Part I - Multiple choice - 1 pt. each.

1. At the start of an action potential, the permeability to sodium:
   A) increases  B) decreases  C) stays the same

2. At the start of an action potential, the permeability to potassium:
   A) increases  B) decreases  C) stays the same

3. Schwann cells are normally found on:  A) axons  B) dendrites
   C) synaptic terminals  D) somas  E) both B and D  F) all of the above

4. Which of the following is not an effector of the somatic nervous system?
   A) cardiac muscle  B) skeletal muscle  C) visceral muscle  D) more than
   one of the above  E) all of the above

5. A muscle begins to contract, but almost immediately [ATP] declines to zero. This
   would affect the muscle’s function by:
   A) leading to spastic (continuous) contraction  B) weakening the contraction strength
   C) increasing the contraction strength  D) leading to total relaxation  E) stopping the
   contraction process and losing the tension generated

6. Focusing light in an unadjustable manner is the function of the:
   A) pupil  B) aqueous humor  C) cornea  D) vitreous humor  E) iris

7. The ______ is a light intensity filter in the human eye.
   A) lens  B) retina  C) cornea  D) iris  E) choroid  F) more than one of the above

In questions 8 through 14, use the following choices (choices may be used more than
once):  A) cerebellum  B) hypothalamus  C) neocortex  D) paleocortex
E) epithalamus  F) midbrain  G) medulla  H) none of the above

8. ______ Area that controls body balance through muscular coordination.

9. ______ Area that contains many subconscious control centers.

10. ______ The posterior pituitary is part of this area.

11. ______ The reticular system is in this area.

12. ______ Evidence indicates this area is used for short-term memory storage.
13. ______ Skin senses ultimately feed information into this area.

14. ______ A spinal reflex travels directly through this area.

In questions 15 through 19 use the following figures as choices (choices may be used more than once), = the time of stimulation:

15. ______ An excitatory transmitter binds to a soma receptor and causes:

16. ______ A 20mV excitatory stimulus is given to a dendrite membrane and causes:

17. ______ An inhibitory transmitter causes this in a dendrite membrane.

18. ______ A membrane in the relative refractory period is stimulated with a bare threshold stimulus.

19. ______ Excitatory inputs to a neuron add up to 40mV; Inhibitory inputs sum to 15mV. Threshold is 5mV. What will happen in the soma of this neuron?

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

1.  ______ Skeletal muscle cells contain more than a single nucleus.

2.  ______ In muscle cells, the T-tubules are used primarily for rapid transmission of action potentials into the interior of the cell.

3.  ______ Ganglion cells in the retina can generate action potentials.

4.  ______ An association or interneuron can pick up information in the spinal cord and transmit it to the brain.

5.  ______ The inner surface of a typical cell membrane is positively charged relative to the outer surface.
6. An association area is a part of the neocortex in which sensory input is initially received by the brain.

7. Visual input is processed in the parietal lobe of the cerebrum.

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

1. _________________ muscle cells are cylindrical in shape and uninucleate. Between these cells are structures called _________________ that allow all cells in the muscle to respond collectively to any stimulus. Input from the sympathetic nervous system would _________________ function in these cells. In general, these cells are relatively _________________ (slow/fast) to respond to stimuli.

2. The epithalamus is located on the dorsal (upper) surface of the _________________ region of the brain. Its primary function is _________________.

3. An above threshold stimulus is given to an axon. The initial effect of this is to greatly increase permeability to _________________ in the axon membrane. This causes the membrane voltage to _________________. Later permeability to _________________ becomes nearly zero while permeability to _________________ increases greatly. After these changes, permeabilities will return to their resting state.

4. The formation of actin-myosin cross bridges is inhibited by a protein called _________________. Only if _________________ is bound to _________________ will this inhibition be removed.

Part IV - Short answer - Pts as indicated.

1. Define: (3 pts each)
   A. spatial summation
   B. H-zone
   C. autonomic nervous system
2. Distinguish between action and local potentials in the following characters (use yes/no, present/absent, etc.) (6 pts)

<table>
<thead>
<tr>
<th>Local</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>decremental transmission</td>
<td></td>
</tr>
<tr>
<td>graded</td>
<td></td>
</tr>
<tr>
<td>caused by inhibitory transmitters</td>
<td></td>
</tr>
</tbody>
</table>

3. Describe the differences between rod and cone systems in the retina that do not allow cones to be used in dim light situations, but that do allow cones to give much sharper vision. (11 pts)
4. Distinguish between a relative refractory period and an absolute refractory period. In each of these periods, how strong does a stimulus have to be in order for a 2\textsuperscript{nd} action potential to be generated? (12 pts)

8. On the following, place a “+” in the blank if the membrane is excitable; a “-“ if not. (5 pts)

- fiber membrane
- dendrite
- Schwann cell membrane
- soma
- axon

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THE END