

# UNIT-I

# EYE (VISION)

Eye

Course No. – VPB 1<sup>st</sup> Professional year

Credit Hrs. – 4+1=5

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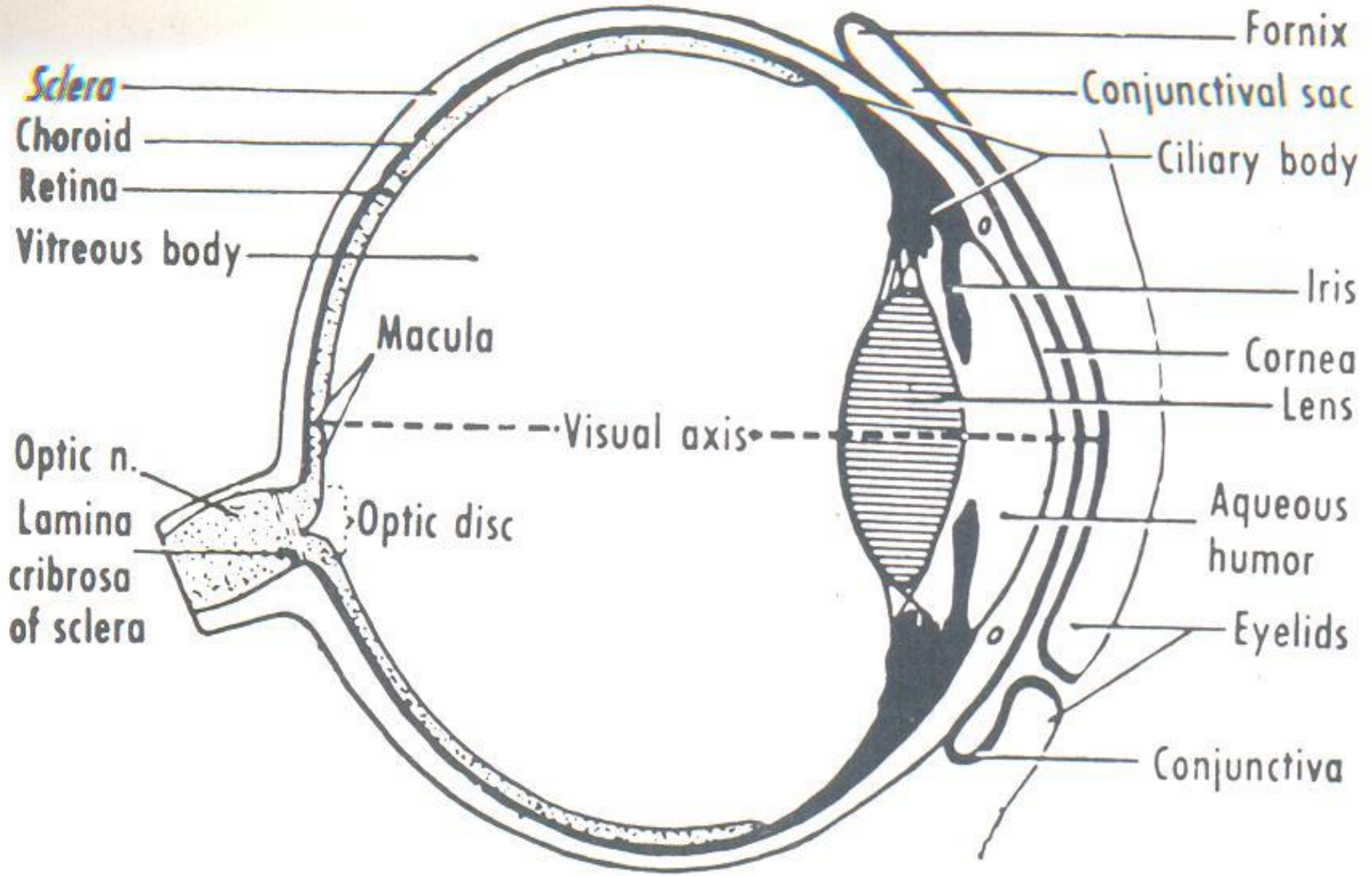
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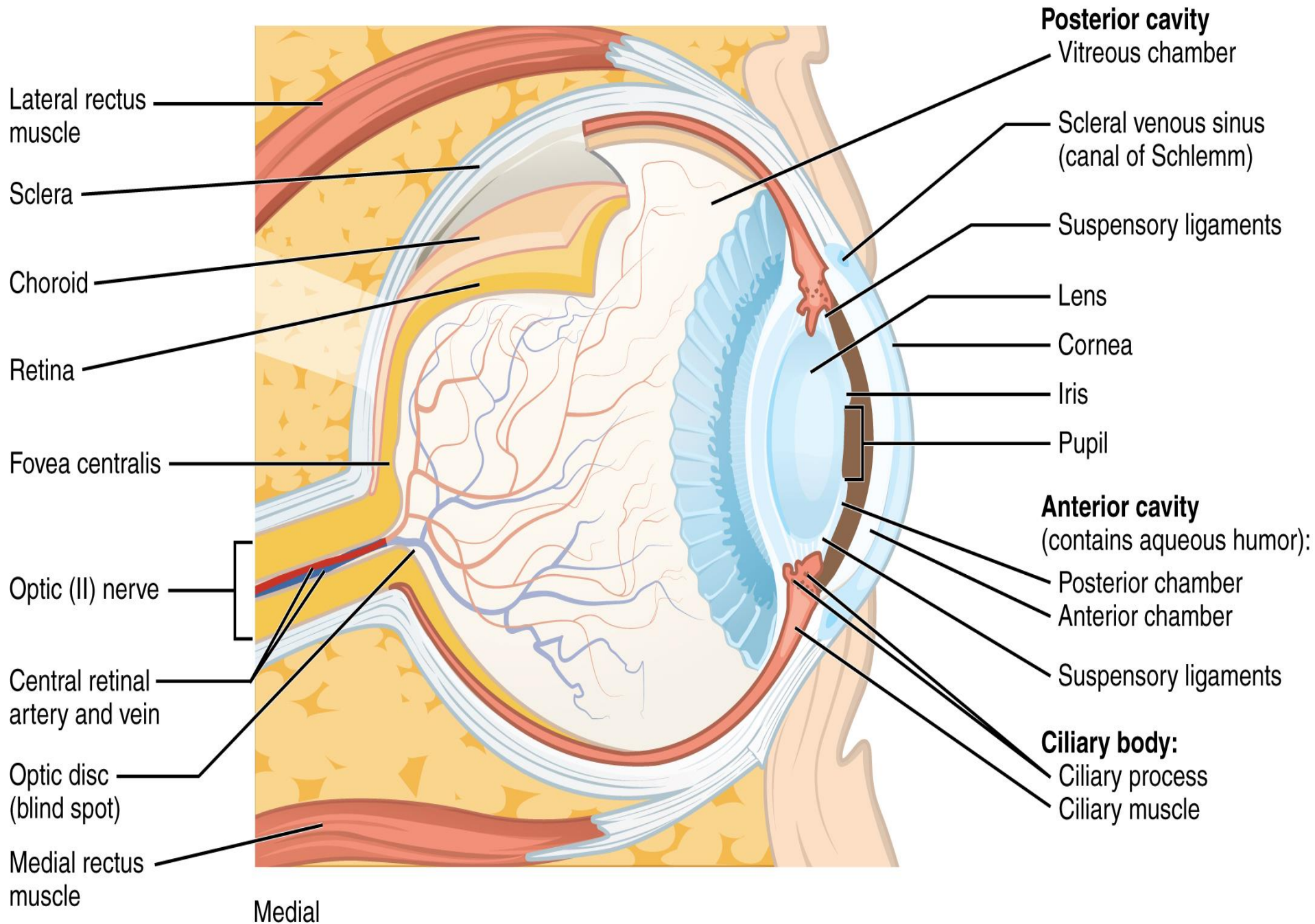
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# Diagram of an eye:



Lateral



- The mucosal tissue around the anterior & lateral portions of the eye is conjunctiva
- Cornea is the outer of the anterior part of the eye which is clear & transparent
- Sclera is the opaque continuation of the posterior most of the eye

### **Snell`s law:**

- It states that the light striking a transmitting medium of greater refractive index will bend the light toward the  $\perp$  to the interface of the medium
- Greater the refractive index greater the optical density & greater the capability of that medium to bend light
- The focusing power of a lens is measured in diopter

**Emmetropic-** When the optics of the eye will result in  $\parallel$  to light rays focusing precisely on the retina

**Myopic-** When the light rays focus in front of the retina, the focus can be corrected with concave lens

**Hyperopic-** When the light rays focus behind the retina & can be corrected with convex lens

### **Retina structure & function:**

- ✚ The 3 functional layers of the retina are ganglion cell layers, bipolar cell layer & photoreceptor layers
- ✚ They are arranged in such a way that light will absorb or reflect by the intervening structures without contributing the image function
- ✚ Tapetum lucidum  $\uparrow$  the %age of light intensity at the photoreceptors

### **Photoreceptor-**

- It consists of rod & cones and they are named according to their shape
- Rods are sensitive to dim light & are denser in the peripheral portion of retina in diurnal animals

- In nocturnal animals, they present denser in the central portions of the retina
- The rod contains a visual pigment called rhodopsin
- Cones are responsible for color vision & are densest in the central region of the retina in the fovea

### **Generation of receptor potential:**

The receptor potential of rod & cone cells are generated by reactions which are initiated by light being absorbed by chemicals called visual pigments

**Electroretinography-** It is an electro-diagnostic test which measures the electrical activity of the retina in response to a light stimulus

### **Color vision-**

- ❖ It seems to be a sensory capacity found in most species at least they should have 2 photopic visual pigments

- ❖ For genesis of receptor potential begins with the bleaching of the visual pigment, a number of ionic & neurotransmitter release
- ❖ Due to an electrogenic Na-K pump in the inner segment  $\uparrow^{\text{ing}}$  extracellular  $\text{Na}^+$ , a steady current flow from the inner to outer portion of the segments
- ❖ During light there is  $\downarrow$  in  $\text{Na}^+$  conductance in the outer segment resulting in a hyper-polarization of the receptor & steady release of neurotransmitter from the photoreceptors in the dark & hyper-polarization stops the release & interpreted as light stimulation
- ❖ Retina is responsible for contrast enhancement, detection of movement & large changes in luminance
- ❖ Bipolar cells synapse with the photoreceptors on one end & the ganglion & amacrine cells on the other
- ❖ Bipolar cells tend to have a small receptive field & constitute a vertical transmission component of the retina

- ❖ Horizontal cells function primarily in lateral inhibition in the retina & are integral to both centre surround fields & directional sensitivity circuits
- ❖ Horizontal cell circuits have the effect of inhibiting the transmission of visual stimulus information & when moves across the retina allow to pass the information in the preferred direction
- ❖ Amacrine cells have many types of receptive fields that are sensitive to movement or onset of visual stimuli
- ❖ Ganglion cells have axons that forms the optic nerve, chiasm & tract
- ❖ These are receptive to the off & on of light stimuli integrates the color contrast enhancement while others respond to preferred directional movement

### **Neurotransmitters-**

- A no. of neurotransmitters are present in the retina
- Ach is found in some amacrine cells



- Dopamine is found in amacrine, horizontal & bipolar cells
- Dopamine & serotonin are involved in red-green color discrimination
- Substance P, somatostatin & glutamate are also present in the retina
- Glutamate is the recognizable & probable neurotransmitter of the photoreceptors