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UNIVERSITY OF TEXAS AT ARLINGTON

DEPARTMENT OF BIOLOGY

HUMAN PHYSIOLOGY
(Biol 3345)

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THIRD INTRASESSIONAL EXAMINATION

April 19, 2007

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First Name Cuong Last Name: Le UTA ID # 1005452979

There are 50 items in this booklet; 45 are multiple choice questions and the remainder are either short essay questions or diagrams to be labeled. Be careful not to overlook any pages in the examination booklet. You have 80 minutes to complete these questions.

During the course of the examination students will remain in their assigned seats. If assistance is needed, the student should raise his/her hand and a proctor will attend the individual needs of that student.

Upon completion of the exam, each student is to remain seated, raise her/his hand, and the exam materials will be collected by a proctor. At no time is the student to leave his/her seat and carry the exam materials to the proctors or other areas of the room.

After collection of exam materials, the student is to immediately, quietly, and promptly leave the Examination Room.

NO EXTRA TIME WILL BE ALLOWED AT THE END OF THE EXAMINING PERIOD FOR ANSWERS TO BE TRANSFERRED.

✧ **GOOD LUCK!** ✧

DIRECTIONS: Each of the numbered items or incomplete statements in this section is followed by answers or completions of the statement. Select the ONE lettered answer or completion that is **BEST** in each case and write your selection in the left margin beside the question. Each multiple choice question is worth 2 points.

1. The lacrimal apparatus:
A. is a system of glands and ducts ✓
B. keeps the cornea moist with continuous tear flow ✓
C. is innervated by sympathetic neurons from cranial nerve VII (P. 359)
D. A and B
E. All of the above are correct. *ava*
2. The flattening of the action potentials of myocardial contractile cells, called the plateau phase, is due to a combination of ____ K⁺ permeability and ____ Ca²⁺ permeability.
A. increasing, increasing
B. decreasing, decreasing
C. increasing, decreasing
D. decreasing, increasing ✓ *feel*
E. cannot be determined
3. What structures monitor vertical movements?
A. cristae and the semicircular canals
B. maculae of the saccule --- are oriented vertically when the head is erect and are sensitive to "vertical" forces. (p. 357)
C. maculae of the utricle
D. B and C
E. All of the above
4. Which of the following is **NOT** a function of smooth muscle tissue?
A. altering the diameter of the respiratory passageways ✓
B. elevating hairs on the arm ✓
C. forcing blood from the heart into the major arteries ✓
D. moving food materials along the digestive tract ✓
E. forcing urine out of the urinary tract ✓
5. The force generated by a single muscle fiber:
A. is always the same ✓
B. can be increased by increasing the frequency of action potentials ✓
C. can be increased due to summation ✓
D. B and C
E. All of the above are correct ✓
6. During the isovolumic phase of ventricular systole,
A. the atria contract
B. the atrioventricular valves and semilunar valves are closed ✓
C. blood is ejected into the great vessels
D. the ventricles are relaxing
E. the ventricles are filling with blood
7. Ca²⁺ is important in the contraction of smooth muscle. Which of the following is **NOT** true about smooth muscle contraction?
A. Ca²⁺ enters the cytosol from the sarcoplasmic reticulum. ✓
B. Ca²⁺ binds to calmodulin ✓
C. Contraction is immediately triggered by calmodulin binding. ✓
D. MLCK (myosin light chain kinase) forms a complex to activate myosin. ✓
E. When MLCK activates myosin, ATPase activity is high and crossbridge formation is active. ✓

A3rd test

8. Displacement of stereocilia toward the kinocilium of a hair cell:

- A. produces a depolarization of the membrane ✓ (p. 352)
- B. produces a hyperpolarization of the membrane
- C. decreases the membrane permeability to sodium ions
- D. increases the membrane permeability to potassium ions
- E. does not affect the transmembrane potential of the cell

9. Excitation-contraction coupling refers to _____

- A. the arrival of acetylcholine at the neuromuscular junction due to its exocytosis from the axon terminal
- B. acetylcholine opening ion channels
- C. the chemical and electrical events that trigger the mechanical events in a muscle fiber
- D. the enzymatic removal of acetylcholine from the synapse which can then allow relaxation to occur
- E. B and D

10. Central fatigue _____

- A. include feeling tired ✓
- B. may precede physiological muscle fatigue ✓
- C. may be related to changes in the brain related to changes in the pH of the blood
- D. A and B
- E. A, B and C

11. Which statement best describes arteries?

- A. All carry oxygenated blood to the heart.
- B. All contain valves to prevent the back-flow of blood.
- C. All carry blood away from the heart. ✓
- D. Only large arteries are lined with endothelium.
- E. All are larger than veins.

12. The purpose of transverse tubules is to:

- A. ensure a supply of Ca^{2+} ions through the muscle fiber
- B. rapidly conduct the action potentials to the interior of the muscle fiber
- C. ensure a supply of glycogen throughout the muscle sarcoplasm
- D. conduct the ATP molecules out of the mitochondria throughout the sarcoplasm
- E. All of these statements are true.

13. The plateau phase of the cardiac muscle action potential is due to:

- A. the movement of fewer sodium ions across the cell membrane
- B. the calcium channels remaining open longer than the sodium channels ✓
- C. the increased membrane permeability to potassium
- D. a decrease in the amount of calcium diffusing across the membrane
- E. an increased membrane permeability to sodium ions

14. Fast pain, usually described as sharp and localized, is carried by:

- A. large, unmyelinated C fibers
- B. small, myelinated A-delta fibers ✓
- C. small, unmyelinated C fibers
- D. large myelinated A-beta fibers
- E. None of the above.

15. Sensations of gravity and linear acceleration are registered in the:

- A. semicircular canals ✓
- B. cochlea ✓
- C. saccule and utricle ✓
- D. ossicles ✓
- E. organ of Corti ✓

* Semicircular canal (Cristae, ampulla) sense rotational acceler. (p. 355)

* Saccule and utricle (maculae) sense linear acceler. + rotation

16. As ATP binds to the myosin head at the beginning of a muscle contraction cycle,
- A. the myosin head detaches from actin ✓
 - B. the myosin head initiates binding with actin
 - C. the myosin head tightens its bond to actin
 - D. ATP does not bind to the myosin head
 - E. None of these complete the statement correctly.
17. Transduction involves
- A. a stimulus altering the permeability of a receptor membrane
 - B. changes in the transmembrane potential of the sensory receptor ✓
 - C. production of a receptor potential ✓
 - D. generation of an action potential that can be processed and interpreted by the CNS ✓
 - E. All of the above
18. The ciliary muscle helps to:
- A. control the amount of light reaching the retina
 - B. control the shape of the lens
 - C. control the production of aqueous humor
 - D. move the eyeball
 - E. None of the above is correct.
19. Which of the following are involved directly in the systemic circulation?
- A. superior vena cava, right atrium, and left ventricle.
 - B. right ventricle, pulmonary artery, and left atrium.
 - C. left ventricle, pulmonary artery, and inferior vena cava
 - D. right atrium, right ventricle, and left ventricle
 - E. inferior vena cava, pulmonary vein, pulmonary artery
20. The ossicles connect the:
- A. cochlea to the oval window
 - B. tympanic membrane to the round window ✓
 - C. oval window to the round window
 - D. cochlea to the tympanic membrane
 - E. tympanic membrane to the oval window ✓
21. The receptors in the inner ear are the:
- A. utricles
 - B. saccules
 - C. hair cells ✓
 - D. supporting cells
 - E. ampullae
22. Tonic receptors:
- A. are slowly adapting receptors ✓ (p. 330)
 - B. fire rapidly when first activated, then slow and stop firing even with a continuing stimulus
 - C. are activated by parameters that must be continuously monitored by the body (p. 334) ✓
 - D. are proprioceptors, for example
 - E. A, C, and D
23. If the EDV is 140 mL, which other values are most likely to occur in a healthy, normal person?
- A. The ESV could be 70 mL and the SV could be 70 mL ✓
 - B. The ESV could be 190 mL and the SV could be 50 mL.
 - C. The ESV could be 50 mL and the SV could be 90 mL. (p. 487) (140 - 70)
 - D. A and B
 - E. A and C
- $SV = EDV - ESV$
 $70 = 140 - 70$

★ 3rd test

24. Which description is **NOT** correctly matched to the tissue?
- A. skeletal muscle – controls voluntary body movements ✓
 - B. cardiac muscle – classified as striated muscle ✓
 - C. cardiac muscle – found **ONLY** in the heart ✓
 - D. skeletal muscle – always attached to bones ✗
 - E. smooth muscle – the primary muscle of internal organs ✓

25. The intensity of a stimulus can be determined by:
- A. population coding ✓
 - B. labeled line coding ✓
 - C. frequency coding ✓
 - D. A and C ✓
 - E. All of the above. ✓

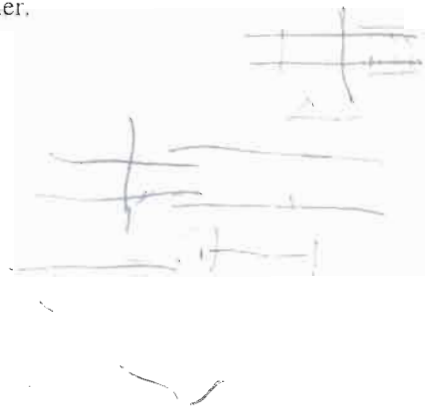
26. The ___ of a sensory receptor may be irregular in shape and overlap with those of neighboring receptors. The size of this area determines the sensitivity to a stimulus.
- A. discriminatory area ✓
 - B. spatial field ✓
 - C. somatic esthetic ✓
 - D. receptive field ✓
 - E. None of the above ✓

27. The thick, gel-like fluid that helps support the structure of the eyeball is the:
- A. vitreous humor ✓
 - B. aqueous humor ✓
 - C. ora serrata ✓
 - D. perilymph ✓
 - E. ortholymph ✓

★

28. During the cardiac cycle,
- A. the p wave of the ECG occurs between the first and second heart sounds ?
 - B. the QRS complex of the EKG precedes the increase in ventricular pressure ✓
 - C. the third heart sound occurs during atrial systole ✓
 - D. the second heart sound coincides with the QRS complex of the ECG ✓
 - E. the greatest increase in ventricular pressure occurs during the ejection phase ✓

★

29. Put these phases of the cardiac cycle in the correct order.
1. opening of the semilunar valves ✓
 2. isovolumetric contraction ✓
 3. atrial systole begins ✓
 4. closure of the AV valves ✓
 5. ventricular filling is complete ✓
 6. ventricular systole begins ✓
 7. ventricular relaxation ✓
 8. ventricular ejection ✓
- A. 4, 5, 1, 2, 7, 8, 3, 6 ✓
- B. 3, 2, 6, 1, 4, 5, 8, 7 ✓
- C. 3, 5, 6, 4, 2, 1, 8, 7 ✓
- D. 3, 5, 6, 1, 8, 4, 2, 7 ✓
- E. 3, 2, 6, 4, 5, 8, 7, 1 ✓
- 

30. The I band contains:
- A. thick filaments ✓
 - B. thin filaments ✓
 - C. an area of overlapping filaments ✓
 - D. All of the above are correct. ✓
 - E. None of the above is correct. ✓

★

31. The loudness or intensity of a sound wave is related to its:
- A. amplitude ✓
 - B. frequency ✓
 - C. duration ✓
 - D. decibels ✓
 - E. pitch ✓
- ★ The intensity of a sound wave is a function of the wave amplitude

32. A viral infection involving the vestibular nuclei may result in:
- A. loss of hearing ✓
 - B. loss of sight ✓
 - C. a sense of dizziness ✓
 - D. local paralysis ✓
 - E. high blood pressure ✓

☆ 3rd test

33. Which of the following statements is true about titin?
 A. Titin returns stretched muscle to their resting length.
 B. Titin stabilizes the position of the contractile filaments.
 C. Titin is helped by actin.
 D. A and B are correct.
 E. All of the above are correct.
34. Which event happens at the start of a cardiac cycle?
 A. Blood is ejected from the atrium.
 B. The SA node fires.
 C. Ventricular systole occurs.
 D. The P wave develops.
 E. Atrial systole occurs.
35. In circulating from the brain to the arm, a drop of blood would NOT have to pass through which of the following structures?
 A. left atrium
 B. aorta
 C. inferior vena cava
 D. pulmonary vein
 E. superior vena cava
36. The structure that separates the cochlear duct from the tympanic duct is the:
 A. tectorial membrane
 B. basilar membrane
 C. membranous labyrinth
 D. bony labyrinth
 E. stapedius
37. The first heart sound is heard when:
 A. the AV valves open
 B. the AV valves close
 C. the semilunar valves close
 D. the atria contract
 E. blood enters the aorta
38. In cardiac muscle:
 A. calcium ions are not released from the sarcoplasmic reticulum
 B. calcium ions do not bind to troponin molecules
 C. calcium ions play no role in the process of contraction
 D. some of the calcium ion required for contraction comes from outside of the cell
 E. calcium ion plays an important role in repolarizing the membrane after the depolarization phase
39. Information about sound must through each of these areas of the brain. Put them in the correct order.
 1. thalamus 2. medulla 3. auditory cortex of cerebrum 4. midbrain
 A. 1, 2, 3, 4 B. 2, 1, 4, 3 C. 2, 4, 1, 3
 D. 3, 2, 1, 4 E. 3, 4, 1, 2
40. The two-point discrimination test:
 A. is used to determine clarity of vision
 B. provides information about olfactory receptors
 C. provides a detailed map for sensory receptors
 D. is used to test for hearing disorders
 E. monitors the activity of taste buds
41. The vitreous chamber of the eye:
 A. contains the lens
 B. helps to stabilize it and gives physical support to the retina
 C. is located between the lens and the iris
 D. contains blood vessels that nourish the retina
 E. All of the above

E = 359
P = 7

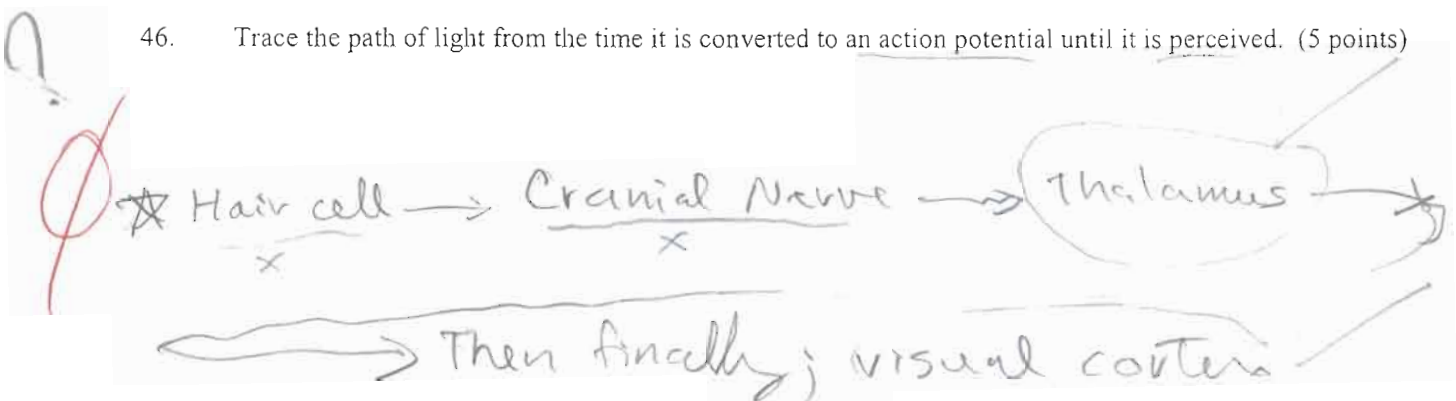
☆ 3rd test

42. An important difference between single-unit and multiunit smooth muscle is:
- A. the ability of single-unit fibers to change into multiunit fibers when advantageous.
 - B. longer actin and myosin filaments in multiunit smooth muscle, which allow coordination of contraction
 - C. numerous gap junctions in single-unit muscle, which allow many cells to work together as a sheet
 - D. closely controlled individual fibers in single-unit smooth muscle to allow fine control and graded contractions by selective activation
 - E. All of the above are correct.
43. Vibrations received the ear are amplified by the action of the:
- A. cochlea
 - B. bones of the middle ear
 - C. oval window
 - D. round window
 - E. tympanic membrane
44. At the conclusion of the power stroke,
- A. inorganic phosphate has been released from the myosin
 - B. actin has been moved toward the M-line
 - C. ADP is released from the myosin head
 - D. the myosin head is tightly bound to actin
 - E. All of the above are correct.
45. Light passes through the following structures in which order?
- A. vitreous humor, cornea, lens, aqueous humor
 - B. cornea, aqueous humor, lens, vitreous humor
 - C. cornea, vitreous humor, lens, aqueous humor
 - D. aqueous humor, cornea, lens, vitreous humor
 - E. vitreous humor, lens, aqueous humor, cornea

Short Answer Questions

Please answer these questions briefly. Label diagrams correctly, with lines pointing to the proper structures. Partial credit will be given where appropriate. Write legibly!! You can use the back of the last page to continue any question. Number them, please!!

46. Trace the path of light from the time it is converted to an action potential until it is perceived. (5 points)



47. Discuss pain modulation as it relates to the gate control theory. (5 points)

if a pain stimulus is adequate to open the gate, the CNS will receive the signal and feel pain. Also, we can

48. Describe the different types of smooth muscle. (5 points)

Two types:

- 1) single-unit smooth muscle - all the cells can contract at the same time; for example cells in intestine, and internal organs.
- 2) multi-unit smooth muscle - the individual cell contracts independently from others, for example, the cell in the male reproductive organ.

49. A certain drug is known to block monovalent cation channels. This drug is used as a "muscle relaxer." Would it affect both smooth and skeletal muscle, or only skeletal muscles? Defend your answer. (5 points)

The drug will affect only the skeletal muscle, because it will block the Na^+ channel. This prevents the skeletal cells from depolarization. (only skeletal cells use Na^+ channel to depolarize)

(Na^+ channel = monovalent cation channel)

50. Please answer only ONE of the following (A OR B). Circle the one you are answering. (5 points)

A. Your physiology professor has 5 liters of blood distributed between his pulmonary and systemic circuits. Assume 20% of the blood is in his lungs at any moment. If his cardiac output is 5 L/min, how long will it take a drop of blood to flow from his right ventricle to his left ventricle? Show your calculations for full points.

OR

B. Explain how Ca^{2+} levels inside myocardial cells are altered.

0.2 (5) 1.0

1) Ca^{2+} sarcoplasmic reticulum

2) Ca^{2+} from outside

3) sarcoplasmic reticulum

4) ...

5) ...

12.5

1.0

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Quiz 6

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Human Phys.

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~~Endocrine System, Hormones~~

- 1) Isotonic - the contraction is the same
- 2) Isometric - the length is the same
- 3) Concentric -
- 4) eccentric -

