**PBIO 375** **NAME**_____
**SECOND exam**

**Wednesday, November 13th, 2024**

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. Which statement about sensory receptors is TRUE?

    a. Sensory perception is the process whereby graded potentials are converted into sensory stimuli.
    b. Sensory receptors are designed to respond equally well to many different kinds of stimuli.
    c. Each type of sensory receptor has a preferred or "adequate" stimulus.
    d. All sensory receptors are neurons with long axons.
    e. Sensory receptors are specialized cells that communicate directly with skeletal muscle fibers.

2. A circuit of neurons that are connected by synapses from a sensory receptor to second and third order sensory neurons in the central nervous system is called a

    a. topographic map.
    b. neural code.
    c. sensory map.
    d. labelled line.
    e. threshold stimulus.

3. All sensory pathways except olfaction project to the thalamus, which acts as

    a. an inhibitory gate.
    b. a relay and processing station.
    c. a supplementary association area.
    d. a bridge between the cerebellum and the spinal cord.
    e. a major construction site.

4. Phasic sensory receptors

    a. are quick to adapt to a constant stimulus.
    b. slowly decrease the frequency of action potentials generated in response to a constant stimulus.
    c. cannot detect the intensity of a stimulus.
    d. fire action potentials at a sustained frequency throughout a stimulus.
    e. are only found in the retina.

5. Which of the following sensations is not detected by the somatosensory system?

    a. touch
    b. cold
    c. vibration
    d. heat
    e. light

6. Fine touch is transmitted to the central nervous system along

    a. large, unmyelinated C fibers.
    b. small, unmyelinated C fibers.
    c. small, myelinated A-delta fibers.
    d. large, myelinated A-beta fibers.
    e. small, unmyelinated A-beta fibers.

7. The gate control theory of pain modulation states that pain transmission can be partially suppressed by

    a. activation of C-fibers.
    b. mechanical stimulation of A-beta fibers.
    c. electrical stimulation of A-delta fibers.
    d. heat stimulation of A-delta fibers.
    e. heat stimulation of A-beta fibers.

8. Which of the following proteins is involved in the <u>initial transduction of taste sensations</u>?

    a. voltage-gated $Ca^{++}$ channel
    b. voltage-gated $K^{+}$ channel
    c. G protein coupled receptor
    d. $K^{+}$ leak channel
    e. ligand-gated ion channel

9. Each olfactory sensory neuron responds to a limited number of odors because it expresses

    a. only muscarinic receptors.
    b. many, but not all, olfactory receptor proteins.
    c. only five types of olfactory receptors.
    d. only one type of olfactory receptor.
    e. only voltage-gated channels.

10. The depolarization of olfactory sensory neurons depends on

    a. increases in ATP release.
    b. $K^+$ ions flowing into the cell.
    c. $Na^+$ ions flowing out of the cell.
    d. increases in adenylyl cyclase activity and cAMP concentrations.
    e. activation of acetylcholine receptors.

11. The relative motion of the tectorial membrane and the basilar membrane leads to activation of ion channels on the

    a. T-tubule membrane.
    b. tympanic membrane.
    c. oval window.
    d. utricle and saccule.
    e. stereocilia of hair cells.

12. The capacity of the auditory system to discern sounds of different frequencies depends upon

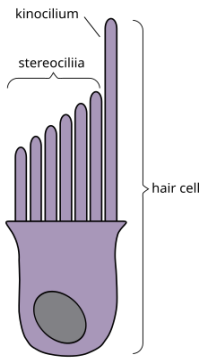
    a. hair cells of different sizes.
    b. hair cells that express different auditory receptors.
    c. the shape and structure of the basilar membrane.
    d. the shape and structure of the tympanic membrane.
    e. the positioning of the ossicles.

13. The loss of our capacity to detect high frequency sounds as we age probably results from

    a. the stiffening of the basilar membrane.
    b. the loss of hair cells at the end of the basilar membrane closest to the oval window.
    c. dampening vibration of the tympanic window.
    d. the stiffening of the tectorial membrane.
    e. over-proliferation of hair cells near the helicotrema.

14. Which sense organ(s) are responsible for detecting tilt of the head (a linear acceleration)?

    a. the semicircular canals
    b. the cochlea
    c. Pacinian corpuscles
    d. the utricles and saccules
    e. the oval and round windows




15. See the figure at right, illustrating the kinocilium in a hair cell. The release of neurotransmitter from a vestibular hair cell at its synapse with a primary vestibular sensory neuron <u>increases</u>

    a. in response to any mechanical stimulation of the hair cell.
    b. when the stereocilia are displaced away from the kinocilium.
    c. when the stereocilia are displaced toward the kinocilium.
    d. when the stereocilia and the kinocilium move in opposite directions.

16. Compensatory eye movements in response to rapid turning of the head are generated automatically by the

    a. vestibulo-ocular reflex.
    b. pupillary light reflex.
    c. visual cortex.
    d. flexion reflex.
    e. stretch reflex.

17. Accommodation by changing the shape of the lens is important for

    a. night vision.
    b. focusing light on the retina.
    c. repairing damage to the cornea.
    d. changing the amount of light that enters the eye.
    e. eliminating the “blind spot”.

18. What region of the retina has the highest density of cone photoreceptors?

a. optic disc
b. optic tract
c. fovea
d. pigmented epithelium
e. periphery of retina

19. The exit point of the optic nerve from the retina creates

a. blurry vision.
b. the macula.
c. nearsightedness.
d. a blind spot in the visual field.
e. strabismus (when eyes are misaligned).

20. Which of the following events occurs in photoreceptors when they are excited by light?

a. membrane cyclic nucleotide-gated (CNG) channels close
b. cGMP concentration decreases
c. the membrane hyperpolarizes
d. transducin is activated
e. ALL of the above occur

21. The T-tubules in muscle fibers are designed to

a. store and release $Ca^{++}$ to trigger a muscle contraction.
b. regulate the action of troponin and tropomyosin.
c. suspend the actin and myosin filaments within the sarcomere.
d. produce ATP in the mitochondria.
e. conduct action potentials into the interior of the muscle fiber.

22. Which of these proteins is NOT involved in skeletal muscle contraction?

a. myosin
b. actin
c. regulin
d. tropomyosin
e. troponin

23. The formation of crossbridges between the heads of myosin molecules and actin in the thin filaments

    a. terminates muscle contraction.
    b. is inhibited by $Ca^{++}$ release.
    c. is the essential mechanism generating muscle contraction.
    d. causes the actin molecule to shorten during the powerstroke.
    e. causes the myosin molecule to shorten during the powerstroke.

24. During the execution of arm flexion, while motor neurons innervating flexor muscles are activated, the motor neurons innervating extensor muscles acting across the same joint are

    a. activated simultaneously.
    b. inhibited.
    c. discharging action potentials at a high frequency.
    d. detached from the proximal tendon.
    e. even more powerfully activated.

25. Which of the following is NOT considered part of the motor unit?

    a. muscle spindle afferent
    b. motor neuron cell body
    c. muscle fibers that the motor neuron innervates
    d. motor neuron axon
    e. neuromuscular junction

26. Regardless of the type of movement performed or its speed, motor units are always recruited

    a. from largest to smallest.
    b. in a random sequence.
    c. in order of decreasing axonal conduction velocity.
    d. in order of decreasing size.
    e. in the same order.

27. The tendon jerk (stretch) reflex is initiated by a stimulus that activates

    a. tropomyosin.
    b. muscle spindle receptors.
    c. nociceptors in the skin.
    d. the vestibulo-ocular reflex.
    e. relay neurons in the thalamus.

28. In response to a noxious, painful stimulus to the right foot

    a. motor neurons innervating extensor muscles in the left leg are inhibited.
    b. motor neurons innervating flexor muscles in the right leg are inhibited.
    c. motor neurons innervating extensor muscles in the right leg are excited.
    d. motor neurons innervating extensor muscles in the left leg are excited.
    e. motor neurons innervating flexor muscles in the left leg are excited.

29. A lesion to the primary motor cortex in a human or non-human primate results in a significant loss of

    a. manual dexterity
    b. sensation
    c. proprioception
    d. thalamic neurons
    e. pain sensitivity

30. A cerebral stroke localized to one cortical hemisphere normally leads to motor deficits

    a. on the same side of the body.
    b. only in the legs.
    c. on the opposite side of the body.
    d. of both hands and both feet.
    e. that are completely resolved within a few minutes.

**END OF TEST**

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