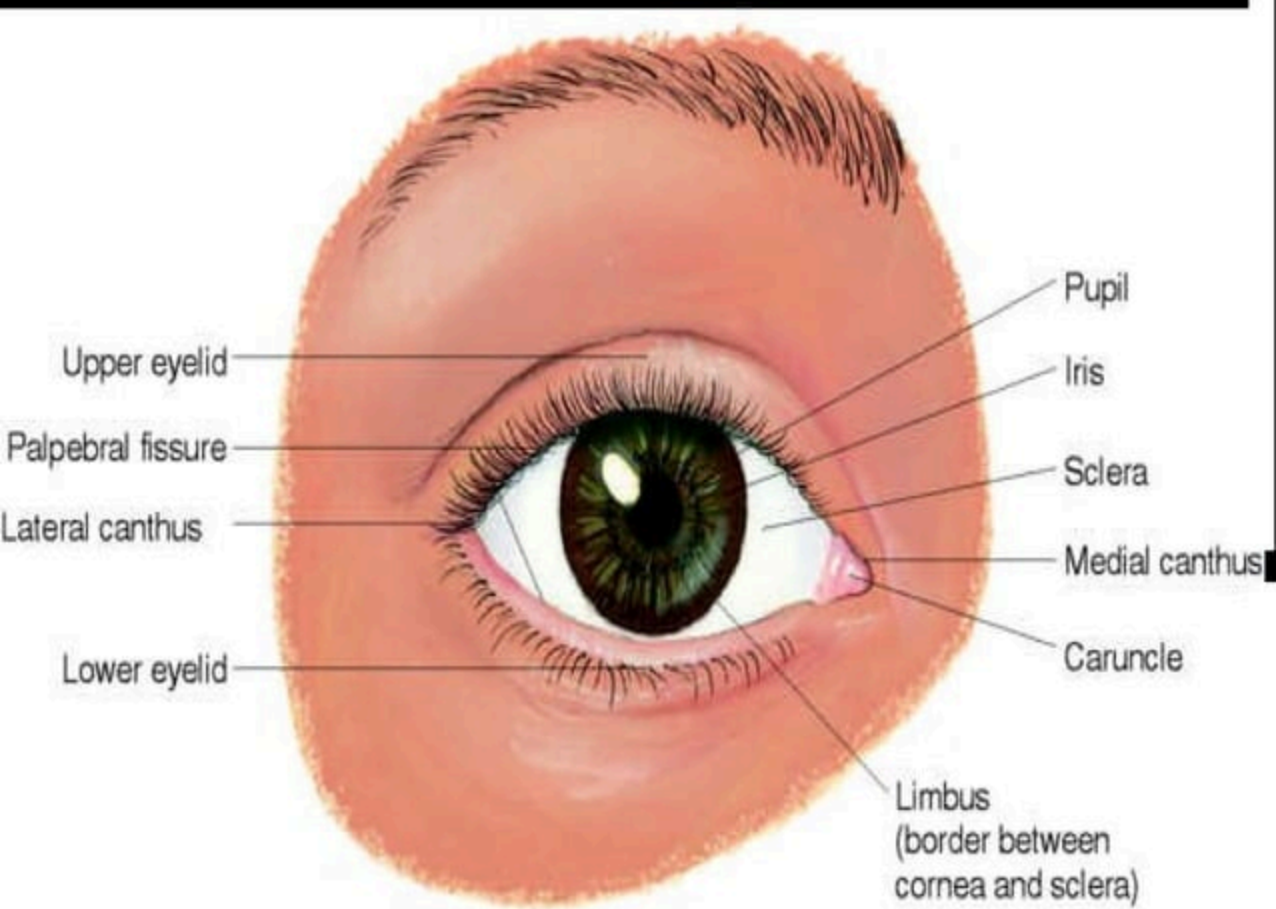


SPECIAL SENSES

VISION



Upper eyelid

Palpebral fissure

Lateral canthus

Lower eyelid

Pupil

Iris

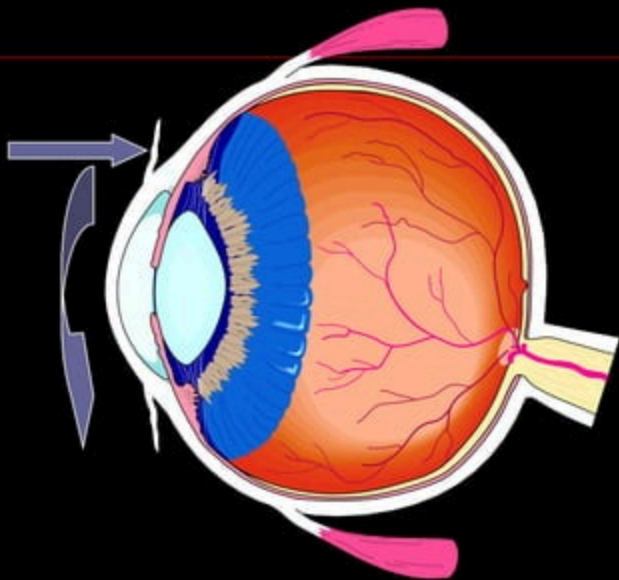
Sclera

Medial canthus

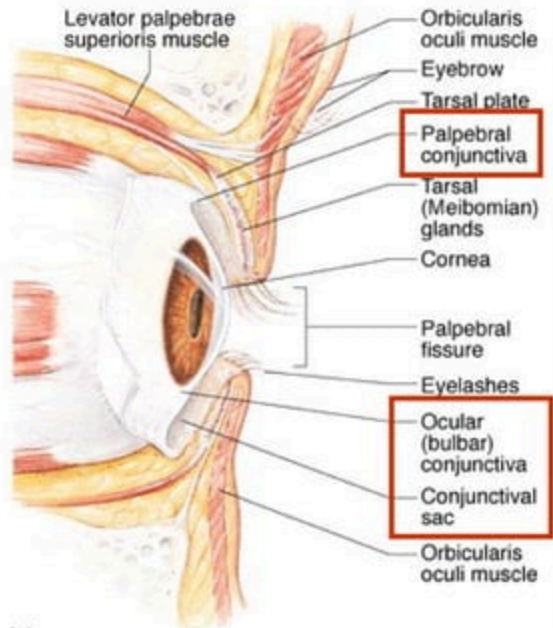
Caruncle

Limbus
(border between
cornea and sclera)

Conjunctiva



Conjunctiva

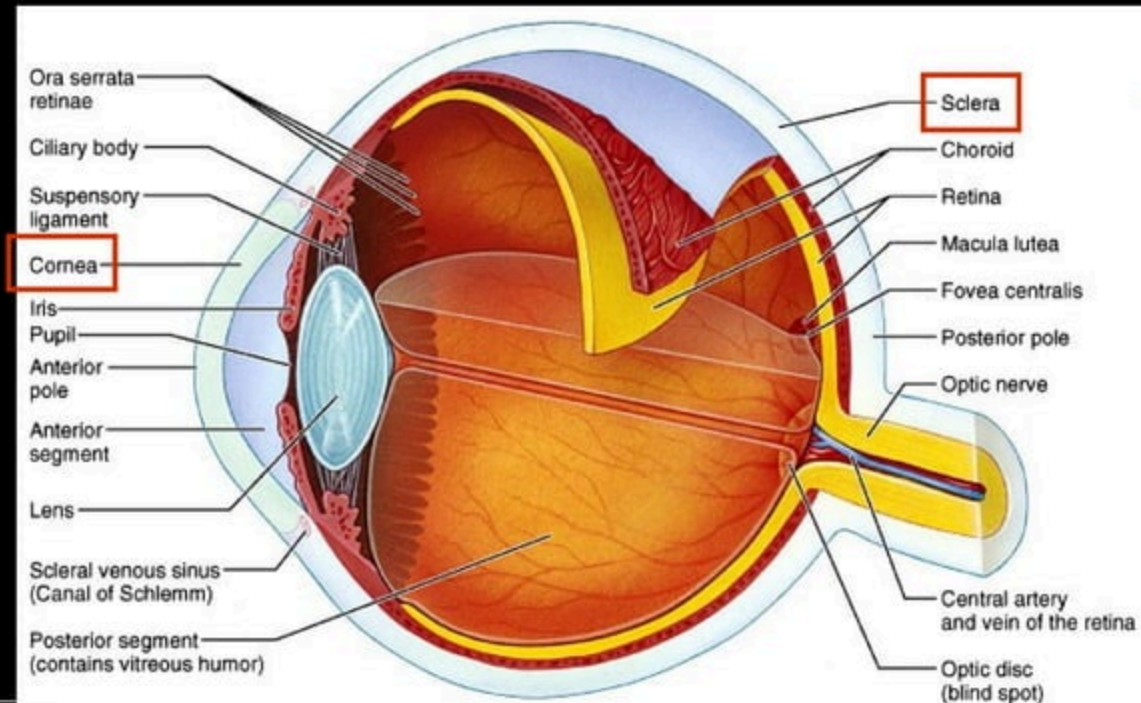


(a)

© BENJAMIN/CUMMINGS

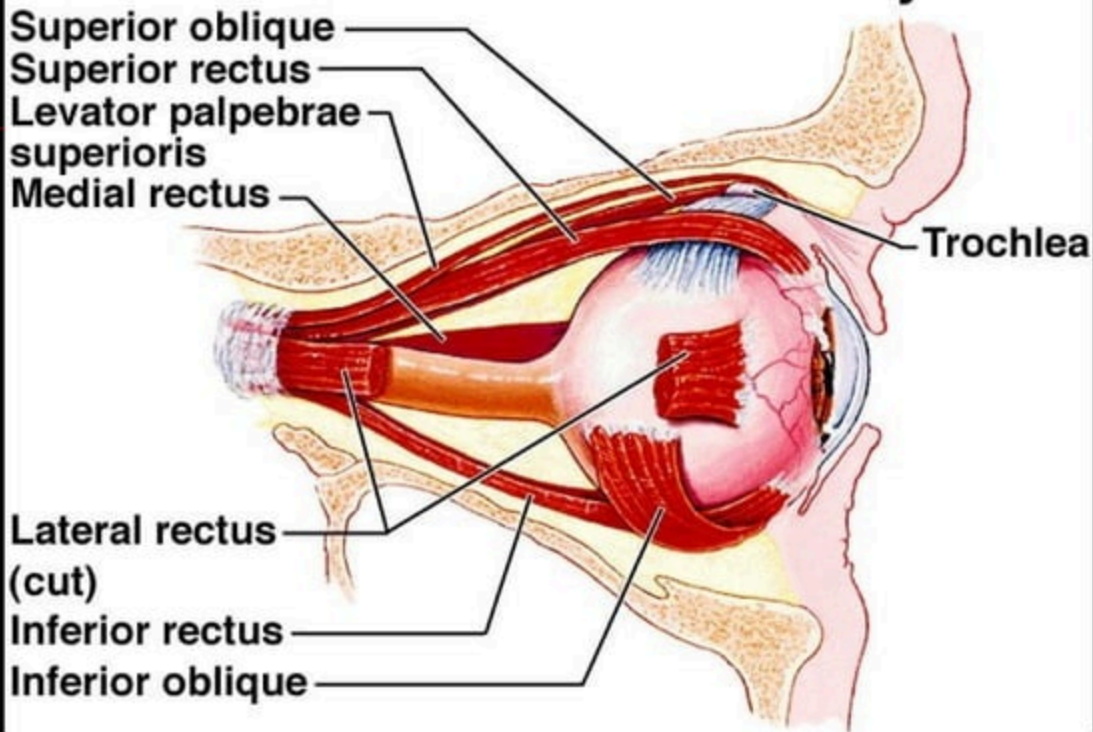
- Covers the inner surface of the eyelids and the anterior surface of the eye.
- Membrane which produces mucous that lubricates the eye and prevents dryness.
- Protects the eye.

Fibrous Tunic



(a)

Extrinsic Muscles of the Eye



Fibrous Tunic

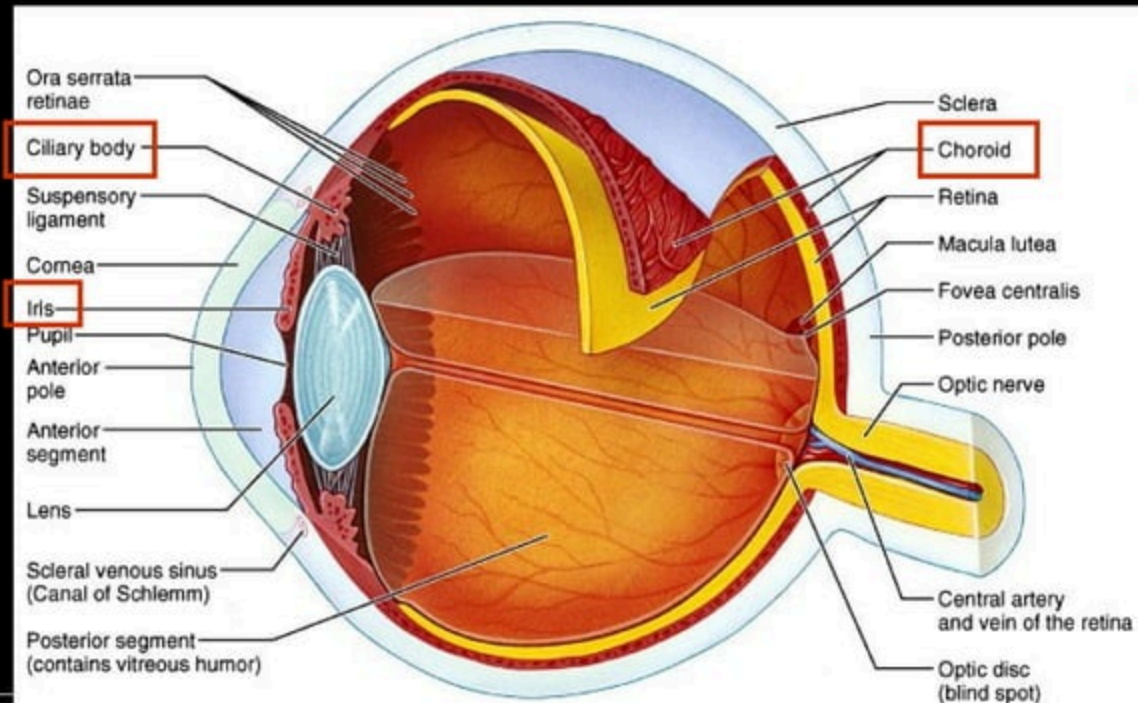
■ Sclera Functions:

- Protects eye
- Shapes eye
- Anchors eye muscles

■ Cornea Functions:

- Transparent window for light entry
- Refracts light

Vascular Tunic



(a)

Vascular Tunic

- Choroid Functions:

- Provides nutrients to all eye tunics.
- Absorbs light preventing reflecting & scattering of light within the eye.

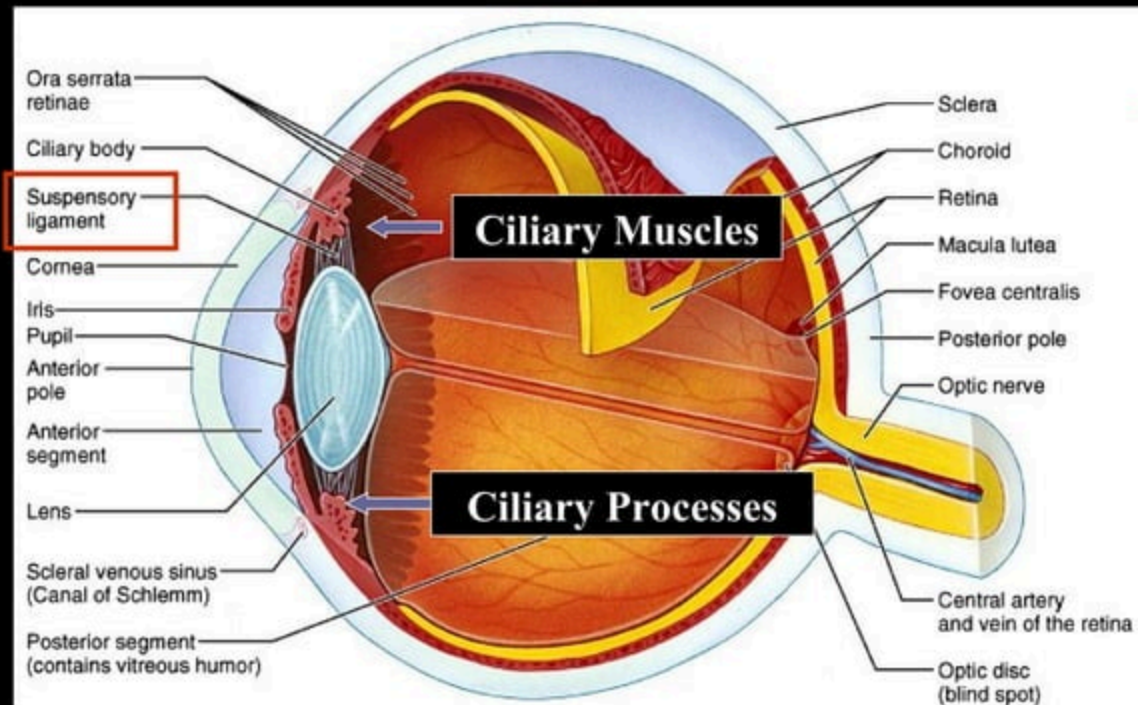
- Ciliary Body Functions:

- Ciliary processes secrete aqueous humor.
- Suspensory ligaments hold lens in place.
- Ciliary muscles pull on the ligaments to change the thickness of the lens.

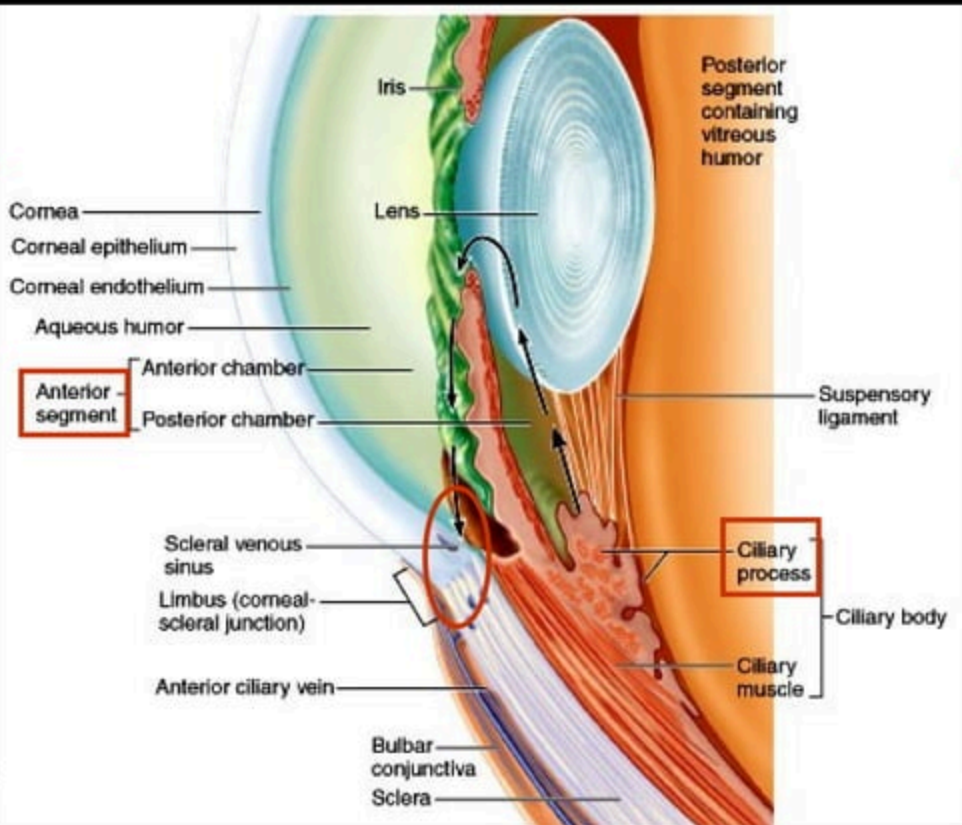
- Iris Functions:

- Constricts or dilates to adjust the amount of light entering the eye.

Vascular Tunic



(a)



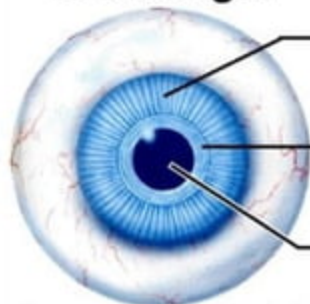
Aqueous Humor

- Helps support the eye internally due to the intraocular pressure it produces inside the eye.
- Supplies nutrients & oxygen to the cornea, lens and portions of the retina.
- Carries away metabolic wastes from the cornea, lens and portions of the retina.



Sympathetic motor
nerve fiber

In dim light



Radially arranged smooth
muscle fibers of the iris

Circularly arranged smooth
muscle fibers of the iris

Pupil

In normal light

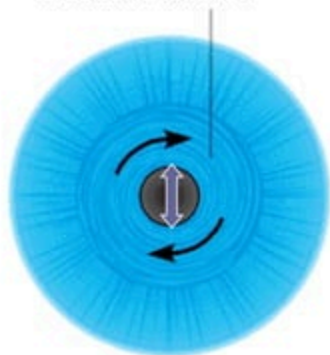


Parasympathetic
ganglion

In bright light

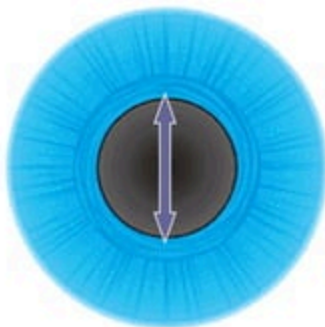
**Pupil Dilation
and Constriction**

Parasympathetic stimulation causes circular muscles to contract

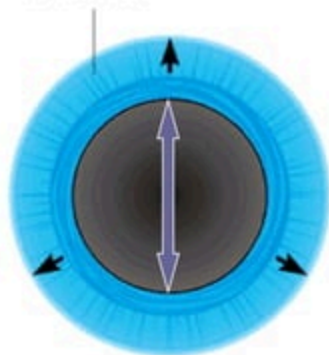


(a) Constricted pupil

Sympathetic stimulation causes radial muscles to contract



(b) Normal pupil

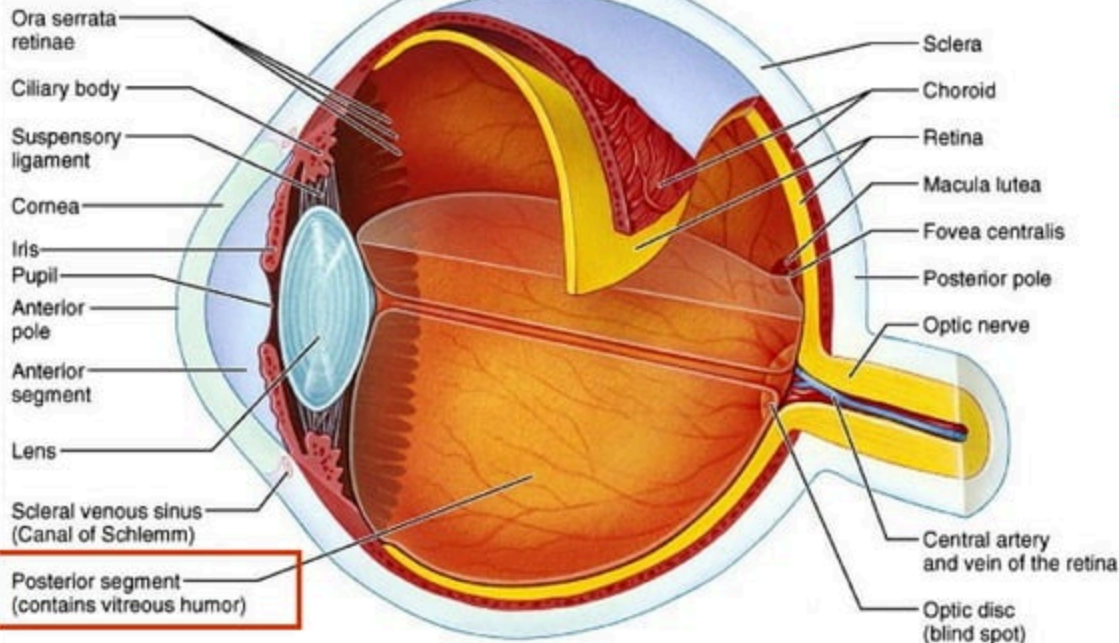


(c) Dilated pupil

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The **iris** constricts or dilates to adjust size of the pupil.

The **pupil** allows light to enter the posterior segment of the eye.



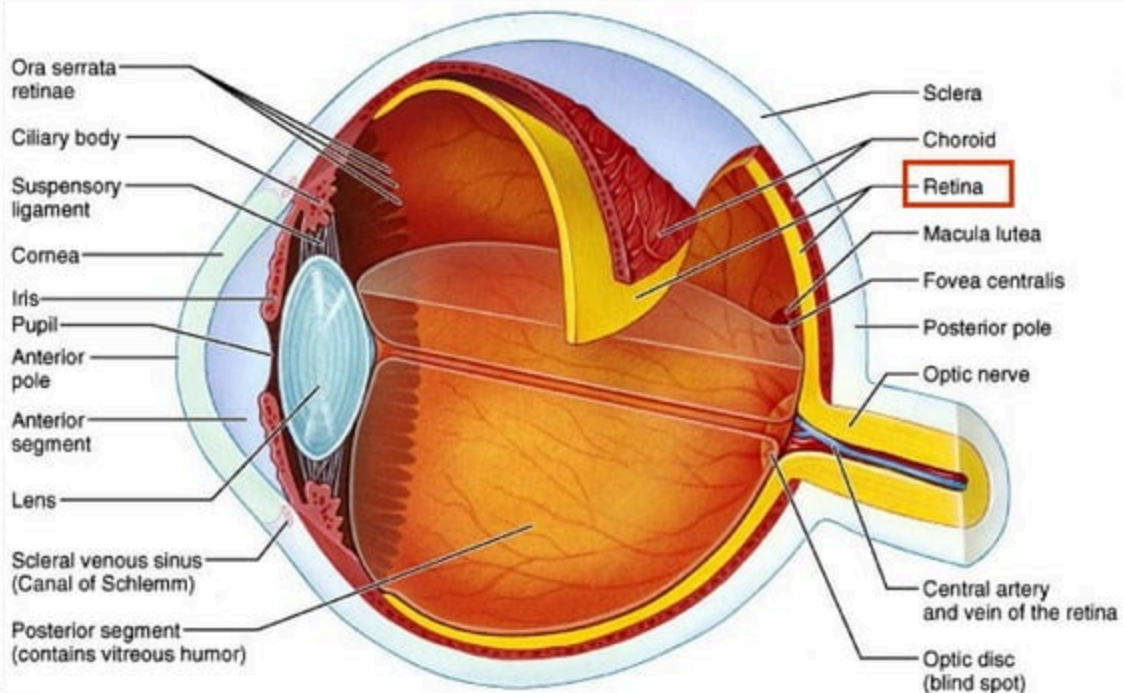
(a)

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Vitreous Humor

- Transmits light within the posterior segment.
- Supports the lens posteriorly.
- Holds the retina in place.
- Contributes to intraocular pressure.

Sensory Tunic



(a)

Retina

■ Pigmented Layer

- Absorbs light
- Carries out phagocytosis
- Stores Vitamin A

■ Neural Layer

- Contains photoreceptors (rods and cones) for visual perception
- Contains bipolar cells & ganglion cells for visual impulse transmission

Retina

■ Fovea Centralis

- Contains only closely packed cones
- Provides acute color vision in bright light

■ Macula Lutea

- Contains more widely spaced cones

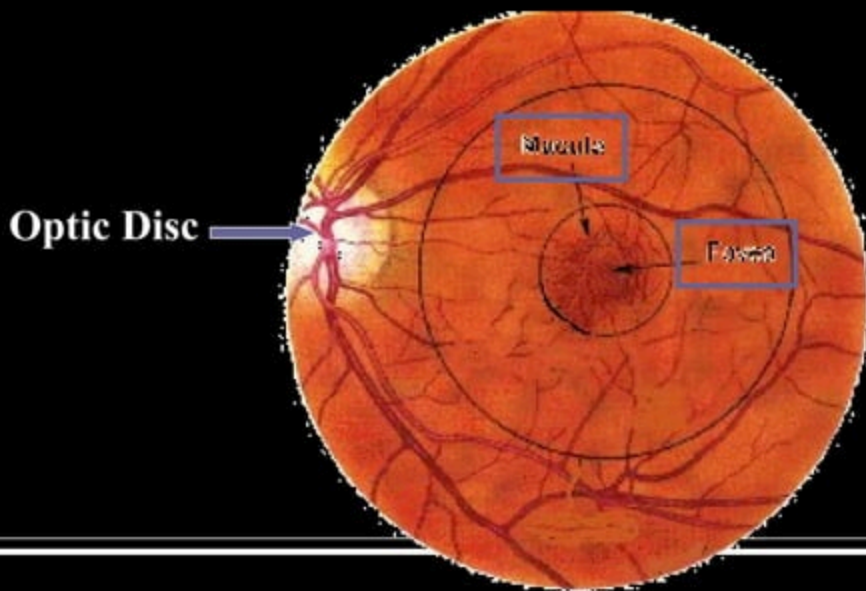
■ Other areas of Retina

- Contain only rods
- Provide night, dim light & peripheral vision
- Shades of grey only

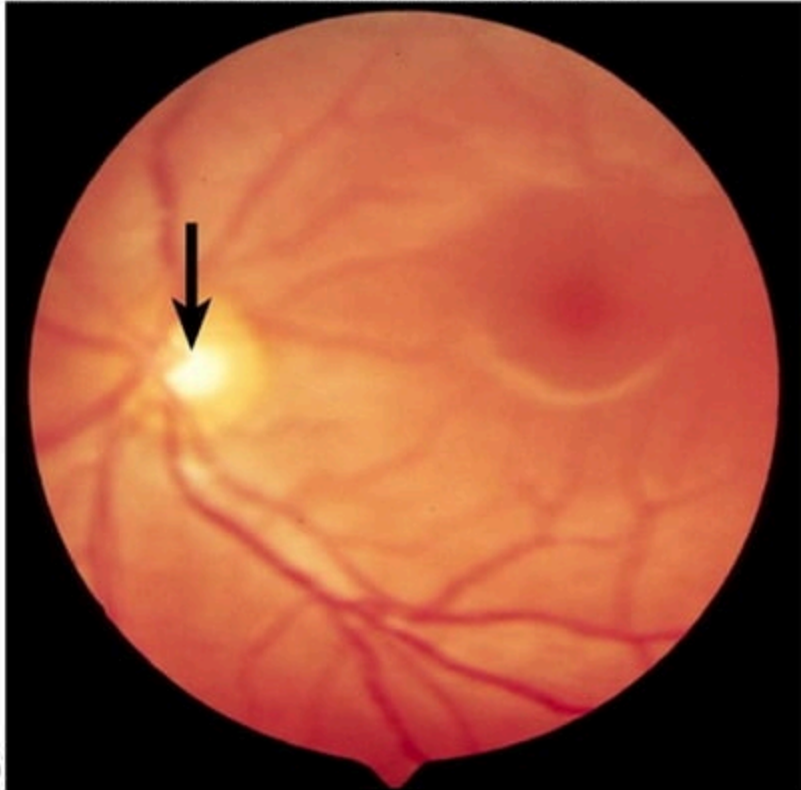
■ Optic Disc

- Contains no receptors
- Blind spot

Retina

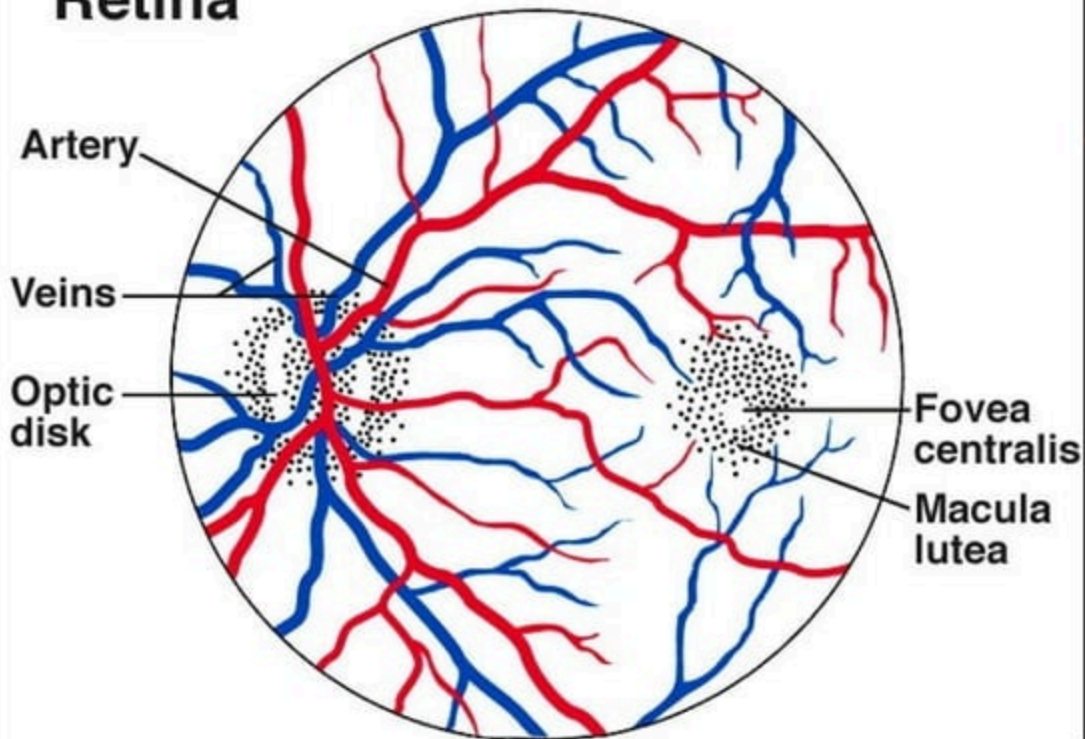


Optic Disk

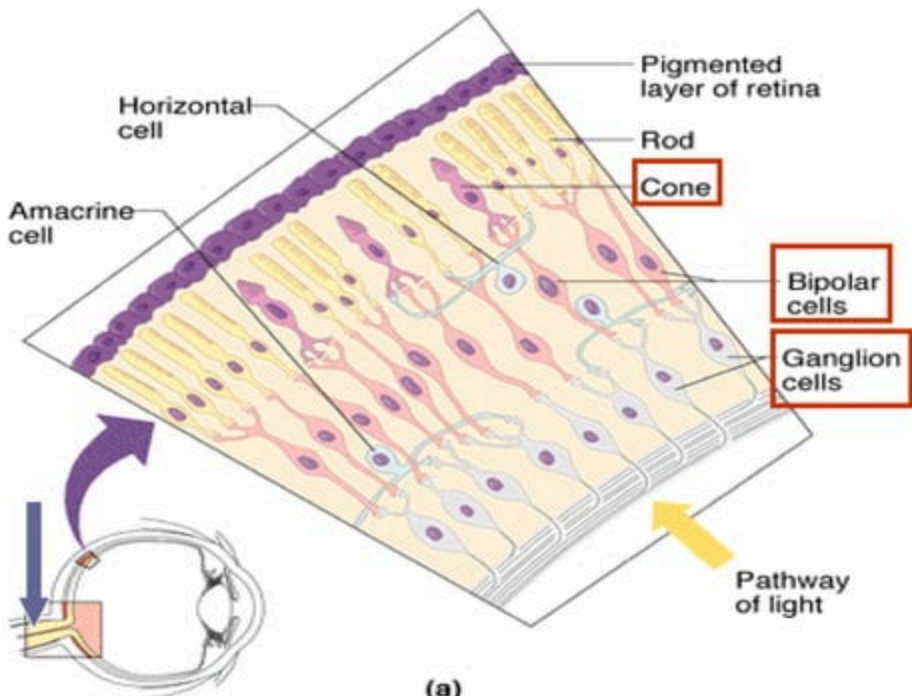


(a)

Retina



Photoreceptors

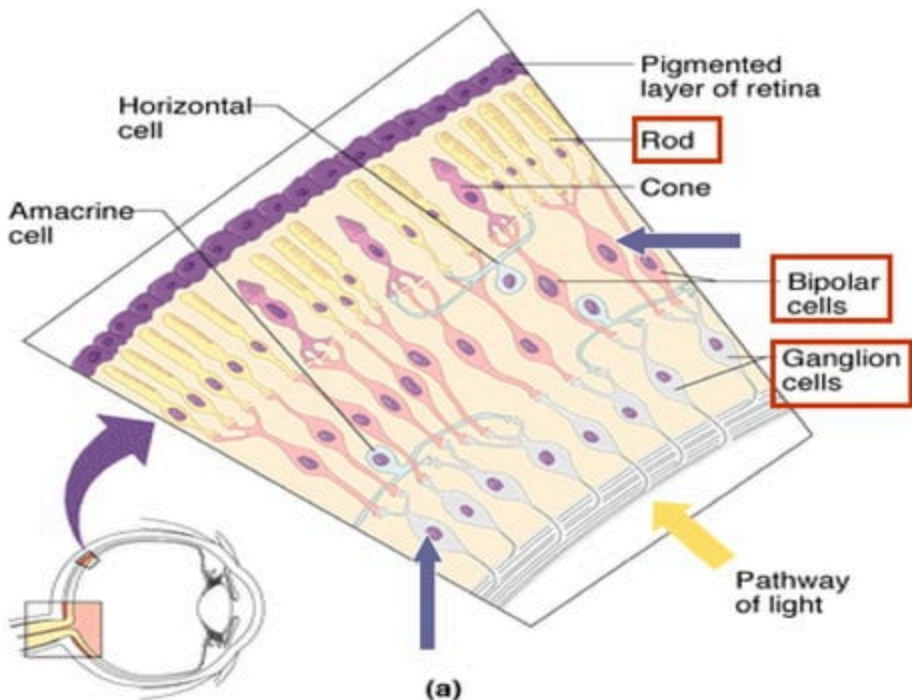


Cones

- Are located in macula lutea but are most highly concentrated in the fovea centralis.
- Are sensitive to bright light (daylight) situations in which light is very intense.
- Each cone synapses with a single bipolar cell which synapses with a single ganglion cell.
- The axons of ganglion cells form the optic nerve to conduct visual images to the brain.

- Provide acute (sharp) color images

Photoreceptors

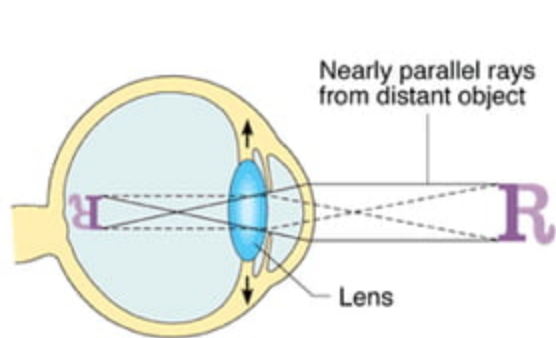


Rods

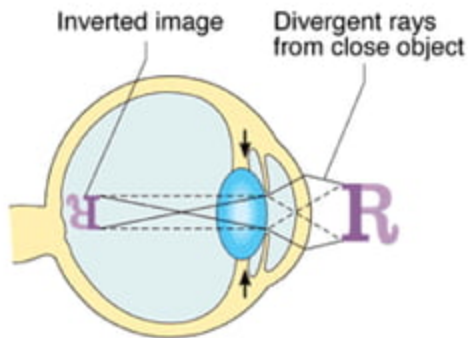
- Most highly concentrated in the retina outside the macula lutea
- Many rods synapse with a single bipolar cell
- Many bipolar cells may synapse with a single ganglion cell which carries stimuli to brain
- More sensitive & function only in dim light, night and peripheral vision
- Images are **blurry** and only in shades of **gray**

Lens

- Refracts (bends) light
- Focuses precise image on the retina (fovea) through **accommodation** (changing thickness)

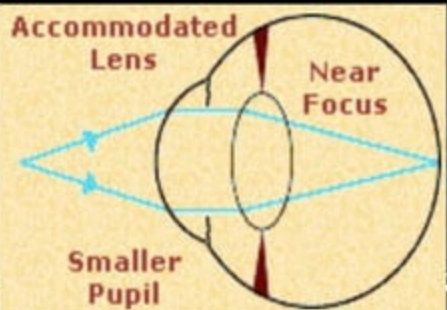
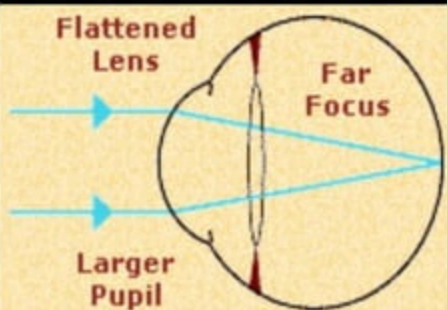


(a) Lens is flattened for distant vision



(b) Lens bulges for close vision

Accommodation and associated disorders



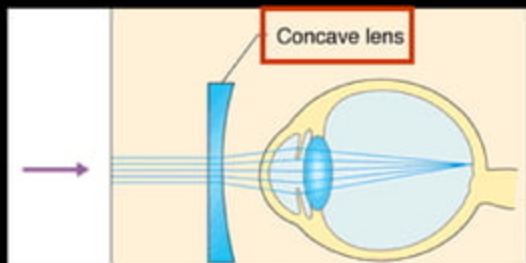
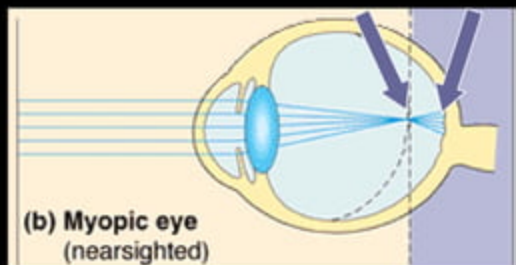
- Accommodation of the lens is limited and age dependent
 - With age, lens becomes stiffer and less compliant.
 - Age related loss of accommodation called **presbyopia**
- Accommodation accompanied by adaptive changes in size of pupil

Visual Example of Presbyopia



Myopia (Nearsighted)

- Eyeball too long
- Distant objects focused in front of retina
- Image striking retina is blurred



Correction:

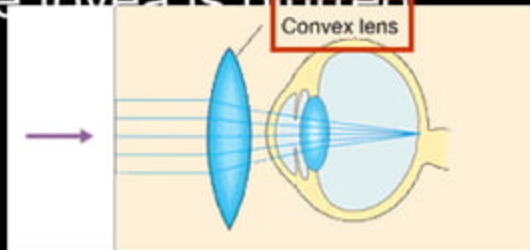
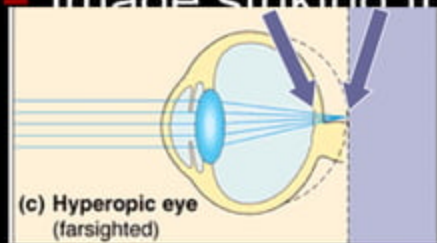
- Concave lens or
- laser surgery to slightly flatten the cornea

Visual Example of Myopia



Hyperopia (Farsighted)

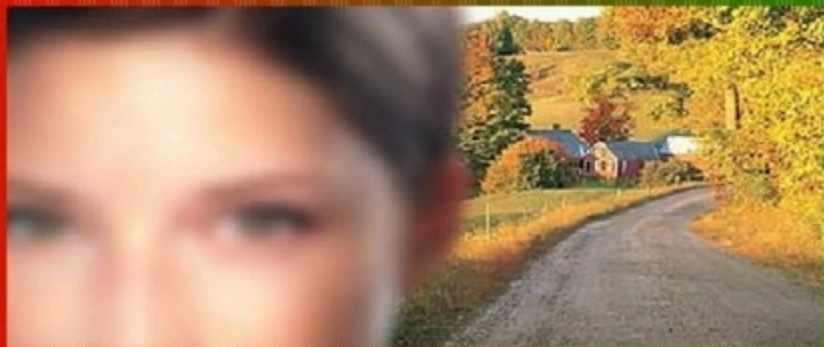
- Eyeball too short, lens too thin or too stiff.
- Nearby objects are focused behind retina.
- Image striking the fovea is blurred



Correction:

- Convex lens

Visual Example of Hyperopia



Diplopia

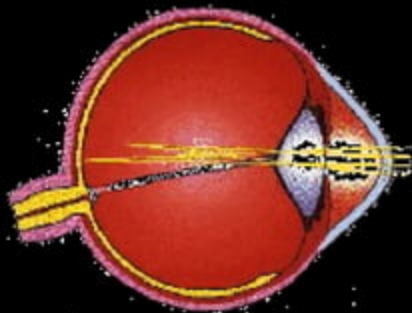
- Diplopia, commonly known as “double vision”, is the perception of two images from a single object. The images may be horizontal, vertical, or diagonal .
- When the eyes are misaligned and aimed at different targets, two non-matching images are sent to the viewer's brain. When the viewer's brain accepts and uses two non-matching images simultaneously, double vision results.
- Diplopia contributes to loss of depth perception and binocular vision.

Visual Example of Diplopia



Astigmatism

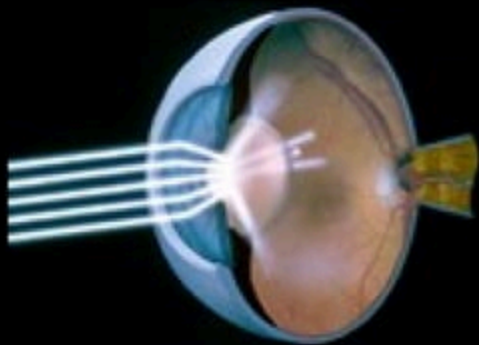
- Irregular Curvature in parts of the cornea or lens
- Causes blurry image



- This may be corrected by specially ground lenses which compensate for the irregularity or laser surgery.

Cararact

- Clouding of lens due to aging, diabetes mellitus, heavy smoking, frequent exposure to intense sunlight or congenital factors



Treatment: Lens Implant

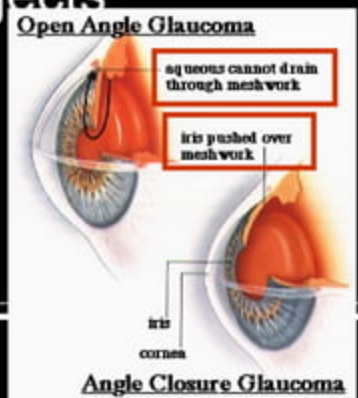
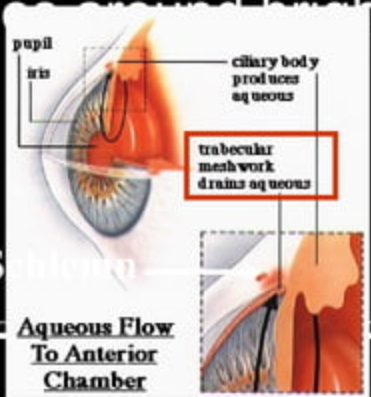
Conjunctivitis

- Inflammation of the conjunctiva by:
- Bacteria, fungi or viruses
- Trauma



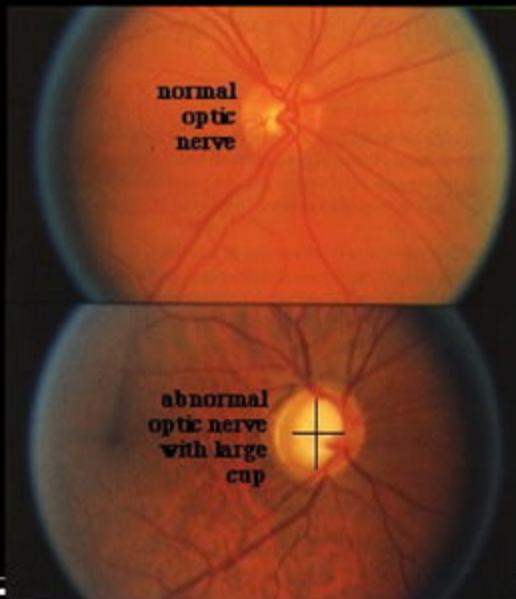
Glaucoma

- Most common cause of blindness.
- Increasing intraocular pressure compresses retina, optic nerve & blood vessels.
- Late symptoms include blurred vision & halos around bright objects



Canal of Schlemm

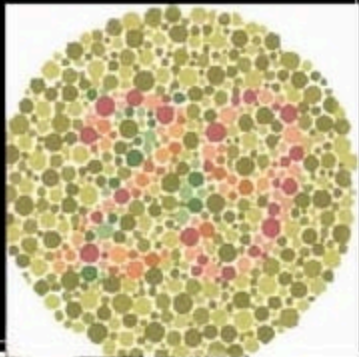
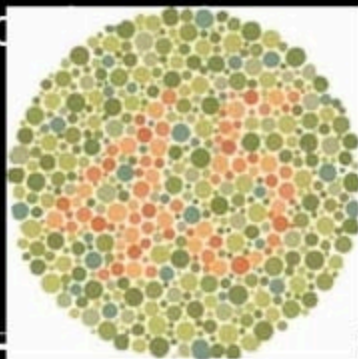
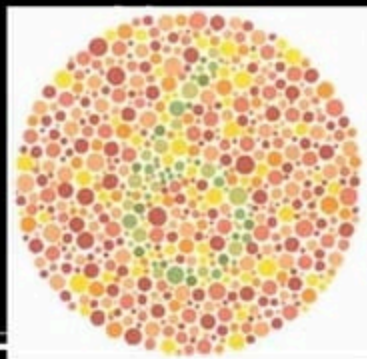
Glaucoma



Damaged Optic Nerve

Color Blindness

- Congenital lack of one or more cone types
- Deficit or absence of red or green cones most common
- Sex-linked trait



What numbers can you see in each of these?

Night Blindness

- Impaired vision at night or in dim light situations
- Rhodopsin deficiency affecting rods
- Most common cause - prolonged Vitamin A deficiency
- Rods degenerate

Macular Degeneration

- Most common cause of vision loss after 65.
- Progressive deterioration of macula



nter



• Dry Form - due to accumulation of pigments in macula due to reduced phagocytosis of cone debris by pigmented layer

• Wet Form - due to invasion of macula with new blood vessels from choroid causing scarring & retinal detachment