STUDENT NAME: _____

STUDENT NUMBER: _____

University of Ottawa ANP 1105A Midterm #1

Date: October 11, 2018 **Duration:** 90 min
Instructor: Stephen Gee

Instructions:

1. Complete all 57 multiple-choice questions (1 mark/correct answer).
2. Please answer the multiple-choice questions on the computer (*scantron*) sheet that is provided.
3. Please put your name and student number at the top of this page, and on the scantron sheet. ***Hand in your scantron sheet*** when you have finished. You may keep the rest of the exam; correct answers will be posted on *BrightSpace*.
4. Make sure this exam is complete. This exam contains **8** pages **and is printed double-sided**. The excuse of missing a page will not be accepted after the examination.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Which of the following is a function of a plasma membrane protein? 1) _____
   A) molecular transport through the membrane
   B) oxygen transport
   C) circulating antibody
   D) forms a lipid bilayer

2) What is the role of tropomyosin in skeletal muscles? 2) _____
   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.

3) _____ epithelium appears to have two or three layers of cells, but all the cells are in contact with the basement membrane. 3) _____
   A) Pseudostratified columnar B) Transitional
   C) Stratified cuboidal D) Stratified columnar

4) When a sarcomere contracts and thin filaments move over thick filaments you would expect to see _____. 4) _____
   A) the I bands to appear smaller B) the A band to appear darker
   C) the H zone to appear wider D) the I bands to appear wider

5) Which of the following describes the plasma membrane? 5) _____
   A) a membrane composed of tiny shelves or cristae
   B) a phospholipid bilayer surrounding the cell
   C) a double layer of protein enclosing the plasma
   D) a single-layered membrane that surrounds the nucleus of the cell

SHORT ANSWER. Choose the letter in the figure that indicates the structure described by the statement in each of the three questions below the figure.

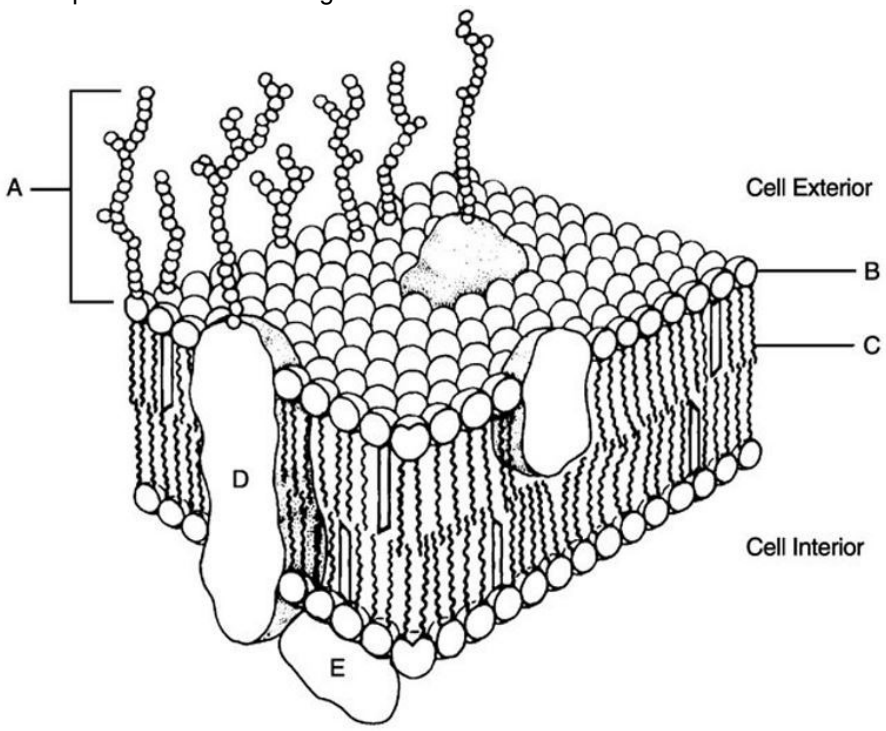

Figure 3.2

Using Figure 3.2, match the following:

6) Peripheral protein. 6) _____

7) Glycocalyx. 7) _____

8) Nonpolar region of phospholipid. 8) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

9) Hypothetically, if a muscle were stretched to the point where thick and thin filaments no longer overlapped, _____. 9) _____
   A) no muscle tension could be generated
   B) maximum force production would result because the muscle has a maximum range of travel
   C) cross bridge attachment would be optimum because of all the free binding sites on actin
   D) ATP consumption would increase because the sarcomere is "trying" to contract

10) What structure in skeletal muscle cells functions in calcium storage? 10) _____
   A) sarcoplasmic reticulum
   B) myofibrillar network
   C) intermediate filament network
   D) mitochondria

SHORT ANSWER. Choose the letter in the figure that indicates the structure described by the statement in each of the three questions below the figure.

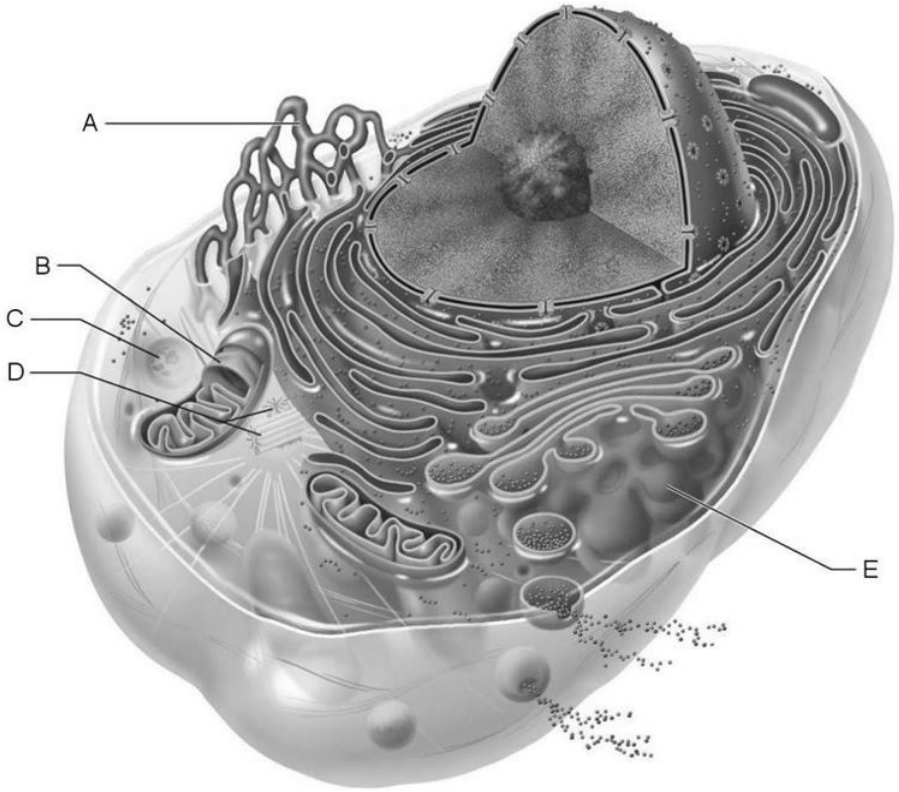

Figure 3.1

Using Figure 3.1, match the following:

11) Forms the mitotic spindle. 11) _____

12) Site of enzymatic breakdown of phagocytized material. 12) _____

13) Packages proteins for insertion in the cell membrane or for exocytosis. 13) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

14) What are the three main components of connective tissue? 14) _____
A) alveoli, fibrous capsule, and secretory cells
B) collagen, elastin, and reticular fibers
C) ground substance, fibers, and cells
D) fibroblasts, chondroblasts, and osteoblasts

15) Which of the following statements is true? 15) _____
A) Cardiac muscle cells have many nuclei.
B) Cardiac muscle cells are found in the heart and large blood vessels.
C) Striated muscle cells are long and cylindrical with many nuclei.
D) Smooth muscle cells have T tubules.

16) During development embryonic cells will fuse to form muscle fibers. This will result in _____. 16) _____
A) the coordination of nerve signals to muscle fibers
B) the striations that appear in skeletal and cardiac muscle tissues
C) multinucleated muscle fibers that can extend as long as 30 centimeters
D) interlocking of cells that can prevent the filaments from sliding

17) Which of the following statements is correct regarding net diffusion? 17) _____
A) The lower the temperature, the faster the rate.
B) The greater the concentration gradient, the faster the rate.
C) The rate is independent of temperature.
D) Molecular weight of a substance does not affect the rate.

18) Select the correct statement regarding adipose tissue. 18) _____
A) Mature adipose cells are highly mitotic.
B) Most of the cell volume is occupied by the nucleus.
C) It is composed mostly of extracellular matrix.
D) Its primary function is nutrient storage.

19) A potential benefit of recruiting slow oxidative fibers for contraction before recruiting fast oxidative and fast glycolytic fibers might be _____. 19) _____
A) to allow for fine control with delicate contractile force with a small stimulus
B) recruiting slow oxidative fibers early helps to tire them out first so that they won't interfere with the more powerful contractions of fast glycolytic fibers
C) because they are slower to respond, slow oxidative fibers must be stimulated first in order to contract simultaneously with the faster fibers
D) There is little to no benefit from recruiting slow oxidative fibers first, and therefore it is in fact fast glycolytic fibers that will be recruited first.

20) What does the central nervous system use to determine the strength of a stimulus? 20) _____
A) frequency of action potentials
B) type of stimulus receptor
C) origin of the stimulus
D) size of action potentials

21) The movement of water across the plasma membrane can be described by all of the following EXCEPT _____. 21) _____
A) carrier-mediated facilitated diffusion
B) simple diffusion
C) facilitated diffusion through aquaporins
D) passive membrane transport

22) In an isotonic contraction, the muscle _____. 22) _____
A) changes in length and moves the "load"
B) does not change in length but increases tension
C) rapidly resynthesizes creatine phosphate and ATP
D) never converts pyruvate to lactate

23) Which of the following surrounds an individual muscle cell? 23) _____
A) perimysium B) endomysium C) epimysium D) fascicle

24) Which of the following is FALSE regarding the membrane potential? 24) _____
A) In their resting state, all body cells exhibit a resting membrane potential.
B) The resting membrane potential is determined mainly by the concentration gradients and differential permeability of the plasma membrane to K^+ and Na^+ ions.
C) The resting membrane potential is maintained solely by passive transport processes.
D) The resting membrane potential occurs due to active transport of ions across the membrane due to the sodium-potassium pump.

25) Myocardium (cardiac muscle tissue) must rhythmically contract for a lifetime. This requires a considerable amount of energy production by the cells. You would expect to see a relatively high amount of which organelle in these cells? 25) _____
A) mitochondria
B) lysosomes
C) smooth endoplasmic reticulum
D) cytoskeleton

26) The mechanism of contraction in smooth muscle is different from skeletal muscle in that _____. 26) _____
A) ATP energizes the sliding process
B) the trigger for contraction is a rise in intracellular calcium
C) actin and myosin interact by the sliding filament mechanism
D) the site of calcium binding site differs

27) During the relative refractory period of an action potential, a larger than normal stimulus is needed to cause another action potential. This is due to the fact that _____. 27) _____
A) the membrane is now impermeable to all ions
B) the inactivation gates on voltage gated sodium ion channels are closed
C) the sodium potassium pump will stop working during relative refractory
D) the voltage gated potassium ion channels remain open long enough to hyperpolarize the axon membrane

28) A type of transport protein found in the plasma membrane of cells lining the inside of the intestine allows sodium ions to diffuse down their concentration gradient. The ions move through the transport protein, and into the cell. These transport proteins will use the kinetic energy of the diffusing sodium ions to bring glucose into the cells as well. This transport protein would best be described as _____. 28) _____
A) a carrier protein
B) a channel
C) a symporter
D) a pump

29) Oxygen starved tissues can release chemical signals into the blood that can change the diameter of nearby blood vessels delivering oxygen and nutrients to the tissues. In doing so, the blood vessels will respond through vasodilation (widening of the vessel). Which muscle type is responsible for this vasodilation? 29) _____
A) striated muscle
B) smooth muscle
C) skeletal muscle
D) cardiac muscle

30) Rigor mortis occurs because _____. 30) _____
A) no ATP is available to release attached actin and myosin molecules
B) proteins are beginning to break down, thus preventing a flow of calcium ions
C) sodium ions leak into the muscle causing continued contractions
D) the cells are dead

31) What is the primary function of wave summation? 31) _____
A) produce smooth, continuous muscle contraction
B) prevent muscle fatigue
C) increase muscle tension
D) prevent muscle relaxation

32) Your instructor gives you an unknown organ for you to examine and identify through microscopy. What should you do first with the sample? 32) _____
A) examine it for artifacts
B) fix it with preservative
C) cut it into sections
D) stain it to enhance contrast

33) Which of the following describes the cells of unitary smooth muscle? 33) _____
A) They consist of muscle fibers that are structurally independent of each other.
B) They depend upon recruitment using the autonomic nervous system.
C) They exhibit spontaneous action potentials.
D) They are used for vision and hair raising.

34) Peroxisomes _____. 34) _____
A) sometimes function as secretory vesicles
B) function to digest particles ingested by endocytosis
C) are functionally the same as lysosomes
D) are able to detoxify substances by enzymatic action

35) Select the correct statement regarding epithelia. 35) _____
A) Stratified epithelia are present where protection from abrasion is important.
B) Pseudostratified epithelia consist of at least two layers of cells stacked on top of one another.
C) Stratified epithelia are tall, narrow cells.
D) Simple epithelia form impermeable barriers.

36) If a postsynaptic cell is stimulated to threshold by temporal summation this implies that _____. 36) _____
A) a presynaptic neuron is sending frequent EPSP
B) the presynaptic neuron is sending frequent IPSP
C) the postsynaptic cell can be influenced by only one presynaptic cell
D) the postsynaptic cell is sending frequent action potential

37) In a tissue type that undergoes a relatively great deal of mechanical stress, like the tissue that lines the intestine, you would expect to see an abundance of _____ between the individual cells of the tissue. 37) _____
A) tight junctions B) connexons C) desmosomes D) gap junctions

38) A red blood cell placed in pure water would _____. 38) _____
A) swell initially, then shrink as equilibrium is reached
B) shrink
C) swell and burst
D) neither shrink nor swell

39) An action potential is regarded as an example of a positive feedback. Which of the following examples below best illustrates the positive feedback aspect of an action potential? 39) _____
A) Voltage gated potassium ion channels open slowly and remain open long enough to cause hyperpolarization.
B) The sodium potassium pump consistently moves ions as long as ATP is available, and regardless of membrane potential changes.
C) A threshold stimulus will cause the opening of voltage gated sodium ion channels that will cause further depolarizing stimulus. This stimulus will open still more voltage gated sodium ion channels.
D) Potassium permeability is about 25 times greater than sodium ions.

40) Which of the following is NOT one of the concepts collectively known as the cell theory? 40) _____
A) All organisms are made of one or more cells.
B) All cells must be motile and divide.
C) Cells only arise from other cells.
D) The cell is the smallest unit of life.

41) During muscle contraction, myosin cross bridges attach to which active sites? 41) _____
A) thick filaments B) myosin filaments
C) Z discs D) actin filaments

42) The fiber type that gives connective tissue great tensile strength is _____. 42) _____
A) elastic B) muscle C) collagen D) reticular

43) Creatine phosphate functions in the muscle cell by _____. 43) _____
A) forming a chemical compound with actin
B) storing energy that will be transferred to ADP to resynthesize ATP
C) inducing a conformational change in the myofilaments
D) forming a temporary chemical compound with myosin

44) Select the correct statement regarding the stem cells of connective tissue. 44) _____
A) "Blast" cells are undifferentiated, actively dividing cells.
B) Connective tissue does not contain cells.
C) Connective tissue cells are nondividing.
D) Chondroblasts are the main cell type of connective tissue proper.

45) The sliding filament model of contraction involves _____. 45) _____
A) actin and myosin lengthening in order to slide past each other
B) actin and myosin sliding past each other and partially overlapping
C) the Z discs sliding over the myofilaments
D) the shortening of thick filaments so that thin filaments slide past

46) Myoglobin _____. 46) _____
A) stores oxygen in muscle cells
B) breaks down glycogen
C) is a protein involved in the direct phosphorylation of ADP
D) produces the end plate potential

47) A cell engulfing a relatively large particle will likely utilize _____. 47) _____
A) phagocytosis
B) receptor-mediated endocytosis
C) exocytosis
D) pinocytosis

48) If a human cell were to increase the amount of cholesterol embedded within its plasma membrane, which of the following would most likely happen? 48) _____
A) The plasma membrane would become more stable, less fluid, and less permeable.
B) The cell would form a plaque that could potentially block a blood vessel.
C) The plasma membrane would become more permeable to ions and less permeable to lipids.
D) The plasma membrane would become more fluid and the phospholipids less stable.

49) An anaerobic metabolic pathway that results in the production of two net ATPs per glucose plus two pyruvic acid molecules is _____. 49) _____
A) the electron transport chain
B) hydrolysis
C) glycolysis
D) the citric acid cycle

50) Which of the following is the correct sequence of events for muscle contractions? 50) _____
A) neurotransmitter release, motor neuron action potential, muscle cell action potential, release of calcium ions from SR, ATP-driven power stroke
B) motor neuron action potential, neurotransmitter release, muscle cell action potential, release of calcium ions from SR, ATP-driven power stroke, sliding of myofilaments
C) neurotransmitter release, muscle cell action potential, motor neuron action potential, release of calcium ions from SR, sliding of myofilaments, ATP-driven power stroke
D) muscle cell action potential, neurotransmitter release, ATP-driven power stroke, calcium ion release from SR, sliding of myofilaments

51) Which of the following would be recruited later in muscle stimulation when contractile strength increases? 51) _____
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 large diameter muscle fibers
D) Small motor units with small diameter muscle fibers

52) Which of the following is NOT a function of dendrites? 52) _____
A) convey incoming messages toward the cell body
B) produce short-distance signals called graded potentials
C) generate nerve impulses and transmit them away from the cell body
D) provide enormous surface area for receiving signals from other neurons

53) Glands, such as the thyroid, that secrete their products directly into the blood rather than through ducts are classified as _____. 53) _____
A) ceruminous B) sebaceous C) endocrine D) exocrine

54) Which of the following is NOT found in cartilage but is found in bone? 54) _____
A) organic fibers B) living cells C) lacunae D) blood vessels

55) Which tissue type is formed by many cells joining together, which are multinucleated? 55) _____
A) cardiac muscle B) dense regular
C) skeletal muscle D) smooth muscle

56) Muscle tone is _____. 56) _____
A) the ability of a muscle to efficiently cause skeletal movements
B) the feeling of well-being following exercise
C) the condition of athletes after intensive training
D) a state of sustained partial contraction

57) The depolarization phase of an action potential is punctuated by the closing of inactivation gates in the voltage gated sodium ion channels. All of the following are consequences of this inactivation except one. Choose the statement below that is not a consequence of the closing of inactivating gates. 57) _____
A) This allows for the one way transmission of action potential down the axon.
B) This stops the depolarization of the axon membrane.
C) This limits the frequency of action potentials down the axon.
D) This allows for the efflux (diffusion out) of potassium ions, resulting in the repolarization of the cell.

1) A
2) B
3) A
4) A
5) B
6) E
7) A
8) C
9) A
10) A
11) D
12) C
13) E
14) C
15) C
16) C
17) B
18) D
19) A
20) A
21) A
22) A
23) B
24) C
25) A
26) D
27) D
28) C
29) B
30) A
31) A
32) B
33) C
34) D
35) A
36) A
37) C
38) C
39) C
40) B
41) D
42) C
43) B
44) A
45) B
46) A
47) A
48) A
49) C
50) B
51) C
52) C
53) C
54) D
55) C
56) D
57) D