

Wednesday, November 17th, 2021

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. The essence of the “neural code” can be best expressed as follows:
 - a) Each amino acid is represented by a sequence of three nucleotides.
 - b) All sensory receptors have an adequate stimulus.
 - c) All sensory receptors respond equally to many kinds of stimuli.
 - d) The discharge rate of a sensory receptor is proportional to the intensity of the stimulus.
 - e) Different types of stimuli produce different types of action potentials.

2. The sensory pathway for olfaction does not include
 - a) any secondary sensory neurons.
 - b) a projection to the thalamus.
 - c) the olfactory bulb.
 - d) olfactory sensory neurons.
 - e) a projection to the cerebral cortex.

3. Tonic sensory receptors
 - a) cannot detect the intensity of a stimulus.
 - b) slowly decrease the frequency of action potentials generated in response to a constant stimulus.
 - c) are quick to adapt to a constant stimulus.
 - d) produce action potentials only at the onset of a stimulus.
 - e) produce action potentials only at the end of a stimulus.

4. Which of the following sensations is not detected by the somatosensory system?
 - a) nociception
 - b) cold
 - c) vibration
 - d) touch
 - e) sound

5. Dull, diffuse pain is transmitted to the central nervous system along
 - a) small unmyelinated C-fibers.
 - b) small, myelinated A-delta fibers.
 - c) large, unmyelinated A-delta fibers.
 - d) large, myelinated A-beta fibers.
 - e) large, myelinated C-fibers.

6. The reduction of pain sensation produced by activating A-beta fibers can be explained by
 - a) the electrical stimulation of motor nerve fibers.
 - b) the Gate Control Theory of signal transmission in the spinal cord.
 - c) the activation of C-fibers.
 - d) the heat sensitivity of A-delta fibers.
 - e) the reduced mechanical thresholds of C-fibers.

7. Which of the following primary gustatory (taste) sensations are transduced by G-protein coupled receptors?
 - a) sweet, bitter, umami
 - b) spicy, salty, bitter
 - c) sweet, salty, floral
 - d) hot, salty, umami
 - e) sweet, salty, sour

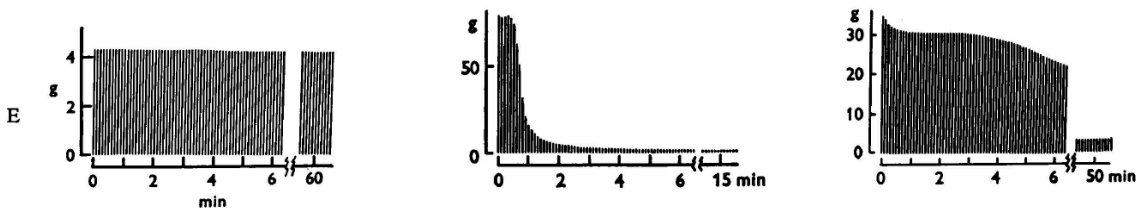
8. Fill in the blank. The binding of an odorant molecule to its receptor triggers _____ in an olfactory sensory neuron
 - a) the closing of ligand-gated ion channels
 - b) an increase in ATP release
 - c) an influx of K^+ ions
 - d) the activation of voltage-gated channels
 - e) increases in adenylyl cyclase activity and cAMP concentration

9. The mechanically-gated ion channels that open in response to a sound wave are found on the
 - a) tympanic membrane.
 - b) stereocilia of hair cells.
 - c) cell bodies of hair cells.
 - d) basilar membrane.
 - e) tectorial membrane.

10. Low and high frequency sounds are detected by
 - a) different types of hair cells.
 - b) only the middle portion of the basilar membrane.
 - c) hair cells located at different sites along the basilar membrane.
 - d) hair cells located exclusively at the helicotrema end of the basilar membrane.
 - e) the vibration of the tympanic window.

11. Which sense organs are principally involved in detecting gravitational forces?
- the semicircular canals
 - the crista within the ampulla
 - the Pacinian corpuscles
 - the utricle and saccule
 - the basilar and tectorial membranes
12. In response to rapid head movements, the eyes move in the opposite direction due to the
- vestibulo-ocular reflex.
 - flexion reflex.
 - pupillary light reflex.
 - clasp-knife reflex.
 - activation of the visual cortex.
13. The capacity of the eye to focus incoming light on the retina depends on
- the rods and cones.
 - changing the shape of the lens.
 - the composition of the vitreous humor.
 - the size of the visual receptive fields.
 - eliminating the blind spot.
14. The fovea of the retina is the area of sharpest visual acuity and has
- the axons of retinal ganglion cells.
 - only rod photoreceptors.
 - only cone photoreceptors.
 - the optic disc.
 - no retinal pigmented epithelium.
15. The “blind spot” in the visual field
- causes double vision.
 - creates nearsightedness.
 - is called strabismus.
 - always bypasses the macula.
 - occurs where the optic nerve exits from the retina.
16. Which of the following events occurs in photoreceptors when they are **excited by light**?
- membrane cyclic nucleotide-gated (CNG) channels open
 - cGMP concentration is increased
 - the membrane depolarizes
 - transducin is activated
 - ALL of the above occur.

17. Fill in the blanks. An essential step in the initiation of crossbridge formation is when Ca^{++} is released from the _____ and binds to _____ on the thin filaments.
- sarcoplasmic reticulum; tropomyosin
 - sarcoplasmic reticulum; titan
 - sarcoplasmic reticulum; troponin
 - transverse tubules; troponin
 - transverse tubules; tropomyosin
18. Action potentials that are initiated adjacent to the neuromuscular junction
- are conducted into the transverse tubules and activate DHP receptors.
 - directly activate myosin to enable muscle contraction.
 - directly activate actin to enable muscle contraction.
 - directly activate ryanodine receptors (RyR).
 - activate a Ca^{++} -ATPase in the sarcoplasmic reticulum membrane.
19. Muscle contraction and shortening are mediated by
- cAMP release.
 - inhibition of serotonin release from the sarcoplasmic reticulum.
 - the formation of crossbridges between the heads of myosin molecules and actin filaments.
 - the release of troponin from the sarcoplasmic reticulum.
 - inactivating actin molecules during the power stroke.
20. When a skeletal muscle contracts
- both thick and thin filaments shorten.
 - only thin filaments shorten.
 - only thick filaments shorten.
 - Z-discs shorten.
 - thick and thin filaments slide past each other, and sarcomeres shorten.



21. The figure presented above shows the tension produced by three types of motor units in response to repeated stimulation. The motor units that fatigue most rapidly (middle panel) are
- the slowest contracting.
 - the first recruited.
 - the smallest motor units.
 - the largest motor units.
 - innervated by the smallest motor neurons.

22. In reflexive, voluntary, and rhythmic movements, motor units are recruited
- in order of decreasing size.
 - in a random sequence.
 - in order of decreasing axonal conduction velocity.
 - from largest to smallest.
 - in the same order.
23. Traumatic damage to one cortical hemisphere often results in profound motor deficits
- that appear only in reflex movements.
 - that affect only the facial muscles
 - on the opposite side of the body.
 - of the hands and feet on both sides of the body.
 - but never interferes with speech.
24. Acetylcholine is the neurotransmitter released by all of the following cells EXCEPT
- sympathetic preganglionic neurons.
 - sympathetic postganglionic neurons.
 - parasympathetic preganglionic neurons.
 - parasympathetic postganglionic neurons.
 - somatic motor neurons.
25. Which of the following **does not** involve sympathetic nervous system activation?
- pupil dilation
 - decreasing heart rate
 - epinephrine release from the adrenal medulla
 - dilation of bronchioles in the lungs
 - fat breakdown
26. Fill in the blank. Drugs that block adrenergic receptors are particularly effective on the target tissues of _____ postganglionic neurons.
- sensory
 - parasympathetic
 - sympathetic
 - olfactory
 - cholinergic
27. Which of the following areas of the brain is most directly involved in autonomic regulation?
- olfactory bulb
 - primary motor cortex
 - basal ganglia
 - cerebellum
 - hypothalamus

28. During which phase of human sleep is the electrical activity recorded from the surface of the brain most similar to that observed in the “awake state”?
- a) slow-wave sleep
 - b) stage 1 sleep
 - c) stage 2 sleep
 - d) REM sleep
 - e) drowsy stage
29. The two cerebral hemispheres are connected to each other by nerve fibers that comprise the
- a) cerebellum.
 - b) corpus callosum.
 - c) amygdala.
 - d) nucleus.
 - e) thalamus.
30. When recalling a prior experience, individual neurons in the brain often generate discharge patterns that are
- a) very similar to those that they produced during the experience.
 - b) very different to those that they produced during the experience.
 - c) unrelated to their prior activity.

END OF TEST

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