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University of Ottawa  
**ANP1105A: Human Anatomy and Physiology I. Fall 2017**

Professors: S. Lemaire and J. Savory

**Midterm 1**

Thursday, October 5<sup>th</sup>, 2017

Exam time: 1 hour, 20 minutes

- 1) 53 multiple choice questions (1 mark/1 correct answer per question), 1 bonus multiple choice question (1 mark) plus 10 marks worth of diagram- labeling, matching and short answer questions.
- 2) Please answer the multiple choice questions on the computer sheet that is provided and answer the remaining questions right on the exam.
- 3) Please put your name and student number at the top of this page, on the top of page 11 and on the computer sheet. **Hand in everything when you have finished.**
- 4) Write the following words 'Version ROCK' on the front of your computer sheet!!
- 5) Make sure this exam is complete. This exam contains **12 pages** **and is printed double-sided.** The excuse of missing a page will not be accepted after the examination.

1. How are phospholipid molecules arranged within the lipid bilayer of the plasma membrane? (ECF=extracellular fluid; ICF=intracellular fluid)
- A. Phospholipid molecules are arranged randomly.
  - B. The polar lipid tails are oriented toward the ECF and the ICF because they are hydrophobic.
  - C. The polar phosphate heads are oriented toward the interior of the lipid bilayer because they are hydrophobic.
  - D. The nonpolar lipid tails line up in the center of the membrane lipid bilayer because they are hydrophobic.
  - E. The nonpolar phosphate heads are oriented toward the ECF and ICF because they are hydrophobic.
2. Which of the following constituents of the plasma membrane serve as specific biological markers for cell- to-cell recognition?
- A. Phospholipids
  - B. Cholesterol
  - C. Integral enzymes
  - D. Integral receptors
  - E. External glycocalyx
3. Which of the following crosses the plasma membrane by simple diffusion?
- A. Peptides
  - B. Glucose
  - C. Carbon dioxide (CO<sub>2</sub>)
  - D. Proteins
  - E. None of the above
4. Which of the following does NOT traverse the plasma membrane by simple diffusion?
- A. Urea
  - B. Oxygen (O<sub>2</sub>)
  - C. Amino acids
  - D. CO<sub>2</sub>
  - E. None of the above
5. Which of the following is a characteristic of facilitated diffusion?
- A. Movement of solute through the membrane by a carrier protein down the concentration gradient
  - B. Movement of solute through the membrane by a carrier protein against the concentration gradient
  - C. Direct passage of solute through the membrane down the concentration gradient
  - D. ATP-requiring
  - E. Cannot be saturated
6. Which of the following statements is true about the plasma membrane?
- A. It contains a double layer of phospholipids whose hydrophobic regions are found on the surface of the membrane.
  - B. The main function of phospholipids is to transport substances through the plasma membrane.
  - C. The main function of cholesterol is to increase membrane stability and fluidity.
  - D. The main function of integrated proteins is to make the plasma membrane fluid.
  - E. The glycocalyx covers the internal surface of the plasma membrane, and its main function is to fix the plasma membrane to the cytoskeleton.

7. During endocytosis:

- A. A section of the plasma membrane breaks off and forms a vesicle inside the cell
- B. Transport can consist of either pinocytosis or phagocytosis
- C. Inside the cell, there may be fusion of the vesicle with a lysosome
- D. Lysosomal enzymes may process (transform) vesicular contents
- E. All of the above

8. Which of the following statements is FALSE concerning the tonicity of the cell external medium?

- A. Tonicity is the ability of a solution to change the shape or tone of cells by altering the cells internal water volume
- B. An isotonic solution has the same osmolarity as inside the cell ✓
- C. A hypertonic solution has higher osmolarity than inside the cell ✓
- D. A cell will shrink in a hypotonic solution

9. Osmosis is a special case of diffusion in which:

- A. a solute moves against its concentration gradient.
- B. water moves down its concentration gradient.
- C. water is moving against its concentration gradient.
- D. water is moving from an area of high solute concentration to an area of low solute concentration
- E. B) and D)

10. The  $\text{Na}^+/\text{K}^+$  ATPase pump moves sodium ions from the cytoplasm to the outside of the cell where the sodium concentration is 14 times higher than in the cytoplasm. This means sodium ions are moved out of the cells by:

- A. simple diffusion
- B. facilitated diffusion
- C. osmosis
- D. active transport
- E. exocytosis

11. Which of the following does NOT apply to the  $\text{Na}^+/\text{K}^+$  ATPase?

- A. more  $\text{Na}^+$  pumped out than  $\text{K}^+$  carried in ✓
- B. energy required ✓
- C. active transport ✓
- D. more  $\text{K}^+$  pumped out than  $\text{Na}^+$  carried in
- E. located on cell membrane

12. Which of the following neuroglia line the central cavities of the brain and spinal cord and provide a fairly permeable barrier between the CSF (cerebrospinal fluid) and nervous tissue?

- A. ependymal cells
- B. oligodendrocytes
- C. Schwann cells
- D. microglial cells
- E. astrocytes

13. Which of the following neuroglia is most responsible for helping determine capillary permeability in nervous tissue?

- A. ependymal cells
- B. oligodendrocytes
- C. Schwann cells
- D. microglial cells
- E. astrocytes

14. Which of the following neuroglia have processes which wrap CNS nerve fibers, forming insulating myelin sheaths on thicker nerve fibers?
- A. ependymal cells
  - B. oligodendrocytes
  - C. Schwann cells
  - D. microglial cells
  - E. astrocytes
15. Which of the following statements concerning myelin sheaths is FALSE?
- A. myelin sheaths are segmented protein-lipoid sheaths along most long or large diameter axons
  - B. myelin sheaths protect and electronically insulate axons
  - C. myelin sheaths increase the speed of nerve impulse transmission
  - D. CNS myelin sheaths are formed of concentric layers of Schwann cell membranes
16. The following characteristics apply to neurons (nerve cells), EXCEPT:
- A. long life
  - B. amitotic
  - C. low metabolic rate
  - D. plasma membrane electrical signalling
  - E. cell to cell interactions
17. The plasma membrane of a resting neuron is more permeable to potassium ions than to sodium ions because the membrane has:
- A. More voltage-gated sodium ion channels
  - B. More ligand-gated potassium ion channels
  - C. More potassium leakage channels
  - D. Fewer voltage-gated sodium ion channels
  - E. More carrier molecules for potassium ions
18. The action potential (axonal nerve impulse) is measured in millivolts (mV) and on average is ranged from:
- A. -90mV to +20mV
  - B. -80mV to +45mV
  - C. -70mV to +30mV
  - D. -30mV to +60mV
19. IPSPs (inhibitory postsynaptic potentials):
- A. are nerve impulses that jump from node to node
  - B. allow activity of neurons to be synchronized
  - C. drive the membrane potential farther from threshold
  - D. are graded, local depolarizations
  - E. are the slowest steps of neurotransmission
20. The relative refractory period of a nerve impulse is:
- A. the time that follows the absolute refractory period
  - B. the time when most  $\text{Na}^+$  channels have returned to their resting state
  - C. the time when some  $\text{K}^+$  channels are still open
  - D. the time when the threshold for the generation of a new action potential (AP) is elevated
  - E. all the above

21. What is the role of tropomyosin in skeletal muscles?
- A. Tropomyosin is the chemical that activates the myosin heads.
  - B. Tropomyosin serves as a contraction inhibitor by blocking the myosin binding sites on the actin molecules.
  - C. Tropomyosin serves as a contraction inhibitor by blocking the actin binding sites on the myosin molecules.
  - D. Tropomyosin is the receptor for the motor neuron neurotransmitter.
22. Most skeletal muscles contain \_\_\_\_\_.
- A. muscle fibers of the same type
  - B. a mixture of fiber types
  - C. a predominance of slow oxidative fibers
  - D. a predominance of fast oxidative fibers
23. Which of the following would be recruited later in muscle stimulation when contractile strength increases?
- A. motor units with the longest muscle fibers
  - B. many small motor units with the ability to stimulate other motor units
  - C. large motor units with small, highly excitable neurons
  - D. motor units with larger, less excitable neurons
24. Myoglobin \_\_\_\_\_.
- A. breaks down glycogen
  - B. is a protein involved in the direct phosphorylation of ADP
  - C. stores oxygen in muscle cells
  - D. produces the end plate potential
25. The strongest muscle contractions are normally achieved by \_\_\_\_\_.
- A. increasing stimulus above the threshold
  - B. increasing stimulus above the treppe stimulus
  - C. increasing the stimulation up to the maximal stimulus
  - D. recruiting small and medium muscle fibers
26. Which of the following statements regarding skeletal muscle is FALSE?
- A. The length of time a muscle can continue to contract using aerobic pathways is called aerobic endurance.
  - B. The point at which muscle metabolism converts to anaerobic pathways is called anaerobic abstinence.
  - C. Activities that require a surge of power but last only a few seconds such as weight lifting rely entirely on ATP and creatine phosphate stores.
  - D. The more on and off activities such as tennis are fueled almost entirely by anaerobic glycolysis.
27. A sustained maximal contraction (without relaxation) and which is caused by a very rapid stimulation of a skeletal muscle is called:
- A. rigor mortis
  - B. contractility
  - C. motor unit
  - D. tetanus
  - E. muscle twitch

28. Calcium ions bind to the ..... molecule in skeletal muscle cells.
- A. tropomyosin
  - B. troponin
  - C. actin
  - D. myosin
  - E. myoglobin
29. In muscle contraction, calcium apparently acts to:
- A. increase the action potential transmitted along the sarcomere
  - B. release the inhibition on Z discs
  - C. remove the blocking action of tropomyosin
  - D. cause ATP to bind to actin
  - E. none of the above
30. The connective tissue membrane that envelops a fascicle is called the:
- A. endomysium
  - B. epimysium
  - C. perimysium
  - D. sarcomysium
  - E. none of the above
31. The major function of the sarcoplasmic reticulum in muscle contraction is to:
- A. make and store creatine phosphate
  - B. synthesize actin and myosin myofilaments
  - C. provide a source of myosin for the contraction process
  - D. regulate intracellular calcium concentrations
32. One functional unit of a skeletal muscle is:
- A. a sarcomere
  - B. a myofilament
  - C. a myofibril
  - D. the sarcoplasmic reticulum
33. Trying unsuccessfully (the car does not move) to push a car out of a snow bank is an example of muscle contractions (in the arms) that are:
- A. isometric
  - B. isotonic
  - C. tetanic
  - D. A) and C)
  - E. B) and C)
34. The compound that is stored as a rapid energy reserve for skeletal muscle contraction is:
- A. creatine phosphate
  - B. ADP
  - C. glycogen
  - D. calcium phosphate
  - E. glucose

35. Muscle tone is:

- A. also called treppe (gradual increase in contraction)
- B. the feeling of well-being following exercise
- C. a state of sustained partial contraction
- D. the condition of athletes after intensive training
- E. none of the above

36. Which of the following sentences is TRUE?

- A. Excitability is: "ability to receive and respond to stimuli"
- B. Contractility is: "ability to be stretched or extended"
- C. Elasticity is: "ability to be stretched or extended"
- D. Extensibility is: "ability to shorten forcibly when adequately stimulated"

37. Which of the following statements is TRUE?

- A. Cardiac muscle cells each have many nuclei.
- B. Smooth muscle cells have T tubules.
- C. Skeletal muscle cells are long and cylindrical with many nuclei.
- D. None of the above are true.

38. The sarcolemma is the:

- A. storage site for calcium ions in muscle fibers
- B. plasma membrane of a muscle fiber
- C. compound that binds oxygen for use in slow oxidative muscle cells
- D. separation between sarcomeres in a muscle fiber
- E. structure that produces acetylcholine

39. In an isotonic contraction, the muscle:

- A. changes in length and moves the "load"
- B. does not change in length but increases in tension
- C. never converts pyruvate to lactate
- D. rapidly resynthesizes creatine phosphate and ATP

40. 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

41. An organ is defined as a structure that is composed of two or more different types of:

- A. molecules
- B. cells
- C. systems
- D. tissues
- E. membranes

42. Select the correct statement regarding the cells of connective tissue.

- A. Connective tissue does not contain cells.
- B. Connective tissue cells are nondividing.
- C. Chondroblasts are the main cell type of connective tissue proper.
- D. Goblet cells are considered to be unicellular exocrine glands

43. A multilayered epithelium with cuboidal basal cells and flat cells at its apical surface would be classified as:

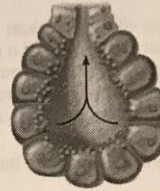
- A. stratified cuboidal
- B. simple squamous
- C. simple cuboidal
- D. stratified squamous
- E. None of the above; there is no epithelium that matches this description.

44. Glands, such as the thyroid, that secrete their products directly into the blood rather than through ducts are classified as:

- A. apocrine
- B. exocrine
- C. endocrine
- D. sebaceous

45. An exocrine gland in which cells secrete their product by exocytosis is called a(n):

- A. merocrine gland
- B. simple gland
- C. holocrine gland
- D. acinar gland
- E. apocrine gland



46. The original embryonic connective tissue is?

- A. mucous connective
- B. mesoderm
- C. vascular
- D. areolar connective
- E. connective tissue proper

47. The three main components of connective tissue are:

- A. ground substance, fibers and cells
- B. alveoli, fibrous capsule and secretory cells
- C. collagen, elastin and reticular fibers
- D. fibroblasts, chondroblasts and osteoblasts

48. Which cell organelle is the site of fatty acid, phospholipid, and steroid synthesis?

- A. Golgi complex
- B. lysosome
- C. mitochondria
- D. rough endoplasmic reticulum
- E. smooth endoplasmic reticulum

49. .... epithelium appears to have two or three layers of cells, but all the cells are in contact with the basement membrane.

- A. Stratified cuboidal
- B. Stratified columnar
- C. Transitional
- D. Pseudostratified columnar

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

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

51. Which of the following fibrous elements give CT high tensile strength?

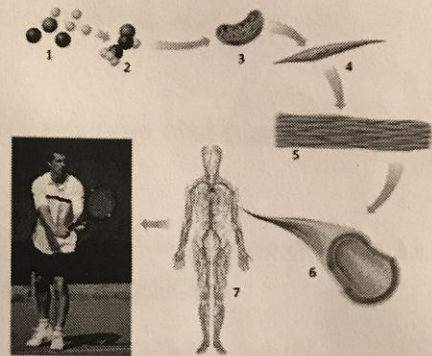
- A. reticular fibers
- B. collagen fibers
- C. elastic fibers
- D. myofilaments

52. What is the function of the cytoplasm in the cell?

- A. Regulating transport into and out of the cell
- B. Suspending cellular structures and providing a place for cellular functions to take place
- C. Packaging and sending out proteins and lipids
- D. Provide the internal framework of the cell

53. Which level of organization consists of specialized cells of the same type joined together?

- A. 2
- B. 3
- C. 4
- D. 5
- E. 6



#### Bonus question

54. According to the course syllabus, if you miss an exam you have \_\_\_ days from the day of the exam to submit proper medical documentation.

- A. 1
- B. 2
- C. 3
- D. 4
- E. 5

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Answer the remaining questions right on the exam**