

## 9 The Sensory System

### *Chapter Summary*

This chapter deals with sensory receptors. The receptors involved with the special senses of taste, smell, sight, hearing, and equilibrium are chemoreceptors, chemoreceptors, photoreceptors, mechanoreceptors, and mechanoreceptors respectively. General receptors located in the skin, viscera, muscles, and joints are responsive to pressure, temperature, body position, and tissue damage. The receptors for taste and smell are taste buds and olfactory microvilli. These receptors work together to produce these sensations. The eye is composed of three layers, an inner retina which houses the photoreceptor cells (rods and cones), a middle choroid, and an outer sclera. The lens, cornea, and vitreous humor serve to focus images on the retina, thereby stimulating the photoreceptors and initiating nerve impulses. The receptors for hearing are located on the spiral organ within the cochlea of the inner ear. Sound waves are transmitted down the auditory canal, part of the outer ear, to the tympanic membrane which vibrates at the frequency of the sound waves. The vibrations are transmitted by the three ossicles of the middle ear to the oval window of the cochlea. Stimulation of the mechanoreceptors on the organ of Corti produces nerve impulses that are interpreted by the brain as sound. The inner ear also houses the organs of equilibrium. Movement of fluid within the semicircular canals is involved in rotational equilibrium. Rotational equilibrium is required when the head is moving. Gravitational equilibrium is required when the head is moving horizontally or vertically and is the result of otoliths moving within the utricle and saccule of the inner ear.

### *Chapter Outline*

- I. General Senses
  - A. Proprioceptors
  - B. Cutaneous Receptors
  - C. Pain Receptors
- II. Senses of Taste and Smell
  - A. Sense of Taste
    1. How the Brain Receives Taste Information
  - B. Sense of Smell
    1. How the Brain Receives Odor Information
    2. Sense of Taste and Sense of Smell
- III. Sense of Vision
  - A. Accessory Organs of the Eye
    1. Eyebrows, Eyelids, and Eyelashes
    2. Lacrimal Apparatus
    3. Extrinsic Muscles
  - B. Anatomy and Physiology of the Eye
    1. Function of the Lens
    2. Pathway for Vision
      - a. Function of Photoreceptors
      - b. Function of the Retina
      - c. Blind Spot
      - d. From the Retina to the Brain
    3. The Optic Chiasma
    4. Primary Visual Areas

- IV. Sense of Hearing
  - A. Anatomy of the Ear
    - 1. Sound Pathway
      - a. Through the Auditory Canal and Middle Ear
      - b. From the Spiral Organ to the Brain
- V. Sense of Equilibrium
  - A. Rotational Equilibrium Pathway
  - B. Gravitational Equilibrium Pathway
- VI. Effects of Aging

*Suggested Student Activities*

1. Discuss the various types of deafness and what kinds of treatment are available.
2. Discuss cataracts, glaucoma, and detached retina, and the treatment for each.
3. Discuss how the elderly can adjust to macular degeneration.

*Answers to Objective Questions*

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|------------------------|---------------------------|
| 1. proprioceptors      | 6. distant, concave       |
| 2. chemoreceptors      | 7. malleus, incus, stapes |
| 3. rods, cones, retina | 8. equilibrium            |
| 4. color, bright       | 9. cochlear, cochlea      |
| 5. accommodates        | 10. cerebrum              |

*Answers to Medical Terminology Reinforcement Exercise*

1. ophthalmo/log/ist - one who specializes in eye conditions (diagnosis and treatment)
2. presby/opia - old vision—hyperopia (farsighted) impairment of vision due to advancing age
3. blepharo/ptosis - drooping of the eyelid
4. kerato/plasty - repair (plastic surgery) of the cornea
5. opto/met/rist - one who measures vision and prescribes glasses
6. lacrima/tor - substance that increases the flow of tears
7. ot/itis media - inflammation of the middle ear
8. tympano/centesis - a surgical puncture of the eardrum to remove fluid
9. micr/otia - small ears (gross hypoplasia or aplasia of the pinna—outer ear)
10. myringo/tome - instrument used to make incision in eardrum
11. irido/malacia - abnormal softening of the iris
12. hypo/geusia - reduced sense of taste

*Audiovisual Materials*

1. Film 16mm - Gateways to the Mind (Human Body Series)
2. Film 16mm - Human Body: Sense Organs (Coronet/MTI Instructional Films)
3. Transparencies - Eye, Ear, and Vision Defects (Career Aids)
4. Model - Eye Discovery Pack (Concept Media)
5. Model - Ear (Concept Media)