



ANATOMY & PHYSIOLOGY

Lab Manual

Customized for
Morton University

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Senses and Sheep Eyeball Dissection

LAB 9

Learning Outcomes

- ▶ Students will be able to measure bone length and height using the metric system.
- ▶ Students will use anatomical position terminology correctly.
- ▶ Students will correctly identify the major organ systems in the human body.

Introduction

In this lab you will examine the senses—sight, hearing, taste, touch, and smell. You will be able to determine if your sensory pathways are in working order. You will dissect a sheep eye and learn the major anatomical features of the eye.

Pre-lab Exercise: Sight

Eye Anatomy

Extrinsic Muscles of the Eye

1. Label Figure 9-1 with the following:

extrinsic muscles
inferior oblique
inferior rectus
lateral rectus
medial rectus
superior oblique
superior rectus
trochlea (a piece of cartilage that acts as a pulley for the superior oblique)

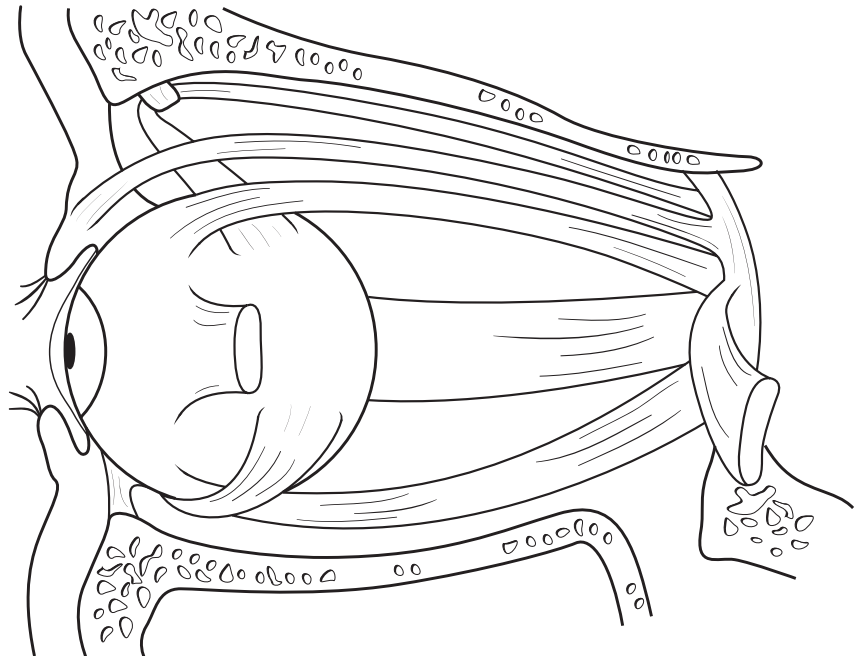


FIGURE 9-1 Extrinsic muscles of the eye.

Exercise: Anatomy of the Eye

Sensation is broadly defined as the detection of changes in the internal and external environments. Sensation may be conscious or sub-conscious, depending on the destination of the sensory information. For example, certain blood vessels have receptors that detect blood pressure. This information is taken to the brainstem, which makes changes as necessary to ensure blood pressure remains relatively constant. This information never makes it to the cerebral cortex, so you are not consciously aware of it.

The following exercises ask you to examine the anatomy and physiology of the **special senses**: vision, hearing and equilibrium, taste, and smell. You also will examine the **general senses** in this unit, which include touch, pain, and temperature.

The eye is a complex organ consisting of three components:

1. External structures, such as the **eyelids** (Figure 9.3),
2. Accessory structures, such as the **lacrimal** (LAK-rim-ul) **gland** (Figure 9.3), and
3. The **eyeball** (Figure 9.4).

Many of the external and accessory structures of the eye protect the delicate eyeball.

Anteriorly, the eye is covered by the accessory structures known as the **palpebrae** (pal-PEE-bray), or eyelids. The internal surface of the eyelids and much of the anterior eyeball are covered with a thin mucous membrane called the **conjunctiva** (kahn-junk-TEE-vuh). Another accessory structure of the eye is the **lacrimal apparatus**, which produces and drains tears. The lacrimal apparatus consists of the **lacrimal gland**, located in the superolateral orbit, and the ducts that drain the tears it produces. The other major accessory structures are the **extraocular muscles**, which move the eyeball.

Materials

- ▶ Eye models
- ▶ Preserved eyeballs
- ▶ Dissection equipment
- ▶ Dissection trays
- ▶ Snellen vision chart
- ▶ Dark green or blue paper
- ▶ Ruler

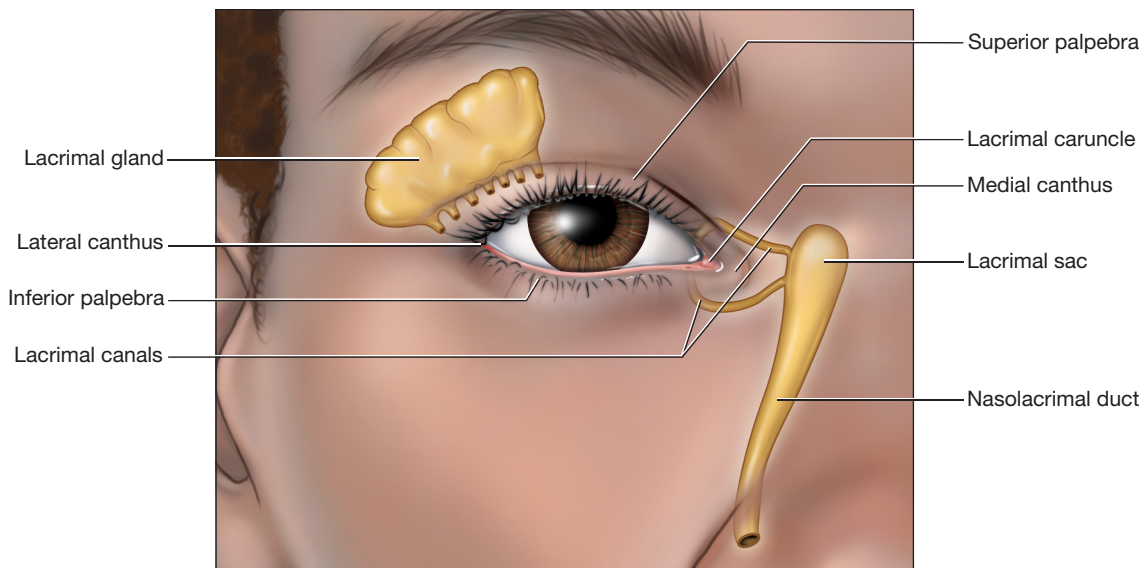


FIGURE 9.3 External and accessory structures of the eye

The eyeball itself is a hollow organ with three distinct tunics, or tissue layers (**Figure 9.4**):

1. **Fibrous tunic.** The outermost layer of the eyeball consists mostly of dense irregular connective tissue. It is avascular (lacks a blood supply) and consists of two parts:
 - a. **Cornea.** The clear cornea makes up the anterior one-sixth of the fibrous tunic and is one of the refractory media of the eyeball (it bends light coming into the eye).
 - b. **Sclera.** The sclera (**SKLAIR-uh**) is the white part of the eyeball, which makes up the posterior five-sixths of the fibrous tunic. It is white because of numerous collagen fibers that contribute to its thickness and toughness (in the same way a joint capsule or a ligament is tough and white).
2. **Vascular tunic.** Also called the **uvea** (**YOO-vee-uh**), the vascular tunic carries most of the blood supply to the tissues of the eye. It is composed of three main parts:
 - a. **Iris.** The pigmented iris is the most anterior portion of the uvea. It consists of muscle fibers arranged around an opening called the **pupil**. As the fibers contract, the pupil either constricts or dilates.
 - b. **Ciliary body.** The ciliary body is located at the anterior aspect of the eye. It is made chiefly of the **ciliary muscle**, which controls the shape of the lens. The muscle attaches to the lens via small **suspensory ligaments**.
 - c. **Choroid.** The highly vascular choroid makes up the posterior part of the vascular tunic. The choroid is brown in color to prevent light scattering in the eye.
3. **Sensory tunic.** This layer consists of the **retina** and the **optic nerve**. The retina is a thin, delicate structure that contains **photoreceptors** called **rods** and **cones**.
 - a. **Rods.** Rods are scattered throughout the retina and are responsible for vision in dim light and for peripheral vision.
 - b. **Cones.** Cones are concentrated at the posterior portion of the retina and are found in highest numbers in an area called the **macula lutea** (**MAK-yoo-luh LOO-tee-uh**). At the center of the macula lutea is the **fovea centralis** (**FOH-vee-uh sen-TRAL-iz**), which contains only cones. Cones are responsible for color and high-acuity (sharp) vision in bright light.

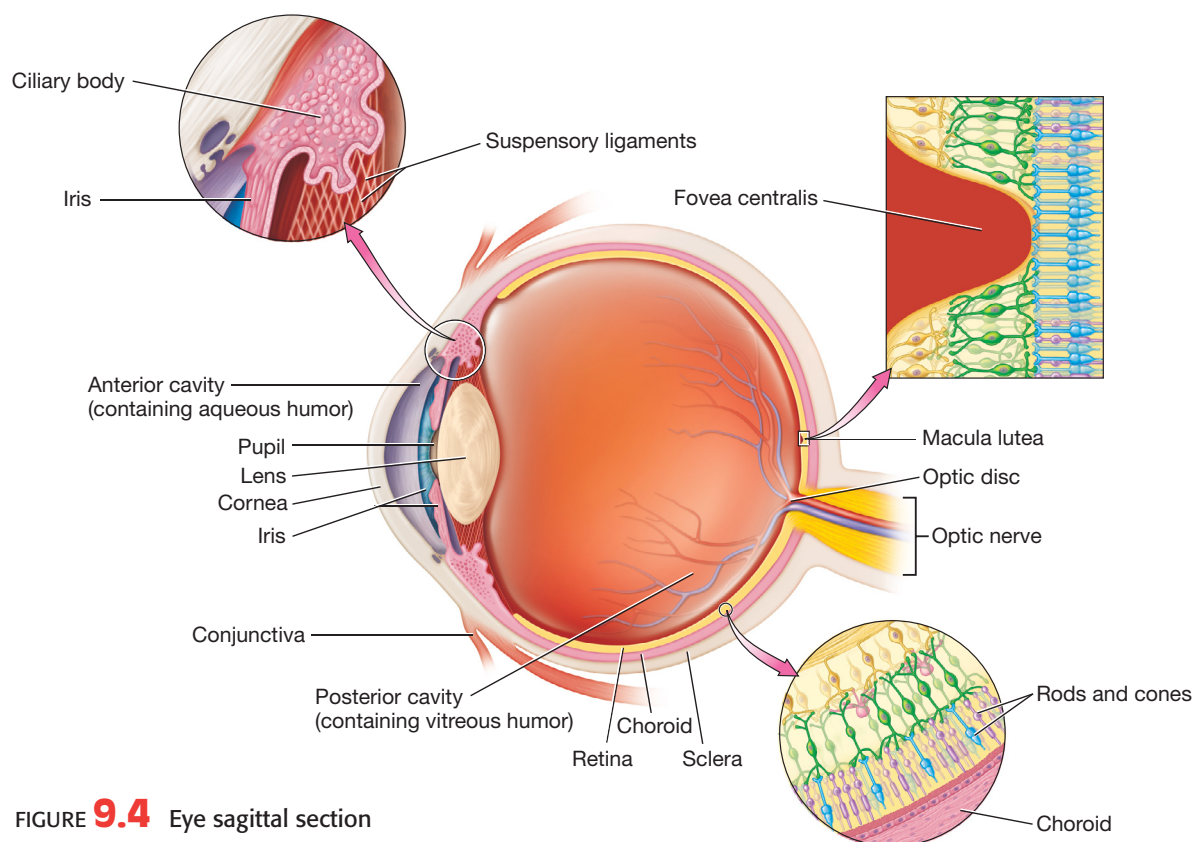
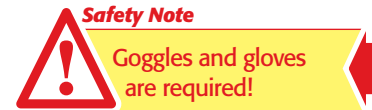


FIGURE 9.4 Eye sagittal section

Procedure 1 Eyeball Dissection

In this exercise you will examine the structures of the eyeball on a fresh or preserved eyeball. I promise eyeball dissection isn't as gross as it sounds!

- 1 Examine the external anatomy of the eyeball (Figure 9.5), and record below the structures you can identify.



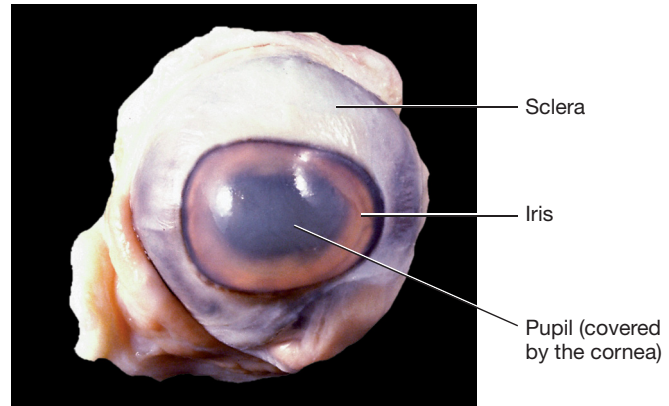


FIGURE 9.5 Anterior view of an eyeball

- 2 Use scissors to remove the adipose tissue surrounding the eyeball. Identify the optic nerve.

- 3 Hold the eyeball at its anterior and posterior poles, and use a sharp scalpel or scissors to make an incision in the frontal plane. Watch out, as aqueous humor and vitreous humor are likely to spill everywhere.

- 4 Complete the incision, and separate the anterior and posterior portions of the eyeball (Figure 9.6). Take care to preserve the fragile retina—the thin, delicate yellow-tinted inner layer.

- 5 List the structures you can identify in the anterior half of the eyeball (Figure 9.7):

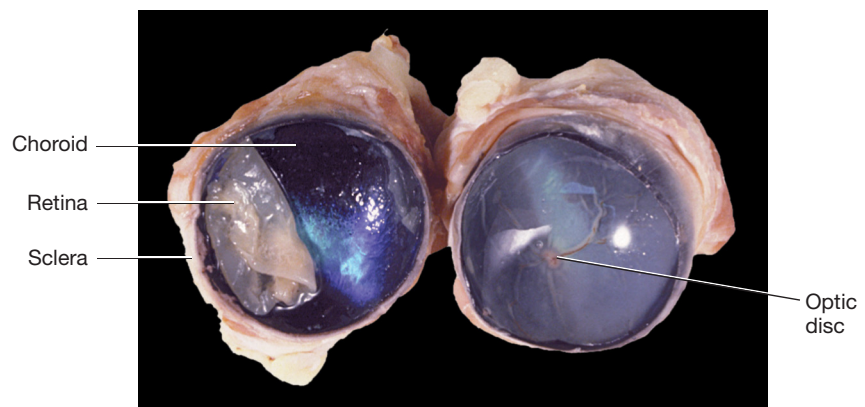


FIGURE 9.6 Frontal section of an eyeball showing the tunics

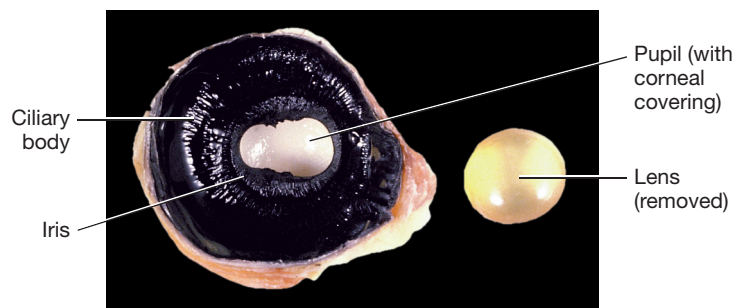


FIGURE 9.7 Posterior view of the anterior portion of an eyeball and lens

Chapter 9 Review

Name _____ Date _____ Section _____

1 Label the following parts of the eyeball on Figure 9.13.

- ☐ Choroid
- ☐ Cornea
- ☐ Iris
- ☐ Lens
- ☐ Optic nerve
- ☐ Posterior cavity
- ☐ Retina
- ☐ Sclera

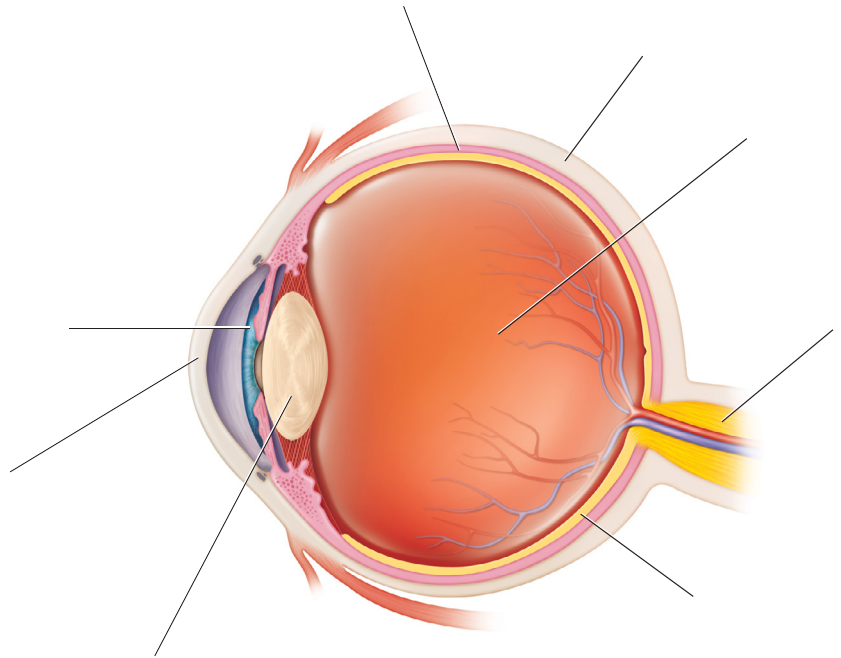


FIGURE **9.13** Eyeball, sagittal section

2 The lacrimal gland is located in the _____ and produces _____.

- a. superolateral orbit; mucus
- b. inferomedial orbit; tears
- c. superolateral orbit; tears
- d. inferomedial orbit; mucus

3 The rods are responsible for _____, whereas the cones are responsible for _____.

- a. peripheral and dim light vision; high-acuity color vision
- b. high-acuity color vision; peripheral and dim light vision
- c. peripheral and color vision; high-acuity and dim light vision
- d. high-acuity and dim light vision; peripheral and color vision

