**Name**- Okon Seubong-abasi

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**Histology of special senses and Neurohistology**

Question 1

The layers of the eye perform distinct functions which coalesce to create a unified, perceptual appearance.

The essential role of the external eye structure is to protect the delicate tissue of the internal eye. The eyelids prevent foreign bodies from entering the inner eye and helps distribute the tear film when blinking. The eyelashes are finely sensitive to touch and warn the eye of possible debris and particles that may cause injury.

The internal parts of the eye have primarily structural and vision function. The internal structure of the eye consists of three layers of tissue arranged concentrically and they are:

1. The outermost layer: Sclera and cornea make up the exterior. The cornea serves a protective role and is responsible for two-thirds of the refractive properties of the eye.

* Sclera- is a dense connective tissue made up of mainly type I collagen fibres. The layers of the sclera from the external to the internal are episcleral, stroma, lamina fusca and endothelium.
* Cornea- consists of type I collagen fibres. It has five layers; the epithelium (non-keratinised stratified squamous epithelium), bowman’s layer, stroma, Descemet’s layer and corneal epithelium

1. The uvea is the vascular layer in the middle. It is a mediator of nutrition and gas exchange as blood vessel course through the ciliary body and iris. It is sub-divided into:

* Iris

The iris consists of a stromal layer with pigmented, fibrovascular tissue and pigmented epithelial cells beneath the stroma

* Ciliary Body- It divides the chamber and the vitreous body. It consists of the ciliary muscle which controls the structure of the lens, which is vital for accommodation and ciliary epithelium which produces aqueous humor.
* Choroid- It consists of a dense network of blood vessels supplying nourishment to structures in the eye.

1. The innermost layer

* Lens- It performs the remaining one-third of refraction of the eye. It separates the aqueous and vitreous humors. It consists of an outer capsule, a middle layer and an inner layer called its nucleus
* Vitreous- It is a jelly-like space made up of type II collagen fibre, separating the retina and lens.
* Retina- It is the nervous tissue of the eye where photons of light convert to neurochemical energy via action potentials.

**Question 2**

The retina has 10 layers for information penetration, which are:-

1. Retina pigment epithelium- It is made up of cuboidal cells containing melanin which absorbs light. The cells also establish a blood-retina barrier through tight junctions
2. The photoreceptor layer “Rod and cone cells”- The layers 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 activity and specificity for colour vision.
3. Outer limiting membrane- A layer of Muller cells and rod/cone junctions which serve to separate the photosensitive regions of the retina from areas that transmit the electrical signals.
4. Outer nuclear membrane- This layer consists of nuclei of rod and cone cells.
5. Outer plexiform layer- This layer consists synaptic processes of rod and cone cells.
6. Inner nuclear layer- This layer contains the cell body of glial, amacrine, bipolar and horizontal cells.
7. Inner plexiform cells- This layer relays information from cells of the inner nuclear layer. Thus, this layer has the axons of amacrine, bipolar and glial cells and dendrites of retinal ganglion cells
8. Ganglion cell layer- This layer contains nuclei of retinal ganglion cells
9. Nerve fibre layer- This layer contains axons of retinal ganglion cells and the astroglia supports them. Collectively, these axons constitute the optic nerve
10. Internal limiting membrane- a thin layer of muller glial cells and basement membrane which demarcates the vitreous anteriorly from the retina posteriorly.