

NAME _____ LAB TIME/DATE _____

REVIEW SHEET
exercise

24

Special Senses: Vision

Anatomy of the Eye

1. Name five accessory eye structures that contribute to the formation of tears and/or aid in lubrication of the eyeball, and then name the major secretory product of each. Indicate which has antibacterial properties by circling the correct secretory product.

Accessory structures	Product
<i>lacrimal glands</i>	<i>saline solution; (lysozyme)</i>
<i>conjunctiva</i>	<i>mucus</i>
<i>tarsal or meibomian glands</i>	<i>oily secretion</i>
<i>caruncle</i>	<i>whitish, oily secretion</i>
<i>ciliary glands</i>	<i>sweat</i>

2. The eyeball is wrapped in adipose tissue within the orbit. What is the function of the adipose tissue?

To package, protect, and cushion the eyeball in the bony orbit.

What seven bones form the bony orbit? (Think! If you can't remember, check a skull or your text.)

sphenoid _____ *ethmoid* _____ *palatine* _____
zygomatic _____ *maxillary* _____
frontal _____ *lacrimal* _____

3. Why does one often have to blow one's nose after crying? *Because tears drain into the nasal cavities via the*

nasolacrimal ducts.

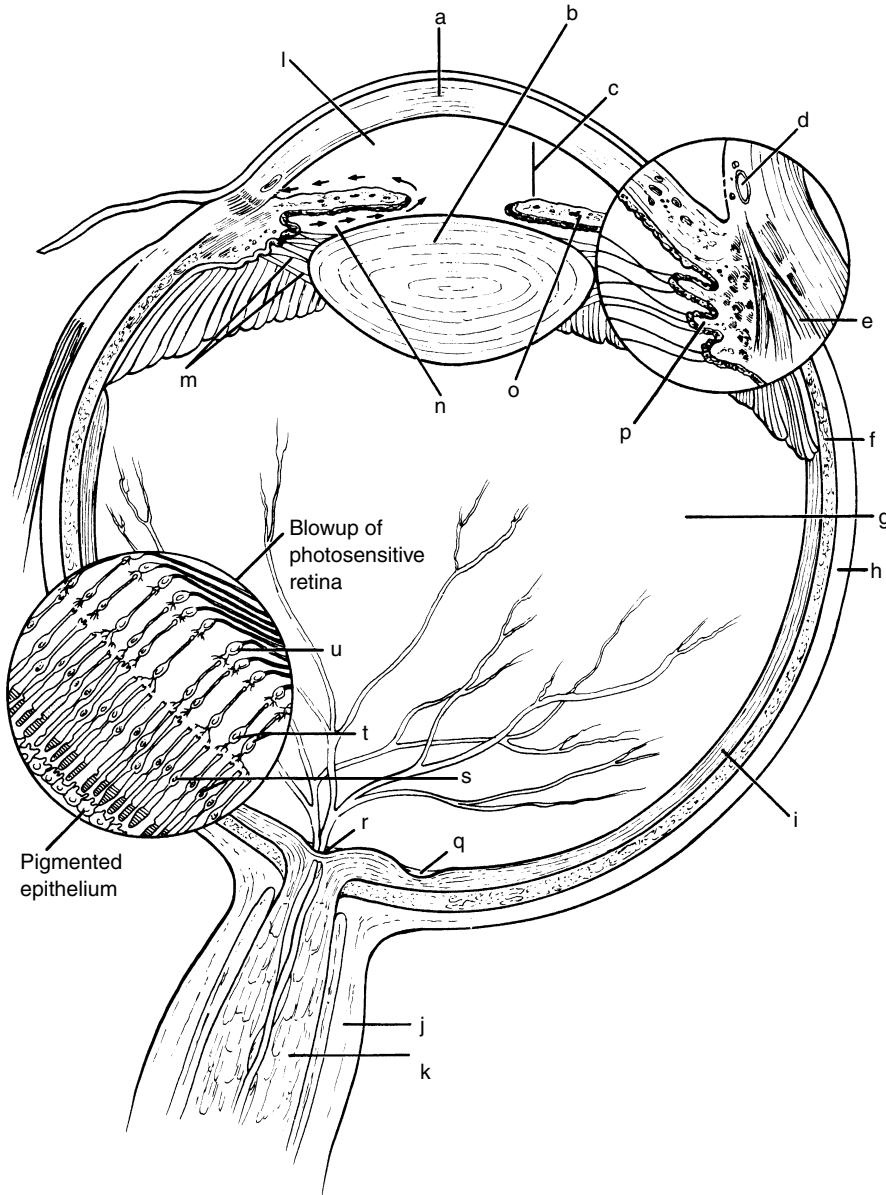
4. Identify the extrinsic eye muscle predominantly responsible for the actions described below.

lateral rectus _____ 1. turns the eye laterally
medial rectus _____ 2. turns the eye medially
inferior oblique _____ 3. turns the eye up and laterally
inferior rectus _____ 4. turns the eye inferiorly
superior rectus _____ 5. turns the eye superiorly
superior oblique _____ 6. turns the eye down and laterally

5. What is a sty? Inflammation of a small oil or sweat gland associated with the eye exterior.

Conjunctivitis? Inflammation of the conjunctiva.

6. Using the terms listed on the right, correctly identify all structures provided with leader lines in the diagram.



- c 1. anterior chamber
- l 2. anterior segment containing aqueous humor
- t 3. bipolar neurons
- p 4. ciliary body and processes
- e 5. ciliary muscle
- f 6. choroid
- a 7. cornea
- j 8. dura mater
- q 9. fovea centralis
- u 10. ganglion cells
- o 11. iris
- b 12. lens
- r 13. optic disc
- k 14. optic nerve
- s 15. photoreceptors
- n 16. posterior chamber
- i 17. retina
- h 18. sclera
- d 19. scleral venous sinus
- m 20. suspensory ligaments
- g 21. vitreous body in posterior segment

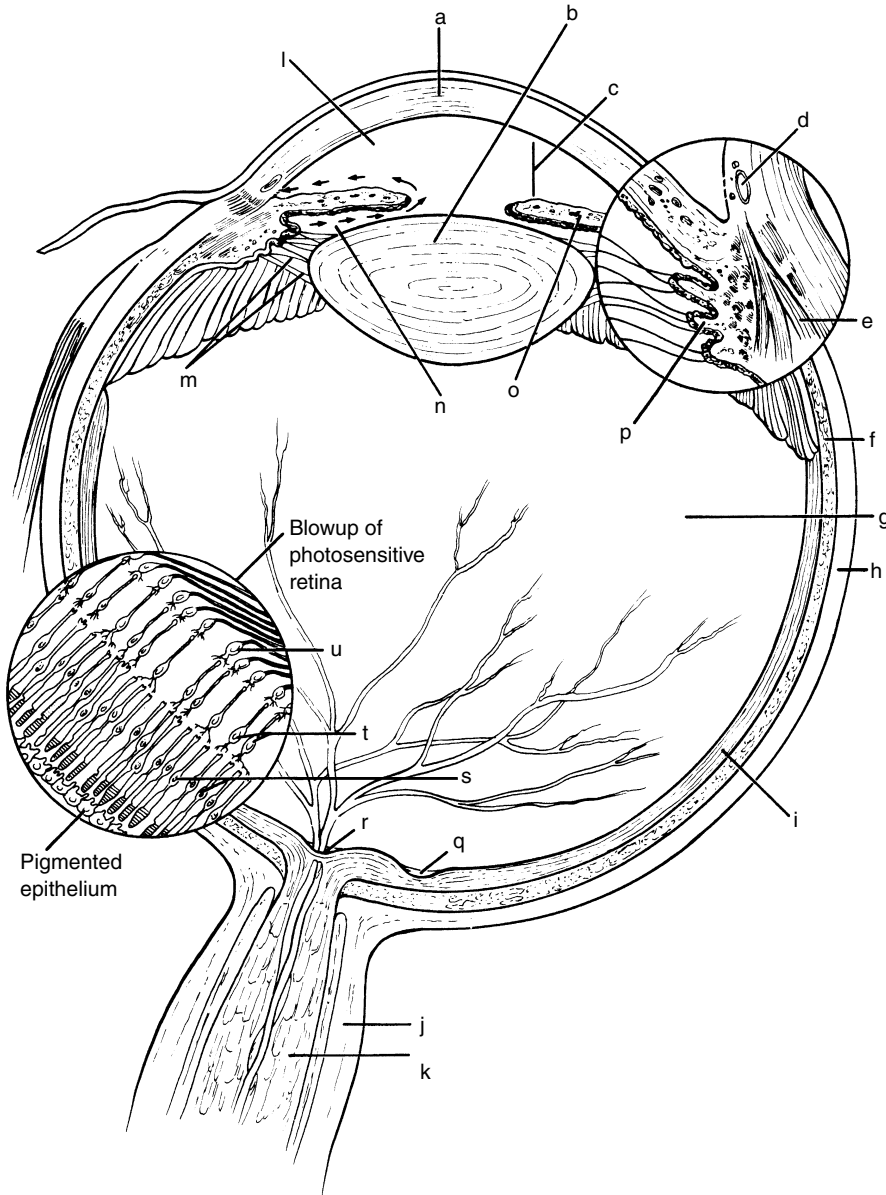
Notice the arrows drawn close to the left side of the iris in the diagram above. What do they indicate?

The flow of aqueous humor from the ciliary processes of the ciliary body to the scleral venous sinus (canal of Schlemm).

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7. Match the key responses with the descriptive statements that follow.

- | | | | |
|------|--|--------------------|-------------------------|
| Key: | a. aqueous humor | e. cornea | j. retina |
| | b. choroid | f. fovea centralis | k. sclera |
| | c. ciliary body | g. iris | l. scleral venous sinus |
| | d. ciliary processes of the ciliary body | h. lens | m. suspensory ligament |
| | | i. optic disc | n. vitreous humor |

- m; suspensory ligament 1. attaches the lens to the ciliary body
- a; aqueous humor 2. fluid filling the anterior segment of the eye
- k; sclera 3. the “white” of the eye
- i; optic disc 4. part of the retina that lacks photoreceptors
- c; ciliary body 5. modification of the choroid that controls the shape of the crystalline lens
- c; ciliary body 6. contains the ciliary muscle
- l; scleral venous sinus 7. drains the aqueous humor from the eye
- j; retina 8. tunic containing the rods and cones
- n; vitreous humor 9. substance occupying the posterior segment of the eyeball
- b; choroid 10. forms the bulk of the heavily pigmented vascular tunic
- c; ciliary body, g; iris 11. smooth muscle structures
- f; fovea centralis 12. area of critical focusing and discriminatory vision
- d; ciliary processes of the ciliary body 13. form (by filtration) the aqueous humor
- a; aqueous humor, e; cornea, h; lens
- n; vitreous humor 14. light-bending media of the eye
- e; cornea 15. anterior continuation of the sclera—your “window on the world”
- k; sclera 16. composed of tough, white, opaque, fibrous connective tissue

8. The iris is composed primarily of two smooth muscle layers, one arranged radially and the other circularly.

Which of these dilates the pupil? The radial layer

9. You would expect the pupil to be dilated in which of the following circumstances? Circle the correct response(s).

- | | |
|-------------------------------------|--|
| a. in brightly lit surroundings | c. during focusing for near vision |
| <u>b. in dimly lit surroundings</u> | <u>d. in observing distant objects</u> |

10. The intrinsic eye muscles are under the control of which of the following? (Circle the correct response.)

- autonomic nervous system somatic nervous system

18. What does the retina look like? Thin yellowish white membrane. (Often becomes crumpled during dissection of the eye.)

At what point is it attached to the posterior aspect of the eyeball? At the optic disc.

Visual Tests and Experiments

19. Match the terms in column B with the descriptions in column A:

Column A	Column B
<u>g; refraction</u> 1. light bending	a. accommodation
<u>a; accommodation</u> 2. ability to focus for close (under 20 ft) vision	b. astigmatism
<u>d; emmetropia</u> 3. normal vision	c. convergence
<u>e; hyperopia</u> 4. inability to focus well on close objects (farsightedness)	d. emmetropia
<u>f; myopia</u> 5. nearsightedness	e. hyperopia
<u>b; astigmatism</u> 6. blurred vision due to unequal curvatures of the lens or cornea	f. myopia
<u>c; convergence</u> 7. medial movement of the eyes during focusing on close objects	g. refraction

20. Complete the following statements:

In farsightedness, the light is focused 1 the retina. The lens required to treat myopia is a 2 lens. The “near point” increases with age because the 3 of the lens decreases as we get older. A convex lens, like that of the eye, produces an image that is upside down and reversed from left to right. Such an image is called a 4 image.

1. behind
2. concave
3. elasticity
4. real

21. Use terms from the key to complete the statements concerning near and distance vision.

Key: a. contracted b. decreased c. increased d. relaxed e. taut

During distance vision: The ciliary muscle is d, the suspensory ligament is e, the convexity of the lens is b, and light refraction is b. During close vision: The ciliary muscle is a, the suspensory ligament is d, lens convexity is c, and light refraction is c.

22. Explain why vision is lost when light hits the blind spot. This area lacks photoreceptors.

23. What is meant by the term *negative afterimage* and what does this phenomenon indicate? Relative to retinal function, a negative afterimage is a dark image of a bright object (e.g. light bulb) that is “seen” when the eyes are closed after viewing the bright object. It indicates that the rhodopsin pigments have been bleached.

24. Record your Snellen eye test results below:

Left eye (without glasses) _____ (with glasses) _____

Right eye (without glasses) _____ (with glasses) _____

Is your visual acuity normal, less than normal, or better than normal? _____

Explain. _____

Explain why each eye is tested separately when using the Snellen eye chart. *There is usually a slight difference in the visual acuity of the two eyes.*

Explain 20/40 vision. *Poorer than normal vision. Able to read #40 letters at 20 feet. The normal eye reads these letters at 40 feet.*

Explain 20/10 vision. *Better than normal vision. Can read #10 letters at 20 feet. The normal eye would have to be 10 feet away to read these letters.*

25. Define *astigmatism*: *Blurred vision due to unequal curvatures of the lens or cornea.*

How can it be corrected? *With specially ground (circularly ground) lenses.*

26. Record the distance of your near point of accommodation as tested in the laboratory:

right eye _____ left eye _____

Is your near point within the normal range for your age? _____

27. Define *presbyopia*: *"Old vision." A hyperopia resulting from decreasing lens elasticity with advancing age.*

What causes it? *Decreased function of an increasingly inelastic lens.*

28. To which wavelengths of light do the three cone types of the retina respond maximally?

red _____, *blue* _____, and *green* _____

29. How can you explain the fact that we see a great range of colors even though only three cone types exist?

When more than one cone type is stimulated simultaneously, intermediate colors (of the visible spectrum) are seen.

30. What is the usual cause of color blindness? *Malfunction or absence of one or more of the three cone types.*

31. Explain the difference between binocular and panoramic vision. Binocular—visual fields overlap considerably but not completely; therefore, slightly different views are received by each eye. Panoramic—little or no overlap of visual fields; therefore, each eye “sees” a different view.

What is the advantage of binocular vision? Allows for depth perception.

What factor(s) are responsible for binocular vision? The slight difference between the visual fields of the two eyes and the partial crossover at the optic chiasma.

32. In the experiment on the convergence reflex, what happened to the position of the eyeballs as the object was moved closer to the subject’s eyes? Eyeballs turned medially.

What extrinsic eye muscles control the movement of the eyes during this reflex? Medial recti

What is the value of this reflex? Allows the image to be precisely focused on the fovea of each eye.

What would be the visual result of an inability of these muscles to function? Diplopia (double vision)

33. In the experiment on the photopupillary reflex, what happened to the pupil of the eye exposed to light?

It constricted. What happened to the pupil of the nonilluminated eye? It constricted.

Explanation? Regulation of pupil constriction by the parasympathetic division of the autonomic nervous system is coordinate (i.e. consensual) and prevents overillumination of the delicate retinal cells.

34. Why is the ophthalmoscopic examination an important diagnostic tool? Allows noninvasive examination of the retinal condition and vasulature.

35. Many college students struggling through mountainous reading assignments are told that they need glasses for “eyestrain.” Why is it more of a strain on the extrinsic and intrinsic eye muscles to look at close objects than at far objects?

No accommodation or convergence is required for distant vision.