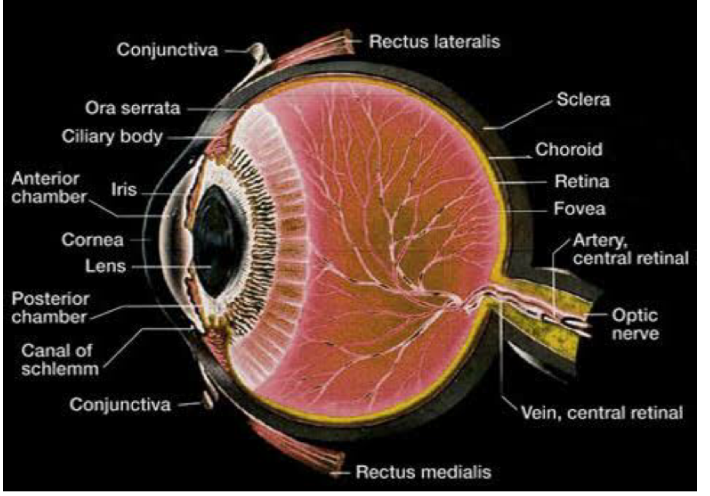
Name: Ashaolu Joseph Oluwadamilare
Matric no: 17/mhs1/064
Department: Medicine and surgery
Course: histology of special sense and neuro histoloy
Course code: ANA 305

ANSWER 1
The eyes are the organ of the visual system of the body, that detect/receive information in for of light and convert it into electro-chemical impulse in neurons thereby resulting in vision.

The shape of the eye(s) varies from person to person but the structures are basically the same, they can be categorized into external and internal structures both of which perform different functions



A. External structures: structures within this category mainly provides the eyes from protection, they are

1. Eye Lashes and Lids
2. Conjunctiva
3. Tear film
4. Accessory glands
5. Muscle

1. *Eyelid:* The eyelid, likewise known as the cover of the eye, a mobile layer made up of skin and also muscular tissue and also covers the eyeball
2. *Conjunctiva*

- The conjunctiva lines the

inner part of the eyelids.

- The tarsal plate lies beneath the conjunctiva and contains meibomian glands, which secrete an oily substance to decrease the evaporation of the tear film.

3. *Tear film:* The tear film consists of aqueous, mucus, and oily secretions.
4. *Accessory glands:* Apocrine glands of Moll, meibomian glands, lacrimal glands.
5. *Muscles:* Orbicularis oculi, levator palpebrae superioris, superior tarsal muscle.

B. Internal structures:
structures within this category mainly provides the eyes with primarily structural and visual function, they are arranged in three layers namely,

1. Outermost: Sclera and cornea
2. Middle layer: The Uvea (consisting of iris, ciliary body and choroid)

3. Innermost: Lens, Vitreous and Retina

1. Outermost layer.

a. *The sclera (white of the eye)*

- The sclera is dense connective tissue made of mainly type 1 collagen fibers, oriented in different directions.
- The lack of parallel orientation of collagen fibers gives the white appearance, as opposed to the transparent nature of the cornea.
- its collagen is continuous with that of the cornea
- The four layers of the sclera from external to internal are episclera, stroma, lamina fusca, endothelium.
- The episclera is the external surface of the sclera. It is connected to the Tenon capsule by thin collagen

fibers. At the corneoscleral junction, also known as the limbus, the Tenon capsule contacts stroma of the conjunctiva.

b. *Cornea (transparent front layer of the eye)*

- Consists of type I collagen fibers oriented in a uniform parallel direction to maintain transparency
- Consists of five layers: epithelium (non-keratinized, stratified squamous epithelium), Bowman layer, stroma (also called substantia propria), Descemet's membrane, corneal endothelium.
- Corneal epithelium: fast growing, regenerating multicellular layer which interacts directly with the tear film.
- Bowman layer: This is a layer of subepithelial basement

membrane protecting the underlying stroma. It is composed of type 1 collagen, laminin, and several other heparan sulfate proteoglycans.

- Stroma: The largest layer of the cornea, the stroma has collagen fibers arranged in a regular pattern. Keratocytes maintain the integrity of this layer. The function of this layer is to maintain transparency, which occurs by the regular arrangement, and lattice structure of the fibrils, whereby scatter from individual fibrils gets canceled by destructive interference, and the spacing of less than 200 nm allows for transparency.
- Descemet's membrane: an acellular layer made of type IV collagen that serves as a modified basement membrane of the corneal

endothelium

- Corneal endothelium: a one cell thick layer made of either simple squamous or cuboidal cells. Cells in this region do not regenerate and have pumps that maintain fluid balance and prevent swelling of the stroma. When corneal endothelial cells are lost, neighboring cells stretch to attempt to compensate these losses.

2. Middle layer

a. Iris:

- Consists of a stromal layer with pigmented, fibrovascular tissue and pigmented epithelial cells beneath the stroma
- The sphincter pupillae and dilator pupillae muscles connect to the stroma
- The pigmented layer of cells blocks rays of light and ensures that light must move

through the pupil to reach the retina

- The angle formed by the iris and cornea contains connective tissue with endothelial channels called the trabecular meshwork, which drains aqueous humor in the anterior chamber into the venous canal of Schlemm. From here, fluid drains into episcleral veins.

b. *Ciliary Body :* The tissue that divides the posterior chamber and vitreous body.

- Consists of the ciliary muscle and the ciliary epithelium
- The ciliary muscle, via the lens zonules, controls the structure of the lens, which is vital for accommodation. Zonules are connective tissue fibers that connect the ciliary muscle and lens.
- The ciliary epithelium produces aqueous humor

which fills the anterior compartment of the eye.

c. Choroid

- Consists of a dense network of blood vessels supplying nourishment to structures of the eye, housed in loose connective tissue.
- The choriocapillary layer is located in the innermost part of the choroid and supplies the retina
- The Bruch membrane is an extracellular matrix layer situated between the retina and choroid and has significance in age-related macular degeneration, where an accumulation of lipid deposits prevent diffusion of nutrients to the retina.

3. Innermost layer:

a. Lens: separates the aqueous and vitreous chambers

- Consists of an outer capsule,

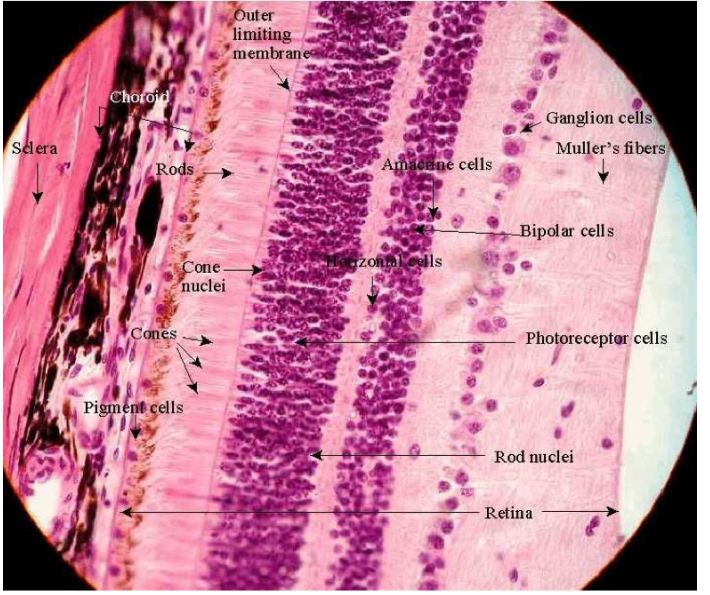
a middle layer called cortex, and an inner layer called the nucleus.

- The capsule is the basement membrane of the lens epithelium which lies below
- New lens cells differentiate from the lens epithelium and are incorporated peripherally, pushing older lens cells towards the middle.

b. Vitreous: a jelly-like space made of type II collagen separating the retina and the lens

c. Retina: nervous tissue of the eye where photons of light convert to neurochemical energy via action potentials

---



Clinical Application

Several of the most common diseases of the eye are manifestations of pathology within specific histological layers. Below are examples of common eye conditions, and the layers of the eye implicated.

- ***"Chalazion"***: A sterile lump often in the upper eyelid caused by obstruction of the meibomian oil glands.
- ***"Conjunctivitis":*** Inflammation of the transparent conjunctiva that may be caused by bacterial or viral

infections, allergies, or exposure to certain chemicals.

- ***"Cataracts":*** A sclerotic nuclear cataract is the most common and is due to opacification in the central nucleus of the lens. Cortical cataracts are due to opacifications in the cortex and have a distinct wedge-shaped appearance. Posterior subcapsular cataracts arise from behind the sac-like structure of the lens.
- ***"Glaucoma":*** Refers to optic nerve damage related to increased intraocular pressure. Drainage of aqueous humor through the trabecular meshwork is often implicated.
- ***"Age-related macular degeneration":*** A progressive eye disease causing damage to the

macula or central portion of the retina. Accumulation of drusen, or lipid-laden deposits in Bruch's membrane of the retina, is associated with disease severity.

- ***"Fuchs Dystrophy"***: A disease of the corneal endothelium, that causes accumulation of excess edema in the corneal stroma. Progression of the disease often causes blisters in the eye, also referred to as bullous keratopathy.
- ***"Floaters":*** The sensation of floaters is due to changes that occur in the jelly-like vitreous layer of the eye.
- ***"Retinal detachment":*** It occurs when the outer pigment epithelial layer separates from the inner neurosensory layer consisting of rods and cones; this is a vision-threatening condition

as the neurosensory layer is unable to receive nutrients from the underlying choriocapillaris and retinal pigment epithelium.

ANSWER 2

The Retina is a thin layer of tissue that lines the back of the eye on the inside. Its a nervous tissue of the eye where photons of light convert to neurochemical energy via action potentials. It is located near the optic nerve.

It's divided into various layers as follows:

Retinal pigment epithelium: made of cuboidal cells containing melanin which absorbs light. These cells also establish a blood-retina barrier through tight junctions.

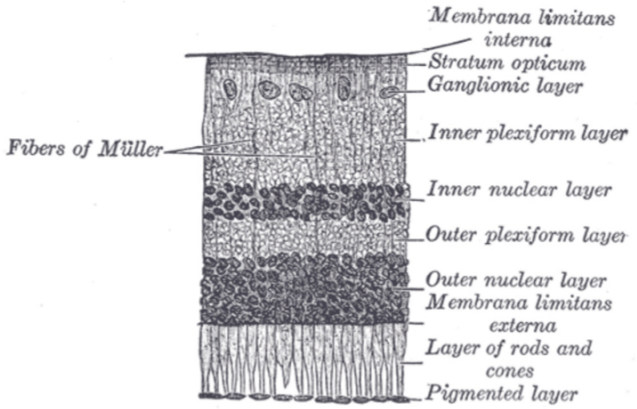
"Rod and cone cells": the layer of cells with photoreceptors and

glial cells. Rods are located peripherally and are more sensitive to light and motion than cones. Cones have higher visual acuity and specificity for color vision.

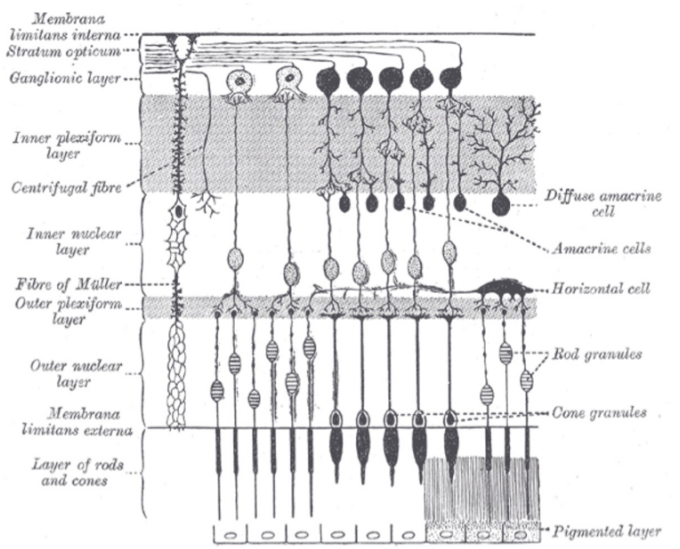
- *"Outer limiting membrane"*: a layer of Muller cells and rod/cone junctions which serves to separate the photosensitive regions of the retina from the areas that transmit the electrical signals.
- *"Outer nuclear layer"*: This layer consists of nuclei of rod and cone cells.
- *"Outer plexiform layer"*: This layer contains synaptic processes of rod and cone cells.
- *"Inner nuclear layer'*: This layer contains the cell body of glial, amacrine, bipolar, and horizontal cells
- *"Inner plexiform layer"*: This layer relays information from

cells of the inner nuclear layer. Thus, this layer has axons of amacrine, bipolar, and glial cells and dendrites of retinal ganglion cells.

- *"Ganglion cell layer"*: This layer contains nuclei of retinal ganglion cells.
- *"Nerve fiber layer"*: This layer contains axons of retinal ganglion cells and the astroglia which support them. Collectively, these axons constitute the optic nerve.
- *"Internal limiting membrane"*: A thin layer of Muller glial cells and basement membrane which demarcates the vitreous anteriorly from the retina posteriorly.



Retina layers



Retina neurons

Clinical correlates

- Macular degeneration - a disease that destroys your sharp, central vision by causes cells in the macula to die
- Diabetic retinopathy: caused

by damages to the tiny blood vessels inside your retina.

- Retinal detachment - a medical emergency, when the retina is pulled away from the back of the eye
- Retinoblastoma - cancer of the retina. It is most common in young children.
- Macular pucker - scar tissue on the macula
- Macular hole - a small break in the macula that usually happens to people over 60
- Floaters - cobwebs or specks in your field of visio