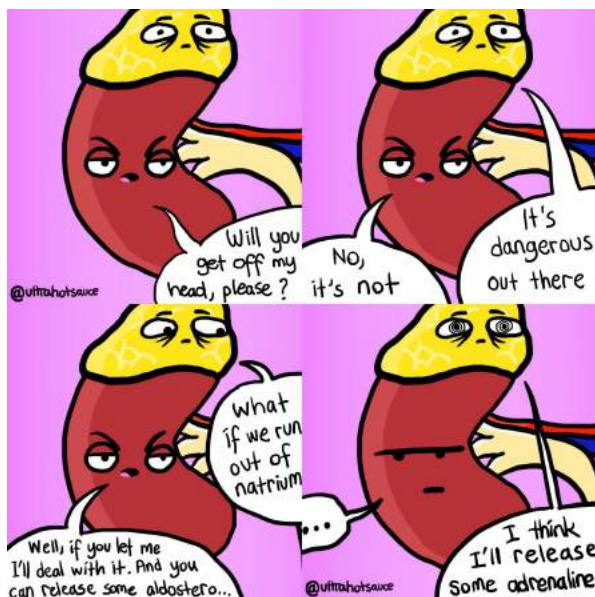


# 2022 SSSS Anatomy and Physiology

Written by BabaGanoush47



## Directions:

- You are allowed one 8.5"x 11" cheat sheet and one non-graphing calculator, both in accordance to the 2022 National Science Olympiad rules
- You will have 50 minutes to complete this exam.
- Any unclear answers will be marked as incorrect
- If you have any questions or feedback, contact me at [j.elsallal@gmail.com](mailto:j.elsallal@gmail.com).
- Have fun and good luck!

Name: \_\_\_\_\_

Email: \_\_\_\_\_

Time: 50 minutes Resources: As specified on the 2022 National Science Olympiad Rules

**Test Format** - This test is organized into 4 sections. Each system has a section dedicated, with both multiple choice and free response questions. The last section consists of 20 fill in the blanks.

## Scoring: DO NOT WRITE HERE, EVENT SUPERVISOR ONLY

Nervous: \_\_\_\_/90

Sensory: \_\_\_\_/90

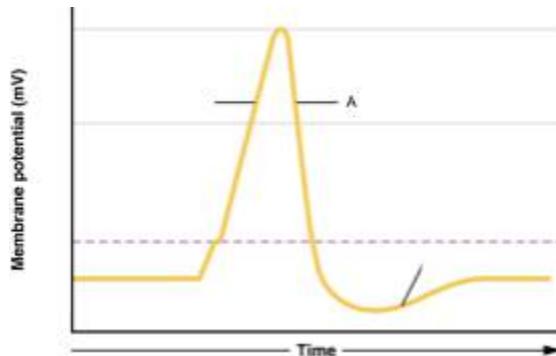
Endocrine: \_\_\_\_/90

Applied knowledge: \_\_\_\_/30

**TOTAL: \_\_\_\_/300**

**Multiple Choice: (2 points each)**

- Which one of these is the resting membrane potential?
  - 70 mV
  - 0 mV
  - 55 mV
  - 70 mV

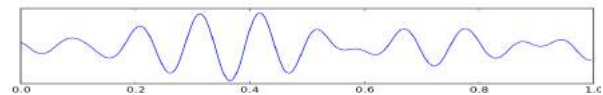


- What step in the membrane potential process is indicated by A in the image above?
  - Depolarization
  - Repolarization
  - Hyperpolarization
  - Hypopolarization
- Of the cranial nerves listed, which does not have to do with the movement of the eye?
  - Optic nerve
  - Oculomotor
  - Trochlear
  - Abducens

Answer question 4 using the image above



- This cephalogram displays a pattern called \_\_\_\_, which is associated with \_\_\_\_\_.
  - Wave and spike, epilepsy
  - Medium interval, drowsiness
  - Delta type, deep sleep
  - Tetha type, focal subcortical lesions



- What wave type is pictured in the image above?
  - Alpha
  - Beta
  - Gamma
  - Omega
- A EEG band of 5 can typically be associated with
  - A coma
  - Drowsiness in adults and kids
  - REM sleep
  - Flight or fight
- Which of the following correctly describes the function of the cerebellum?
  - Coordinates movement
  - Vision
  - Voluntary movement
  - Temperature control
- In which of the following would you not find bipolar neurons
  - The retina
  - The nose
  - The ears
  - The spinal cord

- The brain consumes approximately \_\_\_\_\_ percent of the body's metabolic output.
  - 20%

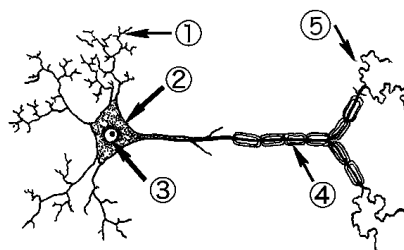
- b. 12%
  - c. 40%
  - d. 60%
10. The connective tissue sheath that surrounds a fascicle of nerve fibers is the:
- a. Epineurium
  - b. Endoneurium
  - c. Perineurium
  - d. Epimysium
11. After being allowed to drive the boat, Kodak black crashed and severely damaged his spinal cord, being left paralyzed waist down. This condition is known as:
- a. Podoplegia
  - b. Paraplegia
  - c. Quadriplegia
  - d. Monoplegia
12. Which of the following statements is true?
- a. The parasympathetic postganglionic neurons are longer than their sympathetic counterparts
  - b. The sympathetic postganglionic neurons are longer than their parasympathetic counterparts
  - c. The parasympathetic preganglionic neurons are longer than their sympathetic counterparts
  - d. The sympathetic preganglionic neurons are longer than their parasympathetic counterparts
13. Parkinson's Disease involves which of the following structures?
- a. Globus Pallidus

19. Oh no, you got a cavity! You go to the dentist. You nervously clutch the seat as the dentist prepares a needle by your side. You feel a sharp twang at the side of your face. Suddenly,

- b. Putamen
- c. Caudate Nuclei
- d. All of the above

14. Which pairing of nerves to function is incorrect?
- a. Vagus- sensory and motor
  - b. Facial nerve-motor
  - c. Hypoglossal-motor
  - d. Acoustic-sensor

Questions 15-18 refer to the image below

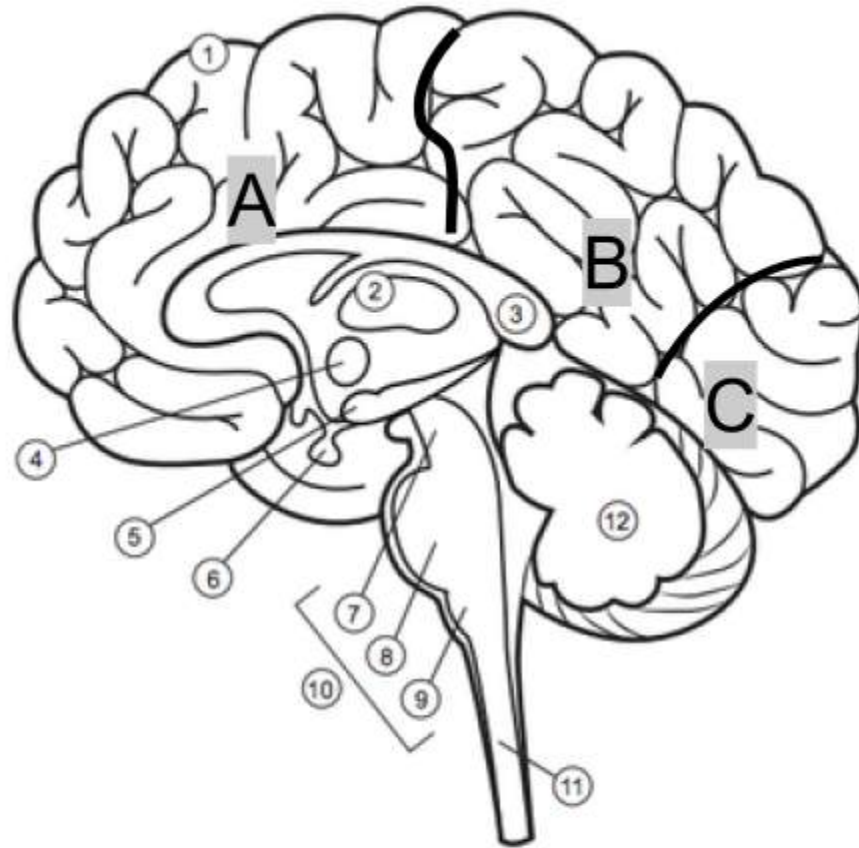


15. Which part(s) contains receptors that receive neurotransmitters?
- a. 1
  - b. 5
  - c. 4
  - d. 1&5
16. Which part(s) send signals to effectors?
- a. 1
  - b. 5
  - c. 4
  - d. 1&5
17. Which part(s) process the incoming message?
- a. 2
  - b. 4
  - c. 2&4
  - d. None of the above
18. Which part(s) contain the nodes of ranvier?
- a. 2
  - b. 4
  - c. 5
  - d. 3

your face goes numb. The dentist is able to fill in that tooth with no pain at all, if the mental anxiety of going to the dentist isn't considered. This got you thinking, how does anesthetic work? Well the answer to that may lie in a very humble structure in your body: the neuron. (11)

- a. Consider the pain which the numbing shot produces. Briefly describe the pathway which the signal for pain takes (2)
- b. Contrast the structure of an electrical synapse to a chemical synapse. (1)
- c. Which type of synapse does the pain signal utilize? (1)
- d. Which two factors largely contribute to the speed of an action potential within a synapse? (2)
- e. Explain each of your answers for d. (2)
- f. If electrical synapses are faster than chemical, then why aren't all of the body's synapses electrical? (2)
- g. Explain how a numbing agent can block the transmission of pain. (3)

20. Label the parts on the brain diagram below (1/2 pt each)



a. Name structure A. List two functions. (3 pts)

b. Name structure B. List two functions. (3 pts)

21. Caffeine and Marijuana. Two vastly different drugs, or are they? You, a researcher, got curious. While doing some reading, you found that both of these drugs take effect by acting in a

place of a neurotransmitter. However, the effects that both produce are astoundingly different. (16)

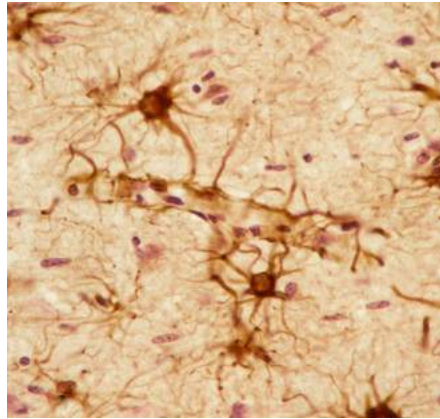
- a. What neurotransmitter(s) does caffeine replace? (1)
- b. What is the function of this neurotransmitter? (2)
- c. What neurotransmitter(s) does marijuana replace? (1)
- d. What is the function of this neurotransmitter (2)
- e. replacing the ligand with a substance that doesn't enervate the receptor? (1)
- f. Based on your answers above, explain why marijuana and caffeine do not produce the same effect. (1)
- g. While reading, you come across the research passage below:

Researchers confirmed that THC exerts its most prominent effects via its actions on two types of receptors, the CB1 receptor and the CB2 receptor, both of which are G protein-coupled receptors.[139] The CB1 receptor is found primarily in the brain as well as in some peripheral tissues, and the CB2 receptor is found primarily in peripheral tissues, but is also expressed in neuroglial cells.[140] THC appears to alter mood and cognition through its agonist actions on the CB1 receptors, which inhibit a secondary messenger system (adenylate cyclase) in a dose-dependent manner.

- i. Explain how a G coupled receptor works (2)
- ii. Which side-effects of marijuana usage may be a direct result of inhibition of CB2 (2)
- iii. Suppose a laboratory creates a drug that acts by denaturing any THC within a cell. Why would or wouldn't this be effective against THC? (2)
- iv. Suppose the same laboratory creates an antidote to marijuana which acts by phosphorylating any Guanosine diphosphate within the cell. Would it be effective? (2)

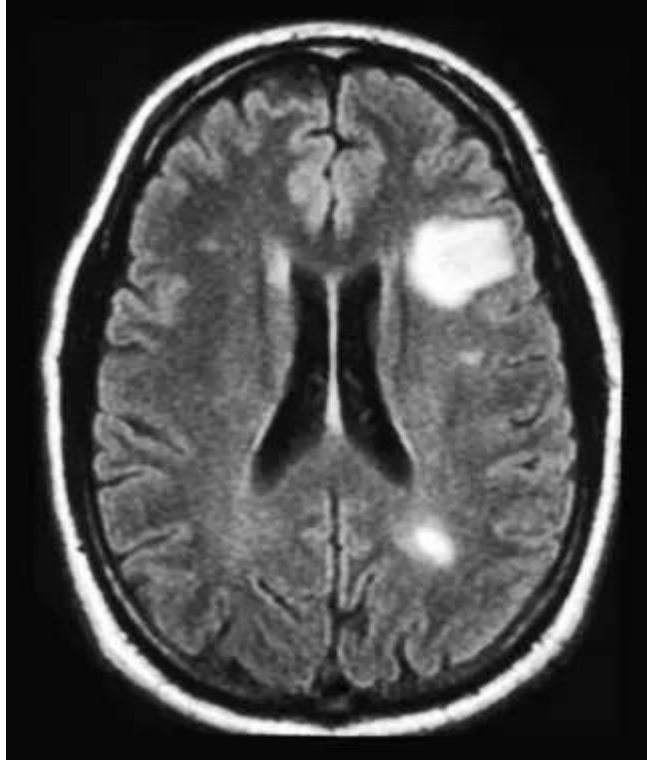
- v. Suppose a laboratory wants to eliminate the cognitive impairment of marujina by making an antidote that targets peripheral cells. Would this be effective? (2)

22. Oh no! While turning into a convertible, Professor DaBaby misplaced his neuroglial histologies! Lend a hand to your favorite CEO and identify the histology below. (5)



- What cell does the histology above depict? How can you tell? (2)
- What role does the cell play structurally? (.75)
- What role does the cell take in the blood-brain barrier? (.75)
- What neurotransmitters can this cell receive? (1.5)

23. A 30 year old woman is referred to your neurology clinic's office. On her record, it states that she is currently going through an episode of burning electrical sensations running across her spine, blurred vision, and impaired speech. You request for the image below to be taken (11).



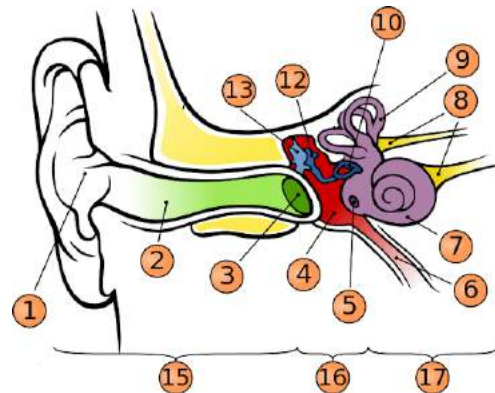
- a. The image was created using what tool? (1)
- b. What do the white patches represent? What are they caused by? (2)
- c. What is likely this condition? How can you tell? (2)
- d. What cells are most affected by this condition? (1)
- e. What can be done to treat the condition? (1)
- f. Using the 2017 McDonald criteria, do you have enough information to diagnose her with the condition? (1)
- g. If you answered yes to f., explain why you can reach a diagnosis. If you answered no to f., explain what more evidence you would need. (3)



**Multiple Choice: (2 points each)**

1. Approximately \_\_\_\_ of taste is smell
  - a. 20%
  - b. 40%
  - c. 60%
  - d. 80%
2. The eye house approximately \_\_\_\_ of all sensory receptors in the body
  - a. 5%
  - b. 15%
  - c. 70%
  - d. 85%
3. Which list of pairings is correct?
  - a. Sweet= lead salts  
Sour=acid  
Salty=inorganic salt  
Bitter=alkaloids  
Umami=glutamate
  - b. Sweet=sugar  
Sour= acids  
Salty=metal ions  
Bitter=lipids  
Umami=alkaloids
  - c. Sweet=lead salts  
Sour=high amount of metal ions  
Salty=salt ions  
Bitter= alkaloid  
Umami=Aspartate
  - d. Sweet=sugars  
Sour=glutamate  
Salty= bases  
Bitter=acids  
Umami=aspartate
4. In the diagram above, the magenta indicates where the taste buds are located?
  - a. Sweet
  - b. Salty
  - c. Bitter
  - d. None of the above
5. Which of the following is not part of the vascular layer?
  - a. Sclera
  - b. Iris
  - c. Lens
  - d. Choroid

6-8 refers to the image below



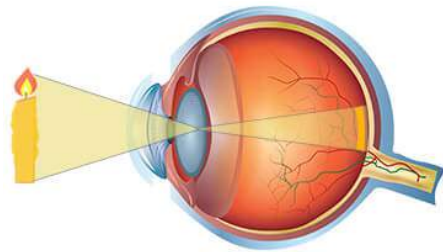
6. Name translates to "hammer"
  - a. 5
  - b. 10
  - c. 12
  - d. 13
7. Contains ceruminous glands
  - a. 2
  - b. 4
  - c. 6
  - d. 9
8. Can become red and inflamed due to otitis media
  - a. 1
  - b. 3
  - c. 8
  - d. 15

Use the diagram below to answer question 4

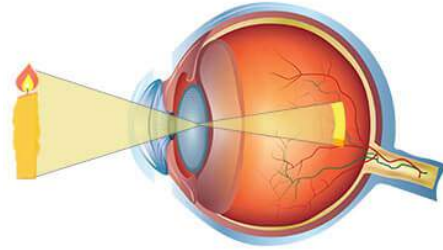


9. Which describes the state chemicals must be to excite olfactory neurons?
  - a. Odorous
  - b. Volatile
  - c. Inflammatory
  - d. Ligand
10. Which cells send impulses to the olfactory cortex?
  - a. Mitral
  - b. Astrocytes
  - c. Olfactory epithelial
  - d. Glomeruli
11. The blind spot of the eye is:
  - a. where more rods than cones are found
  - b. where the macula lutea is located
  - c. where only cones occur,
  - d. where the optic nerve leaves the eye
12. Myopia is caused by:
  - a. Excess build up of fats and lipids on the lens
  - b. Longer than normal eye
  - c. Shorter than normal eye
  - d. Faulty synaptic terminals in the rods and cones
13. Which of the following best tracks the usage of rhodopsin in a specialized receptor in the retina?
  - a. Pigment genesis, pigment degradation, pigment regeneration
  - b. Pigment genesis, pigment bleaching, pigment renaitre
  - c. Pigment synthesis, pigment bleaching, pigment regeneration
  - d. Pigment expansion, pigment depletion, pigment conversion
14. Select the correct pathway for the generation and flow of tears:
  - a. Lacrimal Gland -> Lacrimal Sac -> Inferior Lacrimal Canaliculi -> Lacrimal Ducts -> Nasal Cavity
  - b. Lacrimal Sac -> Lacrimal Gland -> Nasolacrimal Duct -> Lacrimal Duct -> Nasal Cavity
  - c. Lacrimal Gland -> Lacrimal Ducts -> Superior Lacrimal Canaliculi -> Lacrimal Sac -> Nasal Cavity
  - d. Lacrimal Sac -> Lacrimal Duct -> Inferior Lacrimal Canaliculi -> Nasolacrimal Duct -> Nasal Cavity
15. Which of the following takes up the most space in the somatosensory cortex relative to the rest?
  - a. Lips
  - b. Head
  - c. Arms
  - d. Internal organ
16. Which receptor would be activated if one were to rub menthol cream onto their legs after an intense workout?
  - a. Thermoreceptors
  - b. Nociceptors
  - c. Mechanoreceptors
  - d. Chemoreceptors

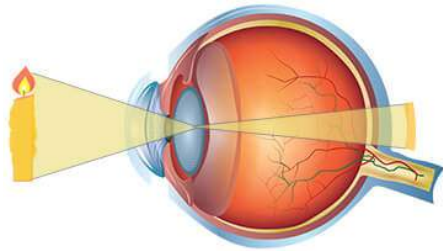
17. Which of the following diagrams correctly depicts the result of a loss of elasticity in the lens?



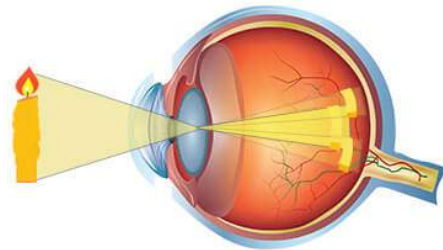
a.



b.



c.



d.



18. If the left image above is a normal cone system, what cone system would a person who sees the right image up have?

- a. Deuteranopia
- b. Tritanomaly
- c. Tetrachromat
- d. Tritanopia

19. Ash Ketchum was in optician school when the pandemic hit. So during online classes, rather than focusing and taking notes, he skipped class and tried to catch them all. That failed and tomorrow is his final on eye disorders. Luckily for him, you have a pair of eyes, so give him a hand in studying. (18)



- a.
- Identify the eye disorder (1)
  - What problem in the structure of the eye produces this disorder? (2)
  - Identify what kind of lens would be needed to correct it (1)
  - Draw the lens from iii (2)



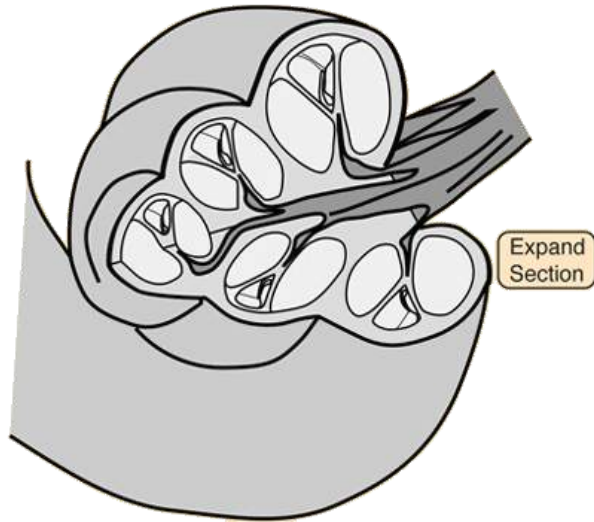
- b.
- i. identify the eye disorder (1)
  - ii. What problem in the structure of the eye produces this disorder? (2)
  - iii. Identify what kind of lens would be needed to correct it (1)
  - iv. Draw the lens from iii (2)



- c.
- i. identify the eye disorder (1)
  - ii. What problem in the structure of the eye produces this disorder? (2)
  - iii. Identify what kind of lens would be needed to correct it (1)
  - iv. Draw the lens from iii (2)

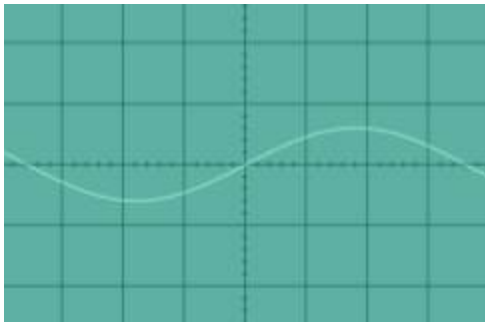
20. (8)

- a. What is the structure below? (2)

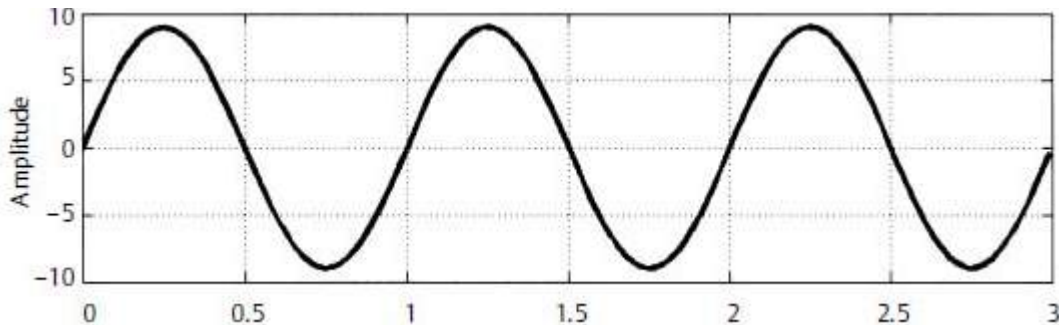


For the following, given the soundwave or frequency, indicate on the diagram above relatively where the basilar membrane would be displaced (Don't overthink it! 2 pts each)

b. 10,000 hertz



c.



d.

membrane)

time (ms)

21. I'm sure we have all heard that the saying "vitamin A improves your eyesight" was just a cover-up by pilots to hide radar technology. However this is not entirely true. Nyctalopia



is a condition where it can be harder or impossible to see in lower light levels. While generally it can be caused by faulty rods in the eye, it can also be caused by Vitamin A deficiency. Using your extensive knowledge on the structure of the retina, explain why this is. (4)

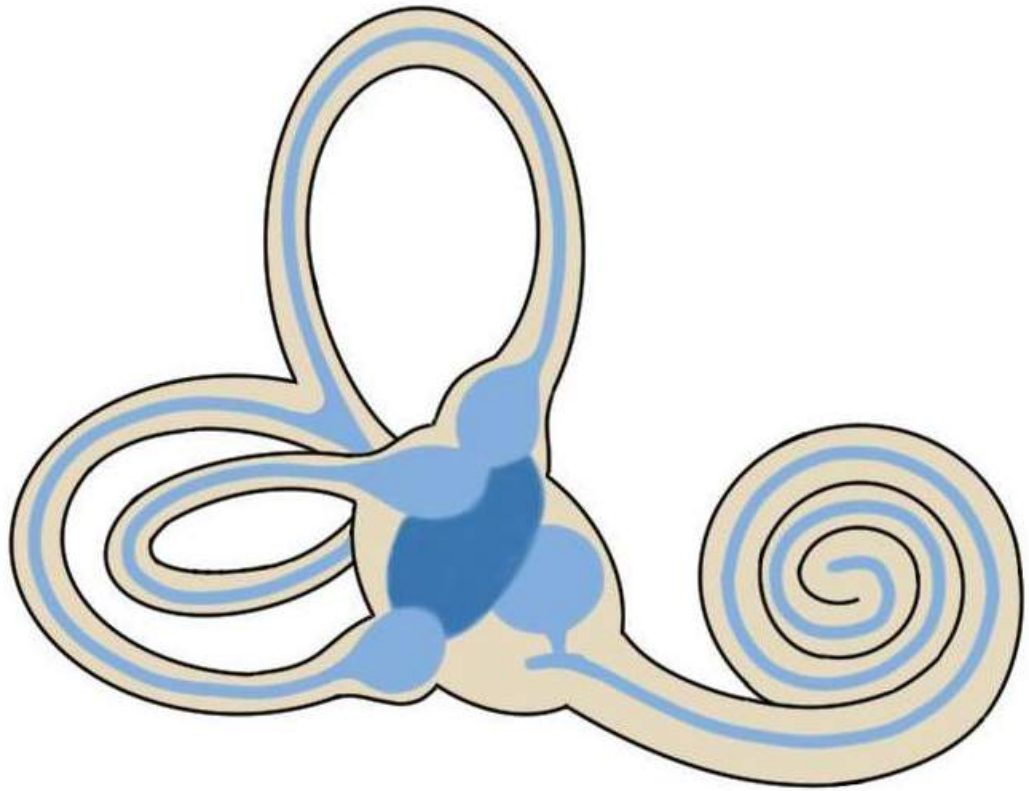
22. It was a hot summer night in Saudi Arabia circa 2018 and I was helping my cousin out at his food truck. According to eugenics, middle easterns have larger noses to help them breath in the warmer air. It was that fateful night where I discovered that it was BS because the moment I entered the food truck, a solid 20 degrees hotter than it was outside, my nose started gushing. That was the first nosebleeds of many that summer. In retrospect, that got me wondering, what exactly is a nose bleed and how can I prevent them? (10)

- a. What structure of the nose do nosebleeds occur the most often? (2)
- b. What about this structure makes it especially vulnerable to nosebleeds? (2)
- c. In that summer of nosebleeds, I noticed that besides the mental pain of knowing my nose was bleeding, I never felt any pain from nose bleeds. Why could this be? (3)
- d. Upon looking for remedies for this nuisance, I found a very common pattern for prevention. Predict what this pattern is and explain why this works. (3)

23. I went on a fishing trip back in 2019, and it was a rather windy day. Usually, I have no problem with boats, but this one time with all the rocking and what not, I got really nauseous and dizzy and could not enjoy the trip. (12)

- a. What system was out of order which caused my motion sickness? (1)
- b. What exactly causes motion sickness? (2)
- c. What are the two structures below? (2)





- d. In the image above, correctly label the semicircular structure with the following: lateral, anterior, posterior (1.5)
  - e. If you were to look out the window to your right, which labelled structure would detect the movement? (2)
  - f. If you were to nod your head, which labelled structure would detect the movement? (2)
- 24.
- a. What's your favorite color :D (1)
  - b. What receptors would be responsible for receiving the color above. (1)
  - c. What would someone with monochromia see the color above as? (.75)
  - d. What would someone with glaucoma see the color above as? (.75)

**Multiple Choice: (2 points each)**

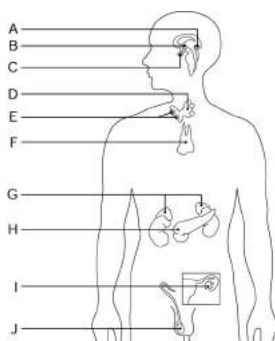
1. Which of the following is not a function of the endocrine system?
  - a. Maintenance of hydration
  - b. Mobilization of body defenses
  - c. Facilitating signal movement through ducts
  - d. Regulation of homeostasis
2. Which is an example of a peptide hormone
  - a. Glucagon
  - b. Estrogen
  - c. Thyroxine
  - d. Adrenaline
3. Which of the following correctly describes a difference between peptide and steroid hormones?
  - a. Steroids are lipophilic, peptides are lipophobic
  - b. Steroids are strictly paracrine, peptides are endocrine
  - c. Steroids are always nonpolar, peptides can be either
  - d. Steroids are never neurotransmitters, peptides can be neurotransmitters
4. Why can steroids not travel freely in the blood?
  - a. They never exist freely
  - b. Due to their unstable nature, they will oxidize with iron in hemoglobin
  - c. They are nonpolar
  - d. The statement is false. Peptides can not travel freely in blood, not steroids.

For 5-7, indicate what kind of stimulus is involved in stimulating the endocrine gland.

5. The suckling of infant at breast stimulates the release of oxytocin which activates the mammary glands
  - a. Humoral
  - b. Neural
  - c. Hormonal
  - d. None of the above
6. The thyroid is stimulated by TRH released by the thalamus
  - a. Humoral
  - b. Neural
  - c. Hormonal
  - d. None of the above
7. Elevated levels of sugar in the body signal for an increased production of insulin
  - a. Humoral
  - b. Neural
  - c. Hormonal
  - d. None of the above
8. Some hormones act by:
  - a. increasing the synthesis of enzymes
  - b. converting an inactive enzyme into an active enzyme
  - c. affecting only specific target organs
  - d. all of the above

9. Which of the following correctly describes the relationship between T<sub>3</sub> and T<sub>4</sub>?
- T<sub>3</sub> is responsible for metabolism while T<sub>4</sub> regulates homeostasis
  - T<sub>3</sub> is a prohormone while T<sub>4</sub> is a steroid hormone
  - T<sub>3</sub> is synthesized out of T<sub>4</sub> while T<sub>4</sub> is synthesized in the thyroid
  - T<sub>3</sub> is involved in sympathetic response while T<sub>4</sub> is involved in parasympathetic response
10. Testosterone is to the male as which hormone is to the female?
- luteinizing hormone,
  - progesterone,
  - Estrogen
  - prolactin

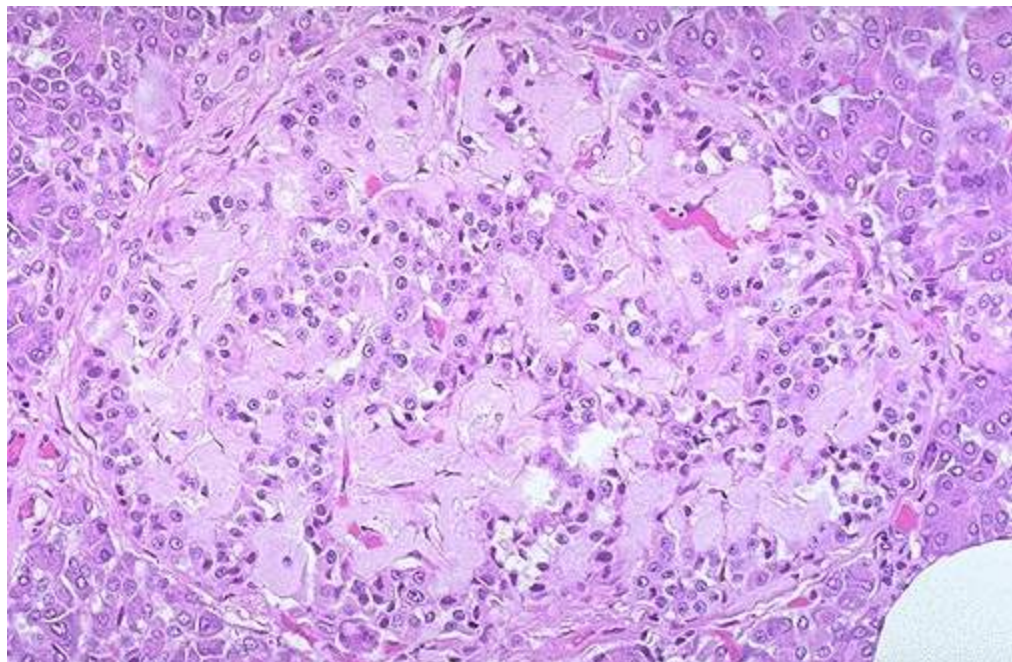
Questions 11-13 refer to the diagram below



11. Controls the levels of calcium in the body
- A
  - D
  - E
  - G
12. Is involved in a blood sugar feedback loops
- F
  - G
  - H
  - I
13. Mood swings are often, albeit falsey, blamed on fluctuations of activities of this gland
- A
  - B
  - C
  - I
14. The thymus produces an important lymphocyte called:
- Macrophage
  - T Cell
  - NK cells
  - B cells
15. Patients treated by lithium for bipolar disorder are at greater risk for a disorder caused by the overproduction of hormones released from this gland.
- Parathyroids
  - Thyroid
  - Thymus
  - Thalamus

16. Which of the following correctly describes the effect of hyposecretion and hypersecretion of follicle stimulating hormone?
- a. Hyposecretion: failure to reach sexual maturation; hypersecretion: no important effects
  - b. Hyposecretion: no important effects; hypersecretion: failure to reach sexual maturation
  - c. Hyposecretion Pituitary dwarfism in children; hypersecretion: Gigantism in children, acromegaly in adults
  - d. Hyposecretion: Gigantism in children, acromegaly in adults; hypersecretion: Pituitary dwarfism in children
17. Baba G presents to the emergency room with symptoms of coughing, sore throat, and shortness of breath. After a blood test, it was found that his iodine levels were dangerously low. What might these symptoms be an indicator of?
- a. Diabetes mellitus
  - b. Addison's disease
  - c. Hypothyroidism
  - d. Goiter
18. Abigail Adams presents to the emergency room with anxiety, an enlarged thyroid, and puffy eyes. What might these symptoms be an indicator of?
- a. Diabetes mellitus
  - b. Addison's disease
  - c. Hyperthyroidism
  - d. Goiter

19. There is a very interesting chemical within the body called norepinephrine. Despite being one unchanging chemical, a wide variety of responses can be produced from it. Moreover, it is somehow considered to be both a neurotransmitter and a hormone. Explain how this can be (hint consider the definition of each term). (4)
20. A patient presents to the emergency room with a stroke. Luckily, you are world class surgeon Dr. Mario and you are able to save her. According to a patient's family member, he was a relatively normal adult until a couple years ago when he became addicted to mountain dew, doritos, and Burger King's 10 piece chicken nuggets after which became his main diet. Prior to his stroke, the patient often complained about foot ulcers, decreased visual clarity, and increased thirst. Upon hearing this, you request a biopsy, which is depicted below. (23)
- Besides the obvious state of the subjects, what is the difference between a biopsy and an autopsy? (1)



- What is the structure depicted above? (2)
- What cells compose this structure? (1)

- d. What are the light-pink patches? (2)
  - e. What is the protein that composes the light-pink patches? (1)
  - f. What caused the light-pink patches? (3)
  - g. You have a suspicion as to what this patient may have, but you need more evidence. You request a blood sugar sample which comes back to be 140 mg/dL. Is this normal? If not, what is a normal level? (1)
  - h. You have gathered enough evidence to come to a conclusion. Diagnose the disease by its full name. (2)
  - i. Provide two pieces of evidence from the passage and one piece evidence from one of the subsections to support your diagnosis. (3)
  - j. Explain why two of your pieces of evidence support your conclusion. Use one from the passage and one from the subsection. (3)
  - k. This disease has many classifications. Classify the disease the patient has and explain your reasoning. (4)
21. Identify the hormone's source organ, one target tissue, and one effect.
- a. Parathormone
  - b. Melatonin,

22. There's no way he'd ask that

That's right, he asked it! For those of you who are new here, I like to include a station in every test that is tailored to test your understanding of a topic all while annoying you in the process. In

a nutshell, it's that one thing you decided not to study because you thought "there's no way he'd ask that."

We often say that hormones are made in glands, but we never question how. Let's say I am a student who was curious about this and ended up reading some pretty complicated stuff that I am having trouble understanding. So be a good tutor and help me out, because for this week's episode, simplify the biosynthesis of the hormones below by answering the questions below. Good luck ;). (25)

a. Oxytocin

- i. Is oxytocin an amine, peptide, or steroid hormone? (1)
- ii. What is the gene that encodes for the precursor protein? (2)
- iii. What is the name of the processes that produce the precursor proteins? (1)
- iv. During the synthesis of this hormone, the precursor protein is broken down into several smaller parts through a process called: (1)
- v. How does the precursor protein being broken down into smaller parts contribute to its classification? (2)
- vi. What enzyme is involved in the final step in releasing the active oxytocin (2)
- vii. What vitamin is the enzyme's cofactor? (2)
- viii. Name one enzyme known to metabolize oxytocin (2)
- ix. What kind of cells is oxytocin made in? (1)

b. Adrenaline

- i. Is oxytocin an amine, peptide, or steroid hormone? (1)
- ii. Which molecule serves as the precursor for adrenaline? (2)
- iii. How do enzymes contribute to a reaction (catalysis will not be accepted) (1)
- iv. Next in the process, an enzyme called AAAH leads to the synthesis of: (2)
- v. AADC is then used to catalyze the reaction of the chemical from iii to what molecule? (hint: smile :)) (2)

- vi. The molecule from iv is then used by the enzyme DBH to synthesis what molecule (hint: this molecule was mentioned in a previous question in this station) (2)
  
- vii. What cell is adrenaline synthesized in? (2)
  
- viii. What part of the adrenal gland is adrenaline synthesized in? (2)



**Applied knowledge**

This year especially, the tested systems are so interconnected that it would not be a proper test of knowledge unless an actual scenario is presented. Fill in the blanks to the passage below with the most appropriate answer. (1.5 points each)

It's a lazy summer morning. Light shines in your room through the curtains and you grudgingly get out of bed and walk towards the door. However, you forgot that you left your vintage tack collection on the ground, and a tack enters your foot. The foot cells have been damaged, releasing the hormone \_\_\_\_\_, a hormone involved in activating an inflammatory response. In the pain receptors, or \_\_\_\_\_, an action potential occurs due to flooding of ions from \_\_\_\_\_ and \_\_\_\_\_ channels. From neuron to neuron, the signal is passed until it reaches an integration center, in this case the \_\_\_\_\_, which it enters through the \_\_\_\_\_. Then from the gray matter to the \_\_\_\_\_ to \_\_\_\_\_ nerve fibers, a motor neuron relays a signal to \_\_\_\_\_ to create a response. You jerk your foot up and look down. You take a moment to process what you're seeing, a copper tack. The \_\_\_\_\_, where long term memories are stored, kicks in and you suddenly remember that you are deathly allergic to copper and if you do not remove the tack and use your allergy pen, otherwise known as an \_\_\_\_\_ pen, you will die of anaphylactic shock. Your response starts in the \_\_\_\_\_, where the danger is recognized, which then sends a signal to the \_\_\_\_\_, which does two things. You feel yourself turning pale, heart rate rising, and even \_\_\_\_\_. In other words, your \_\_\_\_\_ nervous system is kicking in. In addition to that, the \_\_\_\_\_ releases CTR, or \_\_\_\_\_, into the \_\_\_\_\_ to signal it to secrete the hormone ACTH. As a result, the adrenal gland is activated. The adrenal cortex releases the hormone \_\_\_\_\_, which increases blood pressure, blood sugar, and suppresses the immune system. Additionally production for adrenaline in the \_\_\_\_\_, is signaled which will aid in immediate reactions. You quickly hop over to your bed, take out the tack, and use your epi-pen. Your heart rate falls and you lay back in bed and let out a sigh. Perhaps it's time to ditch the vintage tacks and stick to fossil collecting.