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University of Ottawa
ANP 1105B
Midterm #1

Date: October 10, 2017
Instructor: J. Carnegie

Duration: 1 hr 20 min

INSTRUCTIONS:

- 1) 53 multiple choice questions (1 mark/1 correct answer per question) plus 6 marks for fill-in-the-blank questions and diagram- labeling.
- 2) Please answer the multiple choice questions on the computer sheet that is provided and answer the remaining questions right on the last page of this exam.
- 3) Please put your name and student number at the top of this page, on the top of the last page and on the computer sheet. **Hand in the last page of the exam and your computer sheet** when you have finished. You may keep the rest of the exam; correct answers for the MCQs will be posted.
- 4) Make sure this exam is complete. This exam contains **9 pages and is printed double-sided**. The excuse of missing a page will not be accepted after the examination.

START HERE

1. Myoglobin is:

- A. a contractile protein
- B. a calcium-binding protein ✓
- C. an oxygen-binding protein
- D. found in smooth muscle only
- E. none of the above

2. Which statement about a RELAXED muscle cell is FALSE?

- A. Myosin cross bridges are bound to ATP.
- B. Calcium ions are stored in the sarcoplasmic reticulum. ✓
- C. Myosin cross bridges are bound to actin.
- D. Tropomyosin-troponin complexes are bound to actin.

3. The "cis" face of the Golgi apparatus:

- A. is where products are dispatched in vesicles
- B. is its concave face ✓
- C. receives transport vesicles from the rough endoplasmic reticulum
- D. is in the centre of the Golgi stack
- E. is continuous with the nuclear membrane

4. Epithelial tissues may contain all of the following EXCEPT:

- A. cilia
- B. nerves
- C. blood vessels
- D. a basal lamina
- E. a basement membrane

5. Most exocrine glands in the human body are classified as:

- A. acinar
- B. apocrine
- C. holocrine
- D. merocrine
- E. endocrine

6. Cell types likely to be found in areolar connective tissue include all EXCEPT:

- A. chondrocytes
- B. fibroblasts
- C. macrophages
- D. mast cells

7. Which of the following is NOT found in the matrix of cartilage but IS found in bone?

- A. live cells
- B. lacunae
- C. blood vessels
- D. collagen fibers

8. Select the most correct statement regarding epithelia:

- A. Simple epithelia form impermeable barriers.
- B. Stratified epithelia are tall, narrow cells.
- C. Stratified epithelia are present where protection from abrasion is important.
- D. Pseudostratified epithelia consist of at least two layers of cells stacked on top of one another.

9. Which of these is NOT considered connective tissue?

- A. cartilage
- B. muscle
- C. adipose
- D. blood

10. Which statement best describes connective tissue?

- A. usually contains a large amount of matrix
- B. always arranged in a single layer of cells
- C. primarily concerned with secretion
- D. usually lines a body cavity

11. Pseudostratified cuboidal epithelium:

- A. lines the respiratory tract
- B. aids in digestion
- C. possesses numerous goblet cells
- D. is not an epithelial classification

12. Which of the following is considered a unicellular exocrine gland?

- A. mast cell
- B. plasma cell
- C. fibroblast ✓
- D. adipocytes
- E. goblet cell

13. The shape of the external ear is maintained by:

- A. adipose tissue
- B. elastic cartilage ✓
- C. hyaline cartilage
- D. fibrocartilage

14. The suffix "blast" in a cell name indicates a(n):

- A. cell that has ruptured
- B. mature cell with reduced capacity for cell division
- C. cell that is part of an exocrine gland ✓
- D. immature cell that can still divide
- E. cell that is part of the stroma of an organ

15. The embryonic connective tissue from which all other connective tissues arise is:

- A. areolar connective tissue
- B. mucous connective tissue
- C. hyaline cartilage ✓
- D. neuroglia
- E. mesenchyme

16. The fiber type that give connective tissue great tensile strength is:

- A. elastic
- B. collagen ✓
- C. reticular
- D. muscle

17. Which of the following is NOT a function of plasma membrane proteins?

- A. determine the fluidity of the membrane
- B. serve as channels
- C. serve as carriers X
- D. serve as membrane-bound enzymes
- E. serve as receptor sites

18. Smooth muscle is characterized by all of the following EXCEPT:

- A. lacks troponin
- B. no sarcomeres ✓
- C. intermediate filaments attach to dense bodies
- D. more thick filaments than thin filaments

19. Connexons are:

- A. the typical cells of connective tissue
- B. fibers that provide nutrient, waste and gas exchange for epithelial cells
- C. proteins found in muscle fibers
- D. proteins that form the channels of gap junctions X
- E. proteins that attach epithelial cells to basal laminae

20. Crenation (cell shrinking) occurs when a blood cell is placed in a(n) solution.

- A. isotonic
- B. hypertonic ✓
- C. hypotonic
- D. merotonic

21. Which of the following does NOT cross the plasma membrane by simple diffusion?

- A. oxygen
- B. urea
- C. alcohol X
- D. glucose
- E. carbon dioxide

22. A cell placed in a solution swells. This means that when the cell was first placed in this solution, the solution was compared to the cytoplasm of the cell.

- A. isotonic
- B. hypertonic
- C. hypotonic ✓
- D. hyperosmotic
- E. B) and D)

23. Which of the following statements is TRUE?

- A. Cardiac muscle cells have many nuclei. ✓
- B. Smooth muscle cells have T tubules.
- C. Skeletal muscle cells are long and cylindrical with many nuclei.
- D. Cardiac muscle cells are found in the heart and in the walls of blood vessels.

24. Which of the following is NOT a characteristic of facilitated diffusion?

- A. movement of solute down concentration gradient
- B. specificity
- C. ATP-requiring ✓
- D. can be saturated
- E. involves a plasma membrane carrier

25. Filtration:

- A. moves fluid down a solute gradient X
- B. moves fluid up a solute gradient
- C. is specific
- D. moves fluid down a pressure gradient
- E. doesn't occur in the body

26. Which of the following is the major positive ion OUTSIDE cells?

- A. nitrogen
- B. hydrogen
- C. potassium ✓
- D. sodium
- E. chloride

27. You have a 2.0 M solution of NaCl. You want to make a solution of glucose that is the same osmolarity as this NaCl solution. What concentration should the glucose solution be?

- A. 0.5 M
- B. 1.0 M
- C. 2.0 M ✓
- D. 3.0 M
- E. 4.0 M

28. Which of the following statements is TRUE?

- A. Saltatory conduction occurs because of the presence of salt (NaCl) around the neuron.
- B. Strong stimuli cause the amplitude of action potentials to increase.
- C. Myelination of neuronal axons in the central nervous system is the job of the oligodendrocyte.
- D. The two major classes of graded potentials are transmitter potentials and receptor potentials.
- E. During depolarization, the inside of the neuron's membrane becomes more negative.

29. Immediately after an action potential has peaked, which cellular gates open?

- A. sodium
- B. chloride
- C. calcium ✓
- D. potassium
- E. none of the above

30. There is one-way conduction at a synapse because:

- A. only postsynaptic dendrites contain synaptic vesicles.
- B. acetylcholine prevents nerve impulses from traveling in both directions. ✓
- C. only the postsynaptic dendrites possess neurotransmitter receptors.
- D. only postsynaptic dendrites release neurotransmitters.

31. Calcium ions play an essential role in chemical synapses because they are necessary for:

- A. the release of neurotransmitters by exocytosis.
- B. the diffusion of neurotransmitters across the synaptic cleft.
- C. the opening of the chemically-gated ions channels of the postsynaptic membrane. ✗
- D. the generation of the action potential on the postsynaptic membrane.

32. Dendrites of postsynaptic neurons:

- A. have chemically-gated channels
- B. conduct impulses away from the cell body
- C. are the site of synthesis of neurotransmitters ✓
- D. have voltage-gated channels
- E. are also called axon terminals

33. The term that refers to a measure of the potential energy of separated electrical charges is:

- A. conductance
- B. resistance
- C. current ✓
- D. voltage

34. Which of the following will occur when an excitatory postsynaptic potential (EPSP) is being generated on the dendritic membrane?

- A. specific sodium gates will open
- B. specific potassium gates will open
- C. sodium gates will open first, then close as potassium gates open
- D. a single type of channel will open, permitting simultaneous flow of sodium and potassium X

35. The threshold of the neuron is the:

- A. time between binding of the neurotransmitter and firing of an action potential
- B. voltage at which the inflow of sodium ions causes the spike of an action potential ✓
- C. total number of sodium ions that enters the cell before the sodium inactivation gates close
- D. total amount of neurotransmitter it takes to cause an action potential
- E. voltage across the resting cell membrane

36. Which of the following statements about resting membrane potential is TRUE?

- A. The cell membrane is more leaky to Na⁺ than to K⁺.
- B. K⁺ tends to diffuse out of the cell. ✓
- C. K⁺ tends to diffuse toward the axonal terminals.
- D. The resting membrane potential exists because the cell membrane is more permeable to Cl⁻ than it is to K⁺.
- E. Na⁺ tends to diffuse out of the cell.

37. The electrochemical gradient for is enhanced by the resting membrane potential of a neuron.

- A. Na⁺
- B. K⁺ X
- C. Neither
- D. Both equally

38. Which of the following statements is TRUE?

- A. A myelin sheath increases conduction velocity because it contains many ions channels.
- B. The conduction velocity of an axon increases with increasing axon diameter. X
- C. Neurons are the only polarized cells in the body.
- D. A myelinated fiber conducts impulses more slowly than an unmyelinated fiber.
- E. The conduction velocity of axons is always the same.

39. The term saltatory conduction refers to the:

- A. leaping of an action potential across the synapse.
- B. movement of sodium ions into the cell during depolarization. ✓
- C. one-way conduction of a nerve impulse across a synapse.
- D. propagation of a nerve impulse along a myelinated axon.
- E. action of the sodium potassium pump.

40. Which of the following statements about an action potential is TRUE?
- A. Threshold is usually 0 mV.
 - B. The hyperpolarization undershoot occurs because K⁺ gates are slow to close.
 - C. Inactivation Na⁺ gates respond more rapidly than activation Na⁺ gates.
 - D. Action potentials decrease in amplitude with distance travelled.
 - E. A second depolarization can occur during the absolute refractory period if the stimulus is greater than threshold.
41. A neurotransmitter that changes the membrane potential from -70 to -65 mV causes:
- A. impulse conduction
 - B. depolarization
 - C. release of neurotransmitter
 - D. hyperpolarization
 - E. production of an action potential
42. Calcium ions bind to the molecule in skeletal muscle cells.
- A. tropomyosin
 - B. troponin
 - C. actin
 - D. myosin
 - E. myoglobin
43. The connective tissue membrane that envelops a fascicle is called the:
- A. endomysium
 - B. epimysium
 - C. perimysium
 - D. sarcomysium
 - E. none of the above
44. The 100 meter dash is a quick and short run requiring explosive speed. On completion of the dash, the runners will continue to breathe hard for several seconds to minutes even though they have no longer running. Which of the following best explains why this is so?
- A. Since the exercise was mostly aerobic, the runners' bodies have not yet realized the run is over.
 - B. The runners' use of stored oxygen, glucose and creatine phosphate is being replenished.
 - C. The runners' fast oxidative muscles are so slow to use oxygen that they only begin aerobic metabolism after the race has finished.
 - D. Slow oxidative fibers are recruited last and have only started to work at the completion of the run.
45. In a RELAXED muscle fiber, which of the following are found in the H zone?
- A. thick filaments
 - B. thin filaments
 - C. cross bridges
 - D. both thick and thin filaments
 - E. thick filaments and cross bridges
46. Which of the following features of the contraction process does NOT apply to BOTH skeletal and smooth muscle?
- A. Actin and myosin interact by the sliding filament mechanism.
 - B. The trigger for contraction is a rise in intracellular calcium.
 - C. Calcium binds to troponin.
 - D. ATP energizes the sliding process.

47. Which of the following is/are most correct?

- A. Muscle length and tension remain constant during isotonic contractions.
- B. Myofilaments are sliding during isotonic contractions.
- C. Isotonic contractions can be concentric or eccentric. ✓
- D. B) and C)

48. Fused tetanus is:

- A. a pathological condition in which stimulation of one muscle triggers contraction of all others in the same motor unit
- B. a sustained contraction with partial relaxation between stimuli
- C. a sustained contraction in which individual twitches cannot be discerned ✓
- D. a brief contraction of all the fibers in a motor unit
- E. a phenomenon that occurs in only muscle cells without refractory periods

49. What is the role of calcium ions in the contractile response of skeletal muscle?

- A. trigger the immediate regeneration of creatine phosphate
- B. bind to lactic acid to remove it from the contracting muscle
- C. remove the inhibitory action of tropomyosin on actin/myosin interaction ✓
- D. diffuse across the synaptic cleft to depolarize the muscle membrane
- E. directly activate ATPase in the myosin head region

50. As an axon enters a muscle, it branches into a number of axonal terminals, each of which forms a junction with a single muscle fiber. A neuron and all the muscle fibers it supplies is called a:

- A. synaptic knob
- B. neuromuscular junction
- C. synaptic cleft
- D. motor end plate
- E. motor unit ✓

51. Exhaustion of glycogen storage within a muscle fiber would have the biggest effect on:

- A. slow oxidative fibers
- B. fast oxidative fibers
- C. fast glycolytic fibers ✓
- D. all three types of muscle fibers would be affected equally

52. Which of the following statements is FALSE?

- A. Rigor mortis is caused by the cessation of ATP synthesis and the irreversible cross-linking of actin and myosin.
- B. Both isotonic and isometric contractions involve excitation-contraction coupling. ✓
- C. Concentric contractions are more forceful than eccentric contractions. ✓
- D. Skeletal muscle is called voluntary because it is the only type of muscle usually subject to conscious control.

53. In a skeletal muscle fiber, which of the following best describes the composition of the structure known as a triad?

- A. actin, troponin and tropomyosin
- B. sarcolemma, sarcoplasm and sarcoplasmic reticulum
- C. terminal cisterna, transverse tubule and terminal cisterna ✓
- D. ATP, creatine phosphate and glucose
- E. A band, I band and H band