

SHEEP EYE DISSECTION

Grade Level: Third Grade
Written by: Peggy Downs, Carbon Valley Academy, Frederick, CO
Length of Unit: One set-up lesson, one content lesson and one dissection lesson (one hour each)

I. ABSTRACT

This unit sets up a laboratory demonstration for “How the Eye Works.” Students will observe as volunteer adults dissect sheep eyes, seeing firsthand the retina, cornea, pupil, and other parts of the eye. Information for training volunteers and ordering sheep eyes and laboratory supplies is included.

II. OVERVIEW

A. Concept Objectives

1. Students understand the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations. *Colorado Science Standard #1*
2. Students understand the characteristics and structure of living things. *Colorado Science Standard #3*
3. Students understand that science involves a particular way of knowing and understand common connections among scientific disciplines. *Colorado Science Standard #6*

B. Content from the *Core Knowledge Sequence*

1. Third Grade Science: Human Body: Vision: How the Eye Works (page 82)
 - a. Parts of the eye: cornea, iris and pupil, lens, retina
 - b. Optic nerve
 - c. Farsighted and nearsighted

C. Skill Objectives

1. Students will interpret scientific illustrations.
2. Students will follow safety rules in a lab environment.
3. Students will follow a procedural lab outline of a sheep eye dissection.
4. Students will observe a sheep eye dissection.
5. Students will identify the most important structures of an eye and describe their functions.
6. Students will compare the similarities between the sheep and human eye.

III. BACKGROUND KNOWLEDGE

A. For Teachers

1. John Burroughs School (online sheep eye dissection)
<http://www.jburroughs.org/science/resources/skeleton/eye/eyetitle.html>
2. Exploratorium (online cow eye dissection)
http://www.exploratorium.edu/learning_studio/cow_eye/index.html
3. Learning Funtastics (online sheep eye dissection)
<http://www.geocities.com/smparker73/home.htm>

B. For Students

1. Kindergarten Science: the five senses and associated body parts (page 19)
2. Grade One Science: body systems (page 38)

IV. RESOURCES

Lesson Two

- A. *The Human Body Revealed*, by Dr. Sue Davidson and Ben Morgan (DK Publishing)

- B. Flashlight
- C. sticky notes with the following words written in large letters: **cornea, pupil, lens, retina, optic nerve, brain**
- D. Instructional Master 52 from *Teacher Handbook Grade 3* (or any other available worksheet with a diagram of the eye)

Lesson Three

- E. Preserved sheep eyes
- F. Vinyl gloves for all participants
- G. Disposable scalpels for adults
- H. Scissors – one for each group
- I. Dissecting trays or other cutting surface – one for each group (several layers of paper plates can work)
- J. Newspaper
- K. Paper towels
- L. Plastic trash bags
- M. Short pencil stubs for students to write with during dissection

V. LESSONS

Lesson One: Get Ready! (one day, one hour)

- A. *Daily Objectives*
 - 1. Concept Objectives
 - a. Students understand the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations.
 - 2. Lesson Content
 - a. Science: Human Body: Vision: How the Eye Works (page 82)
 - i. Parts of the eye: cornea, iris and pupil, lens, retina
 - ii. Optic nerve
 - iii. Farsighted and nearsighted
 - 3. Skill Objectives
 - a. Students will identify the most important structures of an eye and describe their functions.
- B. *Materials*
 - 1. Appendix A: Check List-copy for teacher
 - 2. Appendix B: Parent Letter-copies for each student
 - 3. Appendix C: Pretest-copies for each student
 - 4. Appendix G: Answer Key-copy for teacher
- C. *Key Vocabulary*
N/A
- D. *Procedures/Activities*
 - 1. Review the following information regarding animal dissection. You may wish to make this information available to concerned parents and/or your administrator. Be prepared to offer the alternative activities suggested in the parent letter to any families who do not wish to participate in the dissection.

<i>The case for dissection</i>	<i>The case against dissection</i>
Dissection provides a hands-on laboratory experience	An estimated 6 million animals are used for labs each year
Students can feel the textures and densities, compare relationships, and relate differences between components	Opposes moral and ethical beliefs
Gives students exposure to laboratory processes and scientific methods for	Expensive cost of preserved specimens compared to alternative

discovery and exploration	options
Core curricular goals are served by dissection	Alternatives can be reused year after year while preserved specimens are only usable for one dissection
Provides students with a sense of fascination, the sense of discovery, and a sense of wonder when students find real structures in specimens	Studies show educationally comparable alternatives are available
Allows students to have a greater understanding of life systems	Alternatives can provide students with technology exposure and skills
Middle school and high school biology classrooms all over the nation will be performing similar experiments.	Teachers speculate that some students choose other courses over Biology in order to avoid dissection.
Introducing dissection at this level may help to reduce these fears.	Introducing dissection at this level may serve to desensitize students to animals.

2. Go to one of the following web sites and view the online dissection:
 - a. John Burroughs School (online sheep eye dissection)
<http://www.jburroughs.org/science/resources/skeleton/eye/eyetitle.html>
 - b. Exploratorium (online cow eye dissection)
http://www.exploratorium.edu/learning_studio/cow_eye/index.html
 - c. Learning Funtastics (online sheep eye dissection)
<http://www.geocities.com/smparker73/home.htm>
 3. Use Appendix A: Check List to prepare for the dissection.
 4. Determine costs: You may wish to collect a student fee for this activity. When I have done this, I have collected \$2.00 per student and that was sufficient to cover all costs. The disposable scalpels may be reused two or three times.
 5. Order supplies. See Appendix A for supply lists.
 6. Choose a date and reserve the room. The dissection may take place in a science lab, cafeteria, or other large classroom. If possible, do not conduct the dissection in your own classroom as it takes a few hours for the fumes to clear.
 7. Announce the activity to the class and answer any questions.
 8. Send home permission slips: Appendix B: Parent Letters.
 9. Arrange alternative activities for students who opt-out. Students choosing to complete an online dissection can complete Appendix D: Student Lab Packet as they observe the online demonstration. Students who wish to write a report should follow your classroom rules for science reports. All students will be expected to take the Unit Assessment at the end of the unit.
 10. Distribute and administer Appendix C: Pretest.
 11. Use Appendix G: Answer Key to correct pretests. Use this information to guide your instruction in Lesson Two.
- E. *Assessment/Evaluation*
1. Appendix C: Pretest

Lesson Two: How Does the Eye Work? (one day, one hour)

- A. *Daily Objectives*
1. Concept Objectives
 - a. Students understand the characteristics and structure of living things.

2. Lesson Content
 - a. Science: Human Body: Vision: How the Eye Works
 - i. Parts of the eye: cornea, iris and pupil, lens, retina
 - ii. Optic nerve
 - iii. Farsighted and nearsighted
 3. Skill Objectives
 - a. Students will interpret scientific illustrations.
 - b. Students will identify the most important structures of an eye and describe their functions.
- B. *Materials*
1. *The Human Body Revealed*, by Dr. Sue Davidson and Ben Morgan (DK Publishing)
 2. Flashlight
 3. sticky notes with the following words written in large letters: **cornea, pupil, lens, retina, optic nerve, brain**
 4. Instructional Master 52 from *Teacher Handbook Grade 3* (or any other available worksheet with a diagram of the eye)
- C. *Key Vocabulary*
1. *Dissection* means cutting and separating the parts of an animal or plant for scientific study.
 2. The *cornea* is a thin, transparent tissue that covers the colored part of the eye.
 3. The *iris* is the colored disc behind the cornea.
 4. The *pupil* is a small opening in the center of the iris that regulates the amount of light that enters the eye.
 5. The *lens* is a small, flexible structure that focuses light on the retina and lies directly behind the iris.
 6. The *retina* lies along the inner wall of the eyeball; made up of two types of light-sensitive receptor cells.
 7. The *optic nerve* is made up of millions of nerve fibers; it acts as the cable connecting the eye to the brain.
- D. *Procedures/Activities*
1. Read aloud from *What Your Third Grader Needs to Know*, “How Your Eyes See,” pages 311-314. (Skip the box labeled “Somewhere Over the Rainbow.”) Show the diagrams as you read.
 2. Discuss the vocabulary words above. On the board, draw a diagram like the one on page 312, “A cross-section of the eyeball” and label each part.
 3. Ask for six volunteers to come to the front of the room. Arrange the students in a line at the front of the room.
 4. Shine a flashlight at the first student, and give him a sticky note that says “**cornea**.” Explain that when light shines in our eyes, it first passes through the cornea.
 5. Have that student kneel on the floor and let the light shine on the second student. Tell the class that the light passes through the pupil next, and give that student a sticky note that says “**pupil**.” Remind students that the pupil is actually a hole in the iris.
 6. Have that child kneel on the floor and shine the light on the next student. Ask the class if anyone know what the next part is. The next student should receive a sticky note that says “**lens**.” Tell students that the lens looks like a clear marble. It focuses the light so that the image is clear, like the lens of a camera.
 7. When that student kneels on the floor, send the light to the next child with a note that says “**retina**.” When you put the sticky note on this student, put the note

- upside down and remind the class that the image gets turned upside-down by the lens.
8. The next student will receive a note that says “**optic nerve.**” Again, put the note upside down, to remind students that the optic nerve sends the message to the brain upside-down.
 9. The last student represents the “**brain.**” Put the note right-side-up, and explain that the brain flips the image back correctly so we can see.
 10. Have the students stand up again and review the process at least once. You may wish to repeat the activity with a different set of students.
 11. Remind students that this is how the eye works.
 12. **Dominant Eye Activity:** Although the muscles in your eye work as a team, they do not learn to work together for several months after you are born. Even after they do, you will still have one dominant eye. It is like being right-handed or left-handed. To find out which eye is stronger, form a circle with your finger and thumb. Hold that position and place your hand in front of you. With both eyes, look at something through the circle. Continue to hold that position and close one eye; then open it. Close the other eye. The eye which is still able to view the object through the circle is your dominant eye.
 13. **Depth Perception Activity:** Depth perception is the ability to see things in “3D.” You need two eyes working together to see this way. Hold two pencils lengthwise (sideways) in front of you, one in each hand. With one eye closed, try to touch the erasers together. Did you miss? Now try it with both eyes open.
 14. Read the text on pages 8, 9 and 12 from *Human Body Revealed*. This book has a transparent overlay page that shows the external features of the eye, and then the internal components, including how the optic nerve connects to the brain.
 15. Review the vocabulary words and the diagram of the eye.
 16. Distribute Instructional Master 52 or other worksheet for independent practice.
- E. *Assessment/Evaluation*
1. Instructional Master 52

Lesson Three: Sheep Eye Dissection (one day, one hour)

- A. *Daily Objectives*
1. Concept Objectives
 - a. Students understand the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations.
 - b. Students understand the characteristics and structure of living things.
 - c. Students understand that science involves a particular way of knowing and understand common connections among scientific disciplines.
 2. Lesson Content
 - a. Science: Human Body: Vision: How the Eye Works
 - i. Parts of the eye: cornea, iris and pupil, lens, retina
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 3. Skill Objectives
 - a. Students will interpret scientific illustrations.
 - b. Students will follow a procedural lab outline of a sheep eye dissection.
 - c. Students will follow safety rules in a lab environment.
 - d. Students will observe a sheep eye dissection.
 - e. Students will identify the most important structures of a sheep eye and describe their functions.
 - f. Students will compare the similarities between the sheep and human eye.

- B. *Materials*
1. Appendix D: Student Lab Packet – copied and stapled into booklets for students
 2. Pencils
- C. *Key Vocabulary*
N/A
- D. *Procedures/Activities*

Set-Up Procedures:

1. Divide students into work teams of 3 to 5 children for each volunteer.
2. Provide copies of **Sheep Eye Dissection Procedures** below to each volunteer.
3. Have students bring a short pencil stub to write with. The pencils will need to be thrown away after the dissection because they will be messy.
4. In a lab, cafeteria, or large classroom, set up work tables for each group. Cover each table surface with newspaper or plastic covering.
5. Provide each work area with paper towels, scalpel, tweezers, lab scissors, plastic trash bag, and a cutting surface (dissecting tray or other hard surface).
6. When class begins, distribute one sheep eyeball to each group.
7. Allow each group to work at its own pace, following the procedures below. Teacher should circulate the room and monitor progress, watching for any students who may need fresh air or a reminder about safety rules.
8. The experience can be overwhelming for some students. Allow students to leave the room and go to a supervised area to clear their heads if the experience becomes too intense. Encourage them to return promptly however, as they will still be expected to complete the packet.

Safety Rules:

9. Review the following safety rules with students. Have students follow along on page 2 of the lab packet.
 - a. Do not touch the scalpels. Only trained volunteers may handle the scalpels.
 - b. Wear safety gloves at all times.
 - c. Do not leave the lab area without permission. Let us know if you feel sick and we will let you go to the rest area.
 - d. Follow basic classroom safety rules at all times, including inside voices, walking, quiet hands and feet, etc.
 - e. Students who do not follow safety rules will be removed from the lab.

Sheep Eye Dissection Procedures:

10. Have students put on their safety gloves.
11. Say: **Here is a sheep's eye.** Tell students to examine the outside of the eye. Say: **Compare the sheep's eye with a neighbor's eye. Whose eye is bigger?** Tell students to circle the correct answer on the lab packet.
12. **Why would a sheep need an eye of this size?** *Sheep are prey. They need large eyes to help them locate and identify predators.*
13. Say: **See how many parts of the eye you can identify. Mark each item on your lab packet as you find it.**
14. After students have examined the eye and marked their packets, check their work with the following information: **You should be able to find the whites (or sclera). You should also be able to identify the fat and muscle surrounding the eye. You should be able to find the covering over the front of the eye (the cornea). You MAY be able to see eyelashes.**
15. Help students find the pink and white tissue around the eye. Tell students: **This is fat and muscle. Without moving your head, look up, look down. Look all around. Six muscles attached to your eyeball move your eye so you can look**

- in different directions. Sheep have only four muscles. They can look up, down, and side to side. They have to move their heads to look all around.**
16. Ask students: **How many muscles does a sheep eye have? (four) How many does a human eye have? (six)** Tell students to write these answers in their lab packet.
 17. **The fat and muscle wrap around the eye and hold it in place. If you reach up and feel around your eye, you'll feel the bone of your skull. The fat cushions the eye in the bony socket so the eye doesn't get bruised. Why do we have fat around our eyes? To protect or cushion the eyes.** Tell students to write this in their lab packets.
 18. Use scissors to trim away the fat and muscle from the eye so that the **sclera** and **optic nerve** are exposed. Tell students: **We cut away all the fat and muscle so we can see the eyeball.**
 19. Use a scalpel to make an incision in the **cornea**. Cut until the clear liquid under the cornea is released. Tell students: **The clear liquid is the aqueous humor. It's made of mostly water and protein. It brings nutrients to the eye and it helps the eyeball keep its shape. Notice the color of the liquid. It is clear or purplish. How would you describe the liquid? It is watery.**
 20. Have students write a few words to describe the **aqueous humor** in their lab packets.
 21. Point out the cornea and tell students: **The cornea is made of tough material. It helps protect your inner eye. It also helps you see by bending the light that comes into your eye. When the sheep was alive, the cornea was clear. In your sheep's eye, the cornea may be cloudy.**
 22. **When the sheep was alive, the cornea gave protection from grass and twigs which might poke the sheep in the eye. To let you see how many protective layers the cornea has, we are going to cut the cornea off. We'll make an incision in the sclera to remove the cornea.**
 23. Use the scalpel to make an incision through the **sclera** in the middle of the eye. Use your scissors to cut around the middle of the eye, cutting the eye in half. You will end up with two halves. On the front half will be the **cornea**.
 24. Once you have removed the **cornea**, place it on the board (or cutting surface) and cut it with your scalpel. Tell students: **Listen carefully. Hear the crunch? That's the sound of the scalpel crunching through layers of clear tissue. The sheep's eye has many layers of make it thick and strong.**
 25. Allow students to examine the cornea. Have students answer the question in their lab packet: **Can you see through the cornea?**
 26. **The next step is to pull out the iris. This is the part of the eye that gives your eye its color. What color is the sheep's iris?** Tell students to answer this question in their lab packets.
 27. The **iris** is between the **cornea** and the lens. Find the **iris** and pull it out. It should come out in one piece.
 28. Tell students: **The iris also contains the pupil. You can see that there is a hole in the center of the iris. That is the pupil, the hole that lets light into the eye. The iris contracts or expands to change the size of the pupil. In dim light, the pupil opens wide to let light in. In bright light, the pupil shrinks to block light out. What shape is the sheep's pupil?** Have students answer this question in their lab packets.
 29. The next part is the **lens**. It is a clear lump about the size of a marble. It will be slightly discolored and yellow, but would be perfectly clear as a living structure. Remove the **lens** and allow students to feel it.

30. Tell students: **The lens feels soft on the outside and hard in the middle.**
31. Allow students to examine the lens. Say: **Hold the lens up and look through it. What do you see?** *You should be able to see images through the lens.*
32. **Put the lens down on a newspaper and look at the words on the page. What do you see?** *Although the lens is cloudy, it should be clear enough to see that it will magnify the words on the page like a pair of reading glasses. Everything will be upside down and backwards. This is how the lens sends the image to the retina.*
33. Give students time to answer the question in their lab packets: **How is the lens like a magnifier?**
34. Put the lens on a cutting surface and use the scalpel to slice the lens in half. **What do you see?** *You can peel away the inner layers of the lens.*
35. **The lens is sort of like an onion. It grows new layers every year.** Tell students explain how the lens is like an onion in their lab packets.
36. Tell students: **The back of the eye is filled with a clear jelly. That is the vitreous humor, a mixture of protein and water. It is clear so light can pass through it. It also helps the eyeball keep its shape.**
37. If the **vitreous humor** is still in the eyeball, empty it out. Have students review what the aqueous humor looked like (*thin, watery fluid*). Have students explain how the vitreous humor is different from the aqueous humor in their lab packets.
38. On the inside of the back half of the eyeball, you can see some blood vessels that are part of a thick fleshy film. Tell students: **That film is the retina. Before we cut the eye open, the vitreous humor pushed against the retina so that it lay flat on the back of the eye.** (It may be all pushed together in a wad now.)
39. Ask students: **What color is the sheep retina?** Have students describe the retina in their lab packets.
40. Tell students: **The retina is made of cells that can detect light. The eye's lens used the light that comes into the eye to make an image. That image is focused on the retina. The cells of the retina transfer the messages to the brain.**
41. Use your finger to push the retina around. The retina is attached to the back of the eye at just one spot. Tell students: **That is the place where all the nerves from the cells in the retina come together. All these nerves go out the back of the eye, forming the optic nerve, the bundle of nerves that carries messages from the eye to the brain. The brain uses information from the retina to make a mental picture of the world.**
42. **The spot where the retina is attached to the back of the eye is called the blind spot. Because there are no light-sensitive cells at that spot, you can't see any images that land in that place on the retina.**
43. Have students answer the question in their lab packets: **Why do we have a blind spot?**
44. Separate the retina from the back portion of the eye and observe the colorful reflective layer of the tapetum (*tuh-PEE-tum*), the blue-green shiny material. Tell students: **This layer reflects light back onto the retina, enhancing night vision in nocturnal and deep-sea animals. Humans do not have this layer. The back of our eye is black to absorb light.** Have students answer these questions in their lab packets: **What color is the sheep's tapetum? What does the tapetum do?**
45. Look for the **optic nerve** at the back of the eye. To see the separate fibers of the nerve, pinch the nerve with a pair of scissors. If you squeeze the **optic nerve**,

you may get some white goop. Tell students: **That is myelin, the fatty layer that surrounds each fiber of the nerve.**

46. Have students answer this question in the lab packets: **What happened when the optic nerve was pinched or cut?**
47. Have students examine the sheep eye and draw a diagram of the parts they have identified in their lab packets. *Diagram should include the basic eyeball shape, cornea, iris, pupil, lens, retina, and optic nerve.*
48. Have students write several sentences on the last page of the lab packet to answer: **What was your favorite part of this experience?**

Clean-up Procedures:

49. Encourage students to participate in lab clean-up.
 50. All remains must be wrapped in paper towels and properly disposed of in a plastic trash bag.
 51. All dissecting instruments, including scalpels, scissors, trays and tweezers must be thoroughly washed with soap and water, dried, and returned to storage.
 52. All used pairs of vinyl gloves must be disposed of in plastic trash bag.
 53. All lab work areas must be washed down with soap and water.
 54. All lab participants must thoroughly wash hands with soap and water.
- E. *Assessment/Evaluation*
1. Collect and review Appendix D: Student Lab Packets.

VI. CULMINATING ACTIVITY

- A. Unit Assessment

VII. HANDOUTS/WORKSHEETS

- A. Appendix A: Check List
- B. Appendix B: Parent Letter
- C. Appendix C: Pretest
- D. Appendix D: Student Lab Packet
- E. Appendix E: Glossary
- F. Appendix F: Unit Assessment
- G. Appendix G: Answer Key

VIII. BIBLIOGRAPHY

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Appendix A Check List

Check List

- Volunteers recruited
- Permission slips sent home
- Dissection scheduled for _____
- Volunteer training scheduled for _____
- Room reserved
- Supplies ordered
- Supplies received

Supply List:

For each small group:
Sheep eyes
Scalpels
Lab scissors
Dissecting tray or other cutting surface
Newspaper
Paper towels
Plastic trash bags
Vinyl gloves (for each participant)

Biological Supply Companies:

(All companies checked for current information and product availability as of July 2006)

Blue Spruce Biological Supply, Inc.
701 Park Street
Castle Rock, CO 80109
1-800-825-8522
<http://bluebio.com>

Carolina Supply Company
2700 York Rd.
Burlington, NC 27215
www.carolina.com

Fisher Scientific
485 Frontage Road
Burr Ridge, IL 60521
1-800-955-1177
www.fishersci.com

Frey Scientific
PO box 8101
100 Paragon Parkway
Mansfield, OH 44903
1-800-225-FREY
www.freyscientific.com

Ward's Natural Science
PO Box 92912
Rochester, NY 14692
1-800-962-2660
www.wardsci.com

Appendix B Parent Letter

(date)

Dear Students, Parents and Guardians,

Your child has an opportunity to participate in an exciting and educational scientific experience. This is an important part of our Core Knowledge unit, "How the eye works". Students will observe the dissection of sheep eyes. This lab experience is scheduled for:

(date)

(time)

As a classroom activity, this type of hands-on experience will hopefully provide students with a wealth of knowledge as well as an understanding of the scientific process. Students will not be allowed to handle the scalpels; they will observe as trained volunteers perform the dissections. Students will be provided with gloves so that they can safely handle the dissected materials. Students will be expected to follow all school and lab safety rules during this lab experience.

In consideration of students, parents, or guardians who may oppose dissections, alternative activities are available. Please discuss this activity as a family and check the appropriate box below.

- I agree to have my child participate in the dissection.
- I agree to volunteer as a group leader in the dissection. I understand training will take place as follows:

(date)

(time)

(location)

- I do not agree to have my child participate in the dissection. I understand my child will be expected to take the unit assessment with the rest of the class.

My child will complete **one** of the following activities:

_____ Observe an online dissection and complete an activity packet provided by the teacher.

_____ Write a 2 to 3 page report explaining "How the Eye Works"

Signatures:

(student)

(parent/guardian)

Thank you for your consideration,

(teacher name)

Appendix C

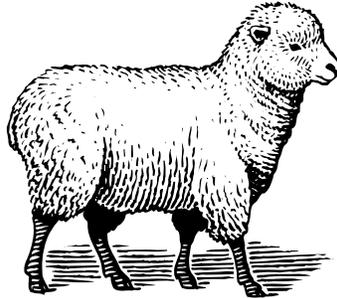
Pretest

Name: _____

Directions: Answer each question to the best of your ability.

1. What is the sclera?
2. What does the lens do?
3. What is the job of the vitreous humor?
4. Describe the cornea.
5. What does the retina do?
6. Describe the pupil.
7. What is the aqueous humor?
8. What is the optic nerve?

Student Lab Packet



Student Name:

Student Lab Packet



Student Name:

Safety Rules

- Do not touch the scalpels. Only trained volunteers may handle the scalpels.
- Wear safety gloves at all times.
- Do not leave the lab area without permission. Let us know if you feel sick and we will let you go to the rest area.
- Follow basic classroom safety rules at all times, including inside voices, walking, quiet hands and feet, etc.
- Students who do not follow safety rules will be removed from the lab.



Safety Rules

- Do not touch the scalpels. Only trained volunteers may handle the scalpels.
- Wear safety gloves at all times.
- Do not leave the lab area without permission. Let us know if you feel sick and we will let you go to the rest area.
- Follow basic classroom safety rules at all times, including inside voices, walking, quiet hands and feet, etc.
- Students who do not follow safety rules will be removed from the lab.



Appendix D, page 3

Whose eye is bigger? (circle one)

The sheep eye? Your neighbor's eye?

Check each part as you find it:

- Sclera ("whites" of the eye)
- Eyelashes
- Fat (lumpy light yellowish material)
- Muscle (stringy light brown or pinkish material)
- Cornea (thick cloudy covering over the eyeball)

How many muscles does the eye have?

Sheep eye _____

Human eye _____

Whose eye is bigger? (circle one)

The sheep eye? Your neighbor's eye?

Check each part as you find it:

- Sclera ("whites" of the eye)
- Eyelashes
- Fat (lumpy light yellowish material)
- Muscle (stringy light brown or pinkish material)
- Cornea (thick cloudy covering over the eyeball)

How many muscles does the eye have?

Sheep eye _____

Human eye _____

Appendix D, page 4

Why do we have fat around our eyes?

What does the aqueous humor look like?

Can you see through the cornea? (circle one)

yes no a little bit

What color is the sheep's iris?

What shape is the sheep's pupil?

Why do we have fat around our eyes?

What does the aqueous humor look like?

Can you see through the cornea? (circle one)

yes no a little bit

What color is the sheep's iris?

What shape is the sheep's pupil?

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When you looked through the lens, what did you see?



How is the lens like a magnifier?

How is the lens like an onion?

When you looked through the lens, what did you see?



How is the lens like a magnifier?

How is the lens like an onion?

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How is the vitreous humor different from the aqueous humor?

What color is the sheep's retina?

Why do we have a blind spot?

How is the vitreous humor different from the aqueous humor?

What color is the sheep's retina?

Why do we have a blind spot?

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What color is the sheep's tapetum?

What does the tapetum do?

What happened when the optic nerve was pinched or cut?

What color is the sheep's tapetum?

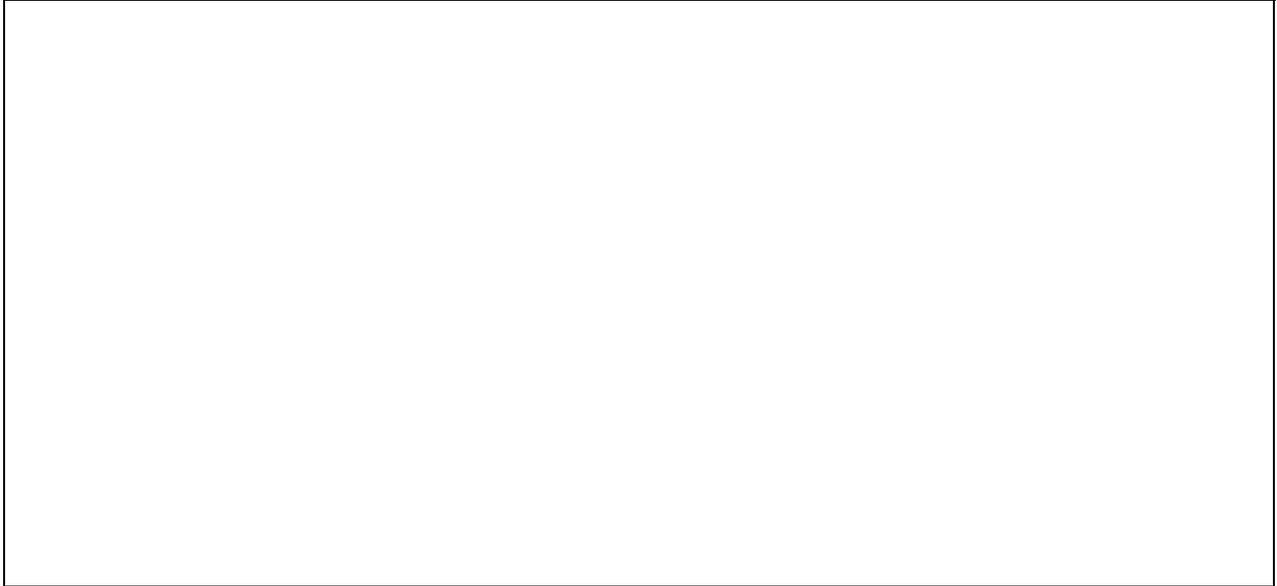
What does the tapetum do?

What happened when the optic nerve was pinched or cut?

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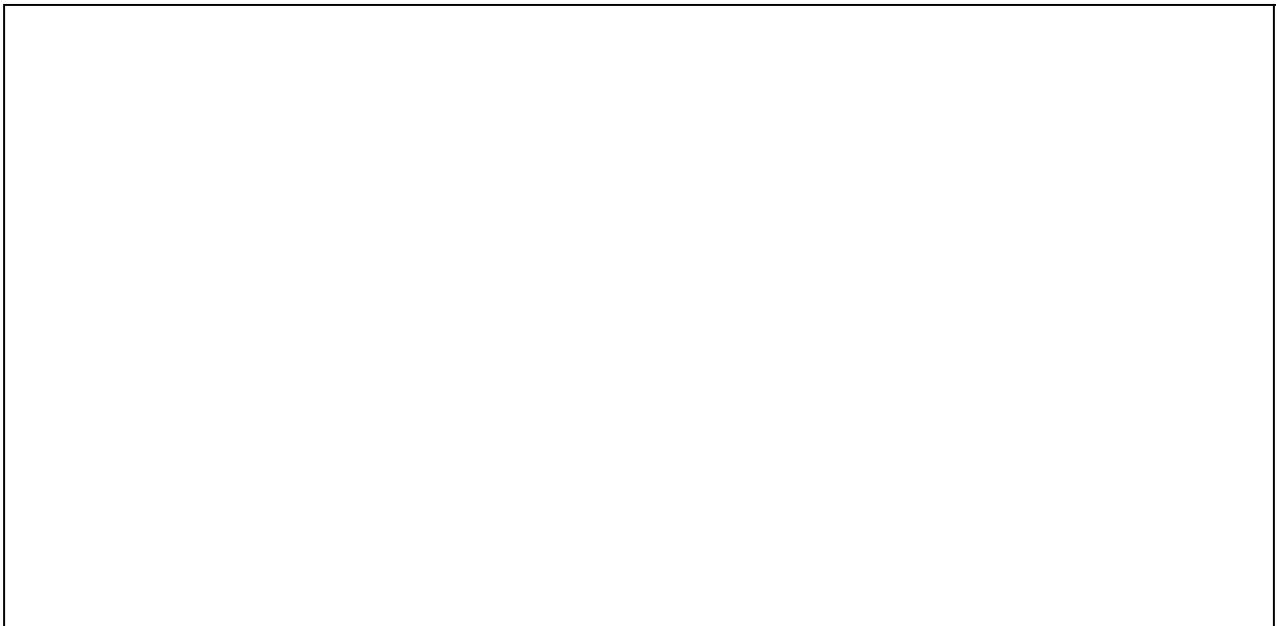
Draw a picture of the sheep's eye. Label each part:

cornea iris pupil lens retina optic nerve



Draw a picture of the sheep's eye. Label each part:

cornea iris pupil lens retina optic nerve



Appendix E

Glossary

Aqueous humor: a clear fluid that helps the cornea to keep its shape

Blind spot: the place where all nerves from the retina join to form the optic nerve. Each eye has a blind spot where there are not light-sensitive cells.

Cornea: a tough, clear covering over the iris and the pupil that helps protect the eye. Light bends as it passes through the cornea. The cornea begins bending light to make an image; the lens finishes the job.

Dissection: cutting and separating the parts of an animal or plant for scientific purposes.

Farsighted: an eye problem where a person is able to see distant objects better than nearby ones.

Fat: a white, lumpy material surrounding the eyeball. Fat cushions and protects the eyes.

Iris: a muscle that controls how much light enters the eye. It is suspended between the cornea and the lens. Human irises come in many colors, including brown, blue, green, and gray.

Lens: a clear, flexible structure that makes an image on the eye's retina. The lens is flexible so that it can

change shape, focusing on objects that are close up and objects that are far away.

Myelin: the white fatty liquid that may be squeezed out of the optic nerve. It is protective fat that surrounds each nerve.

Nearsighted: An eye problem where a person is able to see nearby objects better than far away ones.

Optic nerve: the bundle of nerve fibers that carry information from the retina to the brain.

Pupil: the dark circle in the center of your iris. It's a hole that lets light into the inner eye.

Retina: the layer of light-sensitive cells at the back of the eye. The retina detects images focused by the cornea and the lens. The retina is connected to the brain by the optic nerve.

Sclera: the thick, tough, white outer covering of the eyeball

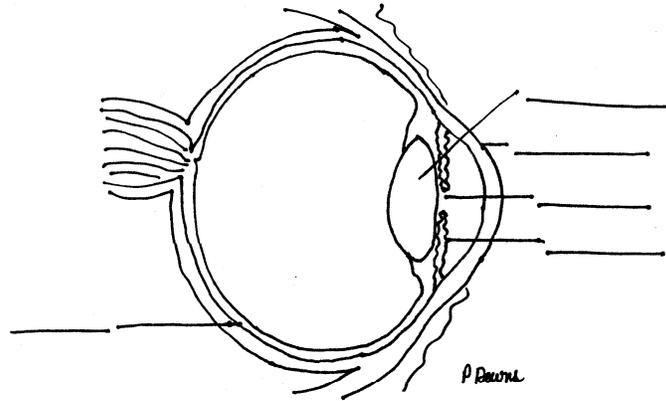
Tapetum: the shiny blue-green material behind the retina. The tapetum reflects light back to the retina to enhance night vision in nocturnal and deep sea animals. Humans do not have this layer.

Vitreous humor: the thick, clear jelly that helps give the eyeball its shape.

Appendix F
Unit Assessment

Name: _____

1. Label the following parts of the eye: **cornea**, **iris**, **pupil**, **lens**, and **retina**. Spell these correctly.



2. Draw a line to match each word with its definition.

Dissection	Able to see distant objects better than nearby ones
Optic nerve	Able to see nearby objects better than far away ones
Nearsighted	Cutting and separating parts of an animal or plant for scientific purposes
Farsighted	Carries messages from the eye to the brain so we can see

3. Number the following steps IN ORDER to describe how the eye works.

_____ The optic nerve sends the upside-down image to the brain, where it is flipped right-side-up and we see.

_____ Light passes through the cornea, the pupil, and the lens.

_____ The retina sends the upside-down image to the optic nerve.

_____ The lens focuses the light on the retina, sending an upside down image.

4. Explain why your pupil gets bigger and smaller.

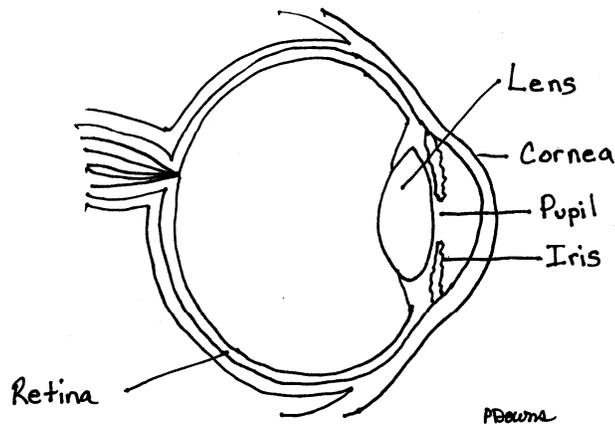
Appendix G, page 1
Answer Key

Pretest Answer Key

1. What is the sclera? *The white part of the eye*
2. What does the lens do? *It focuses the light on the retina*
3. What is the job of the vitreous humor? *It helps the eye keep its shape and it helps to focus the light on the retina*
4. Describe the cornea. *It protects the eye and helps focus the light*
5. What does the retina do? *The retina detects images focused by the cornea and the lens.*
6. Describe the pupil. *The pupil is the black hole in the center of the iris.*
7. What is the aqueous humor? *It is a clear, runny liquid behind the cornea.*
8. What is the optic nerve? *It is the bundle of nerves at the back of the eye, connecting the eye to the brain*

Unit Assessment Answer Key

1. Label the following parts of the eye: cornea, iris, pupil, lens, and retina. Spell these correctly.



Appendix G, page 2

2. Draw a line to match each word with its definition.

Dissection	↘	↙	Able to see distant objects better than nearby ones
Optic nerve	↘	↙	Able to see nearby objects better than far away ones
Nearsighted	↘	↙	Cutting and separating parts of an animal or plant for scientific purposes
Farsighted	↘	↙	Carries messages from the eye to the brain so we can see

3. Number the following steps IN ORDER to describe how the eye works.

- | | |
|----------|---|
| 4 | The optic nerve sends the upside-down image to the brain, where it is flipped right-side-up and we see. |
| 1 | Light passes through the cornea, the pupil, and the lens. |
| 3 | The retina sends the upside-down image to the optic nerve. |
| 2 | The lens focuses the light on the retina, sending an upside down image. |

4. Explain why your pupil gets bigger and smaller.

Acceptable answers include an explanation of how the iris expands to allow more light when it is dark, and how the iris contracts to let in less light when it is bright.