IMPORTANT INFORMATION
• Multiple-choice questions: 35 @ 3 each = 105 points. Choose the most correct answer.
• Short-answer questions: 3 for 45 points
• I will return your Scantrons on Thursday and your “essays” next Tuesday.
• Only a few of you need to worry about this, but Friday is the last day to drop this class.
• Relax, think (read the questions), excel!

Refer to the spinal cord cartoon at right to answer the next three (3) questions.

1. Somatic motor nuclei are located within the area labeled ____.
   a. a        b. b        c. c        d. d        e. none of these

2. Visceral sensory nuclei are located within the area labeled ____.
   a. a        b. b        c. c        d. d        e. none of these

3. The cell bodies of somatic sensory neurons are located within the area labeled ____.
   a. a        b. b        c. c        d. d        e. none of these

4. Cutting the ventral ramus of a spinal nerve would destroy the ____ of ____ neurons.
   a. axons; sensory                           b. axons; motor                           c. cell bodies; motor
   d. a and b only                           e. a, b and c

5. The outermost (most superficial) meninx of the spinal cord is the ____.
   a. arachnoid membrane                      b. dura mater                           c. endoneurium
   d. perineum                                e. pia mater

6. The dorsal root of the spinal cord conveys ____.
   a. mostly motor, but some sensory information       b. mostly sensory, but some motor information
   c. only motor information                         d. only sensory information
   e. nerve impulses in tiny little attaché cases

7. The spinal cord ends nearest vertebra number ____.
   a. C7               b. C3PO              c. L2               d. S2               e. T10

8. Which of the following reflexes is contralateral, intersegmental and polysynaptic?
   a. crossed extensor reflex                      b. flexor (withdrawal) reflex         c. knee-jerk reflex
   d. muscle spindle reflex                        e. patellar reflex

9. The whitish, outermost covering of the nerves that you will be identifying on the cadavers later this term is known as ____.
   a. endoneurium       b. epineurium      c. myelin       d. perineurium       e. John
10. Motor and sensory information travels between a spinal nerve and the skin and skeletal muscles of the back by way of ___.
   a. a dorsal ramus   b. a dorsal root   c. a ventral ramus   d. a ventral root   e. FedEx

11. Which of the following nerve plexuses DO NOT exist in the human body?
   a. brachial plexus   b. cervical plexus   c. lumbar plexus   d. sacral plexus   e. thoracic plexus

12. How many interneurons should be present in the diagram of the flexor reflex you will draw for this exam?
   a. 0     b. 1     c. 2     d. 3     e. \( \pi r^2 \)

13. The cartoon at right shows a ___ neuronal circuit.
   a. converging   b. diverging   c. parallel   d. reverberating   e. serial

14. Muscle spindles send action potentials to the spinal cord ___.
   a. constantly   b. only when muscle tone decreases   c. only when muscle tone increases   d. only when the spindle is compressed   e. only when the spindle is stretched

15. Gray matter in the CNS would be expected to contain all of the following EXCEPT ___.
   a. astrocytes   b. microglia   c. neuron cell bodies   d. Schwann cells   e. unmyelinated axons

16. The oculomotor and trochlear nerves influence eye movements. Their nuclei are found within the ___.
   a. cerebellum   b. medulla   c. midbrain   d. pons   e. substantia nigra

17. If the both lateral geniculate nuclei in your thalamus were destroyed, you would be most likely to lose your sense of ___.
   a. hearing   b. honor   c. taste   d. touch   e. vision

18. People with Parkinson’s disease suffer from too much muscle tone because their ___ is/are deteriorating.
   a. basal ganglia   b. caudate nuclei   c. neuromuscular junctions   d. primary motor cortex   e. substantia nigra

• Use the following to answer the next two (2) questions:
   a. frontal lobe   b. occipital lobe   c. parietal lobe   d. temporal lobe   e. ear lobe

19. The primary visual cortex and the visual association area are found here.

20. The primary somatosensory cortex is found here.

• Use the following to answer the next two (2) questions:
   a. hypothalamus   b. inferior colliculus   c. pons   d. superior colliculus   e. thalamus

21. The regulation of body temperature is a primary function of this brain region.

22. Generating reflexive responses to visual stimuli is the primary function of this brain region.
23. Dilation of blood vessels serving a particular area of the brain would be expected to occur when ___.
   a. tissue [CO₂] increases  
   b. tissue [H⁺] increases  
   c. tissue [O₂] decreases  
   d. a, b and c  
   e. b and c only

24. The choroid plexuses produce cerebrospinal fluid. Which of the following is/are true of the choroid plexuses?
   a. Its capillary endothelial cells are connected by tight junctions.
   b. Astrocytes cover capillaries in a choroid plexus and regulate capillary permeability.
   c. Capillaries in a choroid plexus are very permeable.
   d. Choroid plexuses are found in all brain ventricles and in the cerebral aqueduct.
   e. None of these is a true statement.

25. As you know, Wilder Penfield poked around the precentral gyrus with his electrode. Stimulating a large area of the cortex caused muscles of the face to move. Stimulating a smaller area of the cortex caused muscles in the back to move. This specifically demonstrates that ___.
   a. more motor units innervate the back muscles  
   b. more motor units innervate the facial muscles  
   c. the back contains more sensory receptors  
   d. the face contains more sensory receptors  
   e. Wilder Penfield and Phineas P. Gage were best buddies

26. Which cranial nerve nuclei are NOT found in the pons?
   a. CN IV  
   b. CN V  
   c. CN VI  
   d. CN VII  
   e. This was not covered in lecture or lab.

27. Body temperature is sensed by thermoreceptors that are classified as ___.
   a. baroreceptors  
   b. exteroceptors  
   c. interoceptors  
   d. nociceptors  
   e. proprioceptors

28. The anterior spinothalamic tracts carry ___ information.
   a. motor  
   b. sensory  
   c. both sensory and motor  
   d. HDTV

29. The only pathway we discussed that involves synapses within sensory nuclei in the medulla is the ___.
   a. anterior spinothalamic tract  
   b. lateral corticospinal tract  
   c. lateral spinothalamic tract  
   d. posterior column pathway  
   e. vestibulospinal tract

30. The slightly crooked graph at right indicates that ___.
   a. cold thermoreceptors only fire when temperature changes  
   b. warm thermoreceptors only fire when temperature changes  
   c. both warm and cold thermoreceptors fire at all possible constant skin temperatures  
   d. the firing rate of both warm and cold thermoreceptors is greatest at 34 °C  
   e. none of these

31. The cell bodies of third-order sensory neurons are found in the ___.
   a. medulla  
   b. pons  
   c. primary sensory cortex  
   d. spinal cord  
   e. thalamus

32. Sensory information from thermoreceptors and pain receptors ascends to the brain in the ___.
   a. anterior spinothalamic tract  
   b. lateral corticospinal tract  
   c. lateral spinothalamic tract  
   d. posterior column pathway  
   e. vestibulospinal tract
33. Of the pathways we discussed in class, the vast majority of axons belonging to upper motor neurons crosses over from one side of the body to the other in the ___.
   a. medulla   b. midbrain   c. pons   d. spinal cord   e. thalamus

34. The axons referred to in the previous question travel in the ___.
   a. anterior corticospinal tract   b. corticobulbar tract   c. lateral corticospinal tract
   d. rubrospinal tract   e. spinocerebellar tract

35. Which slowly-adapting receptor is a free nerve ending?
   a. Meissner’s (tactile) corpuscle   b. Merkel’s (tactile) disc   c. nociceptor (pain receptor)
   d. Pacinian (lamellated) corpuscle   e. Ruffini’s corpuscles (end organs)

Short-answer questions (45 points)

A. Clearly diagram the structure and function of a Flexor Reflex. Include ALL diagrammatic information shown in Figure 13-19 AND label your diagram with the following ADDITIONAL terms: (30 points)

<table>
<thead>
<tr>
<th>Anterior/ventral side of spinal cord</th>
<th>Motor neuron cell bodies (label both)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axon collaterals to other segments of spinal cord</td>
<td>Pain receptor</td>
</tr>
<tr>
<td>Dorsal horn</td>
<td>Posterior/dorsal side of spinal cord</td>
</tr>
<tr>
<td>Dorsal root</td>
<td>Sensory neuron cell body</td>
</tr>
<tr>
<td>Dorsal root ganglion</td>
<td>White matter</td>
</tr>
<tr>
<td>Gray matter</td>
<td>Ventral horn</td>
</tr>
<tr>
<td>Interneuron cell bodies (label both)</td>
<td>Ventral root</td>
</tr>
</tbody>
</table>

- Use arrows to indicate the flow of information through this reflex arc.
- Use appropriate symbols to indicate excitatory (+) and inhibitory (-) synapses.
- CLEARLY indicate all synapses. For example, like this: o--------< o----------<
- Because you are adding information to the figure, you will need to construct your own key. You may use the one in the text as a backbone (pun intended) for your key. Be sure to define any abbreviations that you use.
- Please note: You will not be graded on the beauty of your artwork, only for the clarity of your diagram. I don’t care if you can draw a frying pan or a human hand. Your goal is to show me that you understand the flexor reflex.

B. Describe the path that CSF takes from the lateral ventricle to the superior sagittal sinus. You need not use complete sentences. (10 points)

C. How are arachadonic acid, the enzyme cyclo-oxygenase and prostaglandins thought to be important in pain pathways? How does aspirin work to “relieve” pain? (5 points)

Please answer on the separate sheets of paper provided for this purpose.