

MATRIC NUMBER: 17/MHS01/303

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COURSE CODE: ANA 305

ASSIGNMENT

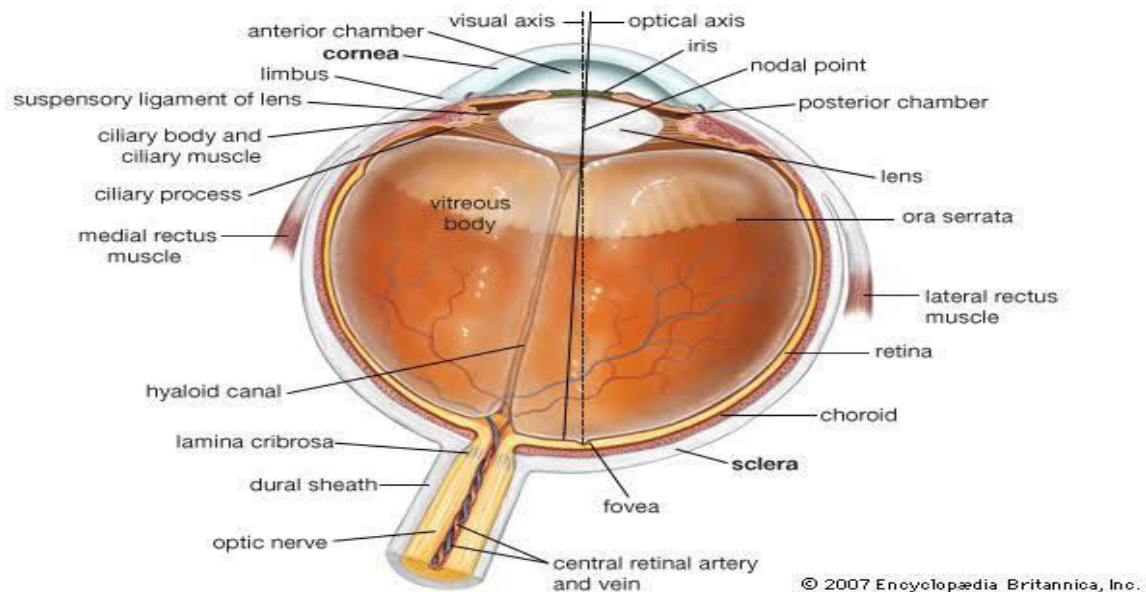
- 1) Write an essay on the histological importance of the eye in relation to their cellular function.
- 2) Corona virus can penetrate the body through the eye and implicate the immune system, briefly discuss the layers of the retina for information penetration.

SOLUTION

**QUESTION 1; Write an essay on the histological importance of the eye in relation to their cellular function.**

ANSWER:

The eye is an organ of visual system. It is a highly development photosensitive organ for analyzing the form, intensity, and color of light reflected from objects and providing the sense of sight. It reacts to light and allows vision. It is protected within the orbits of the skull. The rods and cone cells in the retina allows conscious light perception and vision including color differentiation and the perception of depth. The eye is part of the sensory nervous system. The external structure of the eye includes the eyelashes, lids, muscles, accessory glands and conjunctiva. The internal layers of the eye consist of 3 layers:



1. The external layer- Sclera and Cornea
2. The vascular layer- Uvea (Iris, ciliary body and choroid)
3. The innermost layer- The retina. : communicates with cerebrum through optic nerve

#### 1) THE EXTERNAL LAYER

##### A) *The sclera* ;

is a dense connective tissue made up of mainly type I collagen fibers, these fibers have no definite orientation thus the giving the sclera a white appearance. The sclera has 4 layers; episclera, stroma, lamina fusca and endothelium.

##### B) *The cornea* ;

is the transparent front layer of the eye, it consists of type I collagen fibers and they are oriented in a parallel direction to maintain transparency. The cornea consists of 5 layers which are:

- *The corneal epithelium*- which is non-keratinized stratified squamous epithelium, a regenerative layer
- *The Bowman's layer*- a layer of subepithelial basement membrane that protects the stroma. It consists of type I collagen, laminin, heparin sulfate proteoglycan
- *Stroma*- the largest layer of the cornea, it contains collagen fibers, keratocytes. This layer functions in maintaining transparency.
- *Descemet's membrane*- This is an acellular layer made of type IV collagen that serves as a modified basement membrane of the corneal endothelium
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- *Corneal endothelium*- Made up of either simple cuboidal or squamous cells, these cells are regenerative. They help to maintain fluid balance and prevent swelling of the stroma.

#### 2) THE VASCULAR LAYER

##### A) *THE UVEA*

-*The iris* consists of the stromal layer which is pigmented, fibrovascular layer (this pigmented layer helps to block rays of light and ensures that light moves through the pupil to reach the retina), the sphincter pupillae and dilator pupillae muscles connected to the stroma.

-*The ciliary body* is a tissue that divides the posterior chamber and vitreous body, it consists of the ciliary muscles and epithelium, the muscle via the lens zonules controls the structure of the lens while the epithelium produces the aqueous humor that fills the anterior component of the eye.

-The choroid consists of a dense network of blood vessels that supply nourishment to structures of the eye, it has loose connective tissue. The choriocapillary layer is located in the innermost part of the choroid layer and it supplies the retina.

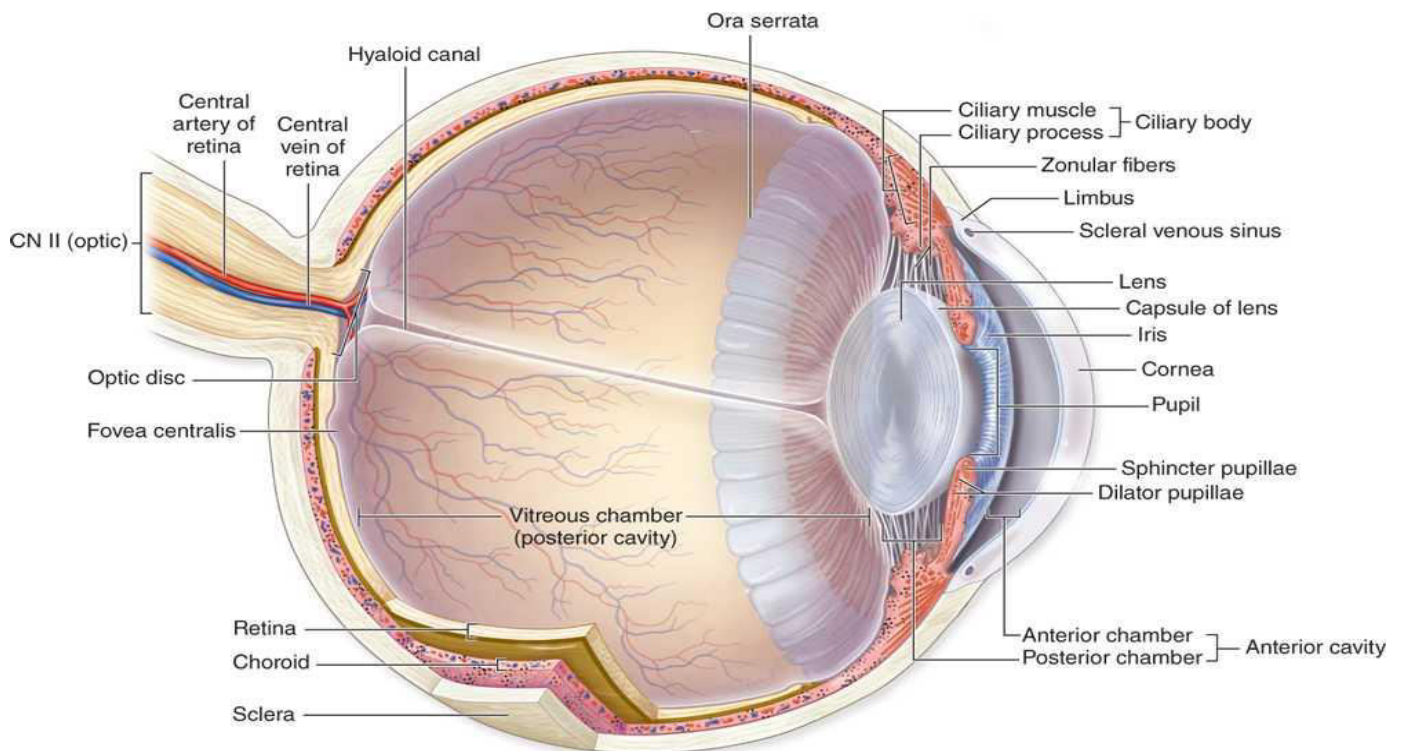
### 3)THE INNERMOST LAYER

#### A}RETINA;

This is a nervous tissue of the eye where photons of light are converted to neurochemical energy via action potentials. It is the innermost tunic of the eye which contains various cells such as ganglionic neurons, amacrine neurons, bipolar neurons, horizontal cells supporting Müller cells and the photoreceptor cells (rods and cones).

The human retina has an average of 92 million rod cells. They are extremely sensitive to light. They are thin and elongated. Their outer segment is shaped like a rod and a modified primary cilium. The inner segment contains glycogen, mitochondria and polyribosomes for the cell's biosynthetic activity. The rod shaped segment has 600-1000 flattened membranous discs with rhodopsin (or visual purple) on their surface which initiates visual stimulus. The human retina has an average of 4.6 million cone cells. They are less sensitive than rod cells. It contains visual pigment iodopsin (or photopsins). They have conical outer segments along with polyribosomes and mitochondria.

#### LENS



The lens is held in place by ciliary zonules and it separates the aqueous humor from the vitreous humor. It has three principal components:

- 1) Thick homogenous lens capsule with proteoglycans and type IV collagen which surrounds the lens and is a surface for attachment of ciliary zone.
- 2) Subcapsular lens epithelium consists of a single layer of cuboidal cells which aid the proliferation of new lens fibers for sustenance of the lens. This proliferation decreases with age.
- 3) Lens fibers are elongated, flattened structures developed from lens epithelium. They are packed together to form a transparent tissue for light refraction.

## VITREOUS BODY

It occupies the vitreous chamber behind the lens. It is a transparent gel-like connective tissue that is 99% water (vitreous humor) with collagen fibrils and hyaluronate contained within a vitreous membrane. It contains hyalocytes which synthesize hyaluronate, collagen and a few macrophages.

**QUESTION 2; Corona virus can penetrate the body through the eye and implicate the immune system, briefly discuss the layers of the retina for information penetration.**

### ANSWER;

The layers of the retina are:

- The retinal pigment epithelium- Made of cuboidal cells containing melanin which absorbs light and these cells establish a blood-retina barrier
- Outer limiting membrane- A layer of Muller cells and rod/cones junction that serves to separate the photosensitive regions of the retina from the areas that transmit the electrical signals
- Outer nuclear layer- Consists of nuclei of rods and cones cells
- Outer plexiform layer- Contains synaptic processes of rods and cones cells
- Inner nuclear layer- Contains the cell body of glial, amacrine, bipolar and horizontal cells
- *Inner plexiform layer*- Relays information from the cells of the inner nuclear layer. It has axons of amacrine, bipolar and glial cells and dendrites of retinal ganglion cells
- *Ganglion cell layer*- Contains nuclei of retinal ganglion cells
- *Nerve fiber layer*- Contains axons of retinal ganglion cells and the astroglia that support them
- *Internal limiting membrane*- A thin layer of Muller glial cells and basement membrane which demarcates the vitreous anteriorly from the retina posteriorly.