

Name: _____ Lab Day/Time: _____

**Eye and Ear
Study Guide, Chapter 20**

Part I. Clinical Applications

1. An infant girl with strabismus is brought into the clinic. Describe what the condition is and what therapy should be tried before surgery?
2. A man in his early 60's come into the clinic complaining of fuzzy vision. An eye examination reveals clouding of his lenses. What is his problem and what factors might have contributed to it?
3. Albinism is a condition in which melanin pigment is not made. How does albinism affect vision and why?
4. A child is brought to the speech therapist because she does not pronounce high-pitched sounds (like "s"). If it is determined that the spiral organ of Corti is the source of the problem, which region of the organ would be defective?
5. Brian is brought to the clinic by his parents, who noticed that his right eye does not rotate laterally very well. The doctor explains that the nerve serving the lateral rectus muscle is not functioning properly. To what nerve is he referring?

Part II

③

The following words are to be used for questions 1-29 and may be used more than once or not at all. There may be times when none of the words fit and you will need to refer to notes or book

Absence	Fovea centralis	Sclera
Aqueous humor	Fibrous	Scleral venous
Auricle	Ganglion cell	Sebaceous ciliary glands
Bipolar cell	Glaucoma	Stapes
Central fovea	Iris	Stapedius
Ceruminous	Incus	Suspensory
Ciliary	Malleus	Tarsal (Meibomian)
Ciliary muscle	Nervous (retinal)	Tensor tympani
Ciliary processes	Non visual	Transparent
Choroid	occipital	Tympanic membrane
Cones	optic chiasma	Vascular
Conjunctiva (Bulbar)	optic disc	Visual
Cornea	Oval window	Vitreous body
Crystallins	Palpebral fissure	Vitreous chamber
External auditory canal	Photoreceptor,	
	Pupil	

1. The space between the upper and lower eyelids that exposes the eyeball is called the _____.
 2. The elongated glands embedded in each tarsal plate are known as _____ glands.
 3. Dilation and congestion of the blood vessels in this structure give an individual "bloodshot" eyes: _____.
 4. Sebaceous glands located at the base of the hair follicles of the eyelashes are called _____.
 5. Briefly explain why your nose "runs" when you cry. _____
 6. The three tunics (layers) of the eyeball are the _____, _____, and _____ tunics.
- Test your understanding of the structure of the eyeball by answering these questions.
7. The "white of the eye" is called the _____.
 8. The anterior portion of the fibrous tunic is called the _____.
 9. This membrane contains numerous blood vessels and a large amount of dark, brown-black pigment and is part of the vascular tunic. Name this membrane: _____.
 10. Secretion of aqueous humor is the function of the _____ _____, while alteration of the lens shape occurs via the _____ _____ Together, these structures form the _____ body.

11. The colored portion of the vascular tunic, suspended between the cornea and the lens, is called the _____. The hole in the center of this structure is the _____.

12. The retina consists of a pigmented epithelium (_____) portion and a neural (_____) portion.

13. The three layers of the neural portion of the retina are the _____, _____, and _____ layers.

14. (*Rods? Cones?*) are responsible for color vision in bright light. The _____ is a small depression in the center of the macula lutea which contains only cone photoreceptors.

15. The axons of the ganglion cells extend posteriorly to the _____ or blind spot. This second name is due to the (*absence? presence?*) of rods and cones here.

Answer these questions about the lens.

16. Proteins called _____, arranged like the layers of an onion, make up the lens.

17. The lens is normally (*opaque? transparent?*) and is held in place by encircling _____ ligaments.

Check your understanding of the interior of the eyeball.

18. The watery fluid located in the anterior cavity is the _____, whereas the jellylike substance in the posterior cavity is called the _____.

19. Another name for the posterior cavity is the _____.

20. The fluid in the anterior cavity is secreted by the _____ and drains through the _____ sinus.

21. Excessive intraocular pressure is called _____.

Complete these questions pertaining to the visual pathways.

22. The crossing point of the optic nerves (CN II) is the _____.

23. The final destination of visual impulses is the (*temporal? occipital?*) lobes of the cerebral cortex.

The following questions relate to the external and middle ear.

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24. The _____ is an elastic cartilage flap which is shaped like the flared end of a trumpet and is covered by thick skin.
25. The _____ leads from the auricle to the eardrum. This tube contains specialized sebaceous glands called _____ glands.
26. The thin, semitransparent partition of fibrous connective tissue between the external auditory canal and the middle ear is the _____.
27. Name the three auditory ossicles: _____, _____, and _____.
28. The stapes fits into a membrane-covered opening called the _____.
29. Two skeletal muscles associated with the auditory ossicles are the _____ and _____ muscles.

Answer these questions about the internal ear

ampulla	perilymph
bony labyrinth	semicircular canals
endolymph	utricle and saccule
membranous labyrinth	vestibule

- _____ 30. Three bony passages, each arranged at approximately right angles to the other two.
- _____ 31. A series of cavities in the petrous portion of the temporal bone.
- _____ 32. Fluid found in the membranous labyrinth.
- _____ 33. Fluid similar to cerebrospinal fluid that surrounds the membranous labyrinth.
- _____ 34. A series of sacs and tubes lying inside, and having the same general form as, the bony labyrinth.
- _____ 35. The oval, central portion of the bony labyrinth.
- _____ 36. Two sacs of the membranous labyrinth in the vestibule.
- _____ 37. A swelling at the end of each of the semicircular canals.

Answer these questions about the auditory pathway.

38. Sound waves striking the tympanic membrane cause the (*incus? malleus?*) to vibrate.
39. The movement of the stapes pushes the membrane of the (*round? oval?*) window in and out.
40. The (*perilymph? endolymph?*) of the scala vestibuli is pushed by the bulging of the oval window.
41. The hair cells of the spiral organ move against the (*basilar? tectorial?*) membrane.
42. Auditory nerve impulses travel over the (*vestibular? cochlear?*) portion of CN (*VII? VIII? IX?*).

Part III

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Check your knowledge of the mechanism of equilibrium by answering these questions.

1. The receptors for static equilibrium are the _____, which are located in the _____ and _____.
2. Hair cells have long extensions of the cell membrane consisting of 70 or more _____ and one _____ anchored firmly to its basal body and extending beyond the longest microvilli.
3. The thick, gelatinous glycoprotein layer floating directly over the hair cells of the macula is called the _____.
4. The nerve impulses for equilibrium are carried on the _____ branch of CN (VII? VIII?).
5. The receptors for dynamic equilibrium, which are located in the ampullae of the semicircular ducts, are called the _____. This positioning permits the detection of rotational _____ or _____.
6. The gelatinous mass covering the hair cells of each crista is called the _____.

Test your knowledge of these visual, auditory, and vestibular disorders.

conduction deafness	otitis media
motion sickness	senile macular degeneration
Ménière's syndrome	sensorineural deafness

7. Nausea and vomiting brought on by repetitive angular, linear, or vertical motion. The cause is excessive stimulation of the vestibular apparatus by motion.
8. The growth of new blood vessels or hard mass under the retina, leading to distorted vision or blindness.
9. An acute infection of the middle ear, caused primarily by bacteria.
10. Lack of the sense of hearing caused by impairment of the cochlea or cochlear branch of cranial nerve VIII.
11. An increased amount of endolymph that enlarges the membranous labyrinth, causing fluctuating hearing loss, attacks of vertigo, and roaring tinnitus.
12. Lack of the sense of hearing caused by an impairment of the external and middle ear mechanisms for transmitting sounds to the cochlea.

Answer (T) True or (F) False to the following questions.

13. _____ The thick, gelatinous glycoprotein layer that rests on the hair cells of the macula is called the otolithic membrane.
14. _____ The maculae are the receptors for static equilibrium.
15. _____ Static equilibrium is the maintenance of body position in response to sudden movements.

Fill in the blank

16. The movement of the stapes pushes on the membrane covering the _____ window.
17. The receptors for color vision and sharpness of vision are the _____.
18. _____ is secreted into the posterior chamber and reabsorbed through the scleral venous sinus.

Using the terms below, fill in the blanks to complete the trek through the outer, middle, and inner ear.

- | | | |
|--|-----------------|------------------|
| pharyngotympanic (Eustachian or Auditory Tube) | oval window | stereocilia |
| endolymph | scala vestibuli | scala tympani |
| incus | organ of Corti | round window |
| pinna (auricle) | cochlear | middle ear |
| tympanic membrane | malleus | external ear |
| ceruminous | vestibular duct | nasopharynx |
| ossicles | tectorial | basilar membrane |
| external auditory meatus | stapes | |

Robo's programming for this trek involves following sound waves through the outer and middle ear until the sound (mechanical) waves are converted into nerve (electrical) impulses in the inner ear.

Robo's trek begins as sound waves are funnelled by the (1) _____ into the (2) _____. The robot's progress is slowed in this area because of the presence of a "waxy" material secreted by (3) _____ glands along the canal. All of a sudden Robo is thrust against the (4) _____, or eardrum, causing a tremendous vibration that pushes the robot from the (5) _____ into the (6) _____, or tympanic cavity. This compartment is an air-filled space containing three bones, the auditory (7) _____. One of the bones looks like a "hammer," the (8) _____, while another one looks like an "anvil," the (9) _____, and the third has an appearance like a "stirrup," or (10) _____. Robo's trek is momentarily halted because of an opening that leads into an elongated channel, the (11) _____ tube, which allows for communication between the tympanic cavity and the (12) _____. After trekking around the opening Robo is "waved" through an ovoid "pane-like" covering, the (13) _____, which is waving back and forth and creating vibrations that set up pressure waves in a clear fluid, the (14) Perilymph of the (15) Scala Vestibuli in the inner ear. The robot is propelled by the pressure waves as they are propagated through the perilymph of the (16) _____ and (17) _____. These pressure waves distort the (18) _____ on their way to the (19) _____ of the tympanic duct. As Robo treks into the duct, it senses a distorted membrane forcing hair cells of the (20) _____ toward or away from the (21) _____ membrane. This movement moves Robo along, and leads to displacement of (22) _____ and stimulation of sensory neurons of the (23) _____ nerve.

Mission Control orders Robo to use the programmed exit route by picking up a pressure wave as it "rolls" back toward the entrance to the vestibular duct. Robo's handlers are happy to retrieve their robot, which is covered with wax and needs recharging because of a run-down battery.

MATCHING:

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

- | | COLUMN A | COLUMN B |
|-------|--------------------------------|---------------------------------|
| _____ | 24 eyelids | neural tunic |
| _____ | 25 lacrimal glands | <u>otitis media</u> |
| _____ | 26 sharp vision | three-dimensional relationships |
| _____ | 27 retina | inner ear |
| _____ | 28 <u>Apex of Cochlea</u> | palpebral |
| _____ | 29 depth perception | ear wax |
| _____ | 30 <u>middle ear infection</u> | equilibrium |
| _____ | 31 ceruminous glands | tears |
| _____ | 32 membranous labyrinth | <u>helicotrema</u> |
| _____ | 33 utricle, saccule | fovea centralis |

34. A lipid-rich product that helps to keep the eyelids from sticking together is produced by the:
- a. gland of Zeis
 - b. meibomian gland
 - c. lacrimal glands
 - d. conjunctiva
35. The fibrous tunic, the outermost layer covering the eye, consists of the:
- a. iris and choroid
 - b. pupil and ciliary body
 - c. sclera and cornea
 - d. lacrimal sac and orbital fat
36. The vascular tunic consists of three distinct structures that include:
- a. sclera, cornea, iris
 - b. choroid, pupil, lacrimal sac
 - c. retina, cornea, iris
 - d. iris, ciliary body, choroid
37. The function of the vitreous body in the eye is to:
- a. provide a fluid cushion for protection of the eye
 - b. serve as a route for nutrient and waste transport
 - c. stabilize the shape of the eye and give physical support to the retina
 - d. serve as a medium for cleansing the inner eye
38. The primary function of the lens of the eye is to:
- a. absorb light after it passes through the retina
 - b. biochemically interact with the photoreceptors of the retina
 - c. focus the visual image on retinal receptors
 - d. integrate visual information for the retina
39. When looking directly at an object, its image falls upon the portion of the retina called the:
- a. fovea centralis
 - b. choroid layer
 - c. sclera
 - d. focal point
40. The bony labyrinth of the ear is subdivided into the:
- a. auditory meatus, auditory canal, ceruminous glands
 - b. saccule, utricle, vestibule
 - c. vestibule, semicircular canals, and the cochlea
 - d. ampulla, crista, cupula
41. The dividing line between the external ear and the middle ear is the:
- a. pharyngotympanic tube
 - b. tympanic membrane
 - c. sacculus
 - d. utriculus
42. Sebaceous glands at the base of the hair follicles of the eyelashes are called
- A. tarsal glands
 - B. lacrimal glands
 - C. ciliary glands
 - D. ceruminous gland
 - E. none of the above are correct
43. This nonvascular structure is a part of the fibrous tunic.
- A. sclera
 - B. ciliary body
 - C. iris
 - D. cornea
 - E. conjunctiva
44. The white portion of the eyeball is called the
- A. conjunctiva
 - B. sclera
 - C. choroid
 - D. uvea
 - E. cornea
- The ciliary body is part of the
- A. fibrous tunic
 - B. vascular tunic
 - C. nervous tunic
 - D. retinal tunic
 - E. none of the above are correct
45. Which of the following is NOT part of the hearing mechanism?
- A. malleus
 - B. tectorial membrane
 - C. scala vestibuli
 - D. tympanic membrane
 - E. macula lutea
46. Information about equilibrium is transmitted by which cranial nerve?
- A. I
 - B. II
 - C. VII
 - D. VIII
 - E. IX
47. The gelatinous mass called the cupula is associated with the
- A. muscle spindle
 - B. macula
 - C. crista
 - D. nociceptor
 - E. joint kinesthetic receptor

48. The auditory ossicles of the middle ear include the:

- a. sacculus, utriculus, ampulla
- b. vestibule, cochlea, organ of Corti
- c. malleus, stapes, incus
- d. otoliths, maculae, otoconia

49. The structure in the cochlea of the inner ear that provides information to the CNS is the:

- a. scala tympani
- b. organ of Corti
- c. tectorial membrane
- d. basilar membrane

50. The receptors that provide the sensation of hearing are located in the:

- a. vestibule
- b. ampulla
- c. tympanic membrane
- d. cochlea

51. The senses of equilibrium and hearing are provided by receptors in the:

- a. external ear
- b. middle ear
- c. inner ear
- d. a, b, and c are correct

52. Ascending auditory sensations synapse in the thalamus and then are delivered by projection fibers to the:

- a. auditory cortex of the parietal lobe
- b. auditory cortex of the temporal lobe
- c. auditory cortex of the occipital lobe
- d. auditory cortex of the frontal lobe

53. The waxy material that slows the growth of microorganisms in the external acoustic canal and reduces the chances of infection is:

- a. gustducin
- b. phenylthioures
- c. cerumen
- d. umami

54. The receptors in the inner ear that provide sensations of gravity and linear acceleration are the:

- a. ampulla and capula
- b. otolith and statoconia
- c. semicircular and cochlear ducts
- d. saccule and utricle

55. The intensity (volume) of a perceived sound is determined by:

- a. which part of the cochlear duct is stimulated
- b. how many of the hair cells in the cochlear duct are stimulated
- c. pressure fluctuations in the endolymph of the vestibular complex
- d. tectorial membrane vibrations

56. The scleral venous sinus drains aqueous humor from the _____.

- | | |
|----------------------|----------------------------------|
| A. vitreous chamber | C. anterior chamber |
| B. posterior chamber | D. posterior cavity |
| | E. none of the above are correct |

57. Some axons of cranial nerve II cross over at the _____.

- | | |
|------------------|-----------------------------|
| A. optic nerve | D. optic bulb |
| B. optic tract | E. A and D are both correct |
| C. optic chiasma | |

58. The _____ is the site where the optic nerve exits the eyeball.

- | | |
|------------------|-----------------------------|
| A. central fovea | D. ora serrata |
| B. macula lutea | E. both A and C are correct |
| C. optic disc | |