Anatomy & Physiology
Division B

Mesa-Wilson Invitational Science Olympiad Tournament
~January 28, 2017~

Teams will have **50 minutes** to complete this event.

Each team may have:
ONE 8.5" x 11" two-sided page of notes
Up to two non-programmable, non-graphing calculators

***Multiple Choice** (1 point each)*

1. Which of the following is NOT true of the enteric nervous system?
    a. It is a subdivision of the peripheral nervous system
    b. It contains both sensory and motor neurons
    c. It cannot function without input from the central nervous system
    d. It is located within the digestive tract

2. Which of the following is a factor in the generation of the resting membrane potential?
    a. Lower concentration of K+ immediately inside the cell membrane
    b. Higher concentration of Na+ immediately outside the cell membrane
    c. Greater permeability of the cell membrane to Na+ than K+
    d. All of the above

3. The pons plays a role in all of the following function except?
    a. balance
    b. salivation
    c. chewing
    d. visual reflexes

4. Which of the following pathways is related to movement coordination?
    a. rubrospinal
    b. reticulospinal
    c. vestibulospinal
    d. tectospinal

5. Which of the following types of brain waves might be observed in adults who are experiencing frustration or who may have a brain disorder?
    a. Alpha waves
    b. Beta waves
    c. Delta waves
    d. Theta waves

6. In which disease does sclerotic sheaths result in poor conduction of action potentials?
    a. Multiple Sclerosis
    b. Parkinson's Disease
    c. Cerebral Palsy
    d. Alzheimer's Disease

7. Which cranial nerve carries taste sensations from the posterior one-third of the tongue?
    a. facial nerve
    b. trigeminal nerve
    c. glossopharyngeal nerve
    d. vagus nerve

8. Which of the following statements about rods is NOT true?
    a. Rods are about 10 times more common than cones
    b. Rods contain a photosensitive pigment called rhodopsin
    c. Rods function better than cones in dim light
    d. Rods do not provide color vision

9. Which of the following is NOT an effect of Graves' Disease on the body?
    a. Enlargement of the extrinsic eye muscles
    b. Heart sounds that are louder than normal
    c. Decreased bone reabsorption
    d. Muscle atrophy and muscle weakness

***Matching* (1 point each)**

Match the following gland to the statements below. Answers can be used more than once or not at all.

a. Anterior Pituitary
b. Posterior Pituitary
c. Thyroid
d. Parathyroid
e. Adrenal Medulla
f. Adrenal Cortex
g. Thymus

10. Releases a hormone that increases milk letdown from mammary glands
11. Releases a hormone that promotes immune system development and function
12. Releases triiodothyronine
13. Releases a hormone that decreases rate of bone breakdown
14. Releases a hormone that increases fat and protein breakdown
15. Releases a hormone that targets melanocytes in the skin

Identify the neurotransmitters as excitatory, inhibitory, or both. Answers can be used more than once or not at all.

a. Excitatory
b. Inhibitory
c. Can be Excitatory OR Inhibitory

16. Endorphins
17. GABA
18. Glycine
19. Dopamine
20. Acetylcholine

Identify the following as being associated with the CNS, PNS, or both. Answers can be used more than once or not at all.

a. CNS
b. PNS
c. Both CNS and PNS

21. Astrocytes
22. White matter forms nerve tracts
23. Ganglion
24. Myelin Sheaths
25. Oligodendrocytes
26. Schwann Cells
27. Serotonin release

Match the parts of the diencephalon to the statements below. Answers can be used more than once or not at all.

a. Hypothalamus
b. Thalamus
c. Epithalamus

28. Most inferior part of the diencephalon
29. May play a role in controlling long-term cycles influenced by the light-dark cycle
30. Influences mood and registers an unlocalized, uncomfortable perception of pain
31. Has a shape similar to a yo-yo with two large lateral parts connected in the center
32. Involved in emotional and visceral response to odors

Match the following disorders to the statements below. Answers can be used more than once or not at all.

a. Myopia
b. Hyperopia
c. Presbyopia
d. Nyctalopia
e. Astigmatism

33. Associated with Vitamin A deficiency
34. May result from a cornea that is too steep
35. Can cause images to look blurry or shadowed
36. Caused when the refractive power of the cornea and lens is too great relative to length of eye
37. Caused by a reduced flexibility in the lens
38. Can be caused by a cornea that is too flat
39. Occurs normally with aging

<u>True or False Questions</u>** – **Please write out the entire word "True" or "False" on your answer document (1point each)

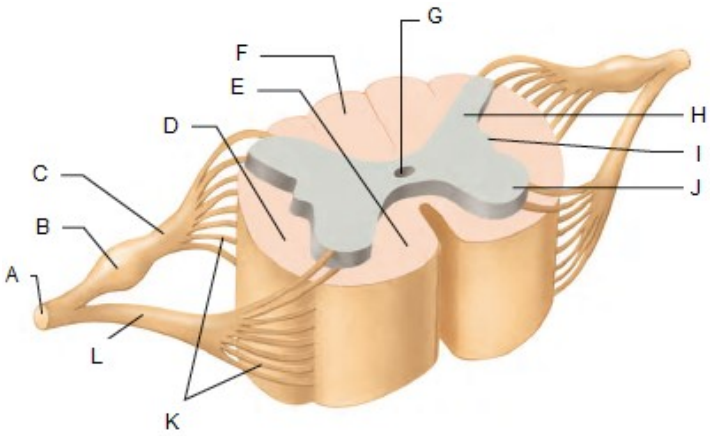
40. Dendrite like structures can project from the peripheral ends of some sensory neurons.
41. Neurons outnumber neuroglia 3 to 1.
42. Action potentials happen in an all-or-nothing fashion depending on if the threshold is reached.
43. Several hundred times more ions cross the cell membrane during conduction in myelinated cells than in unmyelinated cells.
44. The midbrain is the largest region of the brainstem.
45. The spinothalamic tract transmits information about body position to the cerebellum.
46. Olfactory neurons are multipolar neurons and are found in the olfactory epithelium lining the superior part of the nasal cavity.
47. Parasympathetic stimulation from the oculomotor nerve causes the circular smooth muscles of the iris to contract and constrict the pupil.
48. Amine hormones are synthesized from the amino acids tryptophan or threonine.
49. Type 2 diabetes mellitus occurs when too little insulin is secreted by the pancreas.

Fill in the Blank (1 point each)

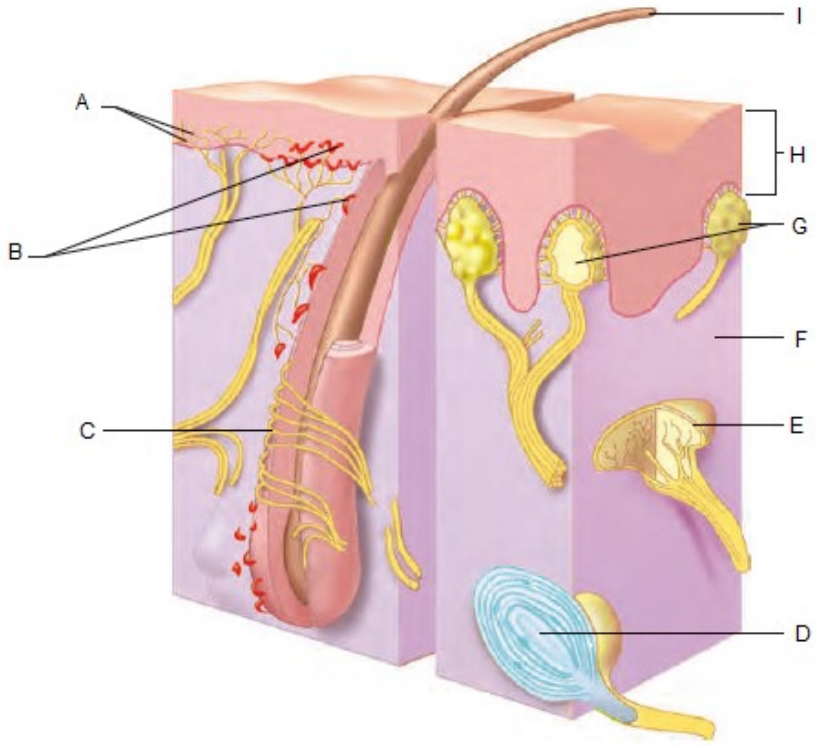
50. Bipolar neurons are found in some sensory organs; however, most sensory neurons are _____.
51. _____ act as immune cells of the central nervous system.
52. Two enlargements, called _____, on the anterior surface of the medulla oblongata are involved in the conscious control of skeletal muscles.
53. The sclera and the cornea make up the _____ tunic of the eye.
54. _____ equilibrium is associated with the vestibule.
55. Giantism is abnormal growth in young people because of the _____ of growth hormone by the pituitary gland.

Diagrams

Answer the following questions based on the spinal cord cross-section to the right.



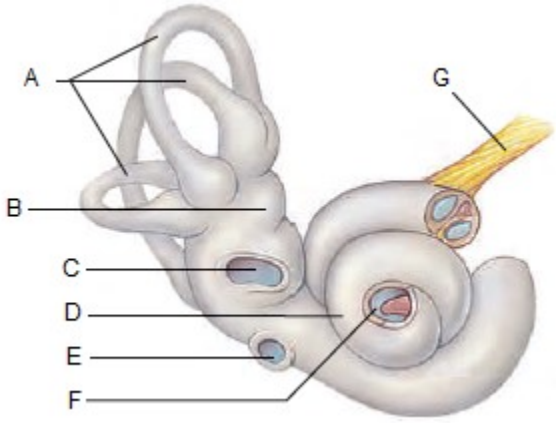
56. What letter corresponds to a fluid-filled space?
57. What letter corresponds to where the cell bodies of pseudo-unipolar sensory neurons are found?
58. What letter corresponds to where the cell bodies of somatic motor neurons are located?
59. What letter corresponds to where the cell bodies of autonomic neurons are located?



Answer the following questions based on the skin cross-section to the left.

60. What letter corresponds to the part that responds to itch?
61. What letter corresponds to the part that detects position?
62. What letter corresponds to the part that is involved in fine, discriminative touch?
63. What letter corresponds to the part that detects continuous touch or pressure?

Answer the following questions based on the image of the bony labyrinth to the right.



64. What letter corresponds to the part that receives vibrations from the perilymph of the scala tympani and dampens them?

65. What letter corresponds to the part that is divided into the utricle and saccule.

66. What letter corresponds to the part that is nearest to the maximum distortion of the basilar membrane with lower pitches?

67. What letter corresponds to the part in which the base of the stapes vibrates?

68. What letter corresponds to the part that can cause motion sickness with continuous stimulation.

Free Response – Tie Breaker Questions

These questions will only be scored in the event of a tie. Scores will be based on thoroughness and quality of response

TB 1. Why is it sometimes difficult to distinguish very cold from very warm objects touching the skin? *(2 points)*

TB 2. Describe three things that could happen to lipid-soluble hormones if binding proteins weren't present. *(3 points)*

TB 3. A woman was prescribed eye drops and when she used them she noticed she could smell and even "taste" them after putting them in her eyes. Explain in detail how this could occur. *(5 points)*