NEUROSCIENCE Review Questions

CHOOSE THE LETTER THAT BEST ANSWERS EACH OF THE STATEMENTS BELOW:

1. The importance of descending control of reflexes may be seen in:
   A. the disappearance of the tonic neck reflexes a few weeks after birth.
   B. the appearance of a Babinski sign after motor cortex damage.
   C. the phenomenon of decerebrate rigidity.
   D. spinal shock.
   E. all answers are correct.

2. What is NOT true of the smallest motor units:
   A. They produce the least tension.
   B. They are the first to be recruited.
   C. They have S muscle fibers.
   D. They have FF muscle fibers.
   E. They are the most resistant to fatigue.

3. Primary motor cortex, area 4:
   A. influences movement via connections to many other motor structures, including the putamen, the cerebellum, and the red nucleus.
   B. has no connections with the SMA and premotor cortex.
   C. has a complete map of the ipsilateral body with small discrete areas devoted to the representation of each muscle.
   D. is more important for the control of the extensors, the antigravity muscles, than the flexors.
   E. does not make a significant contribution to the corticospinal tract.

4. Comparing alpha and gamma motoneurons, which is TRUE:
   A. Alpha motoneurons innervate the intrafusal fibers.
   B. The motoneuron pool consists of both alpha and gamma motoneurons innervating a particular muscle.
   C. The larger the gamma motoneuron the larger the number of muscle fibers it innervates.
   D. Alpha motoneurons are used only in voluntary movement and gamma motoneurons only in reflexes.
   E. Each alpha motoneuron innervates muscle fibers in several different muscles.

5. Which statement about the stretch reflex is TRUE:
   A. Stretching one muscle can cause relaxation in the antagonist muscle.
   B. The stretch reflex is a polysynaptic reflex.
   C. The effects of lesions in the CNS always result in an increased activation of stretch reflexes and, thus, increased muscle tone.
   D. Dorsal rhizotomy (cutting the stretch reflex afferents) has little effect on muscle tone.
   E. Afferents involve group III fibers.

6. Decerebrate rigidity differs from decorticate rigidity in the muscle groups affected. It is TRUE that:
   A. in decorticate rigidity there is increased tone in the flexors of the legs.
   B. in decerebrate rigidity there is increased tone in the extensors of all 4 limbs.
   C. in decerebrate rigidity the stretch reflexes of the extensors are less excitable than normal, because of the loss of descending excitatory axons.
D. in decorticate rigidity there is increased tone in the flexors of all four limbs.
E. decreased muscle tone is a common symptom of cerebral palsy.

7. Cortical connections between Wernicke’s and Broca’s language areas on one side of the cortex would involve which pathway:
   A. anterior commissure
   B. internal capsule
   C. corpus callosum
   D. superior longitudinal fasciculus
   E. projection fibers

8. Which of the following conditions is TRUE in a normal person who is awake but at rest (i.e. not moving):
   A. axons from Globus Pallidus are not active (do not fire action potentials)
   B. axons from Ventral Lateral nucleus inhibit motor areas of cerebral cortex
   C. axons from Globus Pallidus inhibit the Ventral Lateral nucleus
   D. axons from Putamen inhibit Globus Pallidus
   E. axons from Putamen excite Globus Pallidus

9. Recent experimental work in "plasticity" of somatosensory maps demonstrates that:
   A. maps change as a result of surgical removal of cortical areas.
   B. the cortical region containing the map of missing fingers expanded to adjacent regions.
   C. use or training can lead to changes in the cortical representation.
   D. receptive field size changed but not the size of the cortical representation of that area.
   E. both A and C.

10. Muscle spindles
    A. are composed of two types of intrafusal fibers, nuclear bag and nuclear chain fibers.
    B. occur in about the same density in all muscles.
    C. are composed of two types of extrafusal fiber, the FR and the FF fibers.
    D. are the receptors for muscle pain.
    E. are found in flexors but not extensors.

11. Each motoneuron pool:
    A. contains motoneurons that all have the same axon diameter
    B. consists of a population of motoneurons that all have the same size cell body.
    C. contains only one type of muscle fiber.
    D. is composed of all the muscle fibers innervated by one motoneuron.
    E. includes all of the motoneurons that innervate a muscle.

12. What is TRUE about motor units:
    A. one motor unit usually contains different types of muscle fibers.
    B. the larger the motoneuron, the greater the number of muscle fibers it innervates.
    C. in any muscle, the largest motor units are the first to be called up or recruited.
    D. a motor unit includes all of the motoneurons that innervate one muscle.
    E. the larger motor units are composed of type S muscle fibers.

13. In spinal shock
    A. there is a temporary increase in tone in the extensors of the arms.
    B. there is a temporary increase in tone in the extensors of the legs.
C. there is complete but temporary paralysis.
D. there is a complete, but temporary, loss of reflexes below the damage.
E. spinal reflexes become hyperactive.

14. Concerning primary motor cortex, area 4:
A. lesions in area 4 result in apraxia.
B. it has a map of the ipsilateral body with small discrete areas devoted to each muscle.
C. it is important for motor planning and bimanual coordination.
D. it works entirely independently of the basal ganglia.
E. single neurons in area 4 can influence motoneuron pools for several muscles.

15. Which of the following statements about language is TRUE:
A. Broca's area controls comprehension of language
B. in most people, language is controlled by the right cerebral hemisphere
C. people with Wernicke's aphasia demonstrate fluent spontaneous speech
D. damage to the inferior temporal lobe produces language disorders
E. Broca's area is located adjacent to somatosensory cortex

16. Which of the following are examples of lower motor neurons:
A. neurons in lamina IX of the spinal cord
B. lateral vestibulospinal tract
C. hypoglossal nucleus
D. all of the above
E. A and C

17. During voluntary movement, alpha motor neurons in the spinal cord may receive input from descending axons in the spinal cord arising from all of the following EXCEPT:
A. red nucleus
B. cerebral cortex
C. cerebellum
D. vestibular nuclei
E. reticular formation

18. Hyperactive reflexes and increased muscle tone associated with upper motor neuron lesions is due to loss of which of the following tracts:
A. reticulospinal
B. vestibulospinal
C. corticospinal
D. thalamic fasciculus
E. rubrospinal

19. Which of the following conditions is TRUE in a normal person who is initiating a movement:
A. axons from the cerebral cortex inhibit cells in the Putamen
B. axons from the globus pallidus inhibit cells in the ventral lateral nucleus
C. axons from the putamen inhibit cells in the globus pallidus
D. axons from the globus pallidus excite cells in the globus pallidus
E. axons from the globus pallidus excite cells in the ventral lateral nucleus

20. Which of the following statements about how the cerebellum controls balance is NOT true:
A. the flocculus and nodulus are important areas of the cerebellum involved in balance
B. the cerebellum controls balance chiefly by controlling the vestibular nuclei
C. the vestibulocerebellum receives axons from the vestibular nuclei and vestibular apparatus
D. the juxtarestiform body is an important link in this pathway
E. it involves projections from the cerebellum to the motor areas of cerebral cortex via thalamus

21. Which of the following statements about the subthalamic nucleus is NOT true:
   A. its axon terminals in the putamen
   B. it sends axons to the globus pallidus
   C. its destruction results in wild, flailing movements of the extremities
   D. axons from the globus pallidus terminate in the subthalamic nucleus
   E. it is part of the diencephalon

22. Which of the following symptoms is NOT associated with Basal Ganglia Disease:
   A. resting tremor
   B. ataxia
   C. muscle rigidity
   D. bradykinesia
   E. dystonic movements

23. Which of the following statements about muscles and their innervation is FALSE:
   A. alpha and gamma motoneurons are both located in lamina IX of the spinal cord.
   B. intrafusal fibers are innervated by alpha motoneurons
   C. the main function of muscle spindles is to detect changes in muscle length.
   D. most spindles contain both nuclear chain and nuclear bag fibers
   E. during movement, alpha and gamma motoneurons are co-activated.

24. Which of the following statements about muscle tone is FALSE:
   A. the corticospinal tract normally suppresses muscle tone.
   B. muscle tone is due primarily to the stretch reflex.
   C. basal ganglia disease is associated with an increase in muscle tone.
   D. immediately after spinal cord transection, muscle tone is decreased.
   E. muscle tone is defined as the resistance to passive stretch.

25. Which of the following statements about apraxia is FALSE:
   A. it can occur with lesions in the parietal lobe
   B. it is a disorder in the execution of skilled movements
   C. it can occur with lesions in the supplementary motor area
   D. it is frequently associated with paralysis
   E. it is usually not associated with sensory impairment

26. Which of the following are examples of upper motor neurons:
   A. corticospinal tract
   B. cerebellum
   C. lateral vestibulospinal tract
   D. all of the above
   E. A and C
27. The basal ganglia and cerebellum are similar in that both:
   A. send axons to the spinal cord
   B. influence the supplementary motor area
   C. influence cerebral cortex on the side opposite to their location
   D. use ventral lateral nucleus of thalamus as a relay
   E. receive sensory information from the spinal cord

28. Sensory information travelling from the leg to the cerebellum is carried by all of the following structures **EXCEPT**:
   A. nucleus dorsalis
   B. lateral cuneate nucleus
   C. dorsal spinocerebellar tract
   D. fasciculus gracilis
   E. inferior cerebellar peduncle

29. Symptoms of cerebellar disease include all of the following **EXCEPT**:
   A. bradykinesia
   B. intention tremor
   C. decreased muscle tone
   D. ataxia
   E. dysmetria

30. Which of the following statements about movement is **TRUE**:
   A. immediately after spinal cord transection, muscle tone is increased
   B. decorticate posture involves increased tone in extensors of the upper and lower limbs
   C. muscle spindles provide information about muscle force
   D. for most cranial motor nerves, one side of cortex controls the opposite side of the head
   E. decerebrate posture can be caused by a lesion in the caudal midbrain

31. Spasticity on the right would be likely after damage to the:
   A. posterior limb of the left internal capsule
   B. left lateral funiculus of the spinal cord
   C. left frontal lobe
   D. all the above
   E. A and C

32. Spasticity and parkinsonian rigidity are similar in that both conditions produce:
   A. weakness
   B. tremor at rest
   C. intention tremor
   D. increased muscle tone
   E. bradykinesia

33. Which of the following is **NOT** a symptom of Kluver-Bucy syndrome:
   A. olfactory hallucinations
   B. loss of emotional responses
   C. docility
   D. loss of visual recognition (psychic blindness)
   E. hypersexuality

34. Which of the following structures is most likely to be damaged in a chronic alcoholic:
A. hippocampus
B. mammillary bodies
C. entorhinal cortex
D. septal nucleus
E. amygdala

For questions 35-38, match the statement below with the correct hypothalamic nucleus in the list.
   A. Ventromedial Nucleus
   B. Supraoptic Nucleus
   C. Posterior Region/Nucleus
   D. Arcuate Nucleus
   E. Chiasmatic Region/Anterior Nucleus

35. Important in heat conservation; causes shivering, vasoconstriction and elevated metabolism.
36. Contains the satiety center. Bilateral damage causes overeating.
37. Important for body cooling; controls sweating, and vasodilation.
38. Neurons in this nucleus secrete a substance in response to changes in blood osmolality.

39. Papez circuit includes all of the following EXCEPT:
   A. hippocampus
   B. cingulate gyrus
   C. amygdala
   D. anterior nucleus of thalamus
   E. mammillary body

40. Damage to the hippocampus would be expected to produce a problem with:
   A. attention
   B. personality
   C. visual recognition
   D. memory consolidation
   E. sexual activity

41. Bilateral removal of the temporal lobes in monkeys (and similarly in humans) results in a characteristic group of symptoms called:
   A. Korsakoff's syndrome
   B. Wernicke's encephalopathy
   C. Panic attacks
   D. Kluver-Bucy syndrome
   E. Uncinate fits

42. Which of the following homeostatic processes is correctly paired with the nucleus which is most directly involved in its control:
   A. Feeding: suprachiasmatic
   B. Blood pressure regulation: ventromedial
   C. Drinking: supraoptic
   D. Sleeping: mammillary
   E. Temperature regulation: arcuate

43. Most of the fibers in the fornix connect:
   A. the hippocampus to the hypothalamus
   B. the cingulate gyrus to the parahippocampal gyrus
C. the amygdala to the hypothalamus
D. the amygdala to the septal nuclei
E. the hippocampus to the dorsomedial thalamic nucleus

1 E
2 D
3 A
4 B
5 A
6 B
7 D
8 C
9 C
10 A
11 E
12 B
13 D
14 E
15 C
16 E
17 C
18 A
19 C
20 E
21 A
22 B
23 B
24 A
25 D
26 E
27 D
28 B
29 A
30 E
31 E
32 D
33 A
34 B
35 C
36 A
37 E
38 B
39 C
40 D
41 D
42 C
43 A
On the diagram below, draw the locations of the 7 cranial nerve motor nuclei at their proper brainstem divisions. Be sure to label each one.
Using the diagram below, draw the cerebrocerebellar circuit involved in the planning of movement. Clearly indicate each neuron in the pathway with a cell body, axon, and terminal at the appropriate levels, places, and sides of the nervous system.