

Bio& 241, A&P, Unit 4 Lab 4

Human Eye and Vision

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Surface Anatomy of the eye:

Eyelid or Palpebrae (*)	Palpebral conjunctiva	Levator palpebrae superioris
Iris (*)	Pupil (*)	Lacrimal caruncle
Sclera (*)	Bulbar conjunctiva	Optic nerve (*)
Superciliary ridge	Superior Palpebral sulcus	Inferior palpebral sulcus
Medial commissure	Lateral commissure	Tarsal plate
Palpebral fissure	Cornea (*)	

Lacrimal Apparatus:

Lacrimal gland	Lacrimal ducts	Superior lacrimal punctum
Inferior lacrimal punctum	Superior lacrimal canal	Inferior lacrimal canal
Lacrimal sac	Nasolacrimal duct	

Skull review

Lacrimal sulcus	Lacrimal foramen
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Extrinsic eye muscles review:

medial rectus	lateral rectus	inferior rectus
superior rectus	superior oblique	inferior oblique
Levator palpebrae superioris		

Intrinsic eye muscles:

Circular iris muscle	Radial iris muscle	Ciliary muscle
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Layers forming the posterior wall of the eye:

Sclera (*) [external or fibrous tunic]	Choroid (*) [Middle or Vascular tunic]
Retina (*) [Internal or Nervous Tunic]	

Internal Anatomy of the eye:

Posterior or vitreous cavity (*)

Vitreous humor [Body] (*)	Ciliary body (*)	Ciliary processes (*)
Ora serrata	Fovea centralis	Macula lutea
Otic disc	Tapetum lucidum (*) [unique to the Sheep eye]	

Anterior cavity (*)

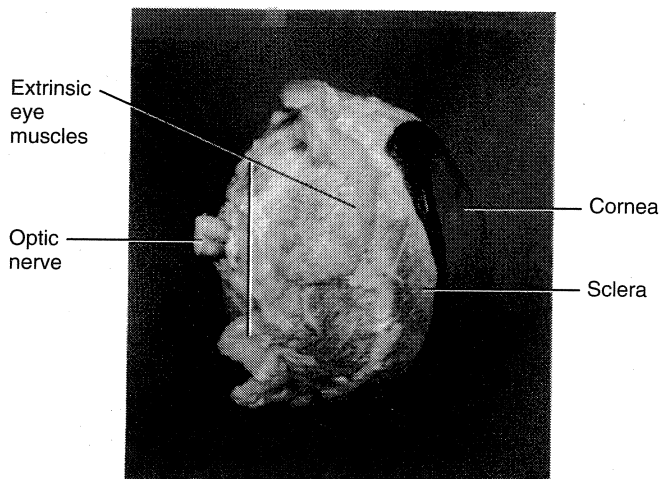
Lens (*)	Suspensory ligaments (*)	Aqueous humor (*)
Posterior chamber (*)	Anterior chamber (*)	Iris (*)
Pupil (*)	Sclera) venous sinus or Canal of Schlemm	

(*) Structures you should observe on the sheep eye.

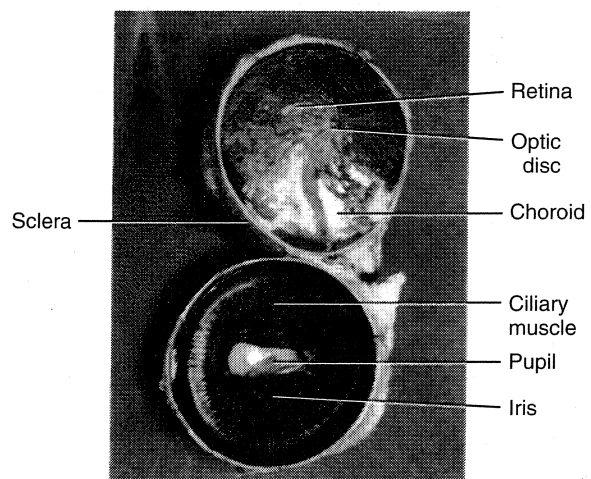
All other structure should be observed on models, charts, and/or pictures.

Dissection of Sheep or Cow Eyes:

1. Obtain a dissection tray, disposable gloves, and a preserved eye
2. Identify the external eye structures: cornea, sclera, optic nerve, and extrinsic eye muscles. In a normal eye the cornea is transparent. Do to the fact that preservative denatures proteins the cornea in the preserved eye will be opaque.
3. Using the point of a scalpel, punch an opening about 1/4-inch posterior to the cornea through the sclera. Be careful not to squeeze to tightly or liquid, aqueous humor, may squirt out of the eye.
4. Using the opening, use scissors to cut an incision all the way around the eye. Separate the eye into anterior and posterior portions. If you are careful, the **vitreous body** should remain in the posterior cavity of the eye and the **lens** will remain with the anterior portion.
5. Carefully remove the lens. Note the suspensory ligaments attached to it. Just like the cornea, the lens should be transparent. Do to the fact that preservative denatures proteins the lens in the preserved eye will be opaque.
6. Carefully remove the vitreous body from the posterior cavity of the eye. The **retina**, the deepest thin beige layer, may separate from the **choroid coat**. Note that the retina is only attached at the **optic disc**.
7. Pull the retina away from the choroid coat, thin black layer. The choroid coat of animals like sheep, cows, and deer has an iridescent reflecting surface called the **tapetum lucidum**. This surface, not found in human eyes, enables animals to see better at night.
8. Separate the choroids coat from the **sclera**, the outer most tough layer of the eye.
9. Discard eye as instructed by your instructor. Clean up your dissecting tray and equipment.



(a) External structures



(b) Anterior and posterior sections

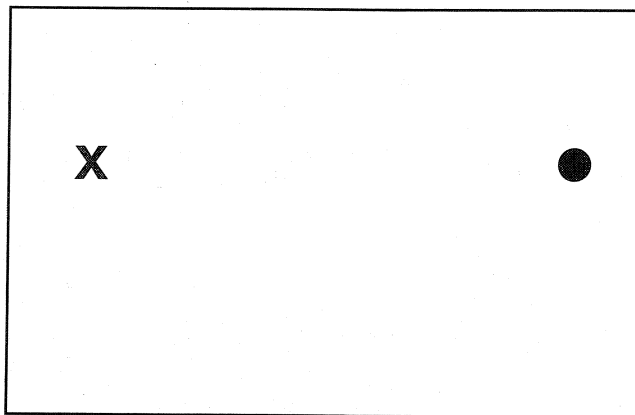
Histology of the Retina:

1. Obtain a microscope and the retina slide from your box.
2. Using the low-power objective. Find the posterior surface of the eyeball. The most superficial layer will be the **sclera** which is made of dense connective tissue.
3. The choroids coat will be the next layer with dark brown to black granules.
4. The inner most or deepest layer will be the retina. Examine the retina with the high power objective and make sure you can find all of the following layers, which will be observed from superficial to deep: Pigmented epithelium, Outer segments of rods and cones, Nuclei of rods and cones, Outer synaptic layer, Nuclei of bipolar neurons, Inner synaptic layer, and Ganglion cell layer. (Use pictures from the textbook, atlas, or PowerPoint's to help identify layers)

Locating the Blind Spot:

1. Your eyes have a blind spot created by the **optic disc**, the point where the optic nerve forms.
2. Looking at the figure below, hold the page with both hands and extend both arms in front of you. Position the "X" in line with your right eye.
3. Slowly, move the figure toward you. The dot will disappear when it crosses your optic disc. If you move the figure too fast, you will miss it. If so try again moving the figure more slowly.
4. Have your lab partner measure the distance between the figure and your eye when the dot disappears. If you continue to move the figure closer to your eye the dot will reappear. Repeat with both eyes.

Distance for Left eye _____ Distance for right eye _____



Blind spot test.

Visual acuity Tests:

These tests measure the ability of the lens to focus light reflected from an object on the central fovea. To adjust for objects at different distances from the eye, the lens must **accommodate**. At 20 feet, light rays from an object are nearly parallel and do not have to bend as much to focus on the central fovea. To observe objects closer than 20 feet, the lens must change shape or accommodate, that is become thicker and more round. The **ciliary** muscle is responsible for lens accommodation. Individuals who have normal distance vision and normal near vision are **emmetropic**. Individuals that have normal distance vision but abnormal (blurry) near vision are **hyperopic** (farsighted). Someone who is **myopic** (nearsighted), will have abnormal (blurry) distance vision but normal near vision.

As we age, the ability of the lens to accommodate is diminishes because the lens losses its flexibility, a persons near point of vision changes. This condition is called **presbyopia**. The average near point of vision for a young adult is 10cm, an adult in their 40's is 20cm, and someone in their 60's is 80cm.

Another eye defect is, **Astigmatism**, which is caused by irregularities in the curvature of either the cornea or lens. Someone with astigmatism will not be able to see all of an image clearly, some parts will be blurry.

Smellen eye chart for Distance Visual Acuity:

1. Have subject stand 20 feet from the Smellen chart and cover the left eye with their hand. First do test without corrective lens.
2. Have subject read the smallest line of letter without squinting. If they can correctly read half of the letters or more, ask them to read the letters on the next smaller line.
3. Record the number of the line with the smallest sized letters read with half or greater accuracy.
4. Repeat procedure with left eye.

Uncorrected results:

Right Eye_____

Left Eye_____

Corrected results:

Right Eye_____

Left Eye_____

*20/20 is normal, 20/40 subject sees at 20 ft what some with normal vision sees at 40 ft.

Smellen Acuity Card for Near Visual Acuity:

1. Have subject hold the Smellen acuity card 14 inches from their face. Have the subject cover the left eye with their hand.
2. Use the same directions you used for read the Smellen distance test.
3. Repeat procedure with left eye.

Uncorrected results:

Right Eye _____

Left Eye _____

Corrected results:

Right Eye _____

Left Eye _____

95			distance equivalent
			$\frac{20}{800}$
874			Point
			$\frac{20}{400}$
2843			26
			$\frac{20}{200}$
638	E W E	X O O	14
			$\frac{20}{100}$
8745	E M W	O X O	10
			$\frac{20}{70}$
63925	M E E	X O X	8
			$\frac{20}{50}$
428365	W E M	O X O	6
			$\frac{20}{40}$
374258	E W E	X X O	5
			$\frac{20}{30}$
937826	W M E	X O O	4
			$\frac{20}{25}$
44733	E W M	O O X	3
			$\frac{20}{20}$

Snellen acuity card.

Measurement of Near Point of Vision:

1. Have subject hold the Smellen Visual Acuity Card 14 inches their eye.
2. Cover left eye and read the letters from the line directly above their near visual acuity results.
3. Have them slowly move the chart closer to their eye until the letters become blurry.
4. Measure the distance from the card to the subjects' eye in centimeters.
5. Repeat with other eye.

Uncorrected results:

Right Eye _____

Left Eye _____

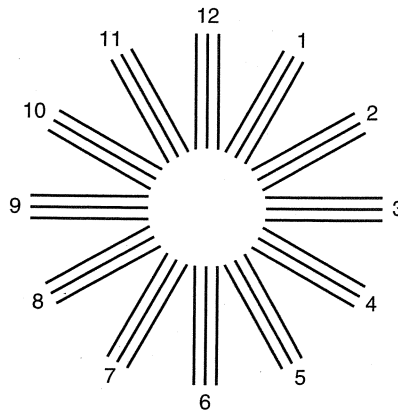
Corrected results:

Right Eye _____

Left Eye _____

Test for Astigmatism:

1. Remove corrective lenses.
2. Cover the right eye and look at the center of the astigmatism chart.
3. If all radiating lines are equally sharp and dark you do not have astigmatism. However if some lines are lighter or blurry than other lines, you have astigmatism.



Astigmatism chart.