THREE LAYERS OF MATURE EYE (p 572)

1) FIBROUS TUNIC

sclera posterior 5/6ths darkly pigmented, many vessels, the limbus is where it joins the cornea greater curvature than sclera, gets O₂ fr air, nutrients fr aqueous humor

cornea anterior 1/5th greater curvature than sclera, gets O₂ fr air, nutrients fr aqueous humor

2) VASCULAR TUNIC

choroid richly vascularized, outer dark, pigmented layer, cuboidal epithelial cells, reduces reflection

ciliary body

ciliary muscle smooth m, regul lens shape

ciliary process manuf. aqueous humor

iris anterior portion of vascular tunic, muscular diaphragm

pupil (p 574) adjusted by constrictor (Psym) and dilator muscles (symp)

3) NEURAL TUNIC (576)

Retina: two layers:

pigmented layer thin outer single layer of cuboid epithelium, in direct contact with the choroid

nervous layer inner of rods & cones, neural interconnections connect with optic nerve

optic disc blind spot where axons exit, circulatory system enters and exits

macula lutea optic center yellowish disc, center of it is fovea centralis, conc of cones

LENS outer epithelial layer, enveloping protein capsule inside thick gel-like fluid: 25% protein, 10% lipid

Cataract defective metabolism of lens, reducing agent glutathione may help.

Astigmatism irregularities of lens or cornea

Lens held in place by suspensory ligaments, tied to ciliary muscle

ANTERIOR CAVITY two chambers: anterior chamber, posterior chamber (p 578)

5-6 mL/day, filled with aqueous humor nourish the cornea

Canal of Schlemm drains back to the blood stream: intraocular pressure:

glaucoma hyper intraocular pressure, presses on optic nerve and blood vessels

POSTERIOR CAVITY filled with vitreous humor, transparent, semifluid, jelly-like

PHOTORECEPTORS: retina has highest O₂ consumption in body (p 583)

resolving power sensitivity function number/retina

Rods: Low high B&W 125 mil/retina

cones: high low color 7 mil/retina

Auxiliary pigments in cones: erythrolabe; chlorolabe; cyanolabe

fovea centralis, macula lutea high conc. of cones:

resolving power high, sensitivity low.

Neural arrangement:

many rods per bipolar, many bipolar per ganglion low resolv, high sens perhaps single cone per bipolar, single per ganglion, high resolv, low sensitivity

Rhodopsin: complex of opsin and cis retinal (586)

light converts cis to trans retinal, dissociation of rhodopsin dissociation causes generation of a nervous impulse.

uses ATP to convert trans back to cis retinal

Inadequate vitamin A leads to night blindness

Three kinds of visual accommodation:

1) pupil, for adjusting quantity of light to retina

2) conversion of trans to cis retinal in the dark: dark adaptation

3) lens, for focusing near or far
Here is an excellent video of the whole sequence leading to the perception of light. It will get challenging when they talk about the chemical processes ultimately leading to a nervous impulse... But my students should be able to understand many of the stages of the process:
https://www.youtube.com/watch?v=AuLR0kzfwBU