

BIO 111 - Laboratory # 8: Nervous System

- **Assigned pages:** Mader, S., et al. 2008. Inquiry of Life. pages as listed for each section
- ✓ Know the objectives and key terms listed for each section
 - ✓ More information available at biolab website: <http://web.cortland.edu/biolab/111.html>
 - ✓ **Gloves and goggles are required (please, go get them if you forgot them)**

I. Mammalian Brain:**1. GOALS:****Objectives - at the end of laboratory #8 you should be able to:**

- 1.) identify and state the functions of the parts of the brain (listed below) using the preserved sheep brain and plastic model of the human brain

Key terms - you should be able to define:

cerebrum	occipital lobe	temporal	pons
right an left cerebral hemispheres	lobe	cerebellum	medulla oblongata
corpus callosum	thalamus		pituitary gland
frontal lobe	hypothalamus		
parietal lobe	diencephalons		
	midbrain		

2. Introduction to the Brain

- 1.) **pp. 231 - 234:** Read and use the procedure and diagrams to locate and learn the functions of the parts of the brain
- 2.) **Review, p. 247:** Answer questions 1 -3.

II. Spinal Nerves and Spinal Cord:**1. GOALS:****Objectives - at the end of laboratory #8 you should be able to:**

- 1.) describe the anatomy of the spinal
- 2.) explain how the spinal cord functions in relation to the brain and nerves
- 3.) describe the path of a spinal reflex arc

Key terms - you should be able to define:

sensory neurons	motor neurons	white matter
interneurons	grey matter	

2. Spinal Cord Model

- 1.) **pp. 235-236 (top):** Use model, lab manual descriptions, and diagram to identify and learn the functions of the spinal cord and spinal nerves
- 2.) **List** the following steps of the reflex arc in order:
sensory neuron, effector, sensory receptor, motor neuron, stimulus, interneuron, response

3. Spinal Reflexes

- 1.) **pp. 236 (bottom) – 237 (top):** Read and follow the procedure for using the reflex hammers
- 2.) **Review, p. 247:** Answer questions 4-7, 18, and 19

III. The Eye:**1. GOALS:****Objectives - at the end of laboratory #8 you should be able to:**

- 1.) identify and state the function of the parts of the eye (listed below), using the preserved sheep eye and plastic model of the human eye
- 2.) explain what causes the "blind spot"
- 3.) describe what occurs when the human eye accommodates for different distances

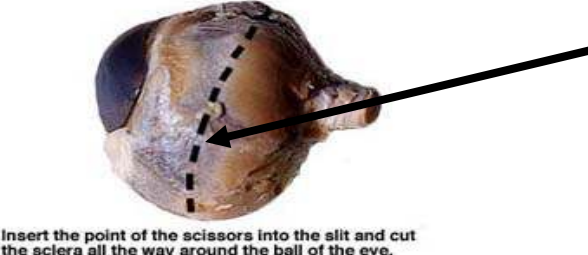
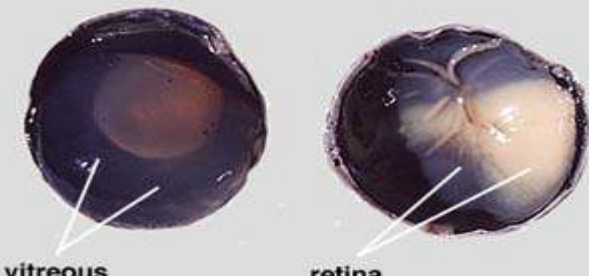
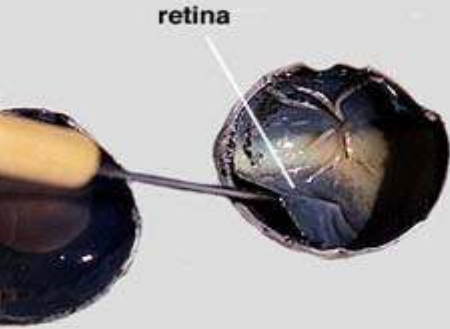
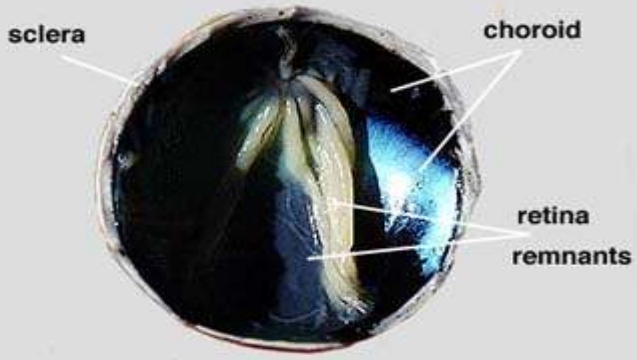
Key terms - you should be able to define:


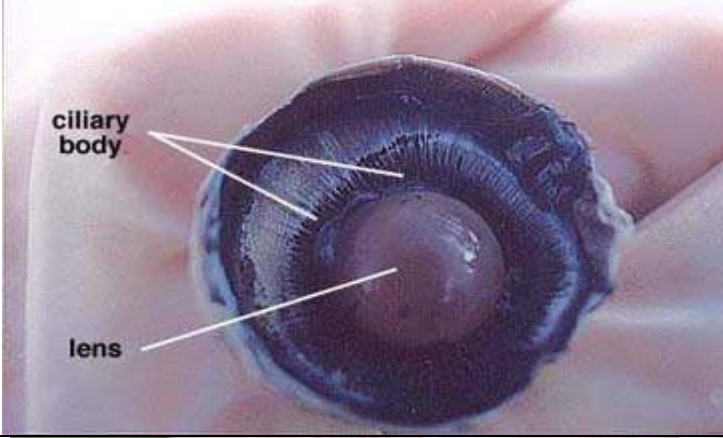
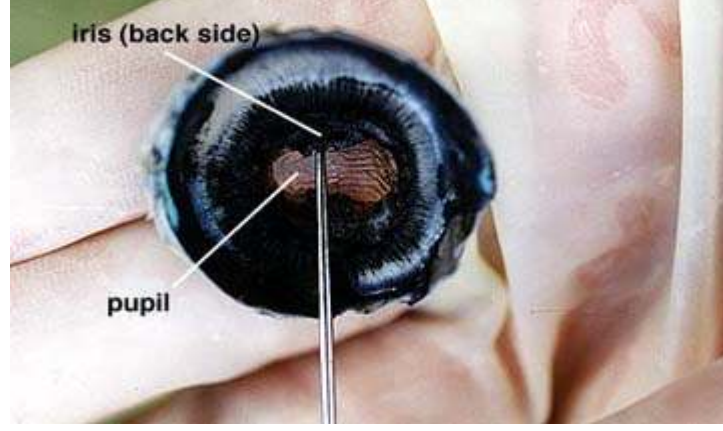
rod cells	blind spot (optic disc)	cillary body	vitreous humor
cone cells	fovea centralis	iris	optic nerve
accommodation	lens	pupil	choroid (layer)
refraction		aqueous humor	

2. Anatomy and function of the eye

- 1.) pp. 237-238 (top): Read and use procedure and diagram to identify and learn the functions of the part of the mammalian eye
- 2.) pp. 238: Read and follow the procedure for 'finding your blind spot'
- 3.) pp. 239: Read and follow the procedure for determining the accommodation of the eye

3. Dissection – Sheep eye (See Figure 18.6, p. 238 in the lab manual for anatomy and follow the steps below.)

 <p>Insert the point of the scissors into the slit and cut the sclera all the way around the ball of the eye.</p>	<ol style="list-style-type: none"> 1.) Remove the fatty tissue from around the eyeball; you should have ONLY the eyeball remaining 2.) Make the cut in the eye as indicated by the hatched line in the diagram at left
 <p>vitreous humor</p> <p>retina</p>	<ol style="list-style-type: none"> 3.) Arrange the two hemispheres of the eye as you see in the photograph at left. Observe the semi-fluid vitreous humor that fills the central cavity of the eye. It is transparent in the living eye but might be cloudy in the preserved specimen. The vitreous humor along with the aqueous humor helps to maintain the shape of the eye. The retina lines the the posterior cavity of the eye and extends forward to the ciliary body.
 <p>retina</p>	<ol style="list-style-type: none"> 4.) Use your probe to lift and pull the retina back from the underlying choroid layer. See the photograph on the left. Notice that the retina is only firmly attached to the choroid at one place. This region is the optic disc or blind spot. Here the nerve fibers leave the retina and form the optic nerve which is directly behind the blind spot.
 <p>sclera</p> <p>choroid</p> <p>retina remnants</p>	<ol style="list-style-type: none"> 5.) Use your forceps to peel the retina away from the underlying choroid layer. The retina should remain attached at the blind spot. The choroid layer is dark and relatively thin. The sclera forms the outermost layer of the eye. The choroid is on the inner surface of the sclera. The retina is the innermost layer of the eye. The choroid contains an extensive network of blood vessels that bring nourishment and oxygen to itself and the other two layers. The dark color, caused by pigments, absorbs light so that it is not reflected around inside of the eye.

<p>Remove the vitreous humor from the anterior hemisphere of the eyeball. Try not to disturb the lens as the watery fluid is removed.</p> 	<p>6.) Use your forceps and probe to remove the vitreous humor from the anterior hemisphere of the eye. See photograph at left. This will take some time and effort as the semi-fluid material separates easily. It helps to turn the hemisphere on edge and to use a scrapping motion to remove the fluid. Try not to disturb the lens that is just below the vitreous humor.</p>
 <p>ciliary body</p> <p>lens</p>	<p>7.) Removal of the vitreous humor reveals the lens, ciliary body, and suspensory ligaments. In the normal condition the lens is transparent except, when as a condition of aging, the lens turns cloudy (cataract). The normal lens is convex shaped and somewhat elastic. It is held in place by the suspensory ligaments that in turn join with the smooth muscle containing ciliary body. When the smooth muscle fibers contract the resulting force flattens the lens and the degree of bending of the light rays is reduced. Relaxation of the smooth muscle results in a thickening of the lens and a greater bending of the rays of light.</p>
 <p>iris (back side)</p> <p>pupil</p>	<p>8.) When the lens is removed, an opening, allowing light to enter the eye is seen. This opening, the pupil is located in the center of the iris. Two muscle layers of the iris regulate the size of the pupil. One layer increases the pupil size with decreasing light intensity and the other layer reduces pupil size with increasing light intensity. Note the oblong shape of the sheep pupil, in humans the pupil is circular. The iris continues all the way around the pupil opening. A second cavity or space is present between the iris and the cornea. This space is filled with a semi-liquid fluid, the aqueous humor; it helps to maintain eye's shape.</p>

The diagrams and descriptions (above) are available for the website: <http://www.jburroughs.org/science/resources/skeleton/eye/eyetitle.html>

4. Review, p. 247: Answer questions 8-10

IV. The Ear:

1. GOALS:

Objectives - at the end of laboratory #8 you should be able to:

- 1.) identify and state the functions of the parts of the ear, using the plastic model of the human ear
- 2.) describe how humans perceive e direction of sound

Key terms - you should be able to define:

pinna	incus ("anvil")	cochlea
auditory canal	stapes ("stirrups")	vestibule
tympanic membrane	auditory tube	cochlear nerve
malleus ("hammer")	semicircular canals	vestibular nerve

2. Anatomy and function

- 1.) **pp. 240-241: Read and use** the description and diagram to identify the parts and learn the functions of the human ear
- 2.) **p. 242: Follow** the experimental **procedure** for "locating sound"
- 3.) **pp. 606-607, lecture text:** Read the more complete description of how the ear functions

3. Review, p. 247: Answer questions 11-13

V. Sensory Receptors:

1. GOALS:

Objectives - at the end of laboratory #8 you should be able to:

- 1.) explain the relationship between the amount of touch receptors and the ability to distinguish two different touch points
- 2.) describe the different sensations felt during the temperature receptors experiment

2. Experiments - Temperature and Touch Receptors

- 1.) **pp. 242-243:** Read the introduction for sensory receptors of the skin
- 2.) **p. 242: Read and follow** the experimental procedure for assessing your "sense of touch"
- 3.) **p. 242: Read and follow** the experimental procedure for assessing your "sense of heat and cold"
- 4.) **p.242: Answer** the questions on this page for **both experiments**

3. Review, p. 247: Answer questions 14 and 15