

**Anatomy & Physiology Fall 2021 Invitational Tournament****School Name****Team: A B C****Time:****Score:****Rank:**

You have 50 minutes to take this test. You are allowed one double-sided cheat sheet and up to 2 non-programmable/non-graphing calculators. Tiebreakers are at the end of the test, and will also contribute to the final score. Highest score wins. Point values listed in parenthesis for each section. For multiple choice, choose the best answer; some may have more than 1 right answer. (Total of 256pts)

**Nervous System:**

1. What is the brain region that is best known as the sensory routing system, and if cortical nerves from sensory organs bypass this region, the cortex won't be able to perceive the sensation of those sensations? (2 pts)
  - a. Hypothalamus
  - b. Post central gyrus
  - c. Cerebrum
  - d. Thalamus
2. What is the neurotransmitter used in the sympathetic nervous system? (2pts)
  - a. Epinephrine
  - b. Dopamine
  - c. GABA
  - d. Glutamate
3. What is the brain's main excitatory neurotransmitter? (2pts)
  - a. GABA
  - b. Glutamate
  - c. Glycine
  - d. Serotonin
4. Initial depolarization of an action potential is because of what? (2pts)
  - a. Potassium ions entering the cell
  - b. Potassium ions exiting the cell
  - c. Sodium ions entering the cell
  - d. Sodium ions exiting the cell
  - e. Calcium ions entering the cell
  - f. Calcium ions exiting the cell
5. The movie Ice Castles (1978), involves a rising ice skater star who suffers a serious head injury after attempting a difficult jump. She suffers a blood clot in her brain that robs her of her eyesight, making her see only light and blurry shapes. Which brain lobe could the blood clot have been located in? (2 pts)
6. Sometimes anti seizure medicine is not effective in very severe cases of epilepsy seizures, which requires an operation in which this brain part is severed, which prevents the

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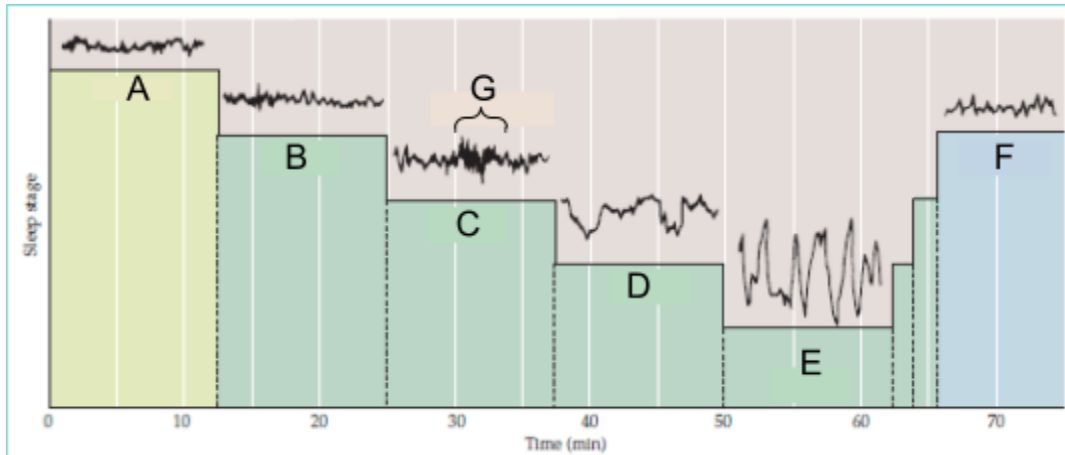
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communication of information between brain hemispheres causing a loss of certain functions. What is that brain part? (2pts)

- a. Cerebrum
  - b. Brainstem
  - c. Corpus callosum
  - d. Thalamus
7. Which brain region regulates vital functions like breathing and your heartbeat? (2pts)
8. Jungkook is practicing for a dance choreo for a performance but keeps getting frustrated at the inability of his legs to execute what he wants them to do. Information is sent from the brain down to his muscles to coordinate their movement. What type of neurons are these? (2 pts)
- a. Interneurons
  - b. Afferent neurons
  - c. Motor glial neurons
  - d. Efferent neurons
9. Kotoko goes to the doctor for a really serious head rash that is painful and blistering. She also feels painful pins and needles, and a slight fever. Her doctor asks if she had chicken pox as a kid. What is her doctor's suspicion of the disorder Kotoko has and give a brief description of the potential etiology (cause)? (4 pts)
10. What is the approximate resting potential of a neuron? (2pts)
11. At resting membrane potential, potassium wants to move \_\_\_out of/into\_\_\_ the cell, and sodium wants to move \_\_\_out of/into\_\_\_ the cell? (circle the right word) (4 pts)
12. Explain why white matter is called white matter and gray matter as gray matter? (4 pts)
13. What layer of brain covering is named for its spider web-like appearance? (2pts)
14. Identify the cranial nerve that is being examined by each clinical test listed below. (6 pts)
- a. Sticking out the tongue and looking at the symmetry.
  - b. Examining the strength and evenness of a shrug.
  - c. Biting down on a pencil, sensation of a Q-tip on the skin, and the corneal reflex.

- d. Smelling strong aromatic oils or salts.
- e. Rinne or Weber test with a with a tuning fork, and testing for balance while standing.
- f. Saying “Ah!” and looking at the position of the uvula, and testing the gag reflex.

15. Use the figure below to answer question #7.



- a. Identify and briefly describe the type of brainwave or the stage labeled in the figure below. For brainwaves give the wavelength range for #A-G, except for F. Assume the person who they got this EEG from started at a very relaxed and calm, meditative state of awakesness. (15 pts)
    - A:
    - B:
    - D+E:
    - F:
    - G:
  - b. The green bars label stages I-IV. What are those sleep stages called? (1 pt)
16. During a lumbar puncture, a needle is inserted between usually the third and fourth lumbar vertebrae. This is usually to diagnose meningitis, tuberculosis, encephalitis, and many other diseases. What fluid is collected for this testing in this procedure? (2 pts)
- a. Blood
  - b. Cerebral spinal fluid

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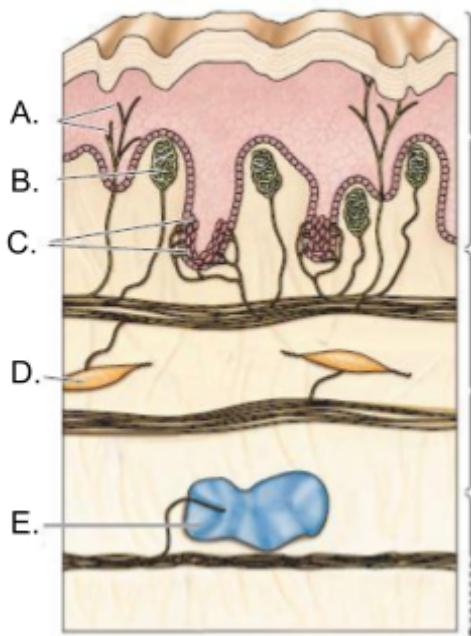
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- c. Subarachnoid fluid
  - d. Interstitial fluid
17. Which of these drugs can act as a stimulant on the body? (2pts)
- a. A cup of espresso
  - b. Smoking cannabis
  - c. A shot of vodka
  - d. Smoking a cigarette
18. Explain the function of myelination, which cells do this (give context), and an example of a related disorder. (9 pts)
19. Which meningeal layer is proximal to the central nervous system? (2pts)
20. Dopamine is a neurotransmitter that helps coordinate body movement. What pathology is the result of a loss of midbrain dopaminergic neurons? (2pts)
21. What type of conduction is the node-to-node traveling of action potentials called? (2pts)
22. Auditory information is processed in which lobe of the cerebrum? (2pts)
23. How many pairs of cranial nerves are there and how many pairs of spinal nerves? (4 pts)
24. People who suffer a stroke in this region can still speak words fluently but what they say lacks total meaning and is gibberish. What is that region? (2 pts)

**Sense Organs:**

1. What is the point in the retina called where the optic nerves exit from and contains no photoreceptors and thus is a blind spot? (2 pts)
2. Yasmina goes to the doctor for issues seeing in dim light. What is the medical scientific name for this eye defect and briefly explain a probable cause? (3 pts)
3. Identify the touch receptors as labeled in the image below and give a brief description of the function (10 pts)



A.

B.

C.

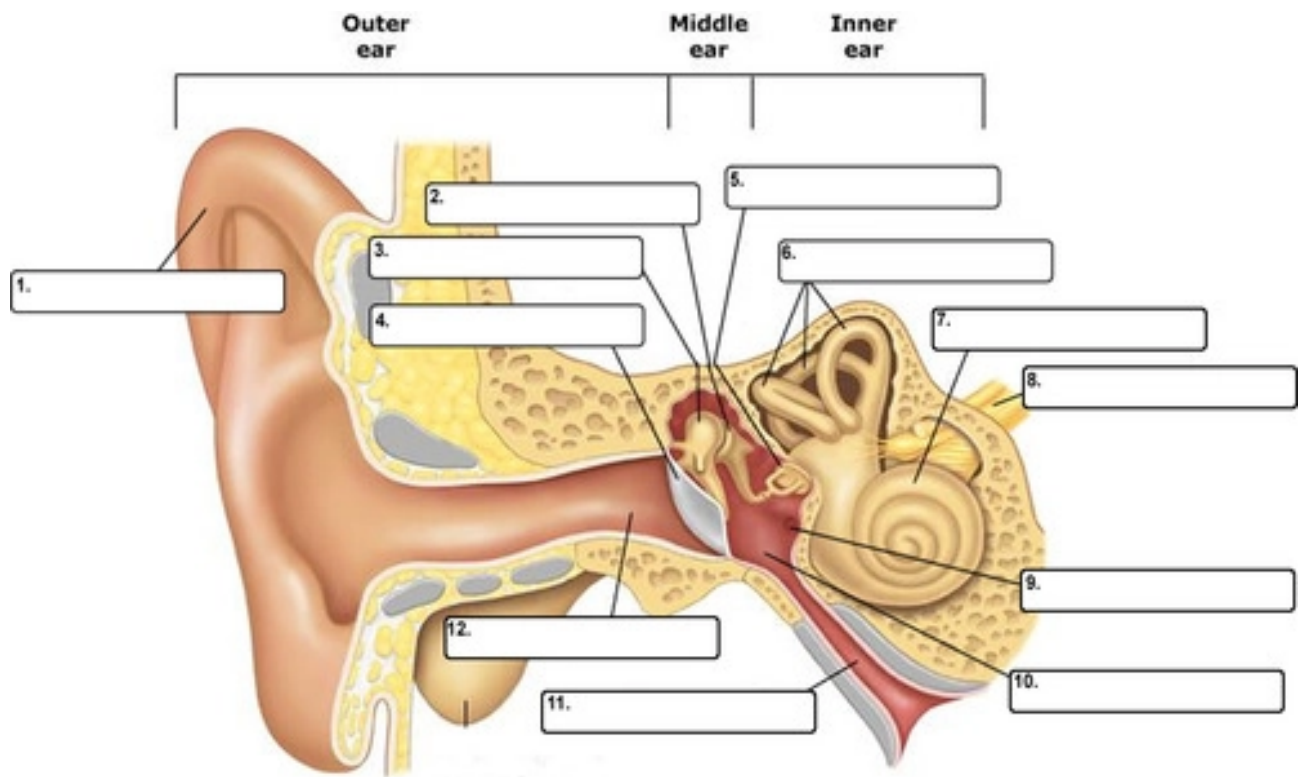
D.

E.

4. What are the names of the muscles that allow focusing of the eye by changing the shape of the lens? (2 pts)
5. Name the three bones that make up the middle ear. (3pts)
6. This structure in the eye serves to control the amount of light entering the eye by dilating and constricting the pupil. (2pts)
  - a. Lens
  - b. Cornea
  - c. Iris
  - d. Ciliary bodies
7. There are two types of light receptors on the retina - rods and cones. What is the difference between these two receptors? (4 pts)

- 8. Gustatory sense refers to what? (2pts)
- 9. What is the function of the vestibule located in the inner ear? (4 pts)
- 10. Mark goes to the eye doctor and reports cloudy spots in his field of vision and difficulty seeing at night. He also says that his eyes seem to be more sensitive to light. What is the likely diagnosis and what structure is affected? (2 pts)
  - a. Cataracts; retina
  - b. Cataracts; lens
  - c. Macular degeneration; retina
  - d. Macular degeneration; lens

Answer the following questions regarding auditory sensation

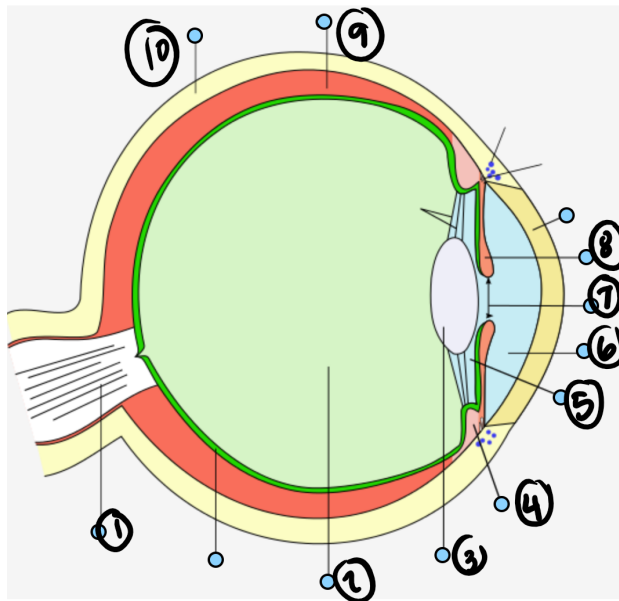


- 11. Label the above diagram on your answer sheet (6pts)

12. Explain the place theory of audition, and discuss what the tonotopic organization of hair cells refers to. (6pts)

13. Explain the purpose of the round window. (2pts)

Use Diagram for Questions 14-16

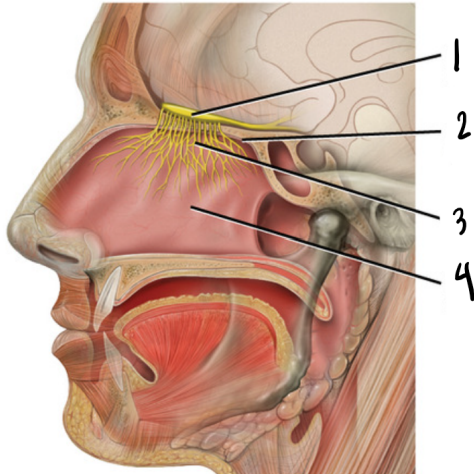


14. Label the Diagram below(10pts)

15. On the above diagram, what is the function of the layer that is labelled #10.( 2pts)
16. Draw a star on the diagram above to identify the blind spot/ optical disk. ( 2pts)
17. Describe the basic aspect of static equilibrium and dynamic equilibrium in the ear. In which process are the maculae utilized?(6pts)
18. What are proprioceptors? (2pts)
- Receptors that help maintain internal homeostasis
  - Receptors that sense pressure
  - Receptors that detect stretch and stimulate a reflex contraction
19. How many specialized receptor cells are in each of your taste buds?(2pts)
- 1000
  - 100
  - 20
  - 5
  - 1
20. Olivia Rodriguez failed to get her driving license because she has trouble seeing far away things clearly? What common eye defect could she have?( 2pts)
- Myopia
  - Hyperopia
  - Cataracts
21. List the 5 types of sensory receptors and provide an example or function of each. (10 pts)



22. Label the Diagram Below( 4pts)



23. Visceral Nociceptors respond to lack of \_\_\_\_\_.(1pt)

24. Which touch receptor senses pressure and vibration changes deep in your skin.(1pt)

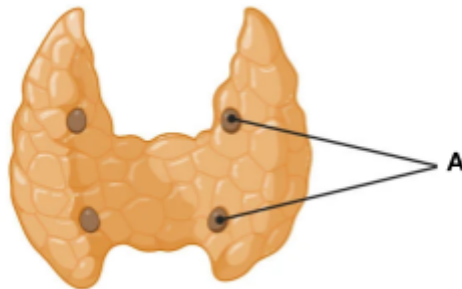
- Pacinian corpuscles
- Meissner's corpuscles
- Merkel disks

**Endocrine System:**

- What are the main hormones released from the adrenal medulla? (4 pts)
- Describe the difference between how steroid and peptide/amine hormones act on the cell. (6 pts)
- In what organ is the pineal gland located in and what does it secrete and describe its role? (5 pts)

4. Which of the following hormones is NOT released by the pituitary gland? (2 pts)
  - a. Follicle stimulating hormone
  - b. Antidiuretic hormone
  - c. Oxytocin
  - d. Aldosterone
5. What is the name of the autoimmune disorder which targets the thyroid gland and damages the tissues causing hypothyroidism? (2 pts)
6. Type 1 Diabetes Mellitus is a result of: (2 pts)
  - a. Insulin insensitivity
  - b. Immune system destruction of insulin-producing beta cells
  - c. Defective GLUT 4 receptors
  - d. Weight gain and excessive sugar intake through the diet
7. A forensic scientist is examining the remains of a body discovered in the desert with very little identifiable information. They locate a shrunken gland below the thyroid between the right and left lung. Is the victim young or old? Also what is the gland the scientist had located to help judge their decision and why were they able to make that decision based off of that? (7 pts)
8. Tumors in this gland can cause changes in vision due to its proximity to the optic nerve. What is the gland? (2 pts)
  - a. Pituitary gland
  - b. Hypothalamus
  - c. Lacrimal gland
  - d. Pineal body
9. Which of the following is false regarding the function and derivation of various steroid hormones (2pts)
  - a. It is thermodynamically favorable for steroid hormones to pass through the cell membrane because their hydrophobic core can easily pass through the lipid bilayer, even with hydrophilic functional groups.
  - b. Adrenal androgens are secreted from the zona reticularis of the adrenal gland and typically consist of a 19 carbon molecular backbone.
  - c. Glucocorticoids are a class of corticosteroids and are often the first-line of therapy for autoimmune inflammatory diseases.

- d. The androgenic steroid DHT is often used as a treatment for androgenetic alopecia, a type of pattern baldness, because it promotes hair growth at the follicle.
10. Explain the relation between oxytocin and prolactin? (6 pts)
11. What is MSH stand for, what does it do, and where is it released from? (6 pts)
12. Describe the difference between the posterior pituitary and anterior pituitary gland according to their association with the hypothalamus. Also list and describe 2 hormones for each. (10 pts)
13. What is the endocrine gland labeled with the letter A in the picture below and does it regulate? (4 pts)



14. What does ADH stand for, what does it do, and where is it released from? (6 pts)
15. Melissa goes to the doctor for diarrhea. Her doctor notices that she has thickened skin on her shins as well as bulging eyes. He writes her a blood test for her thyroid hormone levels. Based on her symptoms, what does her doctor suspect Melissa has? (2 pts)



