

Fundamentals of Neuroscience

Neuroscience · Answer Key · 25 Questions

1. Which glial cell type is primarily responsible for forming the myelin sheath in the central nervous system?

- A) Astrocytes
- B) Oligodendrocytes**
- C) Microglia
- D) Schwann cells

2. What is the resting membrane potential of a typical mammalian neuron?

- A) -70 mV**
- B) -30 mV
- C) 0 mV
- D) +40 mV

3. Which neurotransmitter is most commonly associated with inhibitory signaling in the adult human brain?

- A) Glutamate
- B) Acetylcholine
- C) GABA**
- D) Dopamine

4. The Broca's area, essential for speech production, is located in which lobe of the brain?

- A) Occipital lobe
- B) Parietal lobe
- C) Temporal lobe
- D) Frontal lobe**

5. Which ion is primarily responsible for the depolarization phase of an action potential?

- A) Potassium
- B) Sodium**
- C) Chloride
- D) Calcium

6. What is the primary function of the cerebellum?

- A) Regulation of body temperature
- B) Coordination and balance**
- C) Processing visual stimuli
- D) Hormone secretion

7. Which structure acts as the primary relay station for sensory information traveling to the cerebral cortex?

- A) Thalamus**
- B) Hypothalamus
- C) Amygdala
- D) Hippocampus

8. The 'all-or-none' principle in neuroscience refers to:

- A) Synaptic transmission strength
- B) The initiation of an action potential**
- C) Receptor binding affinity
- D) Neurotransmitter synthesis

9. Which part of the neuron is primarily responsible for receiving incoming chemical signals?

- A) Axon
- B) Myelin sheath
- C) Dendrites**
- D) Node of Ranvier

10. Long-term potentiation (LTP) is a cellular mechanism believed to underlie which cognitive process?

- A) Reflex arcs
- B) Sleep cycles
- C) Learning and memory**
- D) Visual processing

11. Which cranial nerve is responsible for the innervation of the heart and digestive tract?

- A) Trigeminal nerve
- B) Vagus nerve**
- C) Optic nerve
- D) Facial nerve

12. What is the blood-brain barrier composed of?

- A) Endothelial cells and astrocyte end-feet**
- B) Cerebrospinal fluid
- C) Dura mater
- D) Schwann cells

13. The 'nodes of Ranvier' are best described as:

- A) Synaptic cleft regions
- B) Gaps in the myelin sheath**
- C) Cell body organelles
- D) Neurotransmitter vesicles

14. Which lobe of the brain is primarily responsible for visual processing?

- A) Frontal
- B) Parietal
- C) Temporal
- D) Occipital**

15. What is the primary excitatory neurotransmitter in the human central nervous system?

- A) Glycine
- B) GABA
- C) Glutamate**
- D) Serotonin

16. Which brain structure is most closely linked to the formation of emotional memories and fear conditioning?

- A) Amygdala**
- B) Cerebellum
- C) Pineal gland
- D) Pons

17. During an action potential, which ion flows out of the neuron to cause repolarization?

- A) Sodium
- B) Potassium**
- C) Magnesium
- D) Chloride

18. What is the main function of the hippocampus?

- A) Motor control
- B) Consolidation of short-term memory to long-term memory**
- C) Vision
- D) Olfactory sensing

19. Which protein complex is essential for the docking and fusion of neurotransmitter vesicles to the presynaptic membrane?

A) SNARE proteins

- B) Hemoglobin
- C) Myosin
- D) Actin

20. The somatosensory cortex is located in which gyrus?

A) Precentral gyrus

B) Postcentral gyrus

- C) Superior temporal gyrus
- D) Angular gyrus

21. Which of the following is NOT part of the brainstem?

- A) Medulla oblongata
- B) Midbrain
- C) Pons

D) Thalamus

22. What is the chemical composition of the myelin sheath primarily made of?

A) Proteins and lipids

- B) Carbohydrates
- C) Nucleic acids
- D) Water only

23. Which type of synapse involves the direct physical connection between neurons allowing rapid ion flow?

A) Chemical synapse

B) Electrical synapse

- C) Axo-axonic synapse
- D) Dendro-dendritic synapse

24. What does the 'reuptake' process involve in synaptic transmission?

A) Degradation of neurotransmitters by enzymes

B) Re-absorption of neurotransmitters by the presynaptic neuron

- C) Production of new neurotransmitters
- D) Blocking of postsynaptic receptors

25. Which brain region is heavily involved in the regulation of the circadian rhythm?

A) Suprachiasmatic nucleus

B) Hippocampus

C) Corpus callosum

D) Broca's area