STUDENT NAME: ……..

STUDENT NUMBER: ……..

University of Ottawa

ANP 1105D

Midterm #1 ANSWERS

Date: February 7, 2013

Duration: 1 hr 20 min

Instructor: Joanna Komorowski

INSTRUCTIONS:

1. **48 multiple choice questions** (1 mark/1 correct answer per question) plus 1 labeling questions (3 marks total) plus two descriptive question (4+7 marks total). **Total possible mark = 62**

2. Please answer the multiple choice questions on the computer sheet that is provided

3. Please **put your name and student number at the top of this page** and at the top of the final page. **Please do not forget to put your course code (ANP 1105D), your surname (last name) and the initials, on the first page of the scantron sheet!!!**

4. Make sure this exam is complete. This exam contains **11 pages**.

5. The excuse of missing a page will not be accepted after the examination.

Good luck!!!!

1. **Which cell organelle is the site of protein synthesis?**

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

2. **Which of the following is TRUE?**

   A. Chromatin consists exclusively of DNA and RNA
   B. The glycocalyx is somewhat fuzzy and sticky because of the numerous cholesterol chains sticking out from the surface of the cell membrane
   C. Microfilaments are thin strands of the contractile protein tubulin
   D. Mature red blood cells do not contain nucleus

3. **At the age of 6 month Anna was diagnosed with Tay-Sachs disease. As her primary care physician, what would you tell her parents?**

   A. That she suffers from a rare disease characterized by loss of mitochondria in her brain cells
   B. That she suffers from the lysosmal disease in which a specific enzyme is missing and thus her lysosomes will become swollen with undigested lipid ganglioside
   C. That she suffers from the rare peroxisomal congenial disease characterized by reduction or absence of peroxisomes
   D. That she has a rare form of cancer

4. **Which of the following organelles contain(s) DNA?**

   A. Lysosomes
   B. Mitochondria
   C. Nucleus
   D. Both B) and C)
   E. All of the above

5. **Which of the following statements correctly describes plasma membrane?**

   A. It is a structure formed by phospholipids and cholesterol designed to be stable against pressure
   B. It is a dynamic fluid structure that is in constantly moving laterally
   C. It is a unique, solid barrier custom designed for each type of cell
   D. It is a flexible protein barrier supported by cholesterol rods.

6. **Lipid rafts:**

   A. Play a role in cell to cell recognition
   B. Are made of glycolipids and glycoproteins
   C. Are made of cholesterol, saturated fatty acids and sphingolipids
   D. Are floating freely in the cytoplasm

7. **Which type of junction is an anchoring junction that is linked to the keratin fibres on the cytosolic side of the cell and with linker proteins cadherins extending to the extracellular space?**

   A. tight junction
   B. desmosome
   C. glycocalyx
   D. integral junction
   E. gap junction

8. **Which of these would you expect to find in or on cells whose main function is absorption?**

   A. microvilli
   B. cilia
   C. desmosomes
   D. gap junctions
   E. secretory vesicles

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 moves against its concentration gradient
   D. water moves from an area of high solute concentration to an area of low solute concentration
   E. water is transported across cell membrane via facilitated diffusion

10. **During endocytosis:**

    A. a section of the plasma membrane brakes off and forms a vesicle inside the cell
    B. transport can consist of either pinocytosis or phagocytosis
    C. extracellular fluid can enter the cell
    D. there may be fusion with a lysosome
    E. all of the above

11. **If cells are placed in a hypertonic solution containing a solute to which the membrane is impermeable, what could happen?**

    A. The cells will swell and ultimately burst
    B. The cells will lose water and shrink
    C. The cells will shrink at first, but will later reach equilibrium with the surrounding solution and return to their original condition
    D. The cells will show no change due to diffusion of both solute and solvent

12. Which statement best describes connective tissue?

A. It usually contains a large amount of matrix and is usually well vascularised
B. It is always arranged in a single layer of cells
C. It is primarily concerned with secretion
D. It usually lines a body cavity
E. It usually contains little matrix and is usually poorly vascularised

13. Which of the following fibers give tendons their high tensile strength?

A. Reticular fibres
B. Elastic fibers
C. Collagen fibers
D. Actin and myosin
E. keratin

14. The urinary bladder can stretch because it is lined with:

A. simple squamous epithelium
B. stratified cuboidal epithelium
C. transitional epithelium
D. simple columnar epithelium
E. loose connective tissue

15. An epithelium "built" to withstand friction is:

A. simple squamous
B. simple cuboidal
C. pseudostratified columnar
D. stratified squamous
E. simple columnar

16. Because this type of tissue is so thin, it is concerned primarily with the movement of various substances across the membranes from one body compartment to another:

A. simple cuboidal epithelium
B. loose fibrous connective tissue
C. simple squamous epithelium
D. transitional epithelium

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

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

18. Which of the following is true about the adipose connective tissue?

A. Increased adipose tissue mass (obesity) has been associated with chronic inflammation and elevated levels of C-reactive protein (CRP)
B. Both white fat and brown fat are necessary for ATP production
C. On average, females need at least 3% body fat to maintain healthy status of their reproductive system
D. none of the above

19. The region of the neuron where the action potential is first generated is called the:

A. soma
B. Nissl body
C. dendrite
D. axon hillock
E. node of Ranvier

20. The term saltatory conduction refers to the:

A. jumping 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. action of the sodium potassium pump
E. propagation of a nerve impulse along a myelinated axon

21. 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

22. When an action potential reaches the axon terminal of a presynaptic neuron, the next event is:

A. immediate release of neurotransmitter
B. uptake of neurotransmitter from the synaptic cleft
C. diffusion of calcium ions out of the cell
D. diffusion of calcium ions into the cell
E. active transport of calcium ions out of the cell

23. Dendrites:

A. conduct action potentials away from the cell body
B. are generally long and unbranched
C. form synapses with the microglia
D. respond to neurotransmitters binding to their receptors by producing local action potentials
E. respond to neurotransmitters binding to their receptors by producing local graded potentials

24. Collections of nerve cell bodies inside the central nervous system are called:

A. nuclei
B. nerves
C. ganglia
D. tracts
E. none of the above

25. During the depolarizing phase of an action potential, which of the following is the primary activity?

A. Potassium ions are flowing into the cell
B. Potassium ions are flowing out of the cell
C. Sodium ions are flowing into the cell
D. Sodium ions are flowing out of the cell
E. Neurotransmitter is diffusing into the cell

26. Which of the following statements is TRUE?

A. The intensity of a stimulus is indicated by the frequency of nerve impulses (action potentials).
B. Almost all of the gated calcium channels are concentrated at the nodes of Ranvier of myelinated axons.
C. Chemically gated channels open when the membrane potential changes.
D. The relative refractory period is the period during which the outward current carried by K+ is exactly equal to the inward current carried by Na+.
E. None of the above statements is true.

27. 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

28. 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

29. 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.

30. A neurotransmitter that changes the membrane potential from -70 to -85 mV causes:

A. impulse conduction
B. partial depolarization
C. release of neurotransmitter
D. hyperpolarization
E. production of an action potential

31. Which of the following is true about the glial cells?

A. Astrocytes can modulate production and postsynaptic availability of neurotransmitters
B. Microglia nourish nerve cells
C. Schwann cells form myelin sheaths on axons in the central nervous system
D. Oligodendrocytes can modulate production and postsynaptic availability of neurotransmitters
E. The ratio between glial and nerve cells is 3:1

32. Which of the following is characteristic of a graded potential?

E. Produced at axon hillock
F. All-or-none
G. Current decreases with distance travelled
H. Induces membrane hyperpolarization
I. Causes release of neurotransmitter

33. Which of the following is true about the nervous system?

A. Afferent nerve fibers conduct impulses toward the central nervous system
B. The non-myelinated fibers are usually smaller and slower than myelinated nerve fibers
C. The number of dendritic synapses can change depending on the activity of the nervous system
D. All of the above are true

34. Temporal summations:

A. enhance depolarization in the postsynaptic neurons
B. increase number of stimulated neurons
C. abolish the effect of the EPSPs
D. occurs when the postsynaptic neuron is stimulated at the same time by a large number of axon terminals

35. Which of the following statements is true?

A. Opening of the cholinergic nicotinic receptors is faster than of the muscarinic receptors
B. In the converging circuit one neuron can activate many other neurons
C. During an absolute refractory period a very strong stimulus can lead to formation of a new action potential
D. Opening of the cholinergic nicotinic receptors requires involvement of G-proteins

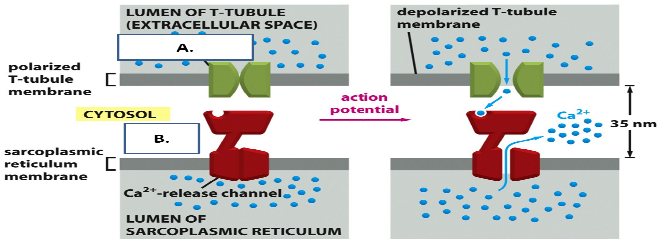
36. There is one-way conduction at the chemical synapses because:

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

37. Which of the following is composed of myosin?

A. thick filaments
B. thin filaments
C. all myofilaments
D. Z disc
E. A) and D)

38. Which of the following (A) or (B) represents opening of the ligand-gated calcium channels?



39. After nervous stimulation of the muscle has ceased, the calcium:

A. is destroyed by cholinesterase
B. is chemically bound to the filaments
C. level in the cytoplasm drops
D. is actively pumped into the sarcoplasmic reticulum for storage
E. C) and D)

40. In skeletal muscle, all of the following molecules are parts of the thin filaments EXCEPT:

A. actin
B. titin
C. tropomyosin
D. troponin
E. B) and D)

41. In the sliding filament model of muscle contraction, the ..... myofilaments move toward each other.

A. troponin
B. myosin
C. thick
D. actomyosin
E. actin

42. 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

43. What structure in skeletal muscle cells functions in calcium storage?

A. mitochondria
B. sarcoplasmic reticulum
C. intermediate filament network
D. myofibrillar network
E. T-tubules

44. In muscle contraction, binding of calcium to troponin acts to:

A. increase the action potential transmitted along the sarcomere
B. release the inhibition on Z dics
C. remove the blocking action of tropomyosin
D. cause ATP to bind to actin
E. none of the above

45. Which of the following surrounds the individual muscle cell?

A. perimysium
B. endomysium
C. epimysium
D. fascicle

46. The giant protein titin:

A. attaches actin filaments together at the Z-discs
B. maintains actin array in precise length (it is exactly the length of actin)
C. changes length when sarcomere contracts and relaxes (can stretch and recoil)

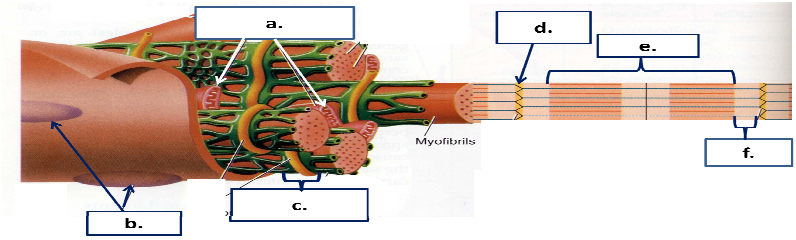
47. Which of the following statements is TRUE?

A. When a muscle fiber contracts strongly, the I bands diminish in size, the H zones disappear and the A bands move closer together but their length does not diminsh
B. Cardiac muscle cells are relatively short, tapering cells with a single, centrally located nucleus
C. The thin filaments contain a polypeptide subunit G-actin that seems to have no function
D. A nerve cell and all the muscle cells it stimulates are referred to as a motor end plate

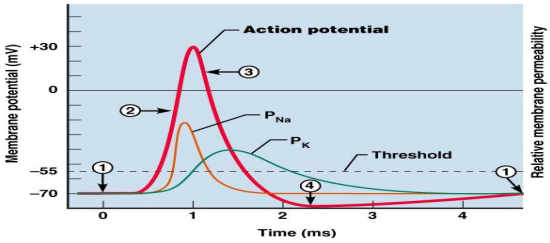
48. Rigor mortis occurs because:

A. the plasma membranes of dead cells become stiff
B. sodium ions leak out of the muscle
C. ATP is not available to release the attachment of actin and myosin molecules
D. proteins are beginning to break down, thus preventing a flow of calcium ions

49. Please label the following (a, b, c, d, e, f) 0.5 mark each correct label, 3 marks total):



50. Please name the phases (2, 3 and 4) of the generation of action potential and describe the ionic events involving specific gates during each of the phases (4 points total)



51. Please <u>choose and answer ONE</u> <u>of one (1) of the following questions</u> (7 marks):

1. **Please draw and label a chemical synapse. Describe step by step the events at a this synapse in response to action potential.**
   Or
2. **Please draw, label and describe step by step the events of the cross bridge cycle.**