STUDENT NAME: ……..

STUDENT NUMBER: ……..

# University of Ottawa

# ANP 1105A

# Midterm #1

Date: October 13, 2011

Duration: 1 hr 20 min

Instructor: Joanna Komorowski

**INSTRUCTIONS:**

1. **45 multiple choice questions** (1 mark/1 correct answer per question) plus 2 labeling questions (1.5 and 2.5 marks; 4 marks total) plus one descriptive question (5 marks total). **Total number of questions = 48; total possible mark = 54**

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 1105A), 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 **10 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 energy production?**

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

2. **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

3. **Microtubules:**

   A. are thin strands made of contractile protein actin
   B. are tough, rope-like fibres made of keratin
   C. are intermediate protein fibres particularly numerous in metabolically active cells
   D. are hollow, tubular cylinders that assist with directional movement of vesicles

4. **Termination of muscle contraction is triggered by:**

   A. depolarization of the T tubules and opening of the ligand-gated calcium channels
   B. the power stroke
   C. attachment of ATP to myosin heads
   D. hydrolysis of ATP
   E. removal of calcium ions from the cytosol back to the sarcoplasmic reticulum

5. **Which of the following statements is true?**

   A. Golgi apparatus packages, modifies and concentrates proteins produced at the endoplasmic reticulum
   B. All human cells contain nucleus
   C. Lysosomes inactivate free radicals
   D. Vaults provide the cells with support and enable some degree of motility within cells

6. **Which of the following is a function of plasma membrane proteins?**

   A. They serve as channels for lipid transport
   B. They serve as channels for ion transport
   C. They serve as cellular receptors
   D. Both A) and B)
   E. Both B) and C)

7. **How are phospholipid molecules arranged within the lipid bilayer of the plasma membrane? (ECF=extracellular fluid; ICF=intracellular fluid)**

   A. Phospholipids 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 ECF and ICF because they are hydrophilic
   D. The nonpolar lipid tails are oriented toward the ECF and the ICF because they are hydrophobic
   E. The nonpolar phosphate heads are oriented toward the ECF and ICF; they are hydrophobic

8. **Glycocalyx:**

   A. plays a role in cell to cell recognition
   B. is made of lipoproteins
   C. plays a role in membrane stabilisation
   D. is floating freely in the cytoplasm

9. **Desmosomes:**

   A. are numerous in skeletal muscle; they organize muscle fibres in bundles
   B. bind neighbouring cells together and prevent separation of these cells
   C. are numerous in the connective tissue
   D. are made of glycocalyx
   E. none of the above is correct

10. **Solution A contains 8% glucose dissolved in water and Solution B contains 4% glucose dissolved in water. Assume that the cells put in these solutions are impermeable to glucose. Which of the followingis true?**

    A. Solution A is hypertonic to Solution B.
    B. Solution B is hypertonic to Solution A.
    C. Solutions A and B are isotonic to each other.
    D. Solution A is hypotonic to Solution B

11. **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

12. **Which of the following is coiled in a relaxed muscle and links the ends of myosin to the Z-discs?**

    A. Nebulin
    B. Alpha-actinin
    C. C- protein
    D. Titin

13. **When acetylcholine binds to the receptors in the skeletal muscle end plate, the next event is:**

A. opening of the end plate's sodium/potassium channels and change in the end-plate's local potential (depolarization)
B. opening of the end-plate's sodium/potassium channels and production of an action potential at the neuromuscular junction
C. opening of the end plate's voltage-gated sodium channels and production of an action potential at the neuromuscular junction
D. opening of the sodium/potassium channels in the T-tubules

14. **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

15. **Soma of the postsynaptic neurons:**

A. has chemically-gated channels
B. conducts impulses away from the cell body
C. contains centrioles that are necessary for the nerve cell division
D. has voltage-gated channels

16. **Connective tissue:**

A. usually is poorly innervated
B. sits on a basement membrane
C. usually is highly vascularized
D. none of the above

17. **Which of the following applies to a muscarinic cholinergic receptor?**

A. It involves activation of G protein
B. It is associated with production of a second messenger
C. Its activation leads to immediate opening of the sodium/potassium channel
D. Both A) and B)
E. All of the above

18. **Sodium ions are moved out of the cells by:**

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

**19. Which phrase best describes epithelial tissue?**

A. usually contains a large amount of matrix
B. is always arranged in a single layer of cells
C. contains "blast" cells
D. usually contains lots of blood vessels
E. is avascular but innervated

**20. 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

**21. Which of the following is true about the cellular transport?**

A. In facilitated diffusion transport of molecules is limited by the saturation of carrier proteins
B. Endocytosis always requires clathrin coating on the extracellular side of the membrane
C. Water can enter the cell only via aquaporins
D. All of the clathrin coated vesicles entering the cell fuse with lysosomes
E. Solute molecules always move from areas of low concentration to areas of high concentration

**22. Which of the following is true about the glial cells?**

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

**23. Which of the following is true about the adipose 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 25% body fat to maintain healthy status of their reproductive system
D. All of the above

**24. The threshold of the neuron is the:**

A. time between binding of the neurotransmitter and firing of an action potential
B. total number of sodium ions that enters the cell before the sodium inactivation gates close
C. voltage at which the inflow of sodium ions causes enough depolarization to produce an action potential
D. total amount of neurotransmitter it takes to cause an action potential

**25. Which of the following is characteristic of a graded potential?**

A. Produced at axon hillock
B. All-or-none
C. Current decreases with distance travelled
D. Induces membrane hyperpolarization
E. Causes release of neurotransmitter

**26. Which statement about a RELAXED muscle cell is <u>FALSE?</u>**

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.

**27. In muscle contraction, binding of calcium to troponin:**

A. increases the action potential transmitted along the sarcomere
B. leads to release of the inhibition on Z dics
C. leads to removal of tropomyosin from the active sites on actin
D. causes binding of ATP to actin
E. none of the above

**28. The point at which an impulse from one nerve cell is communicated to another nerve cell is the:**

A. cell body
B. receptor
C. synapse
D. effector
E. axon hillock

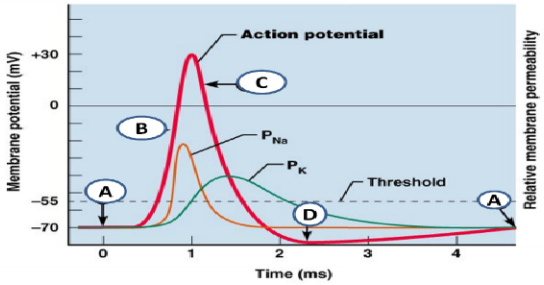
**29. The plasma membrane of a resting neuron is more permeable to potassium ions than to sodium ions because the membrane has:**

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

**30. In which of the following neurons would an action potential be conducted most rapidly?**

A. In a large diameter, unmyelinated neuron
B. In a large diameter, myelinated neuron
C. In a small diameter, unmyelinated neuron
D. In a small diameter, myelinated neuron

**31. Which of the following (A, B, C or D) represents the hyperpolarization?**




**32. 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.

**33. Which of the following statements is TRUE?**

A. The intensity of a stimulus is indicated by the size of action potential
B. Chemically gated channels open in response to electrical stimulation and changes in the membrane potential.
C. The intensity of a stimulus is indicated by the frequency of nerve impulses (action potentials).
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.

**34. The IPSP is inhibitory because:**

A. It hyperpolarizes the postsynaptic membrane
B. It prevents calcium ions entry into the presynaptic terminal
C. It changes the threshold of the neuron
D. It reduces the amount of neurotransmitter released by the presynaptic terminal

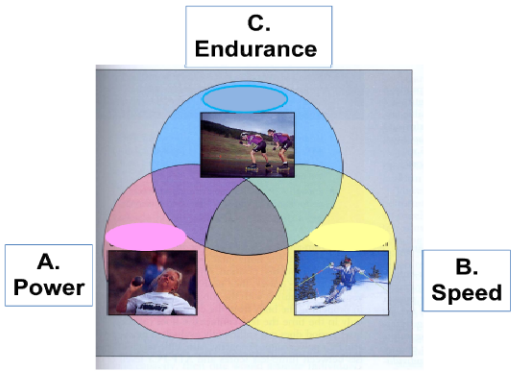
**35. The role of acetylcholinesterase is to:**

A. act as transmitting agent
B. amplify or enhance the effect of acetylcholine
C. destroy acetylcholine a brief period after its release by the axonal endings
D. stimulate the production of serotonin

**36. One functional unit of a skeletal muscle is:**

A. a sarcomere
B. a myofilament
C. a myofibril
D. the sarcoplasmic reticulum

**37. Which of the following types of physical activity (A, B or C) uses anaerobic breakdown of glucose (glycolysis) as a main energy source for ATP production?**




**38. In the sliding filament model of skeletal muscle contraction, muscle shortening is accompanied by:**

A. shortening of the A band and the H zone
B. shortening of the I bands and the H zone
C. shortening of both the A and I bands
D. shortening of both the A and I bands and shortening of the H zone

**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 pumped is back into the sarcoplasmic reticulum for storage
E. Both C) and D)

**40. Characteristics of isometric contraction include <u>all EXCEPT:</u>**

A. shortening
B. increased muscle tension
C. no change in muscle length
D. calcium and energy requirement

**41. Which of the following is true?**

A. Skeletal muscle bundles are covered by endomysium
B. Temporal (wave) summation usually results in fused (complete) tetanus
C. Muscle fatigue is always due to accumulation of lactic acid during exercise
D. Slow twitch muscle fibres require longer time to reach a peak tension and to relax
E. Troponin is a structural protein

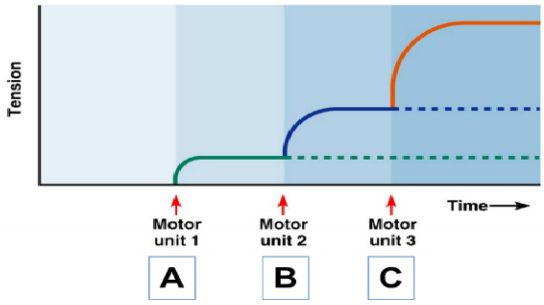
**42. The function of the T-tubules in skeletal muscle contraction is to:**

A. Transmit the action potential deep into the muscle cells
B. Store glycogen
C. Release and store calcium
D. Form a cytoskeleton

**43. Which of the following best describes the skeletal muscle fibre?**

A. It contains many nuclei, sarcolemma, sarcoplasm and myofilaments composed of nebulin and titin
B. It contains one terminal cisterna and two T-tubules per one sarcomere
C. It contains one nucleus, sarcolemma, sarcoplasm and myofibrils composed of actin and myosin myofilaments
D. It contains many nuclei, sarcolemma, sarcoplasm and myofibrils composed of actin and myosin myofilaments
E. It contains many nuclei, ATP-filled sarcoplasmic reticulum and myofibrils made of actin and myosin

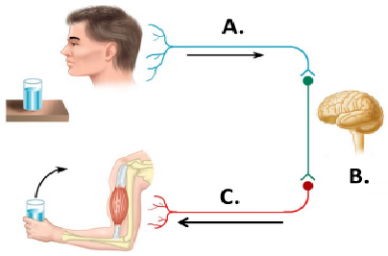
**44. Which of the following (A, B or C) represents recruitment of the SO (slow twitch) muscle fibres?**



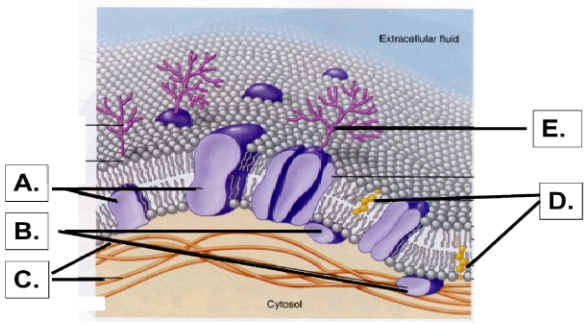

**45. In skeletal muscle fibre ATP is needed for:**

A. dissociation of myosin from actin
B. uncovering of the active sites on actin
C. removal of calcium from the cytosol after the stimulation has ceased
D. both A) and B)
E. both A) and C)

**46. Please label the following neurons (A, B and C); (0.5 mark/label, 1.5 total mark)**



**47. Please label the following structures (0.5 mark per label; 2.5 marks total)**




**48. Describe briefly, <u>in a point</u> form <u>ONE of</u> the following: (5.0 marks total)**

1. Main events following the arrival of an action potential at the terminal knob of axon (the events at the presynaptic and postsynaptic membranes and at the synaptic cleft of the chemical synapse)
   **Or**
2. Main events occurring during the cross bridge cycle (muscle contraction and relaxation)