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.

<table>
<thead>
<tr>
<th>Accessory structures</th>
<th>Product</th>
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2. The eyeball is wrapped in adipose tissue within the orbit. What is the function of the adipose tissue?

________________________________________________________________________

3. Why does one often have to blow one’s nose after crying? ____________________________________________
   ______________
   nasolacrimal ducts.

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

   ____________________________________________ 1. turns the eye laterally
   ____________________________________________ 2. turns the eye medially
   ____________________________________________ 3. turns the eye up and laterally
   ____________________________________________ 4. turns the eye inferiorly
   ____________________________________________ 5. turns the eye superiorly
   ____________________________________________ 6. turns the eye down and laterally

5. What is a sty? ____________________________________________

________________________________________________________________________

Conjunctivitis? ____________________________________________
6. Correctly identify each lettered structure in the diagram by writing the letter next to its name in the numbered list.

   1. anterior chamber  
   2. anterior segment  
   3. bipolar neurons  
   4. choroid  
   5. ciliary body and processes  
   6. ciliary muscle  
   7. cornea  
   8. dura mater  
   9. fovea centralis  
  10. ganglion cells  
  11. iris  
  12. lens  
  13. optic disc  
  14. optic nerve  
  15. photoreceptors  
  16. posterior chamber  
  17. retina  
  18. sclera  
  19. scleral venous sinus  
  20. suspensory ligaments (ciliary zonule)  
  21. posterior segment

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

7. The iris is composed primarily of two smooth muscle layers, one arranged radially and the other circularly.
   Which of these dilates the pupil?

8. You would expect the pupil to be dilated in which of the following circumstances? Circle the correct response(s).
   a. in bright light  
   b. in dim light  
   c. focusing for near vision  
   d. observing distant objects

9. The intrinsic eye muscles are controlled by (circle the correct response):
   autonomic nervous system  
   somatic nervous system

162  Review Sheet 24
10. Match the key responses with the descriptive statements that follow.

<table>
<thead>
<tr>
<th>Key</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>a.</td>
<td>aqueous humor</td>
<td>c.</td>
<td>cornea</td>
<td>j.</td>
<td>retina</td>
</tr>
<tr>
<td>b.</td>
<td>choroid</td>
<td>f.</td>
<td>fovea centralis</td>
<td>k.</td>
<td>sclera</td>
</tr>
<tr>
<td>c.</td>
<td>ciliary body</td>
<td>g.</td>
<td>iris</td>
<td>l.</td>
<td>scleral venous sinus</td>
</tr>
<tr>
<td>d.</td>
<td>ciliary processes of the ciliary body</td>
<td>h.</td>
<td>lens</td>
<td>m.</td>
<td>vitreous humor</td>
</tr>
<tr>
<td>i.</td>
<td>optic disc</td>
<td></td>
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</table>

1. fluid filling the anterior segment of the eye
2. the “white” of the eye
3. part of the retina that lacks photoreceptors
4. modification of the choroid that controls the shape of the crystalline lens and contains the ciliary muscle
5. drains the aqueous humor from the eye
6. layer containing the rods and cones
7. substance occupying the posterior segment of the eyeball
8. forms the bulk of the heavily pigmented vascular layer
9. smooth muscle structures (2)
10. area of critical focusing and discriminatory vision
11. form (by filtration) the aqueous humor
12. light-bending media of the eye (4)
13. anterior continuation of the sclera—your “window on the world”
14. composed of tough, white, opaque, fibrous connective tissue

Microscopic Anatomy of the Retina

11. The two major layers of the retina are the epithelial and neural layers. In the neural layer, the neuron populations are arranged as follows from the pigmented epithelial layer to the vitreous humor. (Circle the proper response.)

- bipolar cells, ganglion cells, photoreceptors
- photoreceptors, ganglion cells, bipolar cells
- ganglion cells, bipolar cells, photoreceptors
- photoreceptors, bipolar cells, ganglion cells

12. The axons of the ____________________________ cells form the optic nerve, which exits from the eyeball.

13. Complete the following statements by writing either rods or cones on each blank.
   The dim light receptors are the ___________. Only ___________ are found in the fovea centralis, whereas mostly ___________ are found in the periphery of the retina. ___________ are the photoreceptors that operate best in bright light and allow for color vision.
Dissection of the Cow (Sheep) Eye

14. What modification of the choroid that is not present in humans is found in the cow eye? ________________

   What is its function: ________________

15. What does the retina look like? ________________

   At what point is it attached to the posterior aspect of the eyeball? ________________

Visual Pathways to the Brain

16. The visual pathway to the occipital lobe of the brain consists most simply of a chain of five cells. Beginning with the photoreceptor cell of the retina, name them and note their location in the pathway.

   1. ________________  4. ________________
   2. ________________  5. ________________
   3. ________________

17. Visual field tests are done to reveal destruction along the visual pathway from the retina to the optic region of the brain. Note where the lesion is likely to be in the following cases.

   Normal vision in left eye visual field; absence of vision in right eye visual field: ________________

   Normal vision in both eyes for right half of the visual field; absence of vision in both eyes for left half of the visual field: ________________

18. How is the right optic tract anatomically different from the right optic nerve? ________________

Visual Tests and Experiments

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

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

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 \____\_, the suspensory ligament is \____\_, the convexity of the lens is \____\_, and light refraction is \____\_. During close vision, the ciliary muscle is \____\_, the suspensory ligament is \____\_, lens convexity is \____\_, and light refraction is \____\_.

22. Explain why vision is lost when light hits the blind spot. _______________________________________________________________________

23. Using your Snellen eye test results, answer the following questions.

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

Explain your answer. _______________________________________________________________________

Explain why each eye is tested separately when using the Snellen eye chart. _______________________________________________________________________

Explain 20/40 vision. _______________________________________________________________________

Explain 20/10 vision. _______________________________________________________________________

24. Define astigmatism. _______________________________________________________________________

How can it be corrected? _______________________________________________________________________

25. Define presbyopia. _______________________________________________________________________

What causes it? _____________________________________________________________________
26. To which wavelengths of light do the three cone types of the retina respond maximally? 

______________________, _________________________, and _________________________

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

________________________________________________________________________

________________________________________________________________________

28. Explain the difference between binocular and panoramic vision. __________________________

________________________________________________________________________

What is the advantage of binocular vision? __________________________

What factor(s) are responsible for binocular vision? __________________________

________________________________________________________________________

29. 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? ________________________________________________________

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

What is the value of this reflex? ____________________________________________

________________________________________________________________________

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

What happened to the pupil of the nonilluminated eye? __________________________

Explanation? ____________________________________________________________

________________________________________________________________________

31. Why is the ophthalmoscopic examination an important diagnostic tool? __________________________

________________________________________________________________________

32. 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? __________________________

________________________________________________________________________