You must put your name and student ID number on both the paper test and your Scantron. Make sure to put the test version number on your Scantron. You must turn in both the test and the Scantron. We will not grade any Scantron without an accompanying test. Show your ID when you turn in your test.

You may write on the test but you must put the answers to each question on your Scantron. We will not re-grade the Scantron so do not fill in the blank until you are sure of your answer.

**True/False (1 point each)**

*Indicate whether the statement is true (A) or false (B).*

1. Neurons can have any number of dendrites, but no more than one axon.
   a. True
   b. False

2. Only sensory neurons are found in a reflex arc.
   a. True
   b. False

3. At synapses, the cell that receives the message is called the presynaptic neuron.
   a. True
   b. False

4. Opiates work at the pain receptors in the skin.
   a. True
   b. False
5. The sympathetic and parasympathetic nervous systems generally have opposing actions on the major internal organs.
   a. True
   b. False

6. Bumps and depressions in the skull are closely related to how well developed the underlying brain areas are.
   a. True
   b. False

7. A single muscle can contract in more than one direction.
   a. True
   b. False

8. Taking a drug that blocks acetylcholine receptors would be helpful for a person with myasthenia gravis.
   a. True
   b. False

   a. True
   b. False

10. In Huntington's disease, earlier onset is associated with slower deterioration over time.
    a. True
    b. False
Multiple Choice (2 points each)

Identify the choice that best completes the statement or answers the question.

11. Neurons differ most strongly from other body cells in their:
   a. temperature.
   b. **shape**.
   c. osmotic pressure.
   d. mitochondria.

12. The structure that contains the chromosomes is called the:
   a. endoplasmic reticulum.
   b. **nucleus**.
   c. mitochondrion.
   d. ribosome.

13. Which of the following is NOT a characteristic of a dendrite?
   a. It tapers as it gets further from the cell body.
   b. **It is in contact with the dendrites of other neurons.**
   c. Its surface may be lined with synaptic receptors.
   d. It receives information from other neurons or the environment.

14. A greater amount of branching on dendrites allows them to:
   a. manufacture more mitochondria.
   b. **have a larger surface area available for receiving information from other neurons.**
   c. increase their membrane permeability.
   d. lower their resting potential.
15. Compared to dendrites, axons usually:
   a. form the information-receiving pole of the neuron.
   b. are shorter than the dendrites.
   c. **are covered with myelin**.
   d. taper in diameter toward their periphery.

16. What is the point from which an axon releases chemicals into the synapse?
   a. the myelin sheath
   b. **the presynaptic terminal**
   c. a dendritic spine
   d. the endoplasmic reticulum

17. Which of the following is a characteristic of glial cells in the human brain?
   a. They are larger than neurons.
   b. They are capable of transmitting impulses when neurons fail to do so.
   c. **They are more numerous than neurons**.
   d. They are like neurons, except that they lack axons.

18. Which would be MOST likely to cross the blood-brain barrier?
   a. **small, uncharged molecules**
   b. large, charged molecules
   c. molecules that are not fat soluble
   d. viruses
19. The blood-brain barrier is most like a(n):
   a. stone wall around a castle that is impermeable.
   b. bullet-proof vest.
   c. balloon that allows air molecules to escape through its wall.
   d. unopened can of soda pop.

20. What is the main source of nutrition for vertebrate neurons?
   a. fats
   b. glucose
   c. sodium
   d. complex carbohydrates

21. What is the difference in voltage called that typically exists between the inside and the outside of a neuron?
   a. concentration gradient
   b. generator potential
   c. resting potential
   d. shock value

22. When the neuron is at rest, what is responsible for moving potassium ions into the cell?
   a. concentration gradient
   b. an electrical gradient
   c. the sodium-potassium pump
   d. both the sodium-potassium pump and electrical gradient
23. Which of the following is true of local neurons?
   a. They exchange information with distant neurons.
   b. They abide by the all-or-none principle.
   c. The change in membrane potential increases as it travels.
   d. **They have short dendrites and axons.**

24. An EPSP is a(n):
   a. **graded depolarization.**
   b. depolarization with a rebounding hyperpolarization.
   c. graded hyperpolarization.
   d. action potential in a reflex arc.

25. In a football game, having two players tackle an opponent at the same time will be more effective than if a single player tries to tackle the opponent alone. The cumulative effect of simultaneous tackling is similar to what principle of synaptic communication?
   a. temporal summation
   b. inhibitory post synaptic potentials
   c. **spatial summation**
   d. reflex arc

26. When a vertebrate animal contracts the flexor muscles of a leg, it relaxes the extensor muscles of the same leg. Sherrington considered this evidence for the existence of:
   a. spatial summation.
   b. temporal summation.
   c. **inhibitory messages.**
   d. the delay in transmission at synapses.
27. The catecholamines include:
   a. epinephrine, norepinephrine, dopamine, serotonin.
   b. epinephrine, serotonin, dopamine.
   c. dopamine, serotonin, acetylcholine.
   d. **epinephrine, norepinephrine, dopamine.**

28. Vesicles are located:
   a. in postsynaptic terminals.
   b. in dendrites.
   c. **in presynaptic terminals.**
   d. outside of the neuron in the extracellular fluid.

29. The main advantage of a neuron releasing more than one neurotransmitter is that:
   a. if it runs out of one, it has others.
   b. it can release different transmitters on different occasions.
   c. **it can send more complex messages.**
   d. it can release one from the axon's terminal and one from another location along the axon.

30. Reuptake is an alternative to which other process?
   a. recycling of neurotransmitters
   b. **enzymatic breakdown of neurotransmitters**
   c. absorption of neurotransmitter by the postsynaptic neuron
   d. re-release of neurotransmitters from postsynaptic neurons
31. Researchers have identified the gene that controls the development of the dopamine type D2 receptor in humans. People with the less common form of this gene were:
   a. somewhat less likely than others to develop severe alcoholism.
   b. **somewhat more likely than others to engage in a variety of pleasure-seeking behaviors.**
   c. somewhat less likely than others to engage in a variety of pleasure-seeking behaviors.
   d. frequently introverts.

32. At the synapse, amphetamine:
   a. blocks the breakdown of dopamine.
   b. **increases the release of dopamine from the presynaptic terminal.**
   c. increases the sensitivity of dopamine receptors.
   d. decreases the sensitivity of dopamine receptors.

33. Cannabinoids are a class of chemicals that include:
   a. nicotine.
   b. cocaine.
   c. morphine.
   d. **marijuana.**

34. A certain drug user experiences intensified sensations and the illusion that time is passing slowly. He also experiences problems with attention and memory. These symptoms are most characteristic of the use of which drug?
   a. LSD
   b. cocaine
   c. nicotine
   d. **marijuana**
35. In anatomy, the opposite of medial is:
   a. lateral.
   b. dorsal.
   c. ventral.
   d. rostral.

36. Cell bodies of sensory neurons are located in the:
   a. spinal cord.
   b. dorsal root ganglia.
   c. white matter.
   d. ventral roots.

37. Sympathetic is to ____ as parasympathetic is to ____.
   a. serotonin; dopamine
   b. dopamine; serotonin
   c. acetylcholine; norepinephrine
   d. norepinephrine; acetylcholine

38. The hindbrain consists of the:
   a. tectum, tegmentum, and reticular formation.
   b. thalamus and hypothalamus.
   c. spinal cord and cranial nerves.
   d. medulla, pons, and cerebellum.

39. Damage to which hindbrain structure would be most life-threatening?
   a. occipital cortex
   b. medulla
   c. cerebellum
40. If a cell in a given column responds to touch on the person's right toe, then another cell in the same column would respond to:
   a. touch on the left toe.
   b. sounds from the right ear.
   c. touch on the right finger.
   d. touch on the right toe.

41. What deficits does a person suffer after damage to the striate cortex in the occipital lobe?
   a. deafness
   b. blindness
   c. loss of touch and other body sensations
   d. loss of fine motor control

42. The precentral gyrus is essential for:
   a. fine movements.
   b. coordination between vision and hearing.
   c. emotions.
   d. hunger and thirst.

43. Which of the following are two kinds of proprioceptors?
   a. extensors and contractors
   b. contractors and muscle spindles
   c. muscle spindles and Golgi tendon organs
   d. muscle spindles and extensors
44. Slow and continuous stretching exercises could relax a muscle by:
   a. stretching the muscle spindle organs.
   b. decreasing glucose utilization.
   c. stretching the Golgi tendon organs.
   d. increasing muscle fiber density.

45. What experience is similar to losing proprioception?
   a. losing your sense of equilibrium
   b. walking on a leg that has "fallen asleep"
   c. a phantom limb
   d. teeth chattering in the cold

46. In adulthood, the rooting and Babinski reflexes:
   a. continue to occur, just as in infancy.
   b. are completely lost, as the reflexive connections disappear.
   c. are suppressed, but they can return if cortical activity decreases.
   d. are suppressed, but they can return if the person is motivated.

47. From where do most of the axons in the dorsolateral tract originate?
   a. primary motor cortex, surrounding areas, and red nucleus
   b. primary somatosensory cortex and areas of the parietal lobe
   c. primary somatosensory cortex and areas of the occipital lobe
   d. red nucleus and reticular formation
48. Damage to the ____ impairs the ability to organize smooth sequences of activities.
   a. premotor cortex
   b. prefrontal cortex
   c. **supplementary motor cortex**
   d. tabes dorsalis

49. The structure composed of the caudate nucleus, putamen, and globus pallidus is the:
   a. **basal ganglia**.
   b. limbic system.
   c. cerebellum.
   d. sympathetic nervous system.

50. Which of the following is NOT common in people with Parkinson's disease?
   a. difficulty initiating voluntary movements
   b. slowness of movements
   c. rigidity and tremors
   d. **outbursts of emotions**

**Diagrams (3 points each)**
For the illustrations or graphs below, identify the numbered structures (numbers correspond to question number on test).

51. Answer choices are:
   a. Axon
   b. Dendrite
   c. **Myelin sheath**
   d. Presynaptic terminal
   e. Soma

52. Answer choices are:
   a. Axon
   b. Dendrite
   c. Myelin sheath
   d. **Presynaptic terminal**
   e. Soma
53. Answer choices are:
   a. **Excitatory Postsynaptic Potential (EPSP)**
   b. Inhibitory Postsynaptic Potential (IPSP)
   c. Resting Potential
   d. Spatial Summation
   e. Temporal Summation

54. Answer choices are:
   a. Excitatory Postsynaptic Potential (EPSP)
   b. **Inhibitory Postsynaptic Potential (IPSP)**
   c. Resting Potential
   d. Spatial Summation
   e. Temporal

55. What type of cell is pictured?
   a. Basket cell
   b. Golgi cell
   c. Granule cell
   d. **Purkinje cell**
   e. Stellate cell

56. What type of fiber connects these cells in the cerebellum to control movement?
   a. Climbing fiber
   b. Mossy fiber
   c. **Parallel fiber**
   d. Axonal fiber
   e. Summation