

IYNA *Brain Facts* Practice Test



International Youth Neuroscience Association

The International Youth Neuroscience Association (IYNA) has compiled a set of practice questions based on the Society for Neuroscience (SfN) publication *Brain Facts*: a commonly-used study material for local and national-level brain bees. We are currently working on another practice test covering the material in *Neuroscience: Science of the Brain*. While these may be valuable for practice, keep in mind that this is an unofficial resource. To learn more about the educational neuroscience resources we provide, check out our website at www.youthneuro.org. We hope you enjoy this study resource!

Best Regards,
Jacob Umans
IYNA Board Chair and MYELIN Initiative Director

Multiple Choice Score	_____/40
True/False Score	_____/30
Fill-In Score	_____/15
Extended Answer Score	_____/15
Total Score	_____/100

Multiple Choice:

1. The highest region in the spinal cord is
 - a. Thoracic
 - b. Lumbar
 - c. Cervical
 - d. Sacral
2. The part of the nervous system dedicated to increasing arousal during a fight or flight response is the
 - a. Parasympathetic Nervous System
 - b. Sympathetic Nervous System
 - c. Somatic Nervous System
 - d. Enteric Nervous System
3. The researchers who first characterized the molecular processes underlying the action potential were
 - a. Golgi & Ramon y Cajal
 - b. Hodgkin & Huxley
 - c. Kandel & Schwartz
 - d. Loewi & Dale
4. Influx of ions through which channels triggers synaptic release of neurotransmitters
 - a. Sodium
 - b. Potassium
 - c. Magnesium
 - d. Calcium
5. Myasthenia gravis is linked most closely to which of the following neurotransmitters
 - a. Glutamate
 - b. Serotonin
 - c. Acetylcholine
 - d. Glycine
6. Which neurotransmitters are catecholamines? Select **all** that apply
 - a. Dopamine
 - b. Serotonin
 - c. Norepinephrine
 - d. Epinephrine
7. Which peptide neurotransmitter is most closely linked to the perception of pain in the peripheral nervous system
 - a. Endorphin
 - b. Met-Enkephalin
 - c. Substance P
 - d. Capsaicin

8. The primary inhibitory neurotransmitter in the spinal cord is
 - a. Glutamate
 - b. Glycine
 - c. GABA
 - d. Glutamine
9. Selective Serotonin Reuptake Inhibitors (SSRIs) are most commonly used as
 - a. Antidepressants
 - b. Anticonvulsants
 - c. Anaesthetics
 - d. Anti-inflammatories
10. Which of the following proteins do **not** guide growth cones
 - a. Netrins
 - b. Ephrins
 - c. Nerve Growth Factors
 - d. Semaphorins
11. The centermost region of the eye, which has the highest visual acuity, is called the
 - a. Macula
 - b. Fovea
 - c. Uvea
 - d. Retina
12. The disorder characterized by pain being elicited by normally innocuous stimuli (e.g. having pain while swallowing) is called
 - a. Hyperalgesia
 - b. Trigeminal Neuralgia
 - c. Complex Regional Pain Syndrome
 - d. Allodynia
13. Which of the following neurotransmitter systems is most closely linked to the process of long-term potentiation
 - a. Dopamine
 - b. Acetylcholine
 - c. Glutamate
 - d. GABA
14. Emotional memories are primarily processed by:
 - a. Striatum and cerebellum
 - b. Cerebral cortex, hippocampus, parahippocampal region
 - c. Hypothalamus and sympathetic nervous system
 - d. Prefrontal cortex
15. Which of the following types of glutamate channels are both ionotropic, and calcium-permeable?
 - a. NMDA
 - b. AMPA
 - c. Kainite
 - d. mGluR

16. Nonfluent aphasia can be caused by damage to
 - a. Wernicke's Area
 - b. Left temporal lobe
 - c. Broca's Area
 - d. Left parietal lobe
17. The motor neurons which allow the brain to fine-tune motor activity and control sensitivity of the muscle spindle organs are called
 - a. Alpha motor neurons
 - b. Beta motor neurons
 - c. Gamma motor neurons
 - d. Delta motor neurons
18. A motor unit is
 - a. An alpha motor neuron and the set of muscles it innervates
 - b. A set of alpha motor neurons and the muscle they innervate
 - c. A set of muscles which work together to form a particular function (e.g. walking, grabbing)
 - d. A region in the primary motor cortex which is linked to a given body part
19. Dysfunctions in this region and neurotransmitter system cause Parkinson's disease
 - a. Substantia Nigra, Dopamine
 - b. Substantia Nigra, Acetylcholine
 - c. Putamen, Dopamine
 - d. Putamen, Acetylcholine
20. Which of the following is **not** a characteristic symptom of Parkinson's disease?
 - a. Tremor
 - b. Rigidity
 - c. Akinesia
 - d. Chorea
21. Which of the following nuclei is the master regulator of our sleep-wake cycle
 - a. Ventrolateral preoptic nucleus
 - b. Suprachiasmatic nucleus
 - c. Subparaventricular nucleus
 - d. Medial geniculate nucleus
22. Which of the following neuroimaging tools is commonly used to study oscillations in neural activity during sleep
 - a. MRI
 - b. CT
 - c. EEG
 - d. PET
23. Acute stress stimulates the release of which of the following neurotransmitters
 - a. Serotonin
 - b. GABA
 - c. Oxytocin
 - d. Norepinephrine

24. The part of the brain releases CRH is the
- Hypothalamus
 - Thalamus
 - Anterior Pituitary
 - Posterior Pituitary
25. Oxidative damage in the brain is most directly caused by
- Decreased levels of neurotransmission
 - Increased levels of neurotransmission
 - Decreased levels of free radicals
 - Increased levels of free radicals
26. Which of the following techniques often requires the use of a viral vector to insert the channelrhodopsin gene into cells
- EEG
 - Microdialysis
 - Optogenetics
 - SPECT
27. Approximately how many protein-coding genes do humans have
- 2,000
 - 20,000
 - 200,000
 - 2,000,000
28. Which of the following techniques has the highest temporal resolution?
- MEG
 - fMRI
 - TMS
 - CT
29. Which of the following neurotransmitter classes is most closely linked to ADHD
- Catecholamines
 - Endorphins
 - Amino Acids
 - Peptides
30. Down Syndrome is commonly diagnosed with each of the following **except**
- Amniocentesis
 - Karyotype
 - Chorionic Villus Sampling
 - Next-Generation DNA Sequencing
31. Nicotine acts on receptors for which neurotransmitter
- Glutamate
 - Serotonin
 - Acetylcholine
 - Norepinephrine

32. Which of the following brain regions is **not** closely related to dopaminergic reward systems in addiction
- Ventral Tegmental Area
 - Nucleus Accumbens
 - Hippocampus
 - Prefrontal Cortex
33. Alzheimer's Disease involves the pathological accumulation into neuritic plaques and neurofibrillary tangles of which proteins
- A β , Tau
 - Tau, ApoE4
 - A β , ApoE4
 - APP, Tau
34. Most FDA-approved drugs to treat Alzheimer's disease target which neurotransmitter
- Glutamate
 - Serotonin
 - Acetylcholine
 - Norepinephrine
35. The mutation responsible for Huntington's disease involves an expanded repeat of this many amino acids
- 3
 - 4
 - 5
 - 6
36. Tourette Syndrome is most closely linked to abnormalities in which brain region
- Prefrontal Cortex
 - Basal Ganglia
 - Broca's Area
 - Primary Motor Cortex
37. Chlorpromazine, a dopamine receptor antagonist once used as a treatment for schizophrenia, had side effects on movement which resemble which other neurological disease
- Huntington's Disease
 - Parkinson's Disease
 - ALS
 - Myasthenia Gravis
38. Non-steroidal anti-inflammatory drugs (NSAIDs) inhibit which class of enzymes
- Cyclooxygenases
 - Prostaglandins
 - Adenylyl Cyclases
 - Hexosaminidases

39. Which of the following is **not** a class of antidepressant
- Selective Serotonin Reuptake Inhibitor
 - Monoamine Oxidase Inhibitor
 - Tricyclic
 - Benzodiazepine
40. The primary researcher involved in elucidating the process of Long-Term Potentiation was
- Arvid Carlsson
 - Eric Kandel
 - Paul Greengard
 - Alois Alzheimer

True/False

- In development, axons are guided by growth cones to the appropriate dendritic target
- Neural induction is the process by which ectodermal cells are induced to differentiate into neurons
- The neurons on the outermost layer of the cerebral cortex are older than the cells at the innermost layer of the cerebral cortex
- Most developing neurons arrive at their destination through tangential migration, though some inhibitory neurons use radial migration to reach their destination
- Visual stimuli from the right half of the visual field goes to the left visual cortex, and vice versa
- The Two-Point Discrimination Test is used to assess visual acuity
- High-pitched sounds cause responses closer to the base of the cochlea than low-pitched sounds
- The hippocampus is the most important brain region involved with maintaining working memory
- Reflexes do not involve any intervention from the brain
- One key role of the cerebellum in movement is to maintain coordination
- Narcolepsy is linked to excessively high hypocretin levels
- Norepinephrine from the locus coeruleus is important in inducing sleep
- The sympathetic nervous system soothes the body once a stressor passes
- Short-term stress temporarily suppresses the immune system
- High levels of cortisol in the bloodstream downregulate the release of ACTH
- Declining intelligence and memory is a normal part of aging
- Duchenne Muscular Dystrophy is an X-linked recessive disorder
- Autism Spectrum Disorder (ASD) is linked to microcephaly, or an abnormally small head size
- Dyslexia may impact people differently depending on the language they speak and read
- Individuals with Down Syndrome have a heightened risk of developing Alzheimer's disease
- Opiate abuse during pregnancy is the most common cause of preventable mental disability

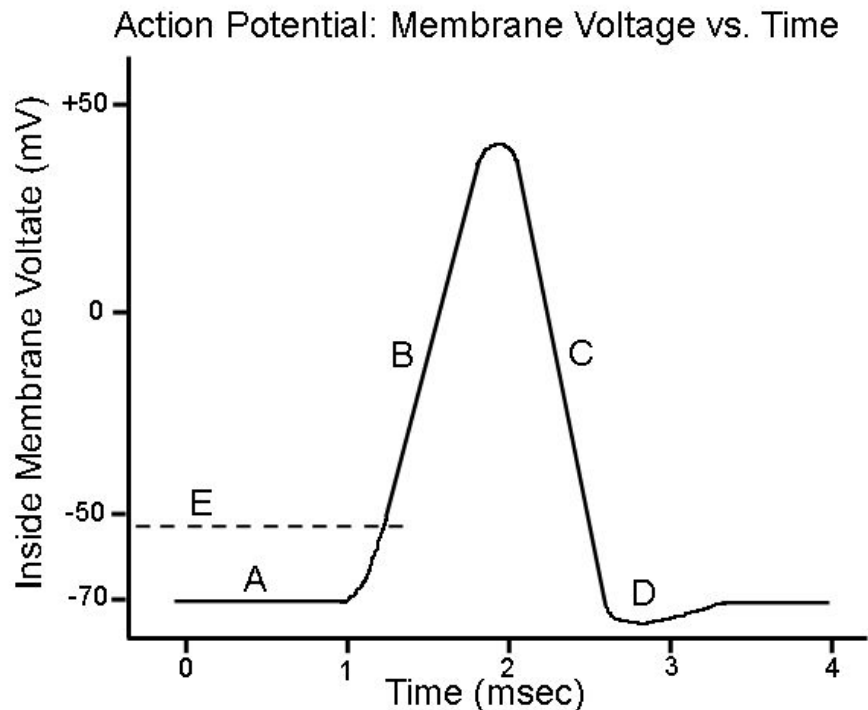
22. There exists a class of receptors in the brain which bind to endogenous molecules resembling Δ^9 -THC, the active ingredient of marijuana
23. Excitotoxicity and oxidative distress are both linked to ALS pathology
24. Apolipoprotein E, a gene closely associated with Alzheimer's disease, encodes a protein which regulates cholesterol metabolism
25. Huntington's Disease is caused by an autosomal recessive mutation on Chromosome 4
26. SSRIs are useful in alleviating the symptoms of OCD
27. Shrunken ventricles are commonly observed in patients impacted by schizophrenia
28. Metastatic tumors are far more common than brain tumors in the brain
29. Primary tumors of the brain are more commonly created by neurons than by astrocytes
30. RNA interference can be used to prevent the production of toxic proteins in the brain

Fill in the Blank

1. There are approximately _____ neurons in the human brain [this question is asking about the number of neurons in the human brain]
2. A _____ is a sensitive neurodevelopmental period in which the nervous system is especially sensitive to environmental stimuli and has a high level of plasticity.
3. Visual information passes through the _____ nucleus of the thalamus to reach the primary visual cortex
4. The sea slug species _____ is a model organism researchers commonly use to study the process of long-term potentiation
5. The fruit fly species _____ is a commonly-used model organism in molecular biology and neurobiology research
6. The gene _____ is of critical importance in learning the mouth and jaw movements which allow speech
7. _____ amnesia is memory disorder in which patients have difficulty forming new memories
8. _____, also known as Lou Gehrig's Disease, is a progressive neurodegenerative disease in which patients gradually lose their ability to move
9. A _____ rhythm is a daily physiological cycle in the biological processes of humans
10. The technique which uses an electric coil to alter neural activity is called _____
11. Down Syndrome most commonly involves trisomy of Chromosome _____
12. _____ of the liver is closely associated with alcohol abuse
13. One neurotoxin used to simulate Parkinson's disease is _____
14. _____ is an enzyme commonly used to open blocked blood vessels to treat ischemic stroke
15. One potential neurological effect of diabetes or neurological AIDS is peripheral _____, or degeneration of peripheral nervous tissue

Extended Answer

Write on the lines below the term (word or short phrase) which best describes parts A-E of the graph below, and state whether the majority of voltage gated sodium or potassium channels are open or closed at this time point. Answer Part F with one or two sentences



A: _____

Voltage-Gated Na⁺ Channels: _____ | Voltage Gated K⁺ Channels: _____

B: _____

Voltage-Gated Na⁺ Channels: _____ | Voltage Gated K⁺ Channels: _____

C: _____

Voltage-Gated Na⁺ Channels: _____ | Voltage Gated K⁺ Channels: _____

D: _____ [the appropriate answer is **NOT** refractory period]

Voltage-Gated Na⁺ Channels: _____ | Voltage Gated K⁺ Channels: _____

E: _____

F: Define the term refractory period and briefly explain why a refractory period typically follows an action potential