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**Course Title:** Histology of Special Senses and Neurohistology
**Course Code:** ANA 305

**Department**: Medicine and Surgery

**Question**
1. Write an essay on the histological importance of eye in relation to their cellular functions.

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

**Answer**

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| **The eye**  |

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| The eye is made up of three basic layers: the outer ***corneo-scleral layer***, the intermediate ***uveal layer*** (***uveal tract***) and the inner ***retinal layer***

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| **Corneo-scleral layer**  |

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| * The corneo-scleral layer forms a tough, fibroelastic capsule which supports the eye. The posterior five-sixths, the ***sclera***, is opaque and provides insertion for the extraocular muscles.
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| The anterior one-sixth, the ***cornea***, is transparent and has a smaller radius of curvature than the sclera. The cornea is the principal refracting medium of the eye and roughly focuses an image onto the retina; the focusing power of the cornea depends mainly on the radius of curvature of its external surface. The corneo-scleral junction is known as the ***limbus*** and is marked internally and externally by a shallow depression. Running from the junction of the cornea and limbus the surface of the eye is covered by ***conjunctiva*** which is reflected into the eyelids. * Uveal layer: the middle layer, the uvea or uveal tract, is highly vascular which is made up of three components: the choroid, ciliary body and the iris. The choroid lies between the sclera and retina in the posterior 5/6th of the eye. It provides support for the retina and is highly pigmented, thus absorbing light which has passed through the retina. Anteriorly, the choroid merges with the ciliary body which is circumferential thickening of the uvea lying beneath the limbus. The ciliary body surrounds the coronal equator of the lens and is attached to it by the suspensory ligament or zonule. The lens is a biconvex transparent structure, the shape of which can be varied to provide fine focus of the corneal image upon the retina. The ciliary body contains smooth muscle, the tone of which controls the shape of the lens via suspensory ligament. The lens suspensory ligament and ciliary body divide the eye into a large compartment containing a thick gel called the vitreous body and compartment part in front containing a watery fluid called aqueous humor. The iris, the third component of the uvea, forms a diaphragm extending in front of the lens from the ciliary body so as to incompletely divide the anterior compartment into two chambers: these are known by the terms anterior and posterior chamber. The highly pigmented iris as an adjustable diaphragm which regulates the amount of light reaching the retina. The aperture of iris is called the pupil. the posterior and anterior chamber contain the aqueous humor, which is secreted into the posterior chamber by ciliary body and circulated through the pupil to drain into a canal at the angle of the anterior chamber, the canal of schlemm. The aqueous humor is the source of nutrients for non-vascular lens and cornea. The pressure of the aqueous humor maintains the shape of the cornea. The large posterior compartment of the eye contain a specialized connective tissue largely composed of a transparent gel known as vitreous body which supports the lens and retina from within as well as providing an optical medium is non-refractive with respect to lens. The vitreous body contains a canal which extends from the exit of the optic nerve to the posterior surface of the lens; hyaloid canal represents the course of the hyaloid artery which supplies the vitreous body in embryological development
* Retinal layer: The photosensitive retina forms the inner lining of most of the posterior compartment of the eye and terminates along a scalloped line, the ora serrata, behind the ciliary body. Anterior to the ora serrata, the retinal layer continues as a non-photosensitive epithelial which lines the ciliary body and the posterior surface of iris. The visual axis of the eye passes through a depression in the retina called the fovea which is surrounded by a yellow pigmented zone, the macula lutea. The fovea is the area of greatest visual activity. Afferent nerve fibres from the retina coverage to form the optic nerve which leaves the eye through a part of the sclera known as the lamina cribrosa. The retina overlying the cribosa. The retina overlying the cribrosa, the optic papilla (optic disc), is devoid of photoreceptor and thus represent a blind spot.

2. Retinal layers1. [Inner limiting membrane](https://en.wikipedia.org/wiki/Inner_limiting_membrane) – basement membrane elaborated by [Müller cells](https://en.wikipedia.org/wiki/Muller_glia).
2. [Nerve fibre layer](https://en.wikipedia.org/wiki/Nerve_fiber_layer) – axons of the [ganglion cell](https://en.wikipedia.org/wiki/Retinal_ganglion_cell) bodies (note that a thin layer of Müller cell footplates exists between this layer and the inner limiting membrane).
3. [Ganglion cell layer](https://en.wikipedia.org/wiki/Ganglion_cell_layer) – contains nuclei of ganglion cells, the axons of which become the optic nerve fibres, and some displaced [amacrine cells](https://en.wikipedia.org/wiki/Retina_amacrine_cell%22%20%5Co%20%22Retina%20amacrine%20cell)
4. [Inner plexiform layer](https://en.wikipedia.org/wiki/Inner_plexiform_layer) – contains the synapse between the [bipolar cell](https://en.wikipedia.org/wiki/Retina_bipolar_cell) axons and the dendrites of the [ganglion](https://en.wikipedia.org/wiki/Retinal_ganglion_cell) and amacrine cells
5. [Inner nuclear layer](https://en.wikipedia.org/wiki/Inner_nuclear_layer) – contains the nuclei and surrounding cell bodies (perikarya) of the [amacrine cells](https://en.wikipedia.org/wiki/Amacrine_cells%22%20%5Co%20%22Amacrine%20cells), [bipolar cells](https://en.wikipedia.org/wiki/Retina_bipolar_cell), and [horizontal cells](https://en.wikipedia.org/wiki/Retina_horizontal_cell).
6. [Outer plexiform layer](https://en.wikipedia.org/wiki/Outer_plexiform_layer) – projections of rods and cones ending in the rod spherule and cone pedicle, respectively. These make synapses with dendrites of bipolar cells and horizontal cells.[[2]](https://en.wikipedia.org/wiki/Retina#cite_note-eb-2) In the [macular](https://en.wikipedia.org/wiki/Macula) region, this is known as the *Fiber layer of [Henle](https://en.wikipedia.org/wiki/Friedrich_Gustav_Jakob_Henle%22%20%5Co%20%22Friedrich%20Gustav%20Jakob%20Henle)*.
7. [Outer nuclear layer](https://en.wikipedia.org/wiki/Outer_nuclear_layer) – cell bodies of rods and cones.
8. [External limiting membrane](https://en.wikipedia.org/wiki/External_limiting_membrane) – layer that separates the inner segment portions of the photoreceptors from their cell nuclei.
9. Inner segment / outer segment layer – inner segments and outer segments of rods and cones. The outer segments contain a highly specialized light-sensing apparatus.
10. [Retinal pigment epithelium](https://en.wikipedia.org/wiki/Retinal_pigment_epithelium) – single layer of cuboidal epithelial cells (with extrusions not shown in diagram). This layer is closest to the choroid, and provides nourishment and supportive functions to the neural retina, The black pigment melanin in the pigment layer prevents light reflection throughout the globe of the eyeball; this is extremely important for clear vision.

These layers can be grouped into 4 main processing stages: photoreception; transmission to [bipolar cells](https://en.wikipedia.org/wiki/Retina_bipolar_cell); transmission to [ganglion cells](https://en.wikipedia.org/wiki/Retinal_ganglion_cell), which also contain photoreceptors, the [photosensitive ganglion cells](https://en.wikipedia.org/wiki/Photosensitive_ganglion_cell); and transmission along the optic nerve. At each synaptic stage there are also laterally connecting [horizontal](https://en.wikipedia.org/wiki/Retina_horizontal_cell) and [amacrine cells](https://en.wikipedia.org/wiki/Retina_amacrine_cell%22%20%5Co%20%22Retina%20amacrine%20cell). |

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