

4

- (3) Sound waves travel through the auditory canal until they reach the eardrum, or tympanic membrane
- c. Tympanic membrane
 - (1) Separates external and middle ear
 - (2) Vibrates when sound waves hit it
 - (3) Transmits sound waves to the middle ear
- 5. Middle ear
 - a. Small space or cavity in the temporal bone
 - b. Contains three small bones (ossicles): malleus, incus, and stapes
 - c. Bones are connected and transmit sound waves from tympanic membrane to inner ear
 - d. Eustachian tube
 - (1) Tube that connects middle ear to pharynx or throat
 - (2) Allows air to enter middle ear
 - (3) Helps equalize air pressure on both sides of tympanic membrane
- 6. Inner ear
 - a. Most complex portion of the ear
 - b. Oval window: membrane that separates inner ear from middle ear
 - c. Vestibule: first section that acts as the entrance to the two other parts of the inner ear
 - d. Cochlea
 - (1) Shaped like a snail's shell
 - (2) Contains delicate hairlike cells that make up the organ of Corti, which is a receptor for sound waves and transmits impulses from sound waves to the auditory nerve, which carries impulses to temporal lobe of cerebrum where they are interpreted as hearing
 - e. Semicircular canals
 - (1) Also located in inner ear
 - (2) Contain a liquid and delicate hairlike cells that bend when the liquid moves with head and body movements
 - (3) Impulses from semicircular canals sent to the cerebellum of the brain help to maintain sense of balance and equilibrium
- 7. Diseases and abnormal conditions of the ear
 - a. Hearing loss
 - (1) Classified as conductive or sensory
 - (2) Conduction loss or deafness
 - aa. Caused by sound waves not being conducted to inner ear
 - bb. Causes: wax (cerumen) plug, foreign body obstruction, otosclerosis, infection, or ruptured tympanic membrane
 - cc. Treatment: eliminate cause, surgery, hearing aids
 - (3) Sensory hearing loss or deafness
 - aa. Caused by damage to inner ear or auditory nerve

- bb. Usually cannot be corrected
- cc. Cochlear implants can improve severe hearing loss
- b. Meniere's disease
 - (1) Collection of fluid in labyrinth of inner ear and degeneration of hair cells in cochlea and vestibule
 - (2) Symptoms
 - aa. Severe vertigo, or dizziness
 - bb. Tinnitus, or a ringing in the ears
 - cc. Nausea and vomiting
 - dd. Loss of balance and tendency to fall
 - (3) Treatment
 - aa. Drugs to reduce the fluid and antihistamines
 - bb. Drainage of fluid
 - cc. Surgery to destroy the cochlea in severe cases, but this causes permanent deafness
- c. Otitis externa
 - (1) Inflammation of external auditory canal
 - (2) Cause
 - aa. Pathogenic organism such as a bacterium or virus
 - bb. Swimmer's ear is one form caused by swimming in contaminated water
 - cc. Inserting bobby pins, fingernails, or cotton swabs into ear can also cause this condition
 - (3) Infants and young children very susceptible
 - aa. Eustachian tube is angled differently than in adults
 - bb. Secretions from nose and throat accumulate in the middle ear, resulting in an inflammatory response that causes the tube to swell shut
 - (4) Treatment: antibiotics; warm, moist compresses; and pain medications
- d. Otitis media
 - (1) Inflammation or infection of the middle ear
 - (2) Caused by a bacterium or virus
 - (3) Frequently follows a sore throat because organisms from throat can enter middle ear through eustachian tube
 - (4) Symptoms
 - aa. Severe pain and fever
 - bb. Vertigo, or dizziness
 - cc. Nausea and vomiting
 - dd. Buildup of fluid in middle ear
 - (5) Treatment
 - aa. Antibiotics and pain medications
 - bb. Myringotomy (incision of the tympanic membrane) and insertion of tubes to relieve pressure and allow fluid to drain

4. Three main layers of the eye
- a. Sclera
 - (1) Outermost layer
 - (2) Tough connective tissue
 - (3) Frequently referred to as the white of the eye
 - (4) Maintains the shape of the eye
 - (5) Extrinsic muscles, responsible for moving the eye within the socket, are attached to the outside of the sclera
 - (6) Cornea: a circular transparent part on the front of the sclera that allows light rays to enter the eye
 - b. Choroid coat
 - (1) Middle layer of the eye
 - (2) Interlaced with many blood vessels that nourish the eyes
 - (3) Pupil
 - aa. Hole in the front of the choroid coat
 - bb. Allows light rays to enter
 - aa. Special part of the choroid coat
 - bb. Colored portion of the eye
 - cc. It is a muscle that controls the size of the pupil and regulates the amount of light entering the eye
 - c. Retina
 - (1) Innermost layer of the eye
 - (2) Made of many layers of nerve cells that transmit light impulses to the optic nerve
 - (3) Two special types of cells in retina
 - aa. Cones: used mainly for light vision, are sensitive to color, and are located in a depression on the back surface of the retina called the fovea centralis, the area of sharpest vision
 - bb. Rods: used for dark or dim vision
5. Other special structures
- a. Lens
 - (1) Circular structure located behind the pupil
 - (2) Suspended in position by ligaments
 - (3) Refracts, or bends, light rays so the rays focus on the retina
 - b. Aqueous humor
 - (1) Clear, watery fluid
 - (2) Fills space between cornea and iris
 - (3) Helps maintain forward curvature of the eyeball
 - (4) Bends, or refracts, light rays
 - c. Vitreous humor
 - (1) Jellylike substance
 - (2) Fills area behind the lens
 - (3) Helps maintain shape of the eyeball
 - (4) Also bends or refracts light rays
 - d. Series of muscles located in the eye provide for eye movement
6. Refraction of light rays
- a. When light rays enter the eye, they pass through a series of parts that bend, or refract, the rays
 - b. Allows rays to focus on retina
 - c. Rays pass through the cornea, aqueous humor, pupil, lens, and vitreous humor to focus on the retina
 - d. In the retina, rays or image are picked up by rods and cones, changed into nerve impulses, and transmitted by optic nerves to occipital lobe of cerebrum (where sight is interpreted)
 - e. If rays are not refracted correctly by the various parts, vision can be distorted or blurred
7. Diseases and abnormal conditions of the eye
- a. Amblyopia, or "lazy eye"
 - (1) Commonly occurs in early childhood
 - (2) Results in poor vision in one eye caused by the dominance of the other eye
 - (3) Treatment
 - aa. Covering good eye to stimulate development of "lazy" eye
 - bb. Exercises to strengthen the weak eye
 - cc. Corrective lenses and surgery
 - (4) If not treated before 8 to 9 years of age, blindness of the affected eye may occur
 - b. Astigmatism (Use Transparency #56)
 - (1) Abnormal shape or curvature of the cornea that causes blurred vision
 - (2) Light rays focus on multiple areas of the retina
 - (3) Corrective lenses (glasses or contact lenses) correct the condition
 - c. Cataract
 - (1) Normally clear lens becomes cloudy or opaque
 - (2) Occurs gradually and is usually a result of aging, but may be the result of trauma
 - (3) Symptoms
 - aa. Blurred vision and halos around lights
 - bb. Gradual loss of vision
 - cc. Milky white pupil in later stages
 - (4) Treatment
 - aa. Surgical removal of the lens
 - bb. Implanting of an intraocular lens or prescribing glasses or contact lenses corrects the vision and compensates for the removed lens
 - d. Conjunctivitis, or pink eye
 - (1) Contagious inflammation of the conjunctiva
 - (2) Usually caused by a bacteria or virus
 - (3) Symptoms: redness, swelling, pain, and pus formation