

THE UNIVERSITY OF ZAMBIA
SCHOOL OF MEDICINE

DEPARTMENTS OF ANATOMY AND PHYSIOLOGICAL SCIENCES

JULY 2018

PGY 4110

NEUROSCIENCES CAT1

DURATION:

TWO (2) HOURS

COMPUTER NO.:

[illegible]

INSTRUCTIONS TO CANDIDATES

1. Write your computer number on the question paper and Special MCQ answer sheet provided
2. Carefully follow the instructions pertaining to each section.

SECTION A. SELECT ONE BEST ANSWER FOR EACH QUESTION

1. Somatosensory neurons in the dorsal root ganglion (DRG) normally transmit information
 - a. from the cell body to the spinal cord.
 - b. from the cell body to the skin.
 - ☒ c. from the skin to the spinal cord.
 - d. from the spinal cord to the skin.
 - e. It would depend on which synapses in the DRG were active.
2. A sensory receptor or "generator" potential is usually due to
 - a. resting or "leak" currents in the cell body.
 - b. the activation of voltage-gated ion channels.
 - c. the activation of ligand-gated ion channels.
 - ☒ d. an external stimulus impinging upon a sensory neuron.
 - e. an internal stimulus modifying a synaptic signal between two interneurons.
3. Golgi tendon organs are most sensitive to
 - a. vibration.
 - b. stretch.
 - ☒ c. tension.
 - d. motion.
 - e. deep pressure.
4. The fastest conducting of the following sensory fibers is the
 - ☒ a. group Ib mechanoreceptors.
 - b. myelinated thermoreceptors.
 - c. unmyelinated thermoreceptors.
 - ☒ d. myelinated pain receptors.
 - e. unmyelinated thermoreceptors.
5. One would expect to find the smallest two-point discrimination threshold on the
 - a. thigh.
 - b. back.
 - c. calf.
 - d. breast.
 - ☒ e. fingers.
6. Which of the following is the afferent system with a large receptive field and slow adaptation?
 - a. Pacinian afferent
 - b. Meissner afferent
 - ☒ c. Ruffini afferent
 - d. Merkel cell
 - e. Hair follicle receptor

slow adapting - Ruffini and Merkel and hair
follicles + joint receptors

Receptive field decreasing order:

- 2 ↑
- Pacinian
 - Ruffini
 - Meissner
 - Merkel

Adaptation decreasing order:
- Meissner

7. Which of the following is the deep skin sensory receptor that is surrounded by an "onion-skin"-like capsule?

- a. Pacinian afferent
- b. Meissner afferent
- c. Ruffini afferent
- d. Merkel cell
- e. Hair follicle receptor

8. Which of the following cells is quite sensitive to skin deformation, particularly to low-frequency stimulation of textured objects?

- a. Pacinian afferent
- ☒ b. Meissner afferent - grip
- c. Ruffini afferent
- d. Merkel cell
- e. Hair follicle receptor

9. Which of the following is *not* a feature of the muscle-spindle-based proprioceptive system?

- a. In-series attachment to tendons
- b. In-parallel alignment with extrafusal muscle fibers
- ☒ c. Mechanically gated ion channels
- d. Group I and II afferent axons
- e. Innervation by ☐ motor neurons

10. In order to increase the decibel measurement of a sound, one would have to alter its wave

- a. form.
- b. phase.
- ☒ c. amplitude.
- d. frequency.
- e. length.

$F = \text{pitch}$
 $A = \text{loudness}$

11. Which of the following is a major distinction between hair cells that operate at 500 Hz and those that operate at 5000 Hz?

- a. The 500 Hz cells make use of different ions in the transduction processes.
- ☒ b. The 500 Hz cells make use of different tip link proteins to confer frequency specificity.
- c. The 500 Hz cells provide a phase-locked auditory signal, whereas the 5000 Hz cells do not.
- d. The 500 Hz cells fatigue far more readily than the 5000 Hz cells do.
- e. All of the above

12. In which of the following ways is the mechanism of hair-cell transduction distinct from other sensory transduction mechanisms (i.e., different from nonmechanical sensory systems)?

- ☒ a. Potassium influx from the endolymph depolarizes the hair cell.
- b. Potassium efflux into the perilymph repolarizes the hair cell.
- c. Calcium and calcium-activated potassium channels contribute to electromechanical resonance.

- d. The two domains of the hair cell operate, in effect, as two distinct Nernstian compartments.
- e. All of the above

13. Which of the following statements about the audible spectrum is *false*?

- a. Children can often hear frequencies that adults cannot.
- b. Small animals are often more sensitive to higher frequencies than larger animals are.
- c. Animals that echolocate often rely on very high-frequency sounds.
- ☒ d. Large predators often make high-frequency sounds as they approach their prey.
- e. Collectively, mammals can hear tones at frequencies ranging from 20 Hz to 200 kHz.

14. Which of the following statements about auditory nerve fibers is *false*?

- a. Afferent fibers receive input from inner hair cells.
- b. Efferent fibers innervate the three rows of outer hair cells.
- c. The characteristic frequency of the hair cells varies systematically along the cochlear axis.
- d. The higher frequency fibers can respond well to stimuli at frequencies in the 10 to 20 KHz range.
- ☒ e. The lower frequency fibers have a sharp tuning peak plus an extended hump.

15. Which of the following statements about mechanotransduction in the cochlea is *false*:

- a. Tip links connect the tops of stereocilia
- b. tip links directly gate cation channels
- c. Stereocilia are stiff due to network of actin filaments
- ☒ d. stereocilia can bend all along their length as well as at the insertion point.
- e. tips of stereocilia are embedded in the tectorial membrane

16. Which of the following is the primary function of the three bones in the middle ear?

- a. Selective transmission of high-frequency sounds
- b. Selective transmission of low-frequency sounds
- ☒ c. Amplification of sound pressure waves to increase auditory sensitivity
- d. Dampening sound pressure waves to prevent damage to the ear
- e. Facilitation of fluid drainage from the eustachian tube

17. The auditory hair-cell bodies are embedded in the

- a. tectorial membrane.
- ☒ b. basilar membrane.
- c. tunnel of Corti.
- d. spiral ganglion.
- e. oval window.

18. Which of the following gives rise to tonotopy (frequency tuning) along the cochlea?

- a. The changing width and stiffness of the tectorial membrane
- ☒ b. The changing width and stiffness of the basilar membrane
- c. The speed at which sound waves propagate along the length of the cochlea
- d. The changing mechanical properties of the cochlear wall along the length of the cochlea
- e. The increasing density of the cochlear fluid along the length of the cochlea

19. Which of the following statements about sensory transduction by hair cells is *false*?

- a. Bending of the cilia toward the longest cilium produces depolarization.
- b. The electrical activity initiated by the tip links is transmitted to the vesicular release sites along microtubules that undergo voltage-dependent rearrangements.
- c. The dynamic range of the hair cell for reporting mechanical events is determined by the degree to which mechanical deflection can result in changes in membrane potential.
- ☒ d. Hair cells are presynaptic to second-order sensory neurons.
- e. The firing of action potentials in second-order sensory neurons can be either up- or down-regulated, depending on the direction in which the bundle of cilia (of the afferent hair cell) is bent.

20. The iris

- a. is responsible for the refraction of light onto the retina.
- ☒ b. regulates the amount of light entering the eye.
- c. applies tension to the lens.
- d. contains the pigment epithelial cells that nourish photoreceptors.
- e. covers the cornea, shielding it from harmful UV rays.

21. Our underwater vision is poor because

- ☒ a. water disperses light, making it impossible to focus.
- b. in water there is no longer a refractive index difference between the cornea and the surrounding media.
- c. water seeps into the iris, causing temporary cloudiness.
- d. the hydrostatic pressure of water changes the shape of the eyeball.
- e. All of the above

22. For which of the following reasons is myopia in humans assumed to be more common now than it was in ancient times?

- a. The vigorous exercise associated with early human lifestyles better nourished the retina.
- b. Early humans were not exposed to the environmental toxins present in modern life.
- c. Chronic exposure to fire smoke had a protective effect on the vision of early humans.
- ☒ d. Early humans did not engage in the kinds of activities (e.g., reading and writing from an early age, watching television) characteristic of modern life.
- e. Myopia was not actually less common, just less recognized.

23. Which of the following represents the most direct pathway for the transmission of visual information from the eye to the brain?

- ☒ a. Photoreceptor ☐ bipolar cell ☐ ganglion cell ☐ brain
- b. Horizontal cell ☐ bipolar cell ☐ ganglion cell ☐ brain
- c. Photoreceptor ☐ bipolar cell ☐ amacrine cell ☐ brain
- d. Photoreceptor ☐ horizontal cell ☐ ganglion cell ☐ brain
- e. Photoreceptor ☐ bipolar cell ☐ amacrine cell ☐ ganglion cell ☐ brain

24. Which of the following statements about bipolar cells is *false*?
- a. Because bipolar cells do not have direct contacts with HCs, they are unaffected by HC activity.
 - b. Off-bipolar cells hyperpolarize in response to light.
 - ☒ c. On-bipolar cells depolarize in response to light.
 - d. Glutamate causes off-bipolars to depolarize.
 - e. Glutamate causes on-bipolars to hyperpolarize.
25. The cerebrospinal fluid (CSF):
- a) Has a higher concentration of glucose than blood
 - b) Contains more protein per unit volume than blood
 - c) Is formed at a rate that is proportional to the CSF pressure
 - ☒ d) Is absorbed at a rate that is proportional to the CSF pressure
 - e) Is removed largely through dural sleeves of the spinal nerve roots
26. The Wernickes area
- (a) Receives no sensory input
 - (b) Is found in the occipital lobe
 - (c) Is responsible for the motor aspects of speech
 - ☒ (d) Is the area of the brain for speech comprehension
 - (e) Is localized only in the frontal lobe
27. Which of the following lobe houses the auditory area and auditory association areas
- a) Occipital lobe
 - b) Frontal lobe
 - ☒ c) Temporal lobe
 - d) Parietal lobe
 - e) None of the above
28. The hippocampal formation is responsible for
- a) Short term memory
 - b) Retrieval of information from long term memory
 - c) Working memory
 - ☒ d) Consolidation of recent memories into long term memories
 - e) None of the above
29. Autonomic ganglia refers to
- a) Axons of autonomic neurons
 - b) Dendrite endings of autonomic postganglionic neurons
 - ☒ c) Cell bodies of autonomic neurons
 - d) Neurotransmitters in autonomic nervous system
 - e) None of the above

30. The cranial nerve nuclei that contain parasympathetic preganglionic neurons are

- ☒ (a) Edinger-Westphal nucleus
- b) The superior salivary nuclei
- c) The inferior salivatory nuclei
- d) The dorsal motor nucleus and the nucleus ambiguus
- e) All of the above are correct

31. The cell type that forms cerebrospinal fluid is the:

- ☒ (a) Ependymal cell
- (b) Neuron
- (c) Oligodendroglial cell
- (d) Satellite cell
- (e) Schwann cell

32. The following statements concern the cerebrum:

- (a) The cerebral hemispheres are separated by a fibrous septum called the tentorium cerebelli
- (b) The bones of the vault of the skull are named from the lobes of the cerebral hemisphere which they lie
- (c) The corpus callosum is a mass of gray matter lying within each cerebral hemisphere
- ☒ (d) The internal capsule is an important collection of nerves fibres, which has the caudate nucleus and the thalamus on its medial side and lentiform nucleus on its lateral side
- (e) The cavity within each cerebral hemisphere is called the cerebral ventricle

33. The following statements concern the peripheral nervous system:

- (a) There are 10 pairs of cranial nerves
- ☒ (b) There are eight pairs of cervical spinal nerves.
- (c) The posterior root of a spinal nerve contains many efferent motor nerves and fibres
- (d) A spinal nerve is formed by the union of an anterior and a posterior ramus in an intervertebral foramen
- (e) A posterior root ganglion contains the cell bodies of autonomic nerve fibres leaving the spinal cord.

34. The following statements concern the vertebral and the spinal cord segmental level:

- (a) The first lumbar vertebra lies opposite the L3-4 segment of the cord
- (b) The third thoracic vertebra lies opposite the third thoracic spinal cord segment
- (c) The fifth cervical vertebra lies opposite the seventh cervical spinal cord segment
- (d) The eighth thoracic vertebra lies opposite the ninth thoracic spinal cord segment
- ☒ (e) The third cervical vertebra lies opposite the fourth cervical spinal cord segment

35. The following statements concern the cell of origin of the tracts listed below

- (a) The fasciculus cuneatus arises from the cells in the substantia gelatinosa
- (b) The anterior spinal thalamic arises from the cells in the posterior root ganglion
- (c) The fasciculus gracilis arises from the cells in the nucleus dorsalis (Clark's column)
- (d) The anterior spinocerebellar arises from the cells in the posterior root ganglion
- ☒ (e) The spinothalamic arises from the cells in the substantia gelatinosa

36. Visceral actions of neostigmine may be blocked without affecting its action on skeletal muscle by using

- A. Physostigmine
- B. D-tubo-curarine
- C. Nicotine
- ☒ D. Atropine

37. Which of these drugs would produce pupillary constriction?

- A. Atropine
- B. Hyoscine
- C. Pethidine
- ☒ D. Physostigmine

38. Which of the following drugs is administered with local anaesthetics to prolong action?

- A. Isoprenaline
- B. Vasopressin
- C. Amphetamine
- ☒ D. Epinephrine

39. The action of morphine in the central nervous system is

- ☒ A. Purely excitant
- B. Purely depressant
- C. Excitant followed by depressant
- D. Excitant and depressant

40. Local anaesthetics block

- A. Synaptic transmission only
- B. Motor and sensory conduction
- C. Motor conduction only
- ☒ D. Sensory conduction only

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41. Which of these anti-depressant drugs is approved for the management of chronic pain?

- A. Fluoxetine
- ☒ B. Amitriptyline
- C. Trazodone
- D. Sertraline

42. Which of the following is an absolute contraindication to opioid use?

- ☒ A. Closed head injury
- B. Myocardial infarction
- C. Acute pulmonary oedema
- D. Burns

43. Which of the following is the most reliable sign that surgical anaesthesia has been reached?
- Analgesia
 - Sedation
 - Loss of eyelash reflex
 - ☒ Loss of consciousness
- *44. Which of these drugs has good analgesic and sedative properties but does not cause muscle relaxation?
- Enflurane - *+ seizure threshold*
 - Nitrous oxide - *potent analgesic; weak anaesthetic*
 - Thiopental - *Also analgesic*
 - Halothane - *good muscle relaxation; non-irritant → ABR - arrhythmias, - possible airway poor analgesic*
45. Ketamine has been associated with which of the following adverse reactions?
- ☒ Distortion of reality
 - Irritation to the respiratory airways
 - Hypotension
 - Respiratory depression
46. Which of the following local anaesthetic agents has vasoconstrictive properties?
- Procaine
 - Tetracaine
 - ☒ Cocaine
 - Lignocaine
47. Halothane is being phased out because it causes
- Angitis
 - ☒ Hepatitis
 - Pulmonary fibrosis
 - Nephrotoxicity
48. Ergot alkaloids interact with which receptor in the brain?
- Serotonin
 - Dopaminergic
 - Adrenergic
 - ☒ All of the above
49. Sumatriptan has highest affinity for with receptor?
- ☒ 5-HT_{1b} - *1d*
 - 5-HT_{2c}
 - 5-HT₃
 - 5-HT_{1c}
50. The mu opioid receptor is related to all the following except:
- Analgesia
 - ☒ Dysphoria - *K*
 - Sedation
 - Dependence

SECTION B (51-75)

INDICATE T FOR TRUE AND F FOR FALSE AGAINST EACH STATEMENT IN THE FOLLOWING QUESTIONS. A ¼ will be deducted for wrong judgement

51 Pethidine differs from morphine in the following features:

- ☒ A. Pethidine has longer duration of action - *shorter duration of action → labour*
- ☒ B. Pethidine does not have anti-tussive action
- ☒ C. Pethidine causes more respiratory depression - *less*
- ☒ D. Pethidine causes mydriasis - *in large doses + tachycardia*

52 Local anaesthetics may be used for various purposes by the following routes:

- ☒ A. Topically
- ☒ B. By infiltration
- ☒ C. Intrathecally
- ☒ D. Intravenously - *regional*

53 Morphine actions include:

- ☒ A. Respiratory depression
- ☒ B. Pupillary constriction
- ☒ C. Diarrhea → *constipation*
- ☒ D. Histamine release → *urticaria, hypotension, bronchoconstriction, hypotension*

54 Undesirable effects of morphine include:

- ☒ A. Hypertension
- ☒ B. Nausea and vomiting T
- ☒ C. Increased bronchial secretions - *however false*
- ☒ D. Dependence

55 Pre-anaesthetic medication

- ☒ A. Permits smoother induction
- ☒ B. Is another term for sedative/hypnotics
- ☒ C. Reduces apprehension
- ☒ D. Refers to any drug given before a surgical operation

56 The following are full agonists on all opioid receptor subtypes:

- ☒ A. Naltrexone
- ☒ B. Naloxone
- ☒ C. Nalorphine - *mixed*
- ☒ D. Pentazocine - *mixed*

Mixed opioid agonist-antagonists

- Nalorphine
- Buprenorphine
- Nalbuphine

57 Relating to the eye:

- ☐ A. Overdose with opioid agonists results in pupillary dilatation
- ☒ B. Parasympathetic innervation of the eye causes miosis
- ☐ C. Dilatation of the pupil is mediated by alpha₁ adrenoceptor activation
- ☒ D. The ciliary muscle contains M₂ muscarinic receptors *Hz*

58 Opioid analgesic drugs:

- ☐ A. Often cause diarrhea
- ☐ B. Should not be given intravenously
- ☒ C. Can cause smooth muscle contraction *- ↑ tone, ↓ motility*
- ☐ D. Reduce the sensitivity of the respiratory centre to carbon dioxide

59 General anaesthetic agents:

- ☐ A. Cause excitation of the respiratory centre
- ☐ B. Are all administered by inhalation
- ☒ C. Include ketamine
- ☐ D. Are all skeletal muscle relaxants

60 Which of the following drugs are correctly matched to the clinical uses?

- ☒ A. Methadone: treatment of opioid dependence
- ☐ B. Pethidine: cough suppressant
- ☐ C. Codeine: constipation
- ☐ D. Naloxone: morphine overdose

61 Which of the following drugs are correctly matched to the adverse effects?

- ☐ A. Thiopentone: hypertension *- hypo*
- ☒ B. Halothane: malignant hyperthermia
- ☐ C. Propofol: tachycardia *- brady*
- ☐ D. Sevoflurane: hallucinations *- Altered mental state - / 348455*

62 Concerning nitrous oxide:

- ☐ A. Has been associated with malignant hyperthermia
- ☐ B. Should not be given in combination with fentanyl
- ☐ C. Produces significant skeletal muscle relaxation
- ☐ D. Has a low Mean Alveolar Concentration value compared to halothane

63 The following are either partial agonists or mixed agonist/antagonists on opioid receptors:

- ☒ A. Pentazocine *- mixed*
 - ☒ B. Nalbuphine *- Antagonist on μ and agonist on κ \Rightarrow same as pentazocine*
 - ☐ C. Methadone *- pure*
 - ☒ D. Buprenorphine *- partial*
- + buprenorphine*

Antagonists - Nalmefene
- Naloxone
- Naltrexone

64 The following agents are used in migraine headache prophylaxis:

- ☒ A. Nifedipine *⇒ Ca²⁺ channel blocker. that causes dilation.*
- ☒ B. Ergotamine
- ☒ C. Tramadol
- ☒ D. Ketamine

65 The following factors determine the onset of action of inhalational general anaesthetics:

- ☒ A. Lipid solubility
- ☒ B. Potency
- ☒ C. Blood-gas partition coefficient
- ☒ D. All of the above

66. The ascending tracts in the spinal cord:

- ☒ (a) The fasciculus gracilis and cuneatus contain fibres that mediate tactile discrimination
- ☒ (b) The lateral spinothalamic tract carries vibration and pressure modalities
- ☒ (c) The spinocerebellar tracts convey impulses from Golgi tendon organs
- ☒ (d) All afferent fibres cross the midline at some stage in the spinal cord

67. Pain receptors in the gut and urinary tract may be stimulated by:

- ☒ (a) Distension
- ☒ (b) Inflammation of the wall
- ☒ (c) Acid fluid
- ☒ (d) Vigorous rhythmic contractions behind an obstruction

68. Hearing loss is best diagnosed as either conductive or sensorineural by:

- ☒ (a) Examination of the tympanic membrane with an otoscope
- ☒ (b) Testing vestibular function
- ☒ (c) Comparing air and bone conduction thresholds
- ☒ (d) Looking for a low frequency hearing loss

69. General sensory pathways:

- ☒ (a) The anterior spinothalamic tracts transmit pain and crude touch
- ☒ (b) The pain receptors are free nerve endings
- ☒ (c) Information from the muscle spindle and golgi tendon organ does not reach consciousness
- ☒ (d) Both the spinothalamic and dorsal column pathways are highly discrete

70. In descending tracts in the spinal cord:

- ☒ (a) Reticulospinal fibres modulate voluntary movements and mediate control of unconscious movement
- ☒ (b) The vestibulospinal tract predominantly inhibits extensor motoneurons
- ☒ (c) Vestibulospinal tracts mediate control of conscious movement
- ☒ (d) The vestibulospinal tract is uncrossed it synapses on ipsilateral motoneurons

71. Concerning neural conduction:

- ☒ (a) Nodes of Ranvier are found only in myelinated nerves
- ☒ (b) In demyelinated conditions conduction rates are often increased
- ☒ (c) Compound action potentials increase as the stimulus is increased
- ☒ (d) Nodes of Ranvier contain a very large concentration of K^+ channels

⇒ Compound AP ⇒ ↑ with ↑ axon length

72. Regarding sound energy:

- ☒ (a) Humans can hear over a range of 70 – 2000 Hz *20 - 20,000 Hz*
- ☒ (b) The bel scale is logarithmic usually expressed in decibels (dBs)
- ☒ (c) Absolute lack of sound corresponds with an intensity of zero decibels
- ☒ (d) Pitch reflects the pressure attained with each sound wave cycle

73. The hair cells in the semicircular canals are stimulated by:

- ☒ (a) Movement of the perilymph
- ☒ (b) Linear acceleration
- ☒ (c) Gravity
- ☒ (d) Movement of endolymph relative to hair cells

74. The tympanic membrane:

- ☒ (a) Modifies the frequencies of sound waves impinging on the ear
- ☒ (b) Stops vibrating almost immediately after the sound stops
- ☒ (c) Transmits sound more effectively when the small muscles of the middle ear are contracted
- ☒ (d) Transmits sound more than 80% less efficiently when the membrane is perforated

75. The basilar membrane:

- ☒ (a) Is broader at the base of the cochlea than at the apex
- ☒ (b) Vibrations stimulate receptors to generate impulses at the frequencies of the applied sounds
- ☒ (c) In the apical region vibrates only to incoming sounds of low frequency

END OF CAT1

SECTION C: MULTIPLE CHOICE QUESTIONS - ONE CORRECT ANSWER
40 MARKS

Circle the answer of your choice. Each question carries 1 mark. No penalty for any wrong answer

1. The stretch reflex:
A. the receptor organ is the extrafusal muscle fiber
B. it does not normally respond to very minor degrees of stretch
✓ ☒ C. the muscle spindles involved in this reflex are most plentiful in the large antigravity muscles
D. the gamma-efferent fibers that supply the spindles are unmyelinated
E. none of the above
2. In spinal shock:
A. the duration is a function of cerebral dominance
B. bladder function is lost
✓ ☒ C. A and B are correct
D. noxious stimuli applied to the skin after spinal transaction evokes flexion response immediately
E. all are correct
3. The dermatome rule is used:
✓ ☒ A. clinically by physicians to determine level of pain perception
B. to explain referred pain
C. to discern the slow pain response
D. to determine the extent of cutaneous tissue damage
E. A and C are correct
4. Which of the following is/are not part of the analgesia system?
A. periaqueductal gray matter
B. periventricular nuclei of the hypothalamus
C. raphe magnus nucleus
D. lateral spinothalamic tract
✓ ☒ E. A and C are correct
5. Which of the following functions are not attributable to the level of the spinal cord And / or lower brain
A. walking motions *- spinal movement*
B. reflex control of blood vessels *- RAS*
✓ ☒ C. equilibrium
D. subconscious activities *- have spinal reflexes*
E. none of the above
6. Synaptic innervations of a number of cells by one fiber is an example of:
A. convergence
B. chronaxie
✓ ☒ C. rheobase
D. divergence
E. reverberation

7. Which is not a feature of the central nervous system in mammals?
- A. spinal cord
 - B. cerebral cortex
 - ✓ ☒ C. sympathetic post-synaptic neuron
 - D. cerebellum
 - E. brain stem
8. Which of the following is not located in the anterior horn of the spinal cord?
- A. anterior motor neurons
 - ☒ B. interneurons
 - C. gamma motor neurons
 - D. alpha motor neurons
 - ☒ E. none of the above
9. More than half of the fibers descending and ascending the spinal cord:
- A. provide multisegmental reflex pathways
 - B. are referred to as propriospinal fibers
 - ☒ C. include pathways of reflex coordination of simultaneous movement of body parts
 - D. are involved in nociception
 - E. A, B, and C are correct
10. An alpha-motor neuron that innervates a postural muscle such as the soleus muscle:
- ☒ A. is excited monosynaptically by Golgi tendon organ afferents
 - B. forms endplates on 3 to 6 skeletal muscles fibers
 - C. contributes to the patellar reflex
 - D. belongs to a fast fatigable motor unit
 - E. is inhibited disynaptic when the antagonist muscle is stretched
- postural muscle*
↓
lateral corticospinal pathway
11. Raising the skin temperature to 52°C activates:
- A. Meissner's corpuscles
 - B. Merkel's cell endings
 - ✓ ☒ C. nociceptors
 - D. Pacinian corpuscles
 - E. Ruffini endings
12. The sensation of high-frequency vibration is signaled by:
- A. Golgi tendon organs
 - B. Meissner's corpuscles
 - C. Muscles spindles
 - D. Nociceptors
 - ✓ ☒ E. Pacinian corpuscles
13. The cell type that forms cerebrospinal fluid is the:
- ✓ ☒ A. ependymal cell
 - B. neuron
 - C. oligodendroglial cell
 - D. satellite cell
 - E. astrocyte

14. The cerebrospinal fluid (CSF):
- ☒ A. has a higher concentration of glucose than blood
 - B. contains more protein per unit volume than blood
 - C. is formed at a rate that is proportional to the CSF pressure
 - ☒ D. is absorbed at a rate that is proportional to the CSF pressure
 - E. is removed largely through dural sleeves of the spinal nerves roots
15. An automobile accident causes an injury of the sciatic nerve. As a consequence of the injury, you would expect:
- ☒ A. death of all of the dorsal root ganglion cells whose axons were interrupted
 - B. release of antibodies to nerve growth factor from Schwann cells ensheathing the damaged axons
 - ☒ C. regrowth of the axons distal to the injury at a rate of 400mm/day *the much slower rate of*
 - D. chromatolysis of motor neurons in the lumbosacral spinal cord
 - E. eventual complete restoration of sensory and motor function
16. Concerning the peripheral and central neurotransmitters and neuromodulators, which statement is most appropriate?
- A. noradrenaline is not found in neurons in the CNS
 - B. glutamate is an inhibitory transmitter
 - ☒ C. the peptide substance P is found in peripheral motor nerve axons *periphery*
 - ☒ D. somatostatin, vasointestinal peptide and cholecystikinin are peptides which are found both in the gut and in neurons of the brain
 - E. GABA receptors are found in the peripheral tissues
17. Which one of the receptors is responsible for monitoring the rate of muscle stretch?
- A. nuclear bag intrafusal fibers
 - B. nuclear chain intrafusal fibers
 - ☒ C. Golgi tendon organs
 - D. Pacinian corpuscles
 - E. Ruffini endings
18. Which one of the following statements best describes cold receptors?
- A. cold receptors produce a sensation of warmth when their firing frequency is very low
 - ☒ B. sudden decrease in temperature always increase the firing frequency of cold receptors
 - ☒ C. cold receptors are tonic receptors that slowly increase their firing rate when the temperature is decreased
 - D. cold receptors do not fire at skin temperature above body temperature
 - E. cold receptors produce a sensation of pain when their firing frequency is very high *heat*
19. Which one of the following statements about pain sensation is correct?
- ☒ A. painful sensations can be elicited by any sensory neuron if its firing frequency is high enough
 - B. painful sensation arising from a particular area of the skin occur only when pain fibers from that area of the skin are stimulated
 - C. cutting the anterolateral tract or both sides of the spinal cord will permanently eliminate painful sensations arising from skin region
- chavasia*

- D. pain fibers conduct impulse to the spinal cord and to skin regions surrounding the site of a painful stimulus
- ☒ E. all the above are correct
20. Which one of the following sensory system uses unmyelinated fibers to convey information to the CNS?
- A. proprioception
- B. vision
- ☒ C. vibration
- ☒ D. temperature
- ☒ E. pressure
21. The styloid process of the temporal bone
- A. develops from the second branchial pouch
- B. is absent in a new born baby
- C. is formed by endochondral ossification
- D. has four muscles attached to it
- ☒ E. the stylomandibular ligament has the origin as the process.
22. The parathyroid glands:
- A. are usually four on each side
- ☒ B. develops from the endoderm of the second pharyngeal pouch
- C. are exocrine in nature
- ☒ D. consist of cords of principal and oxyphil cells *unlike parafollicular cells*
- ☒ E. shrivel and disappear in old age
23. The following are all features of the facial nerve in the petrous part of the temporal bone except:
- A. the greater petrosal nerve
- B. geniculate ganglion
- C. nerve to stapedius
- ☒ D. tympanic plexus
- ☒ E. chorda tympani
24. The following foramina match with the structures that pass through them except:
- | | | | |
|------------------------------------|----------------------|---|----------------------------|
| A | stylomastoid foramen | - | posterior auricular artery |
| B | foramen of Vesalius | - | emissary vein |
| <input checked="" type="radio"/> C | foramen spinosum | - | middle meningeal artery |
| D | foramen rotundum | - | maxillary nerve |
| <input checked="" type="radio"/> E | jugular foramen | - | hypoglossal nerve |
25. Concerning air sinuses
- A. frontal sinuses are present at birth
- B. sphenoid sinus is not present at birth
- ☒ C. the floor of the maxillary sinus overlies the second premolar tooth
- ☒ D. ethmoidal sinuses all have one common opening
- ☒ E. the sinuses are all symmetrical.

26. The following statements regarding the thyroid cartilage are all true **except**:
- ☒ A. the thyroid laminae are medial to the piriform recesses
 - ☒ B. the sternothyroid muscle is attached to the oblique line
 - ☒ C. the thyrohyoid muscle is attached to the oblique line
 - ☒ D. the inferior constrictor muscle is attached to the oblique line
 - ☐ E. it ossifies in the elderly *to become bone?*
27. The tongue:
- ☒ A. has lymphatics from its tip which drain into the preauricular lymph nodes
 - ☒ B. it starts to develop at about the fourth week
 - ☒ C. is retracted by genioglossus
 - ☒ D. is supplied by dorsal lingual arteries which are branches of the inferior alveolar artery
 - ☐ E. all of the above
28. The mandibular nerve:
- ☒ A. exits from the skull through the foramen rotundum
 - ☒ B. contains preganglionic fibres to the parotid gland
 - ☒ C. has an anterior division which is chiefly sensory in function
 - ☐ D. continues as the mylohyoid nerve
 - ☒ E. supplies the tensor tympani muscle
29. The cornea of the eyeball
- ☒ A. is adducted and elevated by the inferior rectus
 - ☒ B. is medially rotated by the inferior oblique
 - ☒ C. is supplied by the nasociliary nerve
 - ☒ D. is abducted by the medial rectus
 - ☐ E. is elevated and abducted by the superior oblique
30. Cerebrospinal fluid is formed in the:
- ☒ A. arachnoid granulations
 - ☒ B. dural venous sinuses
 - ☒ C. subarachnoid space
 - ☐ D. choroid plexuses
 - ☒ E. tela choroidea
31. Which part of the brain lies just inferior to the lower free edge of the falx cerebri?
- ☐ A. corpus callosum
 - ☒ B. diencephalon
 - ☒ C. tectum of the midbrain
 - ☒ D. thalamus
 - ☒ E. cerebellum
32. Preganglionic parasympathetic fibres to the lacrimal gland synapse in the:
- ☐ A. otic ganglion
 - ☒ B. ciliary ganglion
 - ☒ C. cervical ganglia
 - ☒ D. pterygopalatine ganglion
 - ☒ E. submandibular ganglion

Which of the following cranial nerves emerge from the pons?

- A. oculo motor
- ☒ B. trigeminal
- C. trochlear
- D. vagus
- E. hypoglossal

34. The inferior sagittal sinus:

- A. flows backwards along the inferior border into the cavernous sinus
- ☒ B. joins the great cerebral vein (of Galen) to form the straight sinus
- C. unites with the superior sagittal sinus at the confluence of sinuses
- D. it receives a few cerebral veins from the lateral surface of the cerebral hemisphere
- E. A and C only

35. The opening of the nasolacrimal duct in the nasal cavity is located in the:

- A. superior meatus
- B. middle meatus
- ☒ C. inferior meatus
- D. bulla ethmoidalis
- E. hiatus semilunaris

36. The superior orbital fissure lies between the:

- ☒ A. lesser wing of the sphenoid and the orbital plate of the frontal bone
- B. lateral pterygoid plate and ethmoid bones
- C. maxillary and ethmoid bones
- D. sphenoid and ethmoid bones
- ~~E. greater and lesser wings of the sphenoid~~

37. Regarding the structure of the tongue:

- A. its musculature is mostly of the smooth type
- B. fungiform papillae are more numerous than filiform papillae
- ~~C. it is divided into the right and left halves by a median fibrous septum~~
- D. circumvallate papillae are supplied by the lingual nerve
- ☒ E. none of the above

38. The tympanic nerve is a branch of the:-

- A. facial nerve
- ~~B. glossopharyngeal nerve~~
- ☒ C. maxillary division of the trigeminal nerve
- D. mandibular division of the trigeminal nerve
- E. vagus

39. The superior meatus communicates with the:

- A. anterior ethmoidal air cells
- B. frontal air sinus
- ~~C. posterior ethmoidal air cells~~
- D. maxillary air sinus
- ☒ E. all of the above

40. The recurrent laryngeal nerve is:
- A. mot or to the inferior constrictor muscle
 - B. mot or to the cricothyroid
 - C. sensory to all the mucous membrane of the larynx
 - D. secretomotor to the thyroid gland
 - ☒ E. the left nerve hooks around the arch of the aorta

END OF TEST