

Wednesday, November 15<sup>th</sup>, 2023

Following directions on the mark-sense form, write your **name, and student number** in the blanks and fill in the bubbles. In addition, write your **name** on this exam.

When finished with the test, turn in both the mark-sense form and the exam at the front of the room.

***PLACE ALL ANSWERS ON THE MARK-SENSE FORM***

**MULTIPLE CHOICE: Always choose the BEST, most complete answer. (2 points each)**

1. Excitable cells that convert physical stimuli into changes in membrane potential are
  - a. called sensory receptors.
  - b. found only in the skin.
  - c. not found in muscles.
  - d. not found in our internal organs.
  - e. never able to fire action potentials.
  
2. The type of stimulus that is most effective in activating a sensory receptor is called the
  - a. threshold.
  - b. adequate stimulus.
  - c. receptor protein.
  - d. motor unit.
  - e. perceptron.
  
3. A series of neurons that are connected by synapses from the sensory receptor to second and third order sensory neurons in the central nervous system is called a
  - a. topographic map.
  - b. neural code.
  - c. labelled line.
  - d. sensory map.
  - e. magnetic resonance image.

4. In a sensory receptor, the decline in response to a long-lasting stimulus is called
  - a. summation.
  - b. the neural code.
  - c. reciprocal innervation.
  - d. excitation coupling.
  - e. adaption.
  
5. The somatic sensory system is responsible for transmitting information about all the following types of physical stimuli EXCEPT
  - a. temperature
  - b. sound
  - c. pain
  - d. vibration
  - e. touch
  
6. Primary sensory neurons conveying pain and temperature information synapse onto a secondary neuron in the
  - a. cerebellum.
  - b. medulla.
  - c. somatosensory cortex.
  - d. spinal cord.
  - e. thalamus.
  
7. What are the differences between how sharp, fast pain and slow, diffuse pain are detected?
  - a. Sharp fast pain is detected by slowly adapting receptors only.
  - b. Slow, diffuse pain is detected by receptors restricted to the skin surface.
  - c. Slow, diffuse pain is detected exclusively by Pacinian corpuscles.
  - d. Sharp, fast pain is detected by receptors located in the hands but not the feet.
  - e. There are two distinct sensory receptors detecting the two types of pain, A-delta and C fibers.
  
8. Which of the following is a primary taste modality?
  - a. hot
  - b. cold
  - c. umami
  - d. metallic
  - e. spicy

9. What kind of protein is an olfactory receptor?
- voltage-gated ion channel
  - ligand-gated ion channel
  - catalytic receptor
  - receptor tyrosine kinase
  - G protein coupled receptor (GPCR)
10. Each olfactory sensory neuron has \_\_\_\_\_ different type(s) of olfactory receptor proteins embedded in its membrane.
- 1
  - 5-7
  - 20
  - 382
  - 5000
11. The fact that odorant molecules can bind to more than one type of olfactory receptor protein explains why
- novel odorant molecules cause the expression of new olfactory sensory neurons.
  - some odors activate non-olfactory accessory neurons.
  - we can discriminate more distinct odors than there are distinct types of olfactory receptors.
  - each individual olfactory sensory neuron expresses many different receptor proteins.
  - olfactory sensory neurons are short-lived.
12. Our experience of flavor in the food we ingest is thought to arise from the convergence of which three sensory modalities?
- tactile, visual and vestibular
  - olfactory, visual and taste
  - auditory, olfactory and somatosensory
  - taste, olfactory and somatosensory
  - taste, olfactory and vestibular
13. ALL of the following vibrate or move in response to a sound wave EXCEPT the
- stereocilia.
  - tympanic membrane.
  - basilar membrane.
  - utricle.
  - oval window.

14. The transmission of sound waves from the outer ear to the inner ear is dependent upon
- the ossicles in the middle ear.
  - fluid entering the inner ear through the round window.
  - the connection between the helicotrema and the tectorial membrane.
  - the connection between the tectorial membrane and the Eustachian tube.
  - the size of the middle ear.
15. The optimal sound frequency to excite a response in a hair cell in the cochlea is strongly influenced by
- the size of its tip-link proteins.
  - its location along the basilar membrane.
  - its distance from the tectorial membrane.
  - the density of  $K^+$  leak channels.
  - the type of neurotransmitter it releases.
16. The semicircular canals are principally responsible for
- diffusing pressure from the cochlear duct.
  - detecting faint, low-frequency sounds.
  - regeneration of hair cells in the cochlea.
  - protecting hair cells in the cochlea from loud sounds.
  - detecting rotational movements of the head.
17. Maintaining visual fixation during head movements is the primary function of
- the balance reflex.
  - the gag reflex.
  - the consensual pupillary reflex.
  - the vestibulo-ocular reflex.
  - the stretch reflex.
18. The sensory receptors responsible for detecting gravitational forces exerted on the body are
- muscle spindles.
  - hair cells.
  - Golgi tendon organs.
  - chemoreceptors.
  - Pacinian corpuscles.

19. Adjustments in the shape of the lens to keep objects in focus is called
- adaptation.
  - accommodation.
  - astigmatism.
  - tinnitus.
  - resonance.
20. Which of the following is TRUE for photoreceptors in the dark?
- cyclic nucleotide channels are closed
  - rhodopsin is bleached
  - they are depolarized
  - they release less neurotransmitter than in the light
  - transducin is activated
21. The existence of different photopigments in different cone photoreceptors is the basis for
- eye color.
  - accommodation.
  - the blind spot.
  - color vision.
  - heightened sensitivity of rod photoreceptors in dim light.
22. During active muscle contractions, force generation depends upon transient chemical bonds that are formed between
- adjacent muscle fascicles.
  - acetylcholine and  $\text{Ca}^{++}$  channels.
  - T-tubules and sarcoplasmic reticulum.
  - troponin and tropomyosin.
  - myosin and actin.
23. The propagation of action potentials from the sarcolemma to the interior of the muscle fiber is dependent on the
- motor endplate.
  - T-tubules.
  - myofibrils.
  - sarcoplasmic reticulum.
  - Golgi apparatus.

24. The speed of muscle shortening varies with
- the level of ATP in the sarcoplasm.
  - the diameter of the T-tubules.
  - the load that the muscle is working against.
  - the amount of acetylcholine released at the neuromuscular junction.
  - the rate of ATP synthesis.
25. Muscle contraction is terminated when
- the thick filaments begin to shorten.
  - the thin filaments slide toward the center of the sarcomere.
  - Cl<sup>-</sup> ions are released from the sarcoplasmic reticulum.
  - Ca<sup>++</sup> ions are pumped back into the sarcoplasmic reticulum.
  - Ca<sup>++</sup> is released from the T-tubules.
26. Which of the following is true about motor units?
- One somatic motor neuron innervates only one muscle fiber.
  - The motor unit includes the afferent neurons innervating the muscle.
  - Each muscle fiber is innervated by multiple somatic motor neurons.
  - Each muscle fiber is innervated by a single somatic motor neuron.
  - The motor unit includes the upper motor neurons.
27. During both voluntary and reflex movements, the first motor units to be recruited are
- slow, fatigue-resistant motor units.
  - the ones with the fastest contraction speed.
  - the ones that generate the most force.
  - innervated by the largest somatic motor neurons.
  - the ones that fatigue the fastest.
28. Motor neurons are normally activated in order of increasing size because
- small cells receive more synaptic input than large cells.
  - small cells consume more energy than large cells.
  - small cells have fewer inhibitory connections than large cells.
  - large cells express fewer neurotransmitter receptors.
  - small cells are easier to excite than large cells.

29. The activation of sensory afferent fibers innervating muscle spindles initiates the
- a. stretch reflex.
  - b. flexion reflex.
  - c. vestibulo-ocular reflex.
  - d. crossed extension reflex.
  - e. startle reflex.
30. Range of movement errors and delayed initiation of movement are typical of lesions to the
- a. spinal cord.
  - b. optic tract.
  - c. cerebellum.
  - d. vestibular nuclei.
  - e. corticospinal tract.

**END OF TEST**

*Please turn in your mark-sense form and your question sheets at the front of the room.*