

NAME: \_\_\_\_\_

DATE: \_\_\_\_\_

PARTNER: \_\_\_\_\_

## **THE VERTEBRATE NERVOUS SYSTEM**

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The vertebrate nervous system includes sensation, integration, and motor output. Sensation includes specialized senses (vision, taste, hearing, etc.) as well as generalized senses (touch, pressure, pain, etc.). In this lab, you will be investigating the structure and function of special senses, the brain and the spinal cord in vertebrate animals.

### **I. TASTE AND SMELL**

*For this exercise, you will work in pairs to perform some simple tests to evaluate the relationship between the senses of taste and smell. Both partners will participate, each using half of the samples so that there is no duplication (and bias).*

1. Student A is seated at the table and is blindfolded (or keeps their eyes closed).
2. Student B hands their partner (A) one of the jellybeans.
3. Student A holds their nose closed, chews the jellybean and tells their partner what they think the flavor is (this is done with their nose closed the entire time).
4. After guessing, the student may unplug their nose and guess again.

<b>Influence of Smell on Taste</b>			
Sample	Perceived Flavor (nose plugged)	Perceived Flavor (nose unplugged)	Actual Flavor
1			
2			
3			
4			
5			
6			

Describe any observed relationship between your ability to taste and the accessibility of your olfactory passages (i.e., smell).

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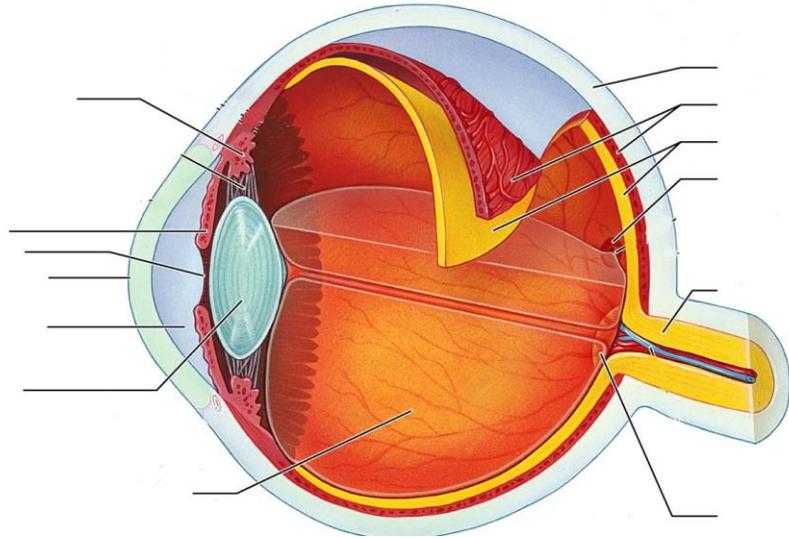
## II. VISION

In this section we will review the structures of the eye and perform some simple checks of eye function.

### A. Structures of the Eye

1. Obtain a preserved sheep eye and perform the dissection as demonstrated by the instructor.
2. Locate the following structures in the dissected eye and identify these by labeling (write the terms) the diagram below. Use your text as a guide.

- a. sclera
- b. cornea
- c. aqueous humor
- d. choroid
- e. ciliary muscles
- f. fovea
- g. lens
- h. iris
- i. pupil
- j. vitreous humor
- k. retina
- l. optic disc
- m. optic nerve



As you were focusing on the eye you were dissecting, what were your ciliary muscles doing (contracting or relaxing) and how did this affect the shape of your lens as it attempted to accommodate the rays of light being reflected into your eye?

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### B. Blind Spot

1. Use the figures below to demonstrate the presence of the “blind spot” (the point on the retina where the optic nerve exits the eye and that is devoid of photoreceptors).
  - a. Hold the paper approx. 20 in from your face.
  - b. Close your left eye.
  - c. Position the + directly in front of your right eye and focus on the object (+).
  - d. Slowly move the page closer toward your face.



- What happens to the dot? \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

2. Repeat the exercise with the image below focusing on the circle with your right eye.



- What happens to the black bars on the right? \_\_\_\_\_  
 \_\_\_\_\_
- For both of these cases demonstrating the “blind spot,” explain what is happening to produce the images perceived (or not perceived). \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**C. Visual Acuity**

*This test will determine the effectiveness of your eyes in accommodating distant images. 20/20 vision represents "normal" vision as determined by reading the Snellen Eye Chart from 20 ft away. A ratio less than 20/20 (ex. 20/40) indicates less than normal vision (i.e., what you read at 20 ft is what someone with “normal” eyesight should be able to read at 40 ft). A ratio greater than 20/20 (ex. 20/15) indicates better than normal vision (i.e., what someone with “normal” eyesight can read from 15 ft you are able to read from 20 ft).*

1. Stand behind the line (20 ft from the eye chart).
2. Remove your glasses if you wear them; leave contact lenses in but check here (\_\_\_) if you were wearing them.
3. Cover one eye with your hand.
4. Starting at the top of the chart, read as far as you can (with your partner standing by the chart and checking as you go).
5. Record the number of the smallest line that was read with complete accuracy in the table below.
6. Repeat the process for your other eye (wait a minute or two for your eye to adjust to the light).

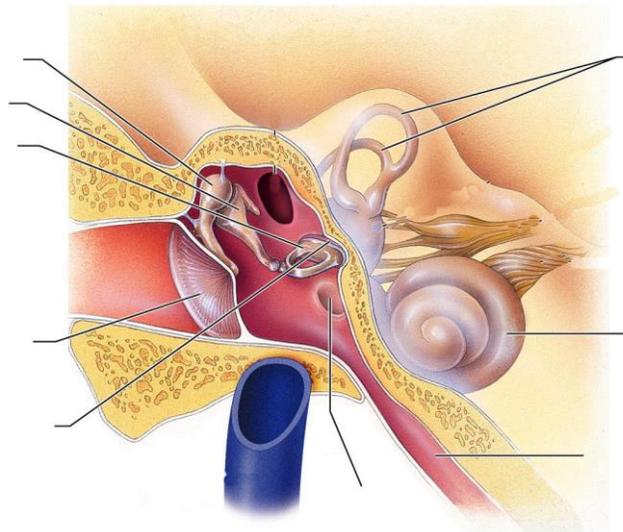
	Left Eye	Right Eye
Eyes only	20 / _____	20 / _____
With glasses / contacts	20 / _____	20 / _____

- Were both eyes the same? \_\_\_\_\_
  - What do these results indicate about the state of your visual acuity (i.e., if you are 20/20, 20/15, whatever your visual state, what does that actually mean)? \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

### III. HEARING

1. Label the structures indicated in the diagram below. Use your text as a guide.

- a. tympanic membrane (ear drum)
- b. malleus (hammer)
- c. incus (anvil)
- d. stapes (stirrup)
- e. oval window
- f. round window
- g. semicircular canals
- h. cochlea
- i. pharyngotympanic tube



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- Which of the structures are part of the middle ear? \_\_\_\_\_
- Which of the structures are part of the inner ear? \_\_\_\_\_
- Of the inner ear structures, which is involved in hearing? \_\_\_\_\_  
Which is involved in balance and motion? \_\_\_\_\_

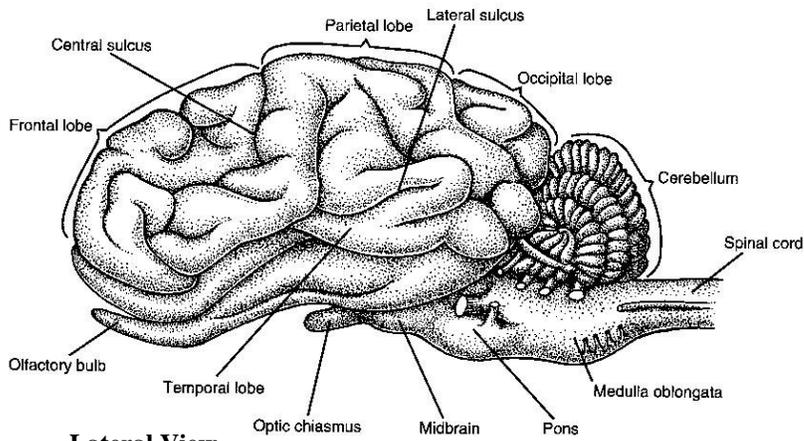
### IV. THE BRAIN

*The brain is the control center of the nervous system. In this exercise, we will use sheep brains as models to learn to recognize the major regions and structures of the mammalian brain.*

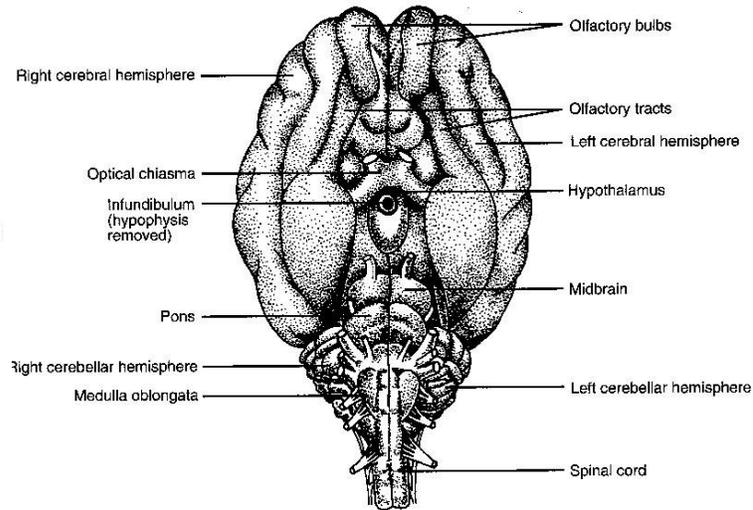
#### A. Sheep Brains

Use the figures below and your text to aid in the identification of brain structures and functions.

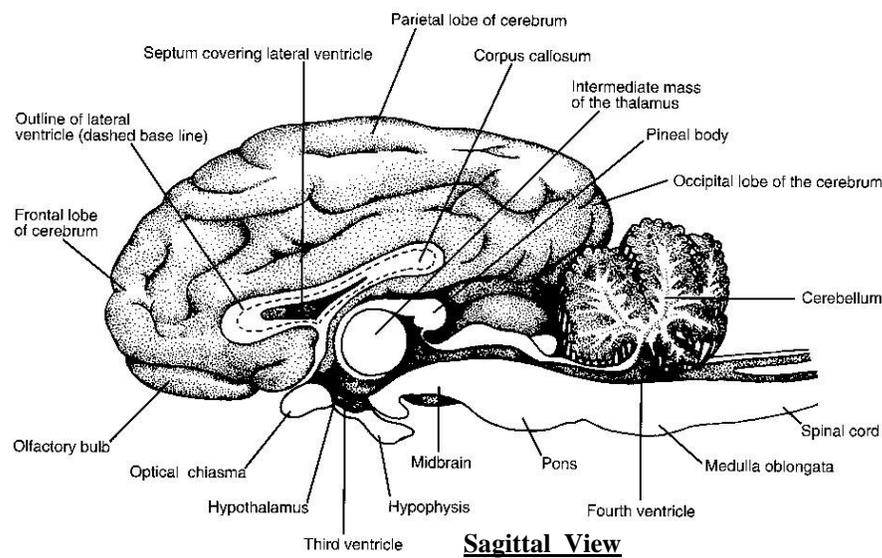
1. Locate the following structures on the whole and sagittal sections of sheep brains provided. Your instructor will initial your findings for confirmation. Also identify what those structures represent or what their primary functions are.



**Lateral View**



**Ventral View**



**Sagittal View**

- meninges \_\_\_\_\_
- Cerebrum
  - cerebral hemispheres \_\_\_\_\_
  - corpus callosum \_\_\_\_\_
  - olfactory bulbs \_\_\_\_\_
  - optic chiasma \_\_\_\_\_
  - lateral ventricles \_\_\_\_\_
- Diencephalon
  - thalamus \_\_\_\_\_
  - hypothalamus \_\_\_\_\_
- Cerebellum
- Brainstem
  - midbrain \_\_\_\_\_
  - pons \_\_\_\_\_
  - medulla oblongata \_\_\_\_\_

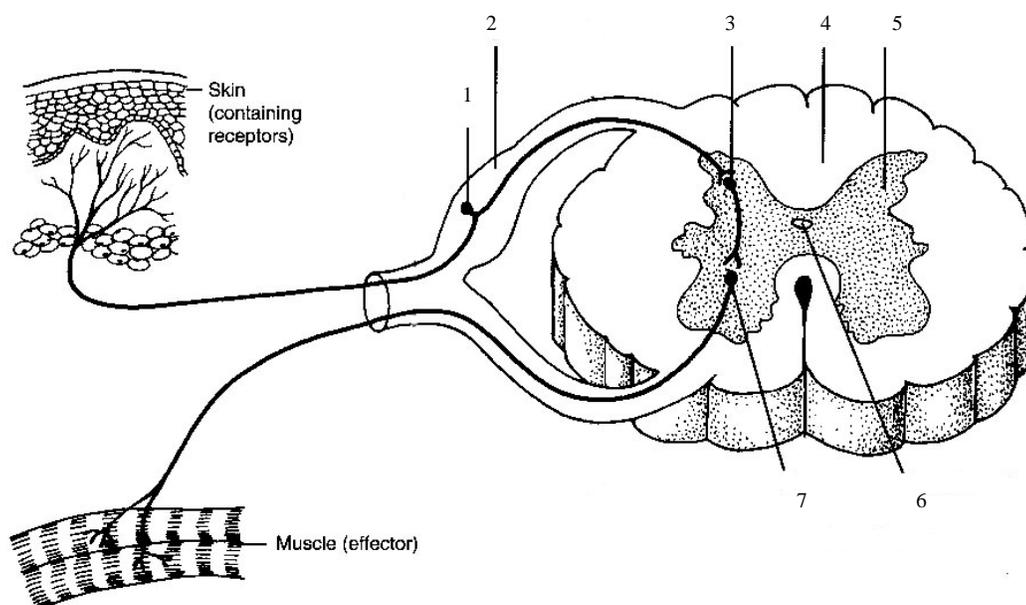
## V. THE SPINAL CORD

This portion of the CNS is protected by the vertebral column and extends as a complete structure from the brain stem into the lumbar region of the spinal column. Peripheral nerves pass through foramina (openings) between vertebrae and extend to all areas of the body. The spinal cord functions largely as a conduit of nerve tracts ultimately leading to or from the brain and is the point at which many reflex activities occur.

### A. Spinal Cord

Use the models provided and your text to assist with this section.

1. Identify the following structures from the diagram of the spinal cord (transverse section) and reflex arc below (place the appropriate number in the space before the term).



\_\_\_ gray matter

- What subcellular portions of neurons are concentrated in this area?

\_\_\_\_\_

\_\_\_ white matter

- What subcellular portions of neurons are concentrated in this area?

\_\_\_\_\_

\_\_\_ central canal

- What substance is found within this space? \_\_\_\_\_
- What is its function? \_\_\_\_\_

\_\_\_\_\_

\_\_\_ dorsal root ganglion

- What structures are localized within this ganglion? \_\_\_\_\_

\_\_\_\_\_

2. When you touch something hot, you "instinctively" pull your hand away from the source of heat. This is an example of a reflex arc, a safety measure designed to take immediate and necessary actions in response to potentially damaging stimuli. Draw arrows on the previous diagram to indicate the direction a nerve impulse would travel from the source of the stimulus to the effector (tissue responding to the stimulus).
3. Identify the functional types of neurons involved in this process.
  - #1 = \_\_\_\_\_
  - #3 = \_\_\_\_\_
  - #7 = \_\_\_\_\_