the cellular level of ATP, which decreases the activity of hexokinase
(B) Fatty acids compete with glucose for NAD^+, which blocks formation of pyruvate
(C) Fatty acids compete with glucose for transport across the cell membrane
(D) Oxidation of fatty acids increases the formation of citrate, which blocks phosphofructokinase
(E) Fatty acids inhibit the formation of pyruvate from lactate

25. Following total destruction of the germinal epithelium of the testes (in the absence of any other changes), which of the following would be expected to occur?

(A) Testosterone secretion would decrease
(B) Luteinizing hormone (LH) secretion would decrease
(C) LH secretion would increase
(D) Follicle-stimulating hormone (FSH) secretion would decrease
(E) FSH secretion would increase

26. A normal person is given a large dose of insulin. Each of the following will occur in the plasma EXCEPT

(A) an increase in potassium concentration
(B) an increase in epinephrine concentration
(C) a decrease in concentrations of amino acids
(D) a decrease in glucose concentration
(E) an increase in glucagon concentration

27. If the hypophyseal portal blood vessels are destroyed, the secretion of each of the following is reduced EXCEPT

(A) cortisol
(B) thyroid-stimulating hormone
(C) testosterone
(D) prolactin
(E) growth hormone

28. Uptake of iodide by thyroid follicular cells occurs

(A) after incorporation into thyroglobulin
(B) after oxidation
(C) against an electrochemical gradient
(D) by passive diffusion
(E) by pinocytosis

29. Micelle formation is necessary for the efficient absorption of each of the following EXCEPT

(A) phytonadione (vitamin K)
(B) cholesterol
(C) palmitic acid
(D) glycerol
(E) vitamin D