

Part I - Multiple choice - 1 pt. each.

1. Across a typical cell membrane, the concentration of potassium is typically _____ outside the membrane as compared to inside. A) higher B) lower C) the same
2. Of the following, to which is a typical cell membrane at rest least permeable?
A) sodium B) chloride C) protein D) potassium E) water
3. At rest in a typical cell membrane: A) there is a voltage with excess negative charge on the inside B) there is a voltage with excess negative charge on the outside C) there is no voltage across the membrane
4. An increase in permeability to which ion directly triggers exocytosis and transmitter release into a typical synapse? A) potassium B) chloride C) sodium
D) calcium E) hydrogen
5. Using the choices as in question 4, increase in the concentration of which ion in the cytoplasm of a muscle cell has the most direct effect on initiating contraction? _____
6. In a rod, a photon of light will ultimately lead to a(n) _____ in the rod membrane.
A) local depolarization B) local hyperpolarization C) action potential D) no specific outcome can be predicted
7. Using the same choices as in question 6, inhibitory synaptic input to a dendrite membrane will cause _____.
8. Using the same choices as question 6, excitatory transmission across a synapse may ultimately cause _____ in a distant axon.
9. Which of the following is found in the midbrain? A) cerebellum B) reticular system
C) thalamus D) pineal gland E) none of the above
10. In the mammalian retina, light will first come into contact with: A) the choroid
B) rods C) bipolar cells D) cones E) ganglion cells
11. The optic nerve is made up of the axons of the _____. (Use the choices in question 10.)
12. Sensory input from your ears is ultimately received by the auditory cortex located in the:
A) frontal lobe B) paleocortex C) temporal lobe D) occipital lobe E) parietal lobe
13. _____ membranes are exciteable. A) soma B) dendrite C) T-tubule D) axon
E) more than one of the above F) all of the above

Part II - True-false - 1 pt. each.

1. We find that a particular muscle cell has only one nucleus. We can then be sure that the cell is not striated.
2. A larger stimulus will lead to a larger sized local potential.
3. A larger stimulus will lead to a larger sized action potential.
4. The parasympathetic nervous system generally prepares the body to respond to some stress.
5. The iris of the eye helps focus light on the retina.
6. Sensory input to the spinal cord enters through the dorsal side of the cord.
7. Transmission of information to and from the brain occurs in the gray matter of the spinal cord.
8. Schwann cell membranes are used to help insulate axons in a nerve.
9. The sarcoplasmic reticulum is a storage area containing mainly Na^+ .
10. The central sulcus forms the boundary between the frontal lobe and the occipital lobe.
11. At the start of an action potential there is a very large increase in permeability to potassium.

Part III - Fill-in - 1 pt. each.

1. During the _____ period a stronger than threshold stimulus is needed to initiate a new action potential. The earlier in time in this period, the _____ the stimulus needs to be. This mean a stronger stimulus gives a greater _____ of action potentials.
2. Simultaneous inputs to a cell from two different synapses will be _____ summated.
3. On the basis of spatial location, synapses _____ will have the greatest effect on the output of a neuron.
4. Synaptic vesicles are storage organelles for _____. Upon release from the vesicles, the stored substances diffuse through interstitial fluids in the _____ and bond to _____ in the membrane of the next neuron in the circuit.

Part IV - Matching - Put an appropriate letter from the right-hand column in each numbered blank. Some letters may be used more than once; some not at all. Some numbers may have more than one correct answer, but you should put only one answer in each blank. 1 pt. each.

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| 1. _____ | Contains respiratory control centers | A. epithalamus |
| 2. _____ | Short term memory storage | B. olfactory lobe |
| 3. _____ | Greatly increased in size in humans | C. midbrain |
| 4. _____ | Regulates cyclic behaviors | D. paleocortex |
| 5. _____ | Sensory center in the paleocortex | E. hypothalamus |
| 6. _____ | A stimulus filter | F. neocortex |
| 7. _____ | Coordinates skeletal muscle contractions | G. reticular system |
| 8. _____ | Somatosensory cortex is in this | H. cerebellum |
| 9. _____ | Many hunger and drive centers | I. medulla |
| 10. _____ | Located in the hindbrain | J. thalamus |
| 11. _____ | Optic/visual sense in a fish brain | |
| 12. _____ | Centers for controlling emotional states | |

Part V - Short Answer - Pts as indicated.

- Define: (3 pts each)
 - decremental transmission
 - autonomic nervous system
 - hyperpolarization
 - refractory period
 - troponin

2. Describe 2 of the functions of ATP in muscle contraction. (9 pts)

3. Draw the distribution of protein filaments in a resting skeletal muscle sarcomere. Label all zones, bands, and lines. Draw the same sarcomere in a contracted muscle (no labels necessary on this one). (10 pts)

4. Draw a local potential caused by an excitatory (+) stimulus to a neuron. Describe the ion movements and permeability changes that occur during the course of the local potential. If a stimulus is less than threshold, why, then, does no action potential occur? (10 pts)

5. Describe the specific functions of each major part of the eye that is involved in helping to optimally focus light on the retina. (9 pts)