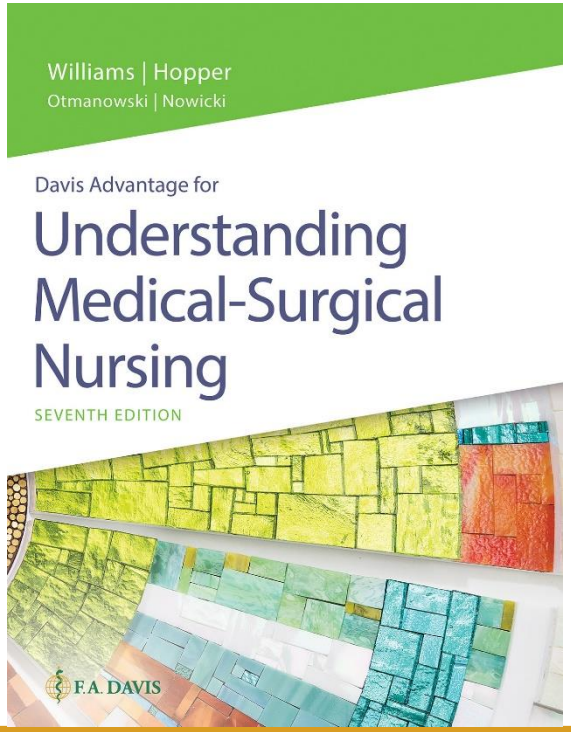


Chapter 51

Sensory System Function, Data Collection, and Therapeutic Measures: Vision and Hearing

Learning Outcomes

- Describe the normal anatomy of the sensory system.
- Explain the normal function of the sensory system.
- List data to collect when caring for a patient with a disorder of the sensory system.

Learning Outcomes (continued)

- Identify diagnostic tests commonly performed to diagnose disorders of the sensory system.
- Assist in planning nursing care for patients undergoing diagnostic tests for sensory disorders.
- Describe therapeutic measures for patients with disorders of the sensory system.

Chapter Concepts

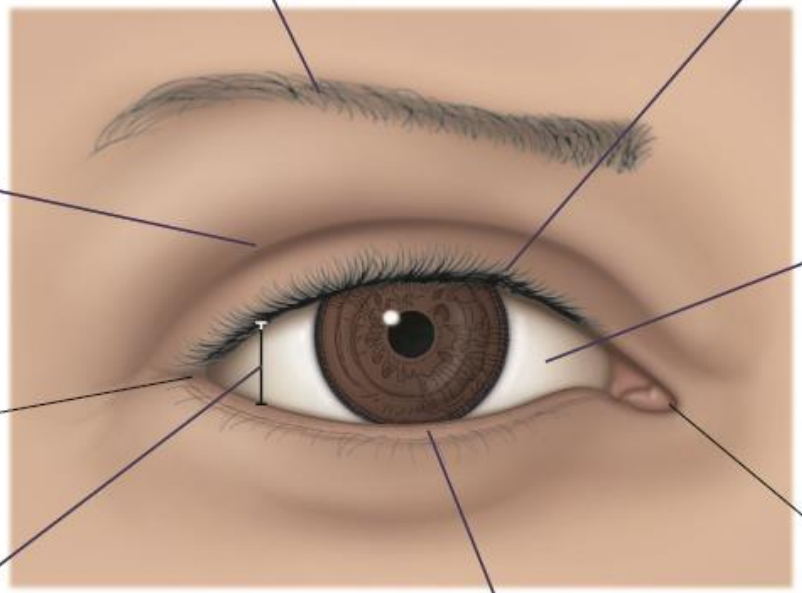
- Sensory
- Safety
- Teaching and Learning

Accessory Structures of the Eye

Eyebrow: Perhaps the most significant role of the eyebrows is to enhance facial expressions, aiding in nonverbal communication. They also help keep perspiration out of the eye and shield the eye from glare.

Eyelashes: These hairs along the edges of the eyelids help keep debris out of the eye. Touching the eyelashes stimulates the blink reflex.

Eyelids (palpebrae): Formed primarily by the orbicularis oculi muscle covered with skin, the eyelids protect the eye from foreign bodies and block light when closed to allow for sleeping. Periodic blinking also helps moisten the eyes with tears and wash out debris.



Conjunctiva: The conjunctiva is a transparent mucous membrane that lines the inner surface of the eyelid and covers the anterior surface of the eyeball (except for the cornea). It secretes a thin mucous film to help keep the eyeball moist. It is very vascular, which becomes apparent when eyes are "bloodshot," a result of dilated vessels in the

Lateral canthus

Medial canthus

Palpebral fissure: This is the opening between the lids.

Tarsal glands: These glands, which lie along the thickened area at the edge of the eye (called the **tarsal plate**), secrete oil to slow the evaporation of tears and help form a barrier seal when the eyes are

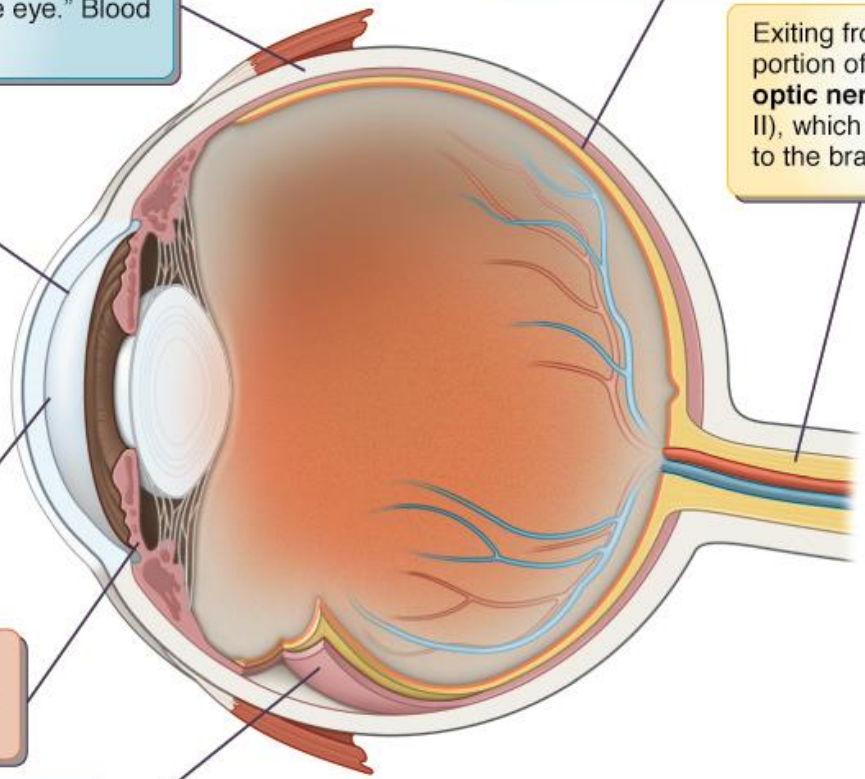
Accessory Structures of the Eye (continued)

- Eyelids
- Eyelashes
- Conjunctiva
- Lacrimal gland
- Tears

Eye Anatomy

- Structure of eyeball
  - Orbit, six extrinsic muscles
  - Cranial nerves innervate muscles: Oculomotor, trochlear, abducens
  - Eyeball layers: Outer sclera, middle choroid, inner retina
  - Choroid layer: Prevents glare
  - Ciliary body: Circular muscle changes shape of lens
  - Circular iris: Dilates, constricts pupil

Eye Tissue Layers



Fibrous Outer Layer

The **sclera**—formed from dense connective tissue— is the outermost layer of the eye. Most of the sclera is white and opaque; it forms what is called "the white of the eye." Blood vessels and nerves run throughout the sclera.

The **cornea** is a transparent extension of the sclera in the anterior part of the eye. It sits over the iris (the colored portion of the eye) and admits light into the eye. It contains no blood vessels.

Vascular Middle Layer

The **iris** is a ring of colored muscle; it works to adjust the diameter of the pupil (the central opening of the iris) to control the amount of light entering the eye.

The **ciliary body** is a thickened extension of the choroid that forms a collar around the lens. It also secretes a fluid called aqueous humor.

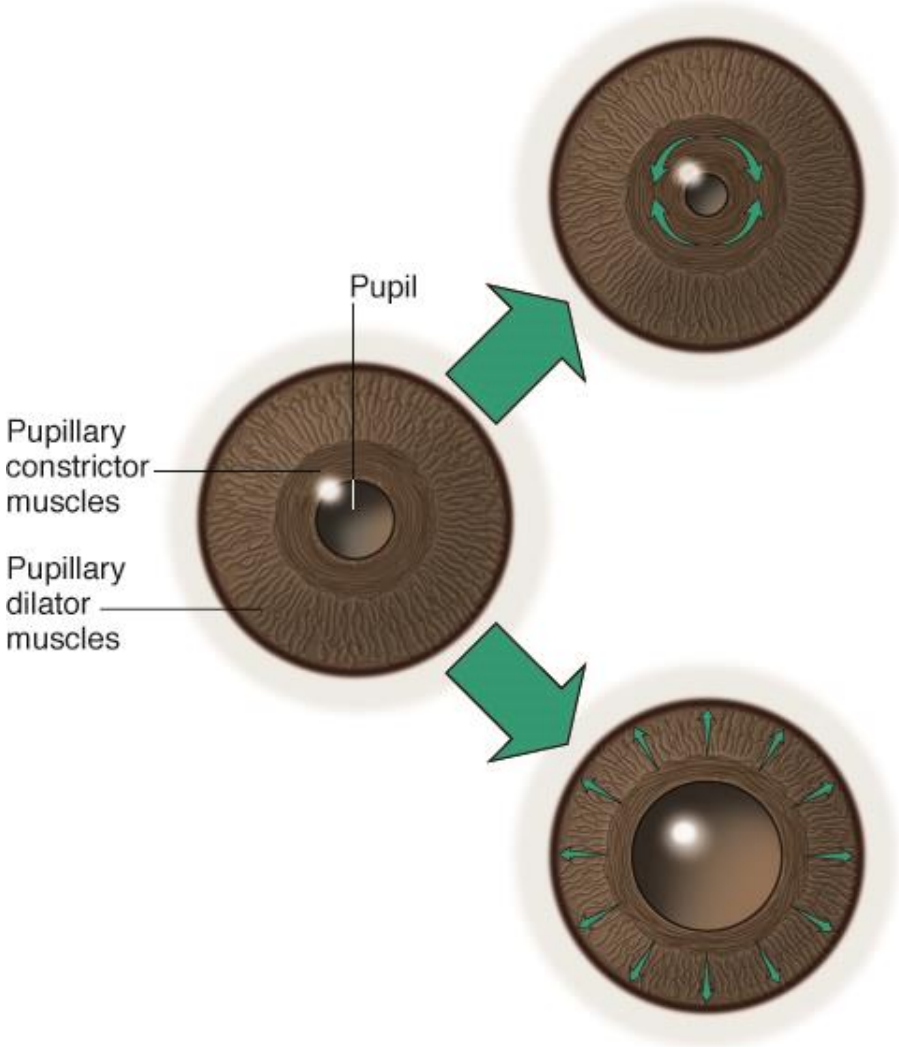
The **choroid** is a highly vascular layer of tissue that supplies oxygen and nutrients to the retina and sclera.

Neural Inner Layer

The **retina** is a thin layer of light-sensitive

Exiting from the posterior portion of the eyeball is the **optic nerve** (cranial nerve II), which transmits signals to the brain.

Pupil Constriction



The **pupillary constrictor** muscle encircles the pupil. When stimulated by the parasympathetic nervous system, the muscle constricts, narrowing the pupil to admit less light.

The **pupillary dilator** looks like the spokes of a wheel. When stimulated by the sympathetic nervous system, this muscle contracts, pulling the inside edge of the iris outward. This widens the pupil and admits more light.

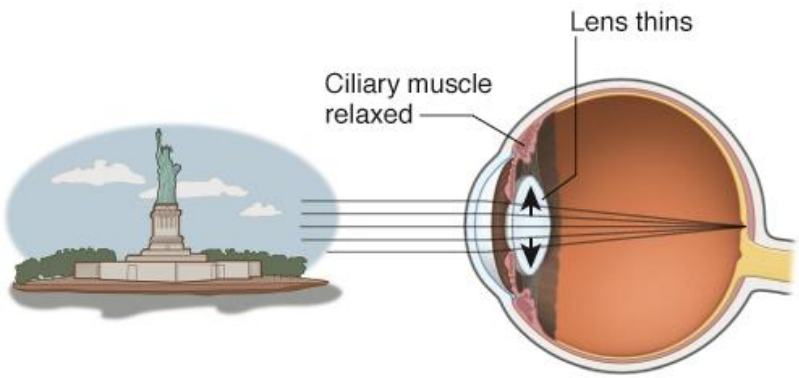
Eye Anatomy (continued)

- Structure of eyeball (continued)
  - Retina: Lines posterior eyeball, contains rods (light)/cones (color) for vision
  - Fovea centralis: Most acute color vision
  - Optic nerve: Transmit images
- Eyeball cavities
  - Vitreous humor: Holds retina in place
  - Aqueous humor: Nourishes lens/cornea

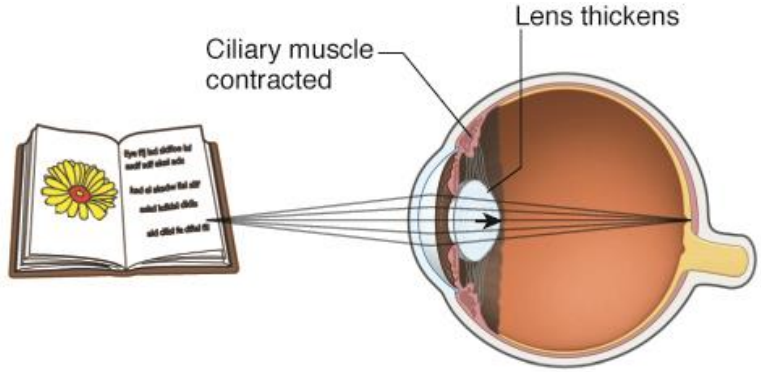
Physiology of Vision

- Focusing of light rays on retina
- Transmission of subsequent nerve impulses to visual areas of cerebral cortex

Physiology of Vision (continued)

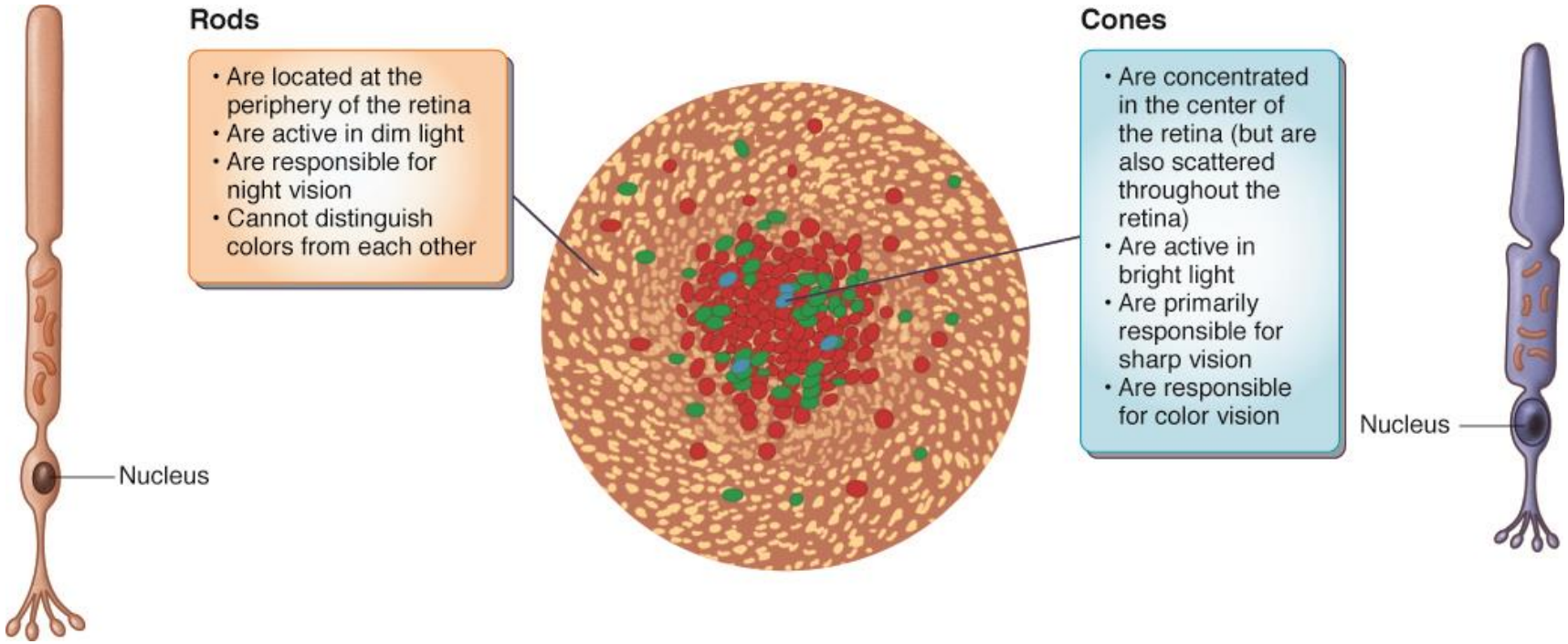


The nearly parallel light rays from distant objects require little refraction. Consequently, the ciliary muscle encircling the lens relaxes and the lens flattens and thins.

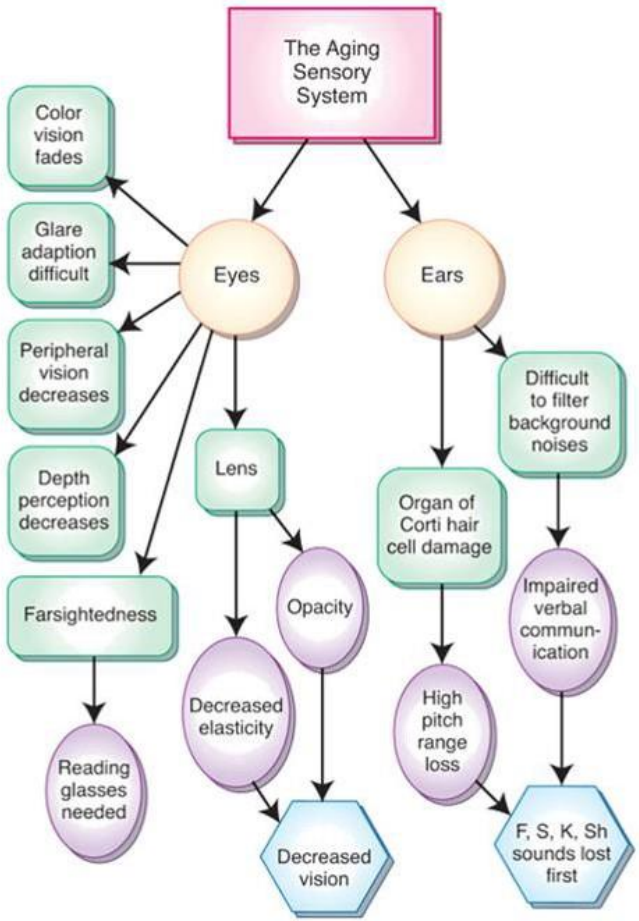


The more divergent light rays from a nearby object require more refraction. To help focus the light rays, the ciliary muscle surrounding the lens contracts. This narrows the lens, causing it to bulge into a convex shape and thicken, giving it more focusing power.

Photoreceptors



Aging and the Sensory System



Aging and the Eye

- Decreased elasticity of lens: Presbyopia
- Difficult peripheral vision
- Decreased pupil size
- Difficult night vision
- Sensitivity to glare
- Clearer: Yellow, orange, red hues
- Distorted depth perception
- Decreased lacrimal secretions

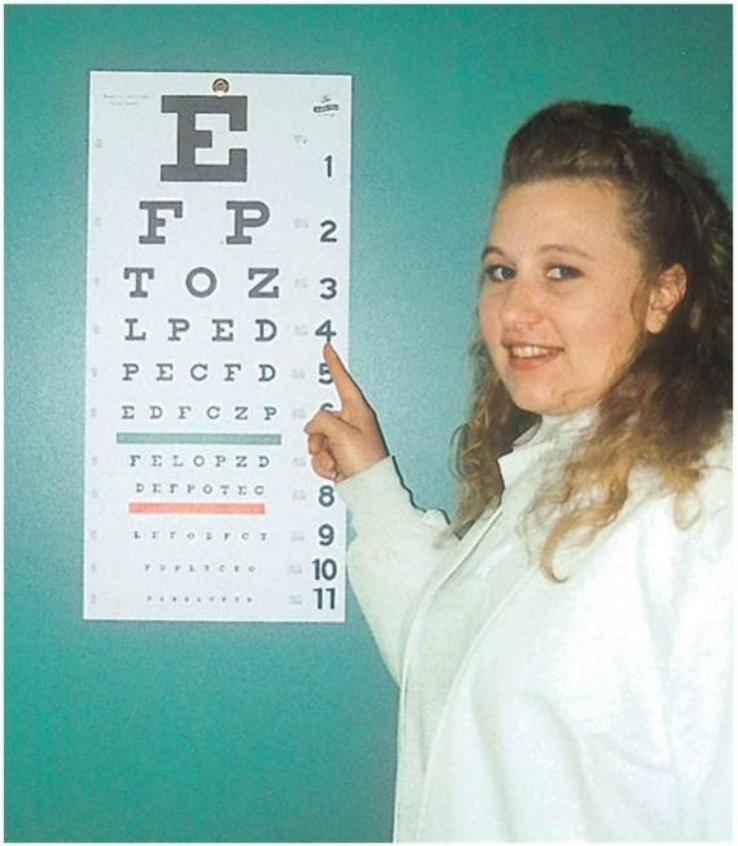
Sensory System Data Collection: Vision

- Subjective data
  - Health history
  - Symptoms

Sensory System Data Collection: Vision (continued_1)

- Objective data: Visual acuity
  - Snellen chart/E chart/Rosenbaum card
    - Normal vision: 20/20
    - Moderate low vision: 20/70 to 20/160
    - Legal blindness: 20/200 or worse with correction
  - LogMAR chart
    - 20/20 = 0.00
    - 0.5 to 1.3 = low vision
    - >1.3 = legal blindness

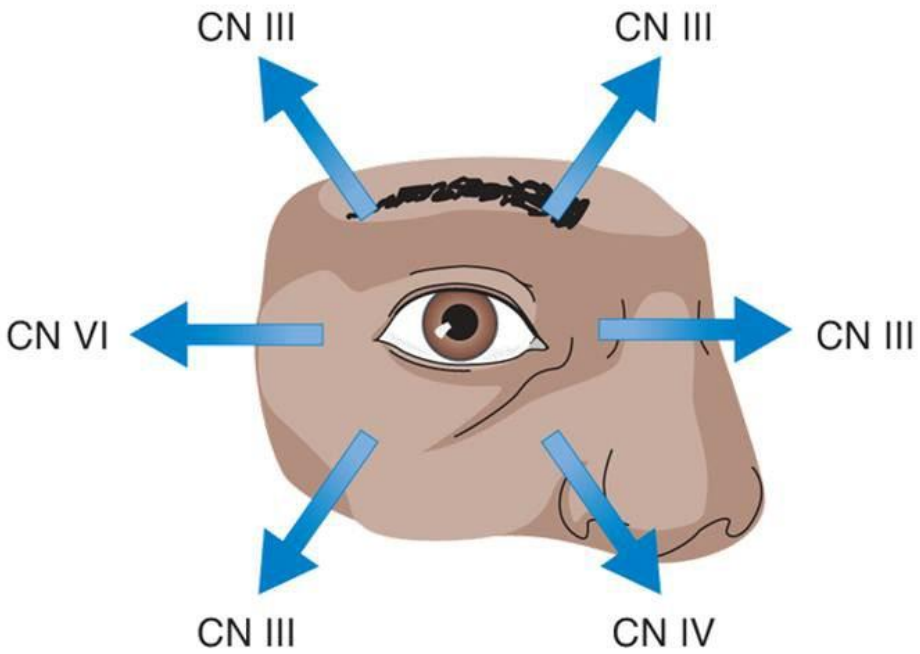
Snellen Chart



Sensory System Data Collection: Vision (continued_2)

- Objective data: Visual acuity (continued)
  - Visual fields by confrontation
  - Muscle balance and eye movement
    - Six cardinal fields of gaze
    - Corneal light reflex
    - Cover test
  - Pupillary reflexes
  - Inspection

Six Cardinal Fields of Gaze



Sensory System Data Collection: Vision (continued_3)

- Objective data: Visual acuity (continued)
  - Examination of internal eye by health-care provider (HCP)
  - Intraocular pressure
    - Normal range: 10 to 21 millimeters of mercury

Diagnostic Tests

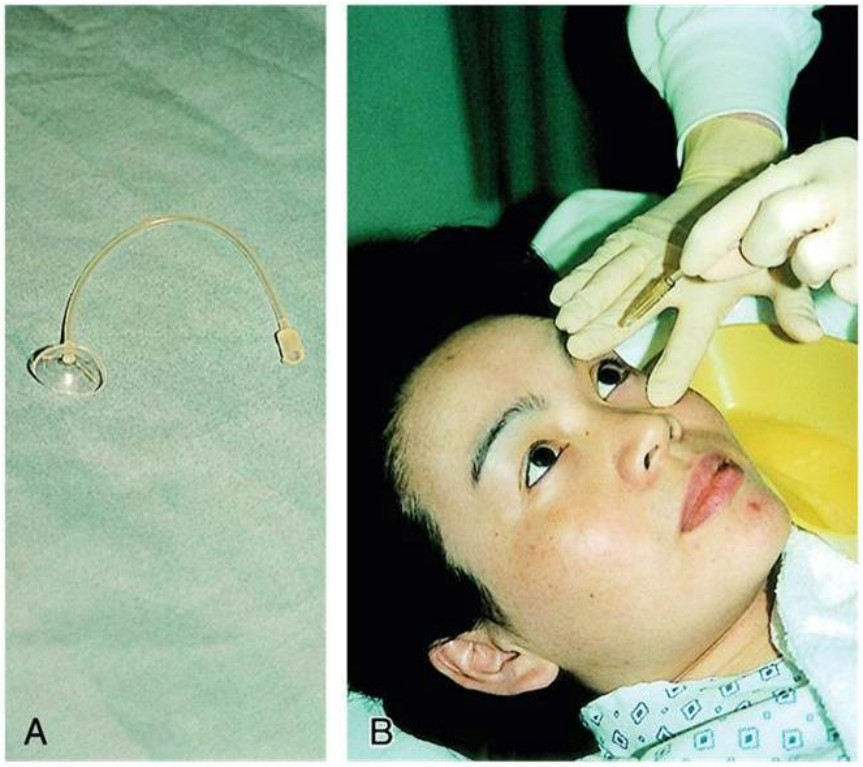
- Exudate culture
- Digital imaging
- Optical coherence tomography
- Angiography: Fluorescein, indocyanine green
- Electroretinography
- Ultrasonography
- Imaging tests

Therapeutic Measures

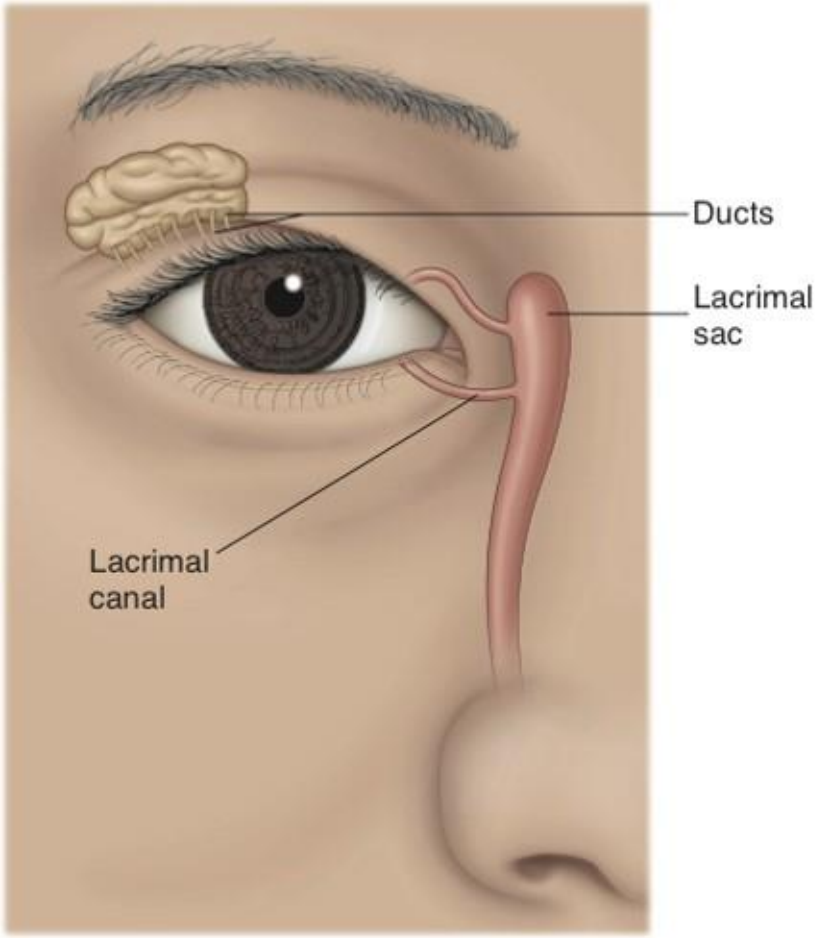
- Regular eye examinations
- Eye hygiene
- Nutrition for eye health
- Eye safety and prevention of injury
- Eye irrigation
- Guide dogs
- Medication administration
  - Punctal occlusion
- Eye patching

Eye Irrigation

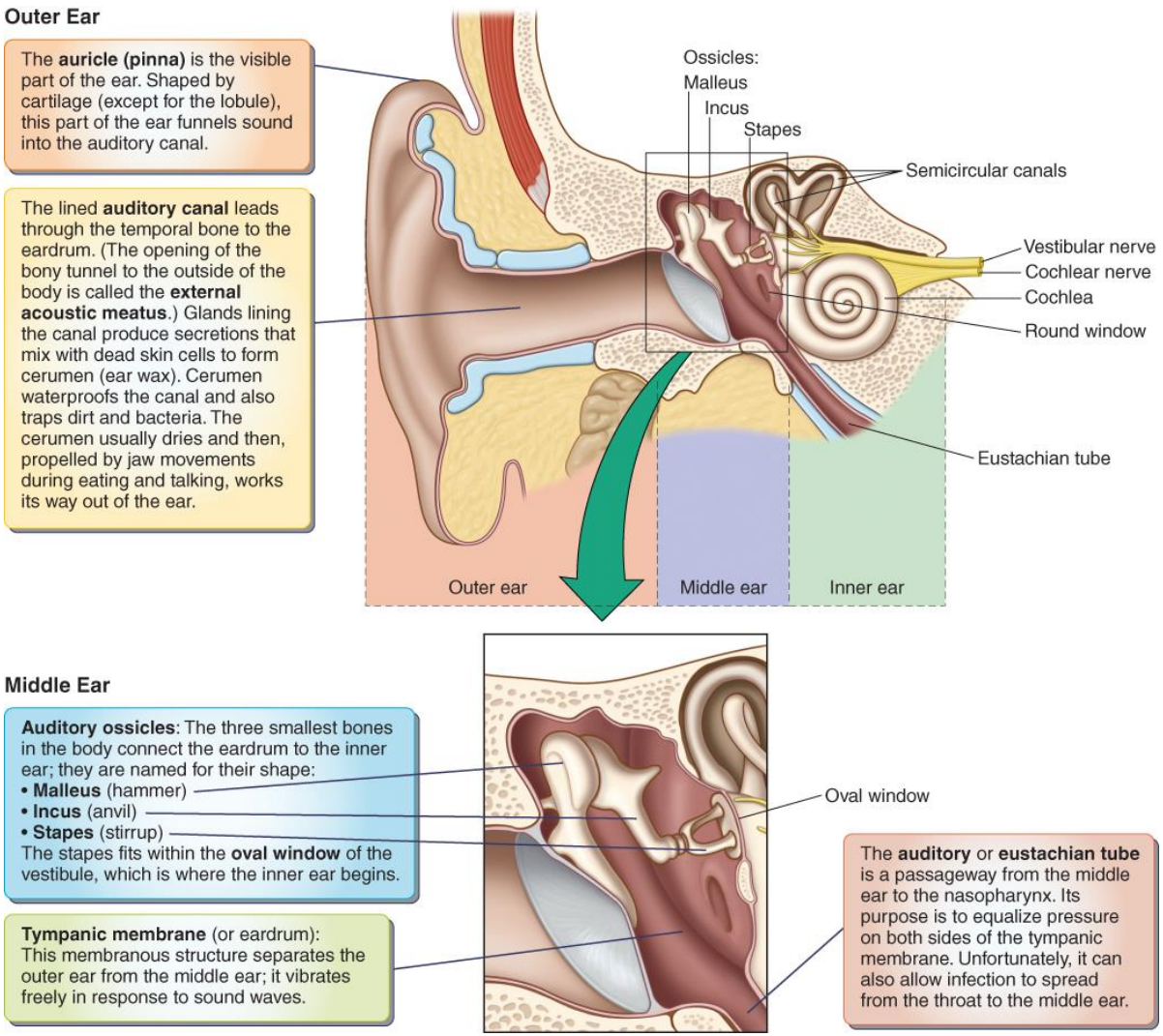
A. Morgan lens
B. Irrigation



Location for Punctal Occlusion



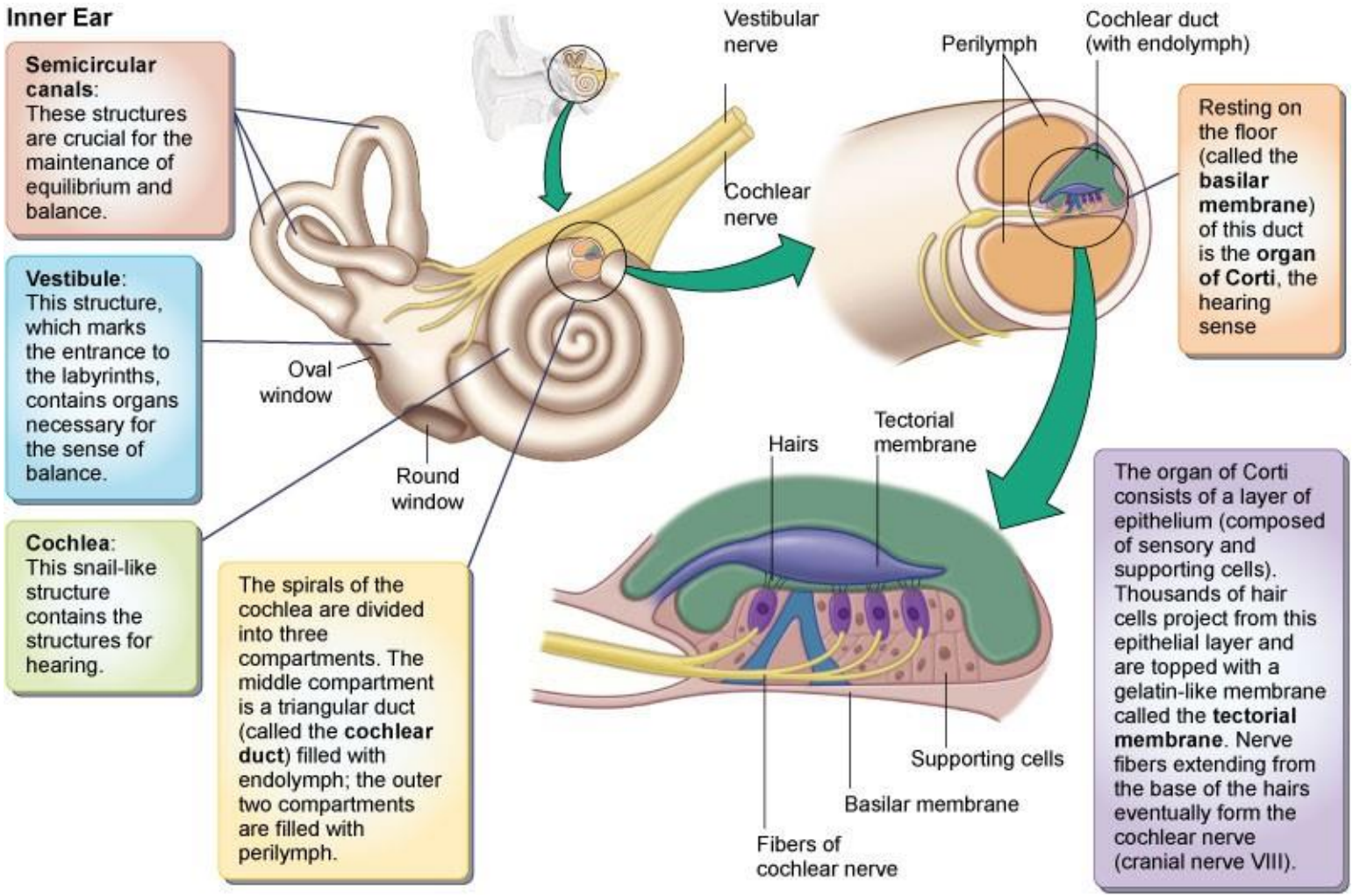
Anatomy: Outer and Middle Ear



Ear Anatomy

- Outer ear
  - Auricle
  - Ear canal
  - Cerumen
- Middle ear
  - Eardrum
  - Malleus, incus, stapes
  - Oval window
  - Eustachian tube

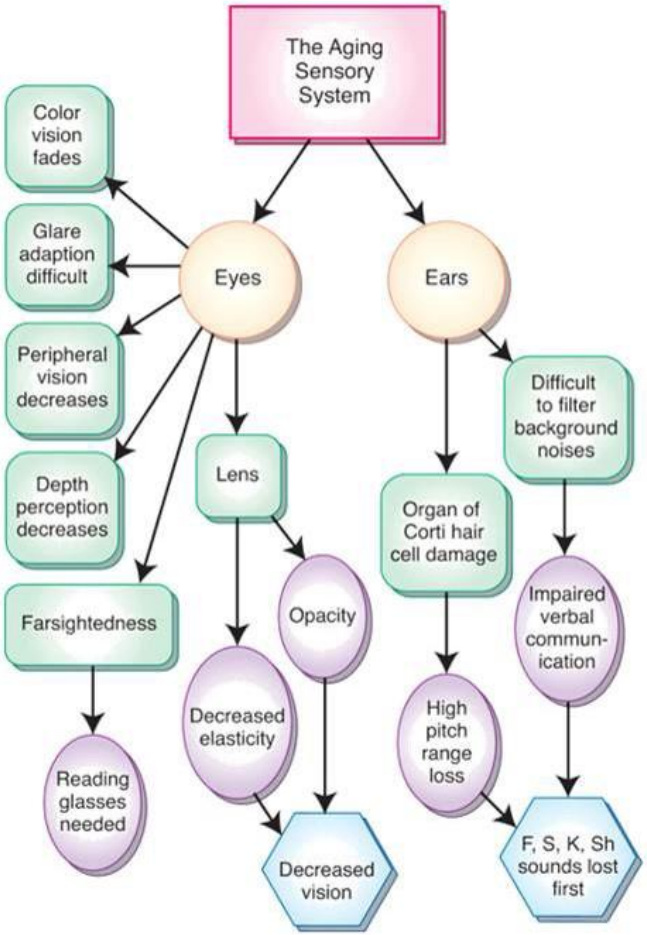
Anatomy: Inner Ear



Ear Anatomy (continued)

- Inner ear
  - Bony labyrinth
  - Perilymph
  - Endolymph
  - Cochlea
  - Utricle, saccule, semicircular canals

Aging and the Sensory System



Aging and the Ear

- Presbycusis
  - Progressive hearing loss
  - Loss of high-frequency sounds

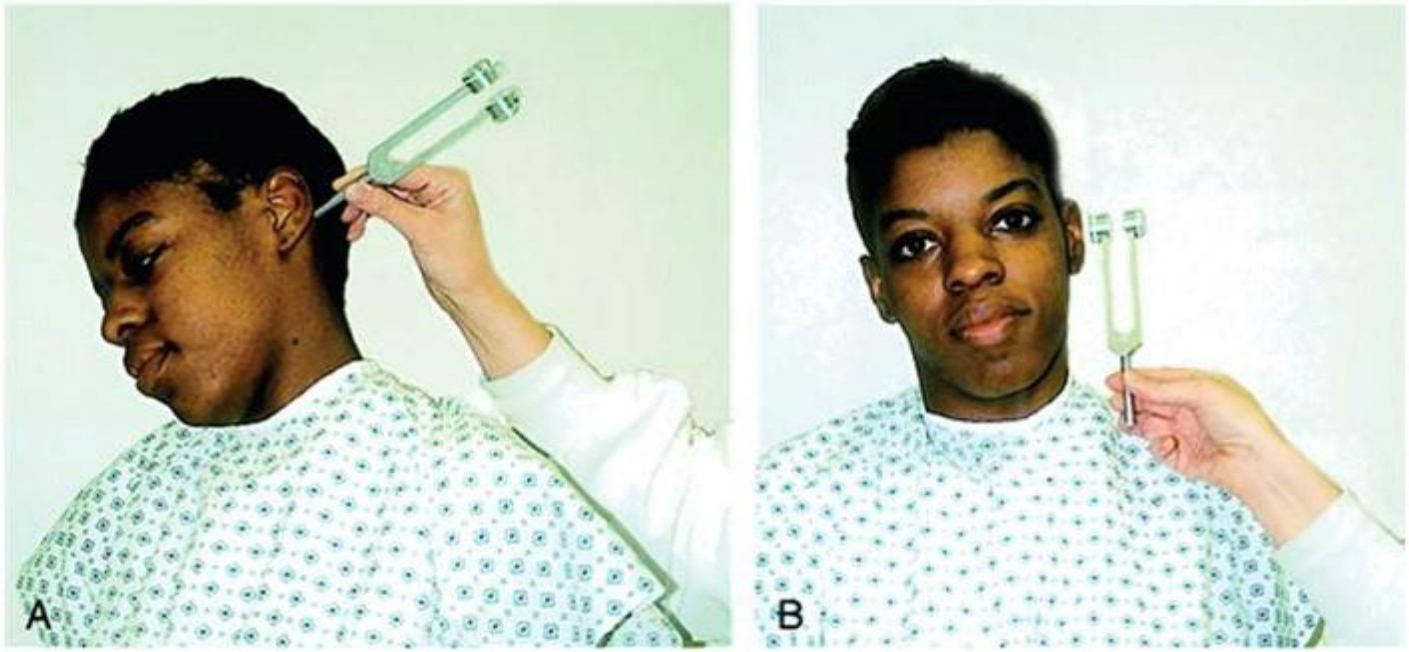
Sensory System Data Collection: Hearing

- Subjective data
  - Health history
  - Symptoms
- Objective data
  - Observe patient behaviors.
  - How does patient communicate?
  - Inspection
  - Palpation

Sensory System Data Collection: Hearing (continued)

- Auditory acuity
  - Whisper voice test
  - Rinne test
  - Weber test
- Balance testing
  - Romberg test

Rinne Test



Weber Test

Diagnostic Tests

- Audiometric testing
- Tympanometry
- Caloric test
- Electronystagmogram
- Computed tomography (CT) scan
- Magnetic resonance imaging (MRI)
- Culture of drainage
- Pathology

Therapeutic Measures

- Medications
  - Anti-infectives
  - Anti-inflammatories
  - Antihistamines
  - Decongestants
  - Cerumenolytics
  - Diuretics

Eardrop Administration

Therapeutic Measures (continued)

- Ear health maintenance
- Assistive devices
  - Hearing aids
- Hearing service dogs
  - Trained to respond to sounds
    - Crying baby, smoke alarm, oven timer

Review Question #1

In planning care for a 75-year-old patient, the nurse recognizes that which of these can affect safety? *Select all that apply.*

1. Decreased elasticity of lens: Presbyopia
2. Decreased depth perception
3. Decreased pupil size
4. Difficult night vision
5. Sensitivity to glare
6. Sees yellow, orange, red hues clearly

Review Question #1 Answer

Correct Answer: 2, 4, 5

Review Question #2

The nurse is to gather subjective visual patient data. What action should the nurse take? *Select all that apply.*

1. Check visual fields by confrontation.
2. Check six cardinal fields of gaze.
3. Ask visual symptoms.
4. Obtain health history.
5. Check pupillary reflexes.

Review Question #2 Answer

Correct Answer: 3, 4

Review Question #3

The nurse must collect data for prior dye reactions for the patient undergoing which of these diagnostic tests?

1. Exudate culture
2. Ultrasonography
3. Optical coherence tomography
4. Indocyanine green angiography

Review Question #3 Answer

Correct Answer: 4

Review Question #4

The patient reports that he cannot hear with his hearing aid. What should the nurse do?
Select all that apply.

1. Clean any cerumen off the tip.
2. Leave the battery on at all times.
3. Adjust volume to when it squeals, and then adjust volume down.
4. Replace batteries if needed.
5. Soak the hearing aid in soapy water.

Review Question #4 Answer

Correct Answer: 1, 3, 4

Review Question #5

The nurse is assisting with a Romberg test. What action should the nurse take for patient safety?

1. Ask patient to sit during test.
2. Stand near patient.
3. Dim the room lights.
4. Close curtains to reduce glare.

Review Question #5 Answer

Correct Answer: 2