BINOCULAR VISION for :-

1- Large visual field

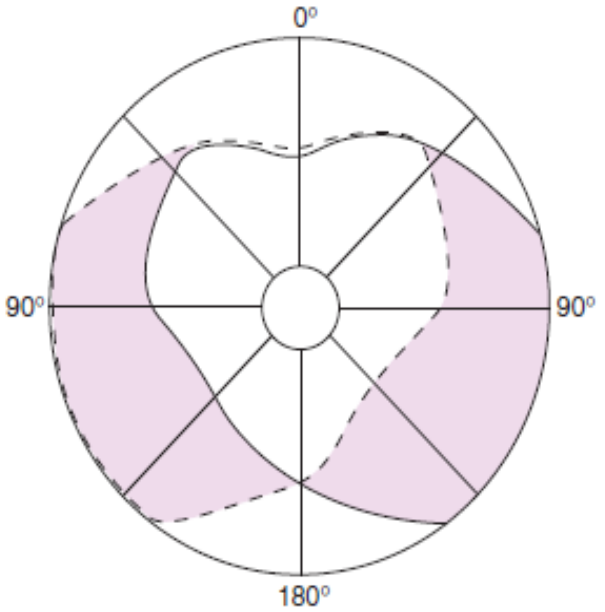
2- cancel the effect of blind spot

3- stereoscopic vision

4- one eye lesion does not affect vision

Monocular and binocular visual fields.
-The dashed line encloses the visual field of the left eye;

- **the solid line, that of the right eye. -The common area (heart-shaped in the center) is viewed with binocular vision.**
- **- The colored areas are viewed with monocular vision.**



Priciples of optics:-

--Biconvex lens(converge) & biconcave lens(diverge)

-Diopter (measure of refractive power

R.P = 1 / Principal focal distance in meters(The distance beyond a convex lens at which parallel rays converge to a common focal point)

Exp/if Principal focal distance of a lens is 25cm, so its R.P=1/ 0.25 meter = 4D

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--The greater the curvature of the lens, the greater the refractive power of the eye

Emmetropic eye;- is the normal eye has image on retina, has diopteric power 59-60D

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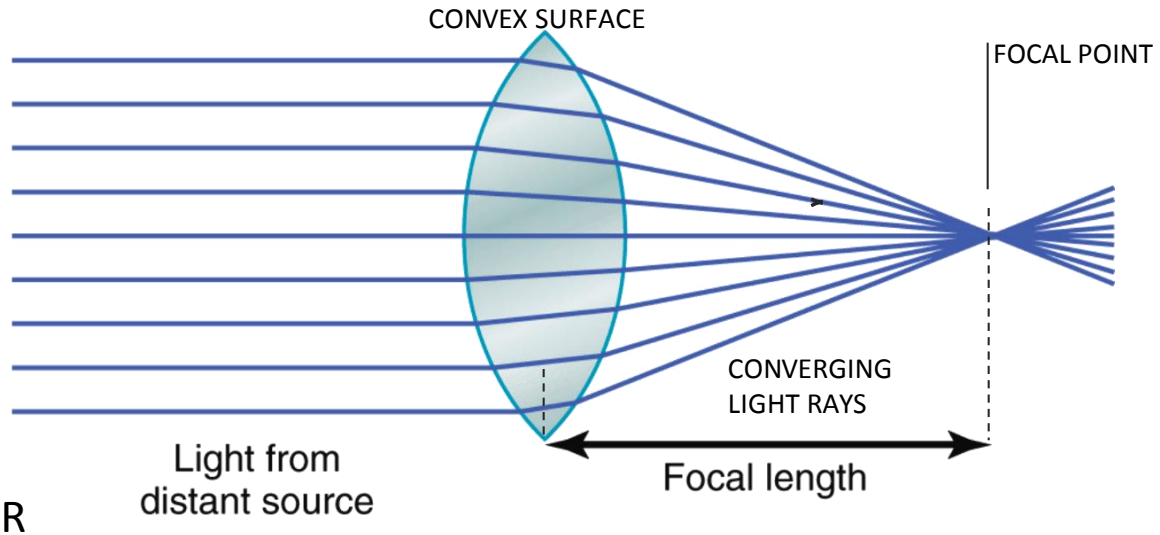
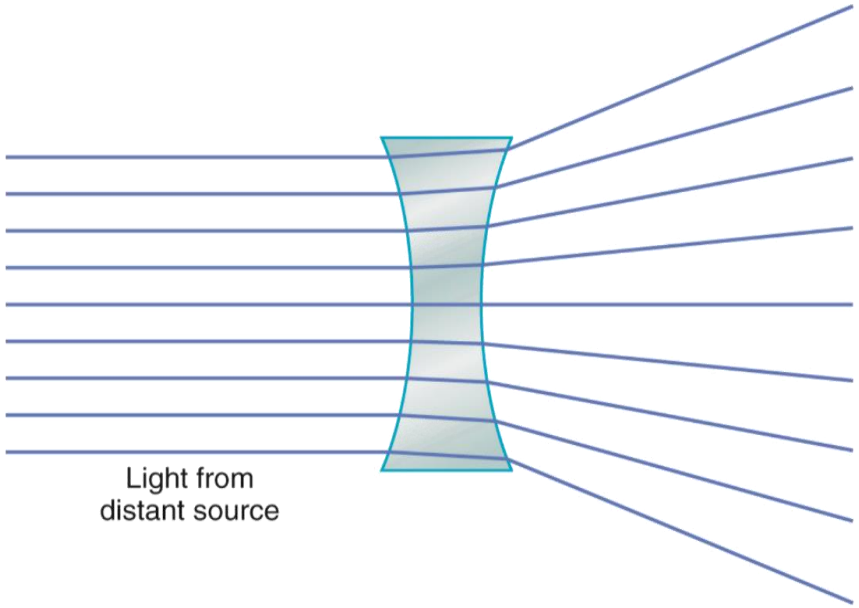
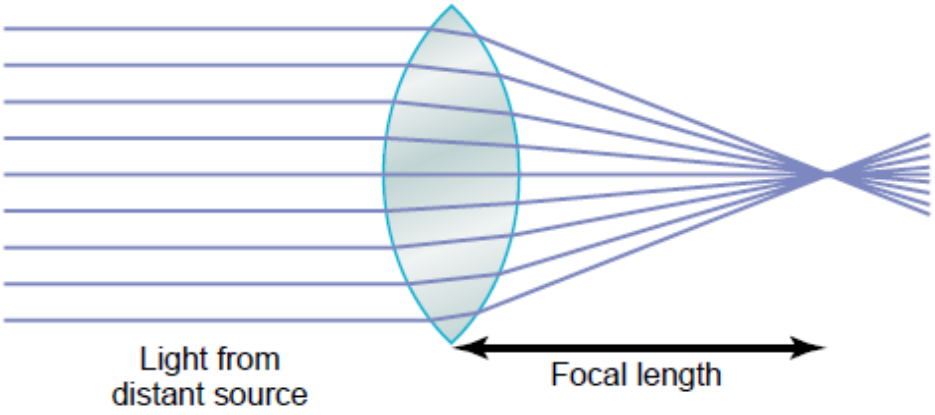
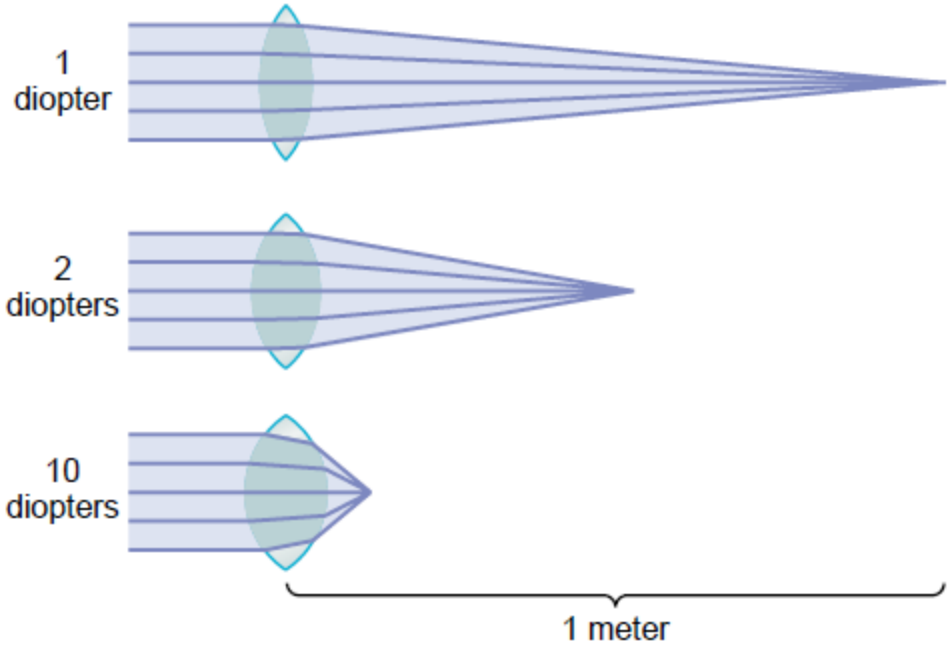


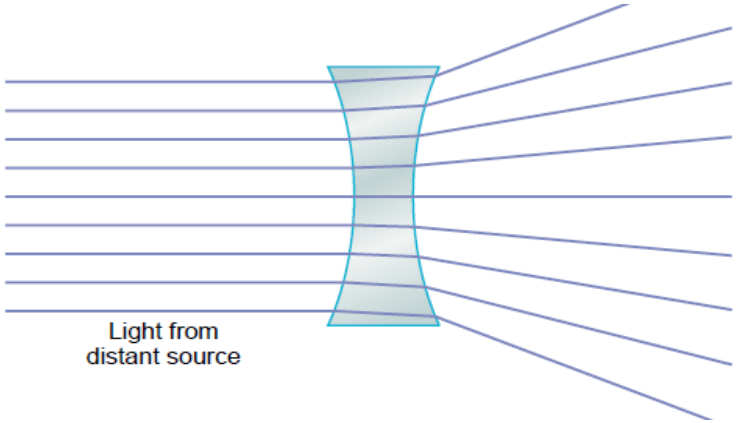
IF THE LENS HAS EXACTLY THE PROPER CURVATURE, PARALLEL LIGHT RAYS PASSING THROUGH EACH PART OF THE LENS WILL BE BENT EXACTLY ENOUGH SO THAT ALL THE RAYS WILL PASS THROUGH A SINGLE POINT, WHICH IS CALLED THE FOCAL POINT





Concave lenses "neutralize" the refractive power of convex lenses. Thus, placing a 1-diopter concave lens immediately in front of a 1-diopter convex lens results in a lens system with zero refractive power

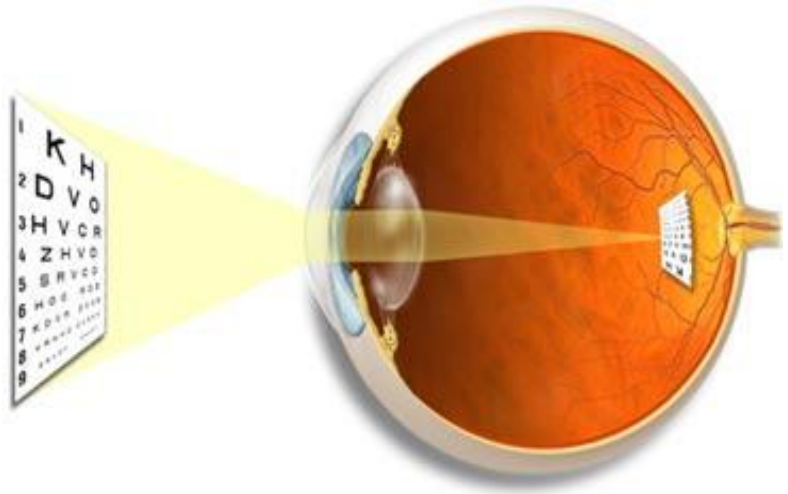


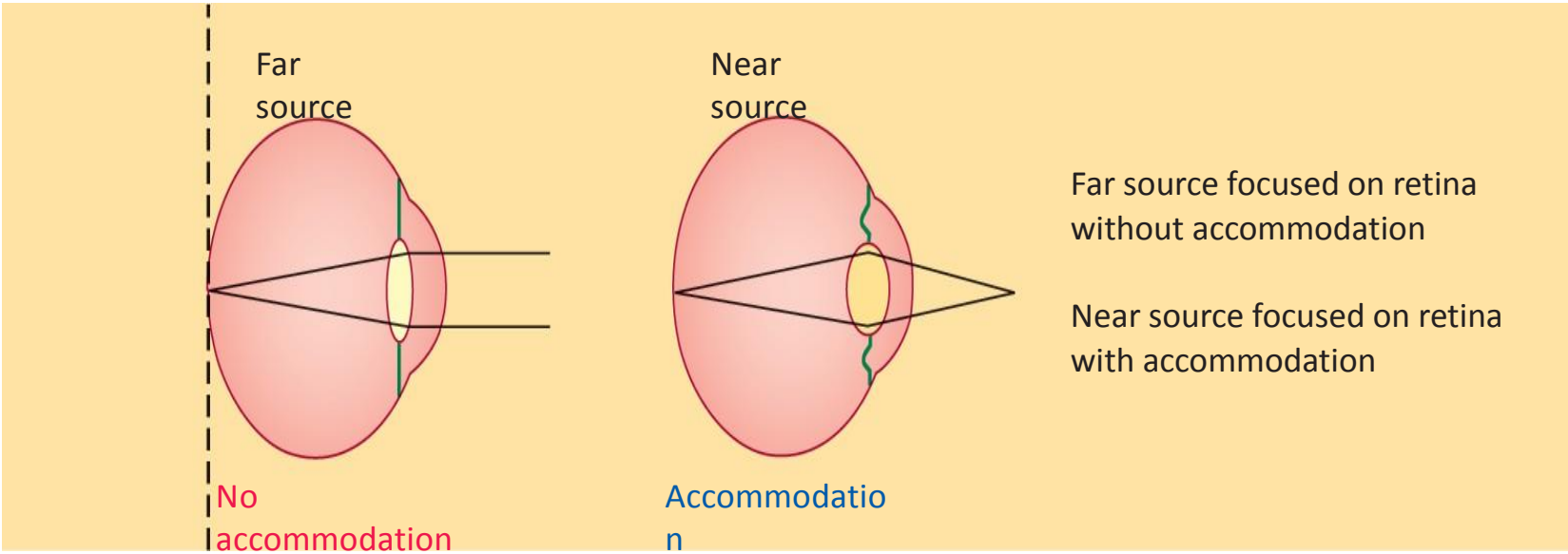


Emmetropic eye

can see all distant objects clearly with its ciliary muscle relaxed & see close objects clearly with ciliary muscles contracted

Normal eye = Emmetropia



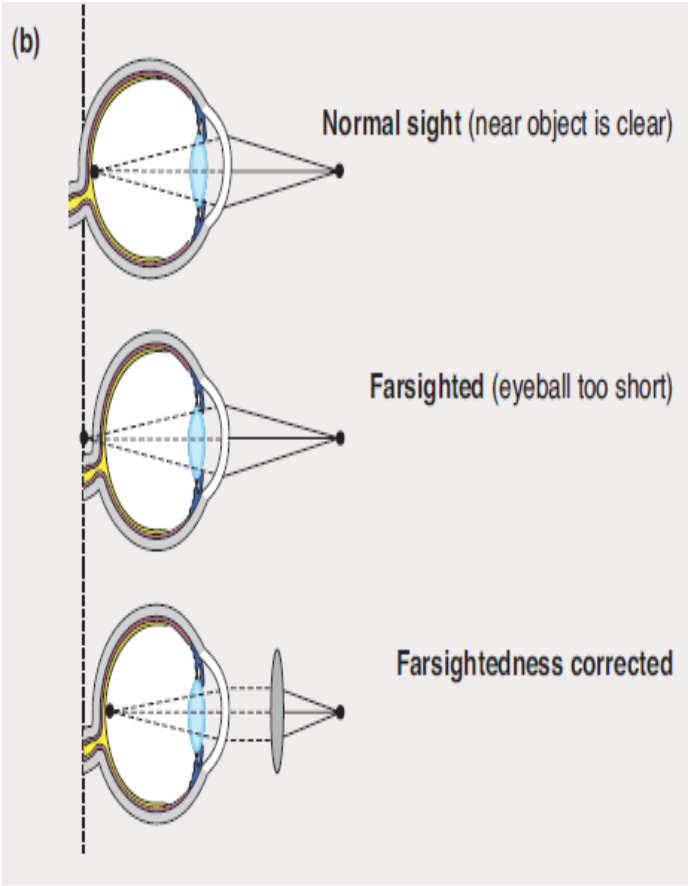


1-Errors of refraction

1/Hyperopia(hypermetropia-farsightedness)

-Small eye ball- weak lens system
-Focus behind retina
-Causes headache & blurred vision
-Continuous accomodation to bring image on retina causes muscular effort on cilliary muscle & prolonged convergence , this leads to headache & finally squint

- Correction by biconvex lens



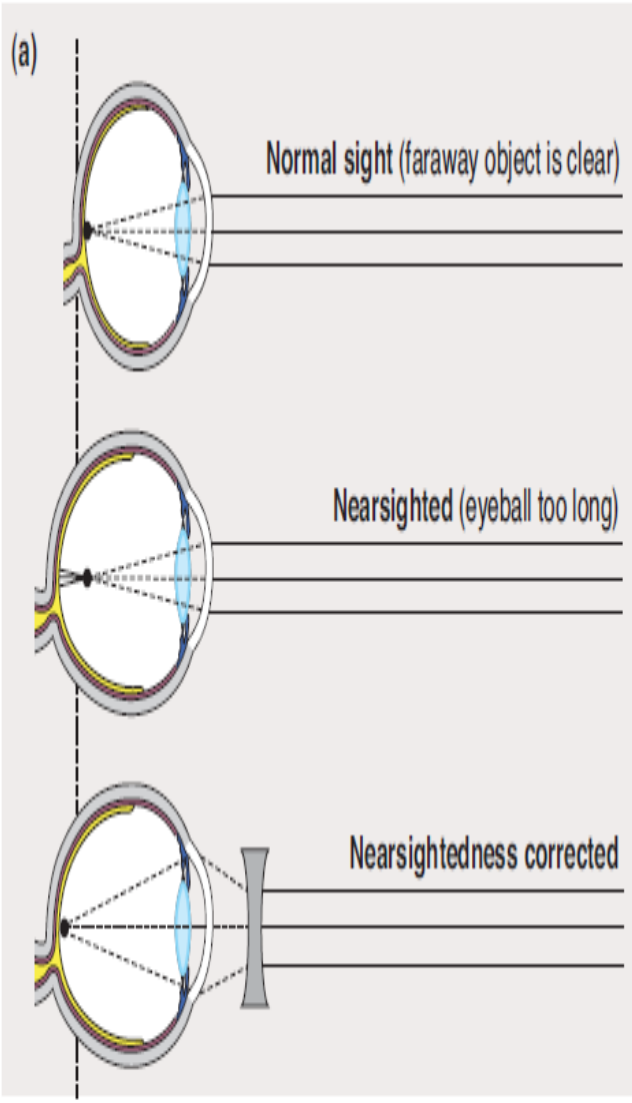
2- MYOPIA(NEAR SIGHTEDNESS)

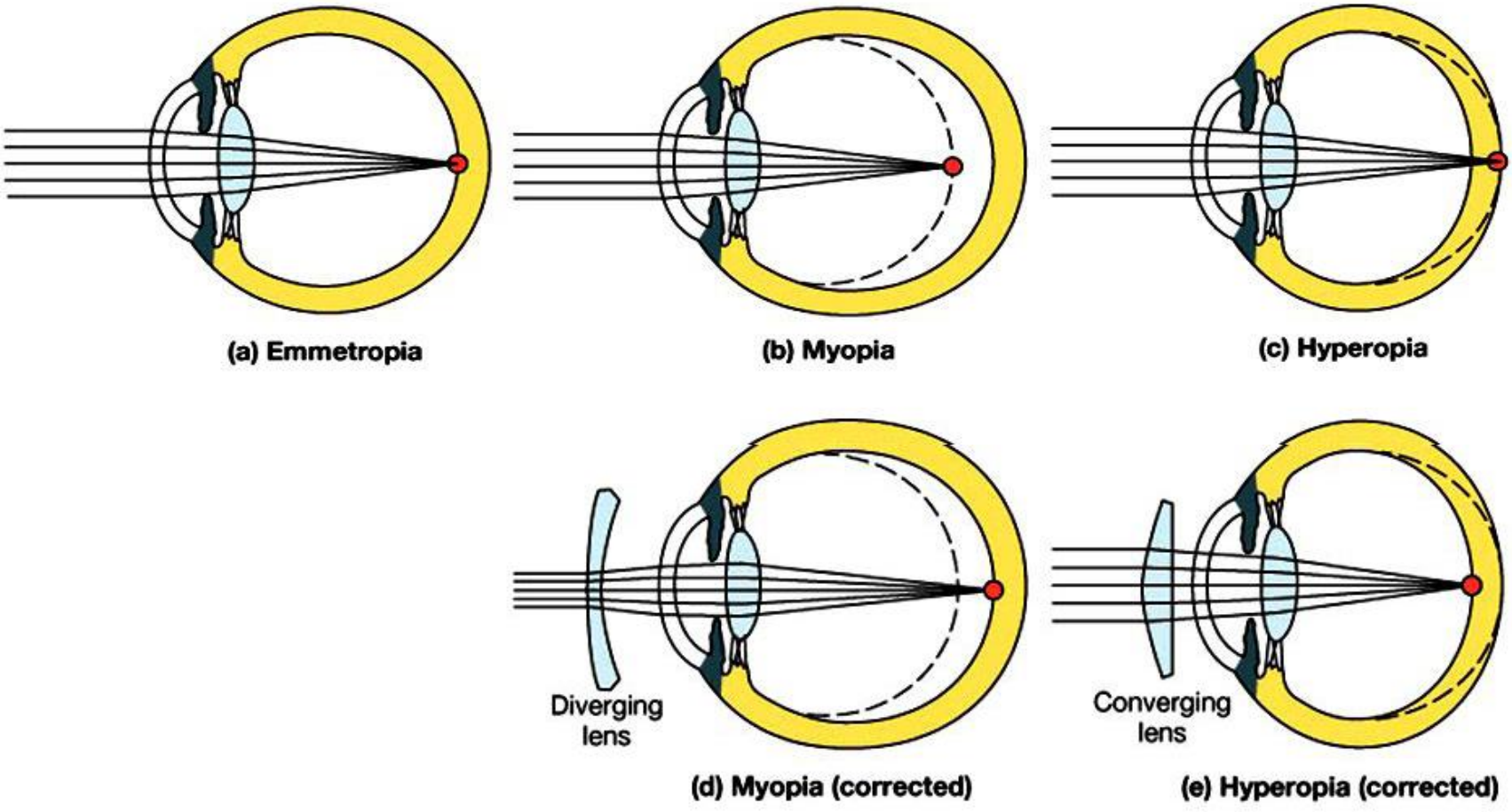
-Genetic large eye ball or too much refractive power of lens system or cornea due to its too curved surface- or due to long antero-posterior diameter of the eye

-extensive close work as in studying

-focus in front the retina

-correction by biconcave lens to diverge rays before strike the lens




(a) Emmetropia
(b) Myopia
(c) Hyperopia
Diverging lens
(d) Myopia (corrected)
Converging lens
(e) Hyperopia (corrected)

3-Presbyopia

(eye near point receeds by age due to loss of accomodation

- **-Focus behind retina**
- **-correction by biconvex lens**

4-Astigmatism

(mainly uneven & ununiform corneal curvature and very little due to uneven lens curvature

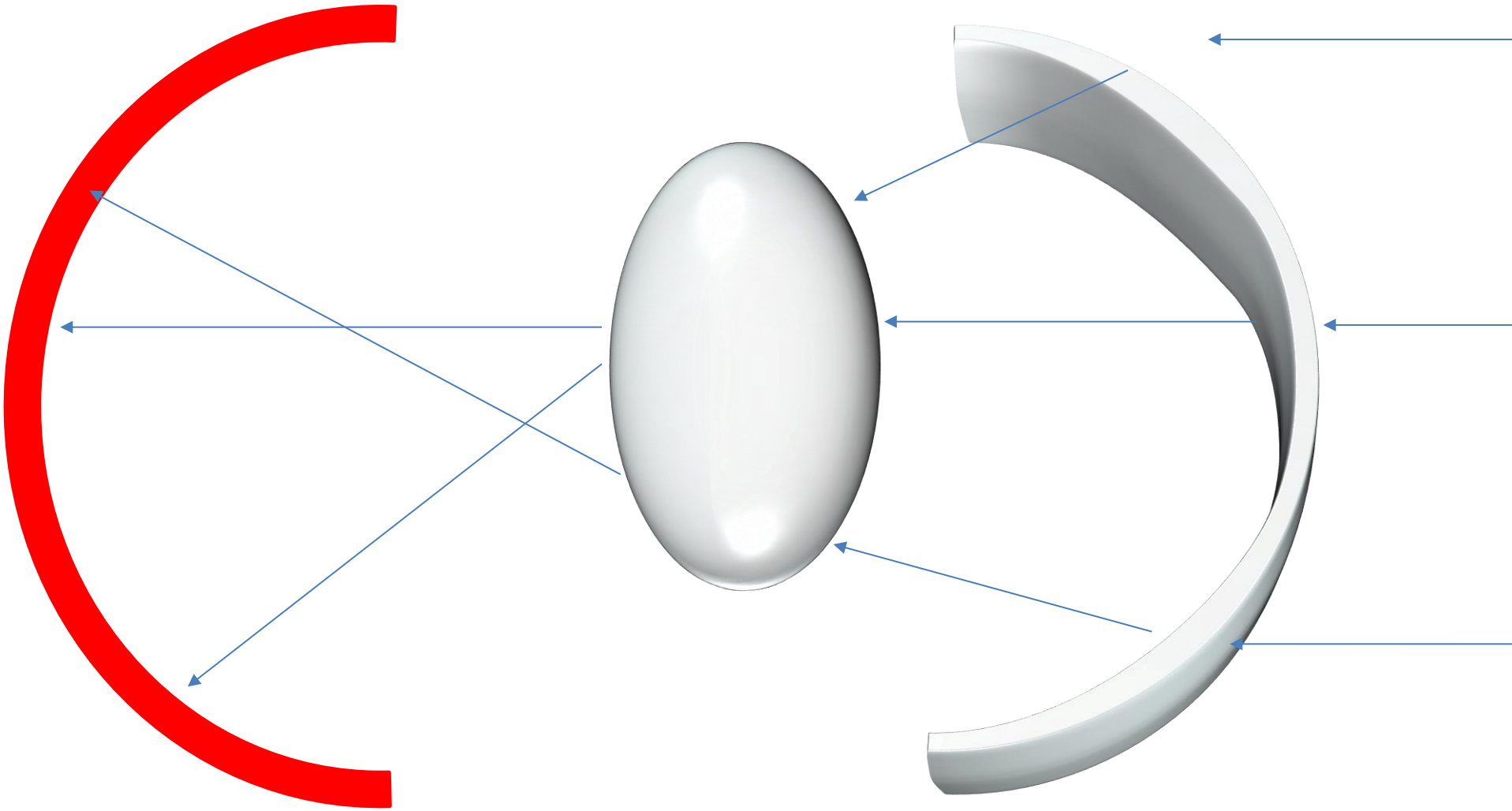
-rays refracted to different foci >>>>>>> blurred vision

-correction by cylindrical lens which bends light rays in only one plane (a focal line)

ASTIGMATISM

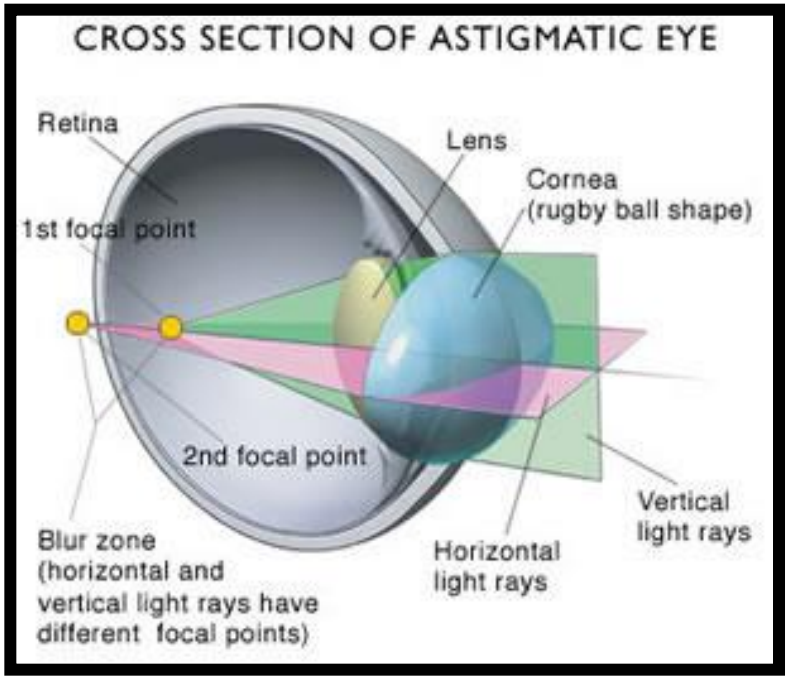
DISTORTED CORNEA

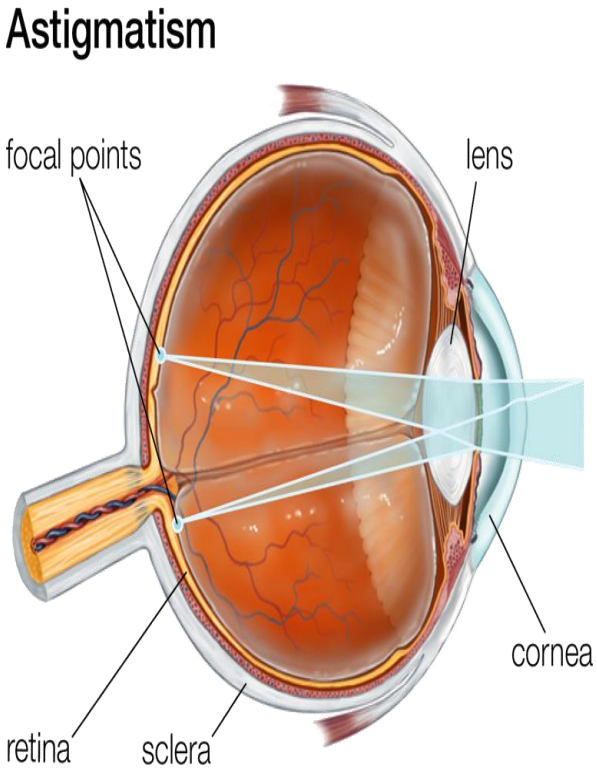
RETINA

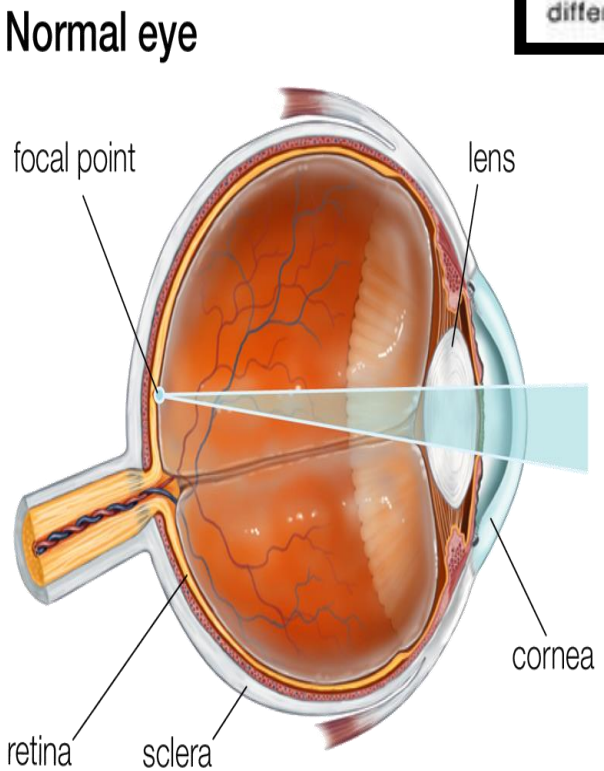


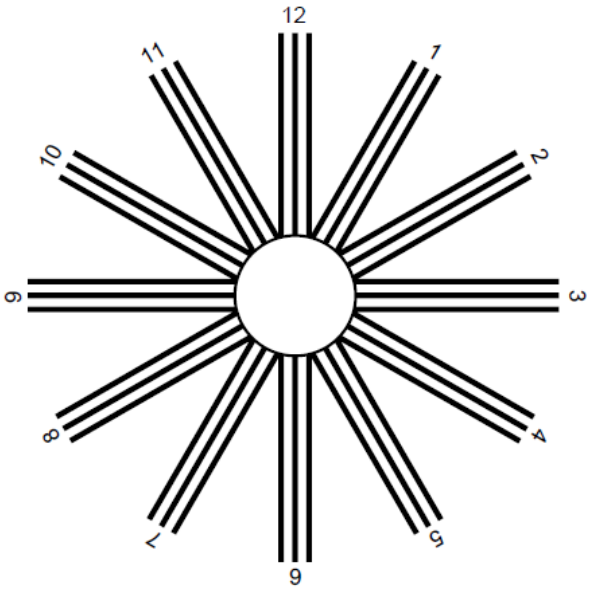
Astigmatism

light rays focus at one focal distance
in more than one focal point









- **LAYERS OF RETINA (10 layers), the most important are :-**

1-Pigment cell layer (vit A) (outermost layer) .what is its value?

(absorb light & prevent its reflection back)

-The pigment layer also stores large quantities of *vitamin A*. This vitamin A is an important precursor of the photosensitive chemicals of the rods and cones.

2- rodes & cones

(their outer& inner segments), but not cell bodies(rodes 90-120 million & cones 4.5- 6 million) - describe their distribution.

photoreceptor cells are responsible for capturing light and transforming this into generator potential to be used by the nervous system

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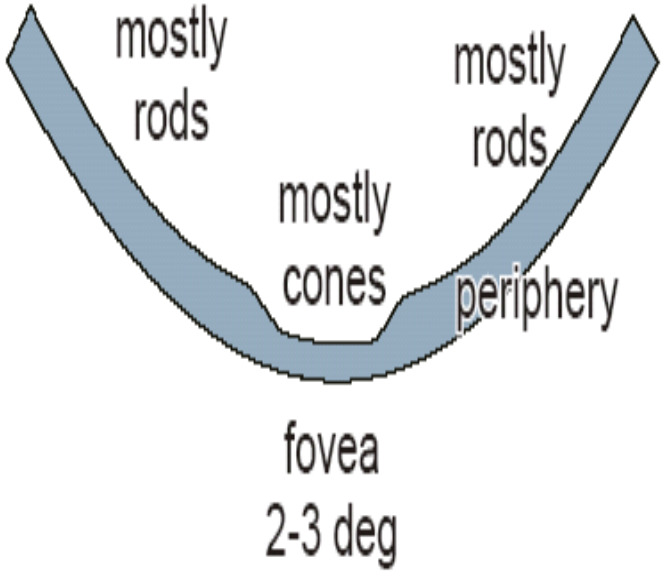
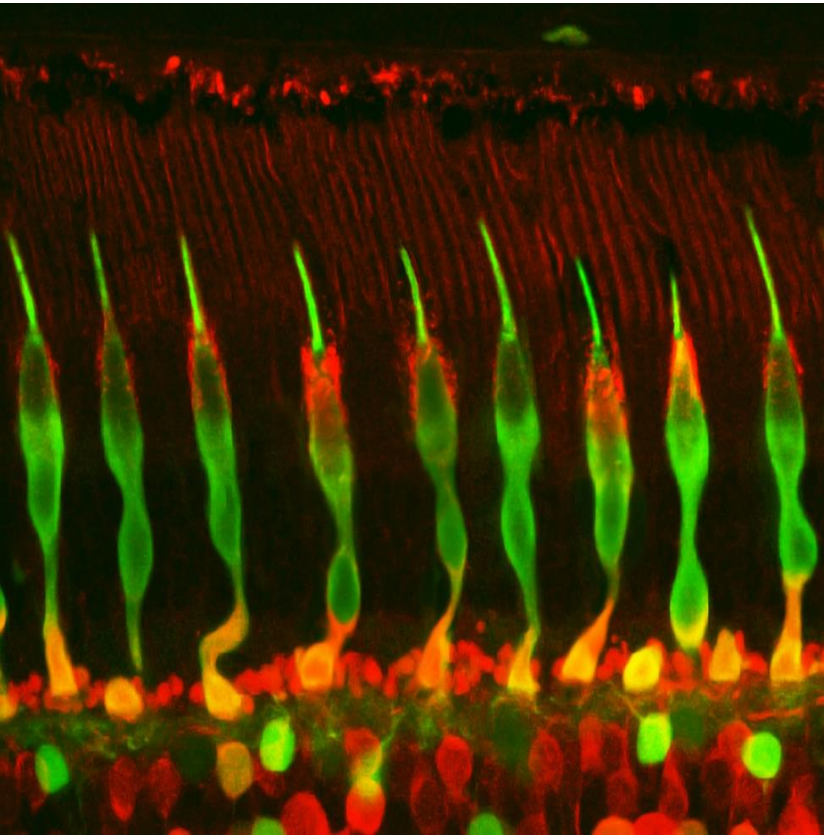
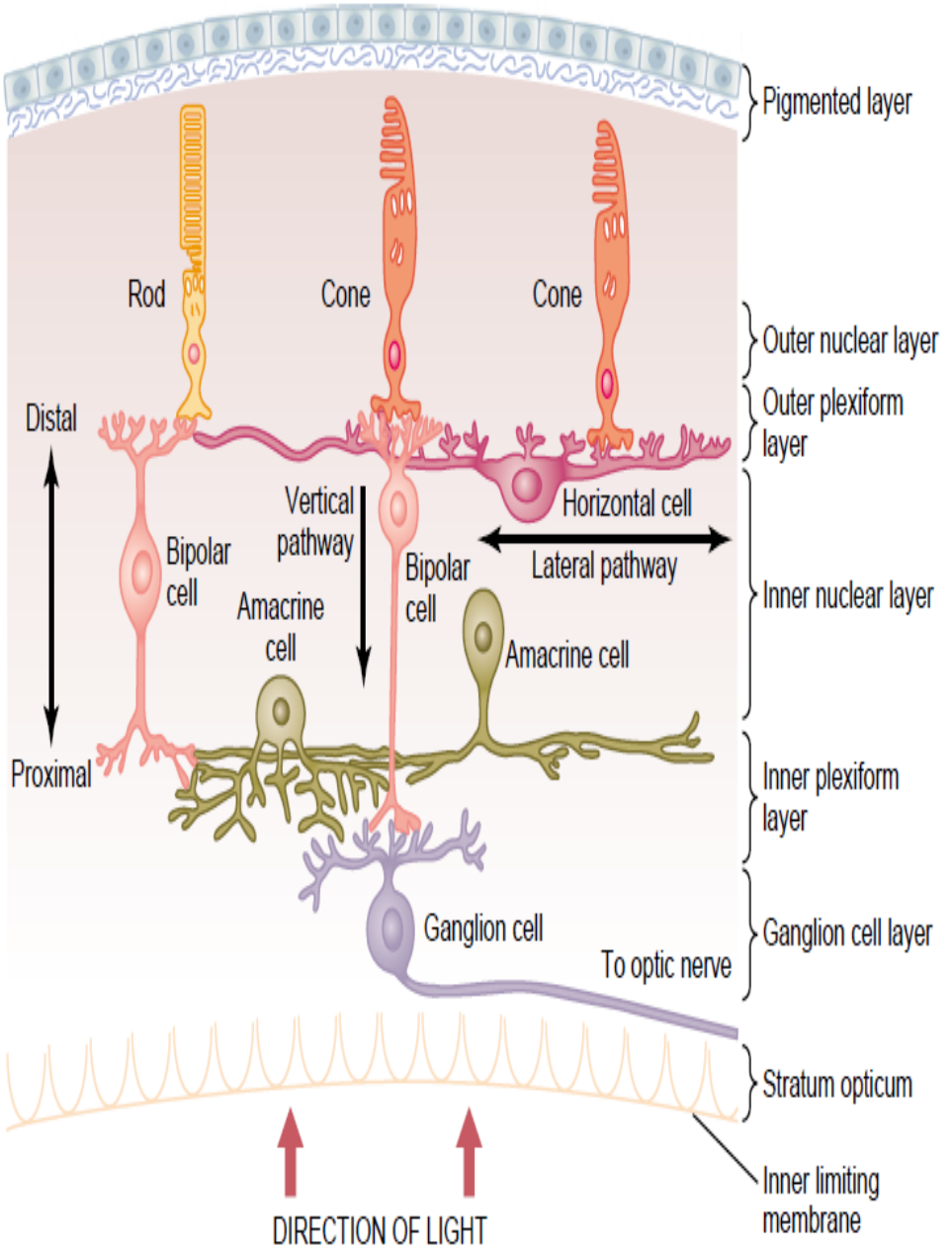
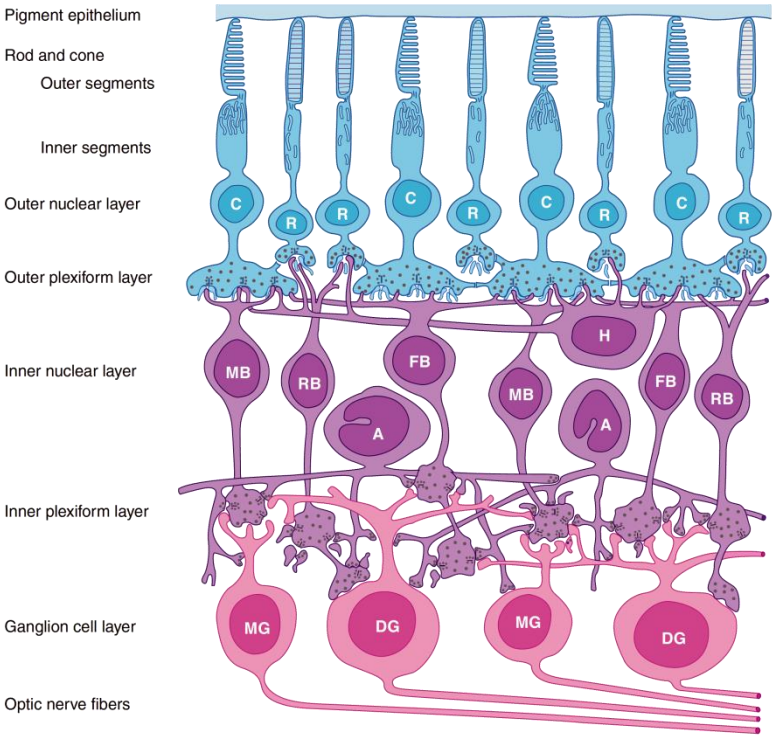


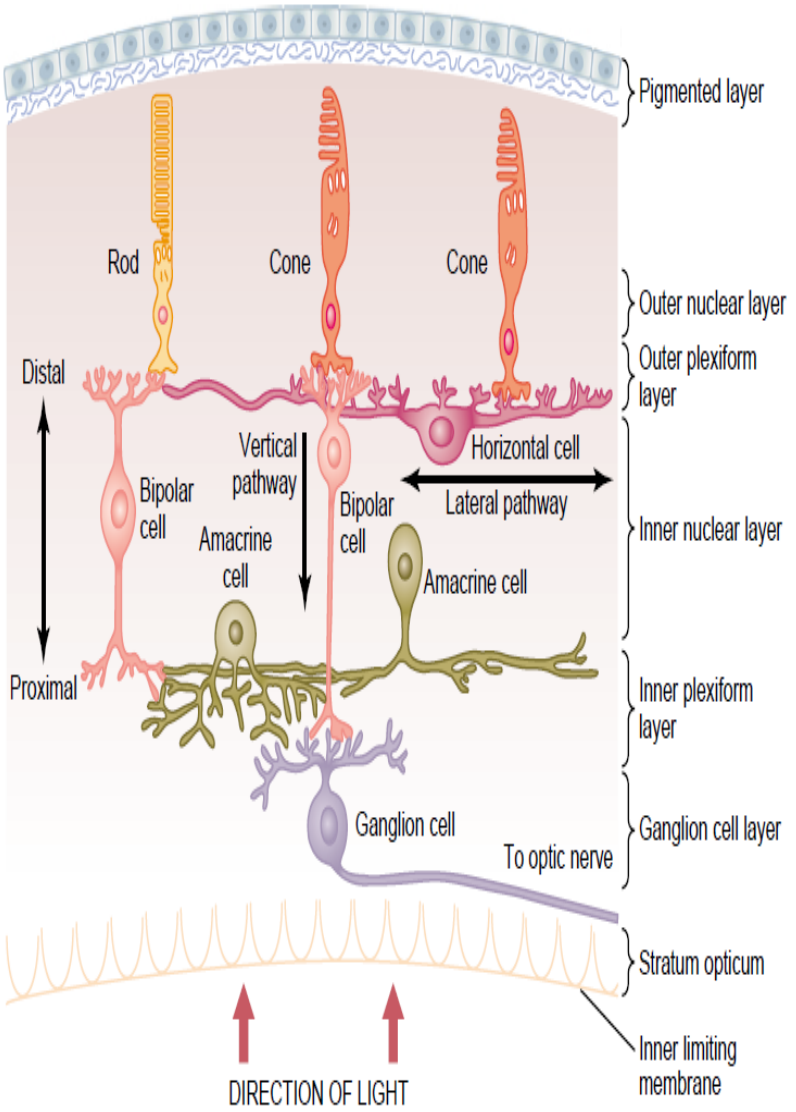



Pigmented layer
Rod
Cone
Cone
Outer nuclear layer
Outer plexiform layer
Distal
Horizontal cell
Vertical pathway
Bipolar cell
Lateral pathway
Amacrine cell
Bipolar cell
Amacrine cell
Inner nuclear layer
Proximal
Inner plexiform layer
Ganglion cell
To optic nerve
Ganglion cell layer
Stratum opticum
Inner limiting membrane
DIRECTION OF LIGHT



RETINAL CELLS

- THE CELL BODIES AND PROCESSES OF THESE NEURONS ARE STACKED IN ALTERNATING LAY
- **there are five basic classes of neurones in th**
  - **photoreceptors,**
  - **bipolar cells,**
  - **ganglion cells,**
  - **horizontal cells,**
  - **amacrine cells.**



3-Outer nuclear layer(cell bodies of rodes & cones)

4-Outer plexiform layer

mainly of Horizontal cells.

5-Inner nuclear layer (bipolar cells)

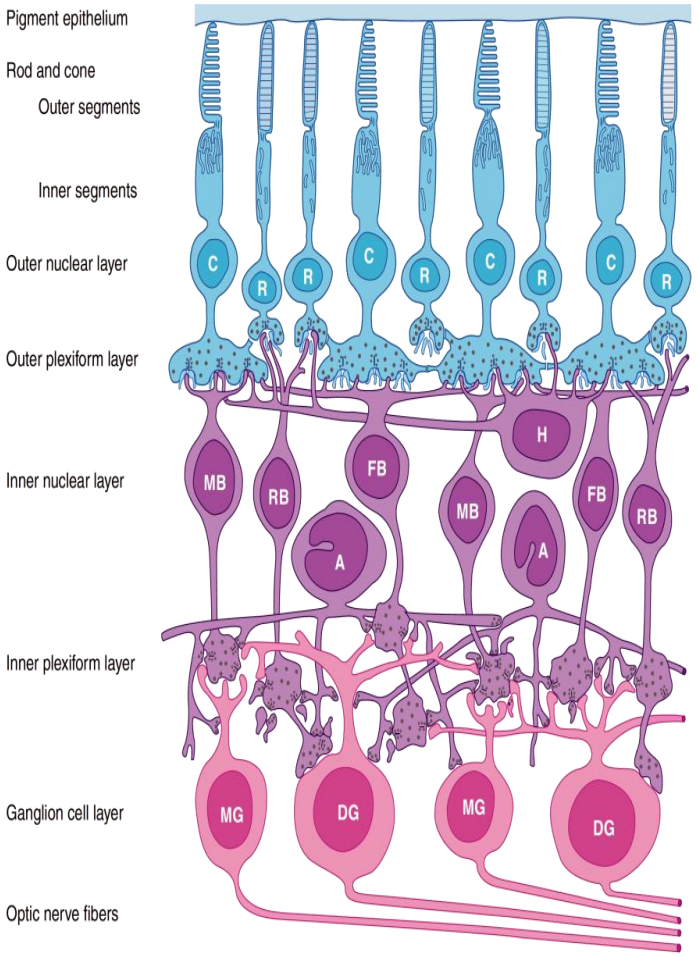
6-Inner plexiform layer.

(amacrine cells) the inner plexiform layer is interposed between the inner nuclear and ganglion cell layers.)

7-Ganglion cell layer

8-Optic nerve fibers (1.2 million fibers)

-# Horizontal cells (outer plexiform layer)
(Make synaptic connections with receptors
 # Amacrine cells (inner plexiform layer)
(make synaptic connections with ganglion cells)



Müller cells are the major glial element of the retina.

-located in the inner nuclear layer

-form architectural support structure

providing metabolic support to retina

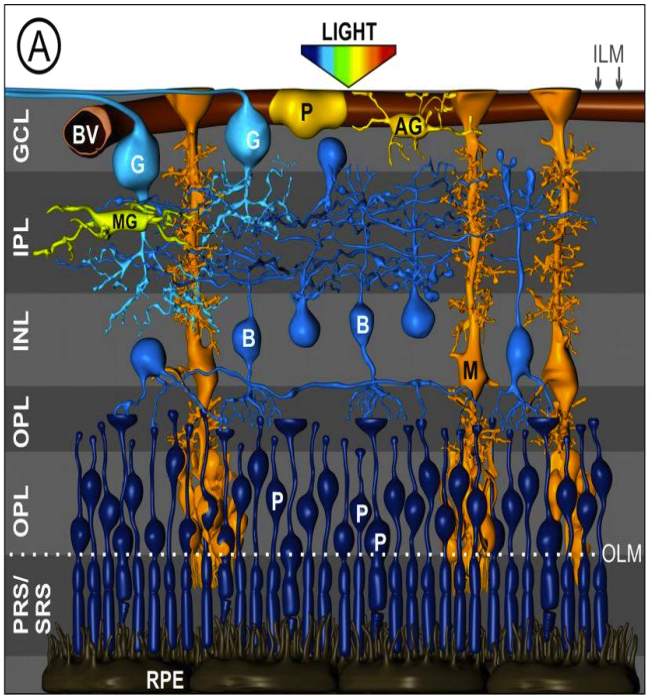
-maintaining synaptic levels of neurotransmitters.

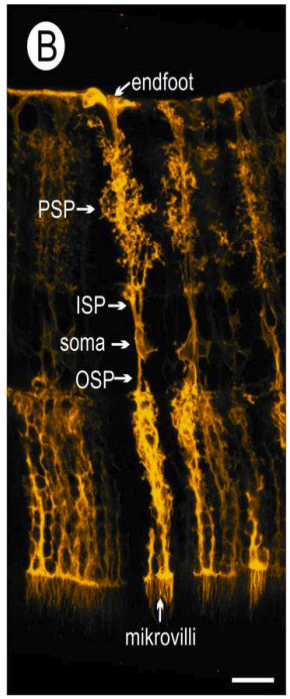
-they can be -

differentiate into a neural progenitor following injury to the retina,

-act as light conductor which funnels light to the rods and cone CELLS.

MÜLLER CELLS ARE SHOWN IN ORANGE





http://www-huge.uni-regensburg.de/Forschung/AG_Grosche/group_Grosche_projects.shtml

Light pathway in the eye:

<u>After light passes through the lens</u> system of the eye and then through the vitreous humor, it *enters the retina from the inside of the eye*

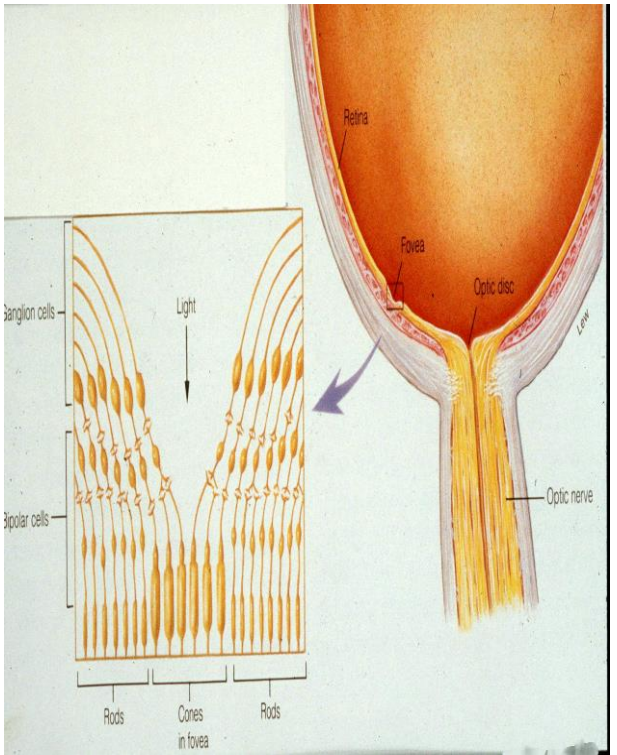
-it passes first through the ganglion cells and then through the plexiform and nuclear layers before it finally reaches the layer of rods and cones located all the way on the outer edge of the retina

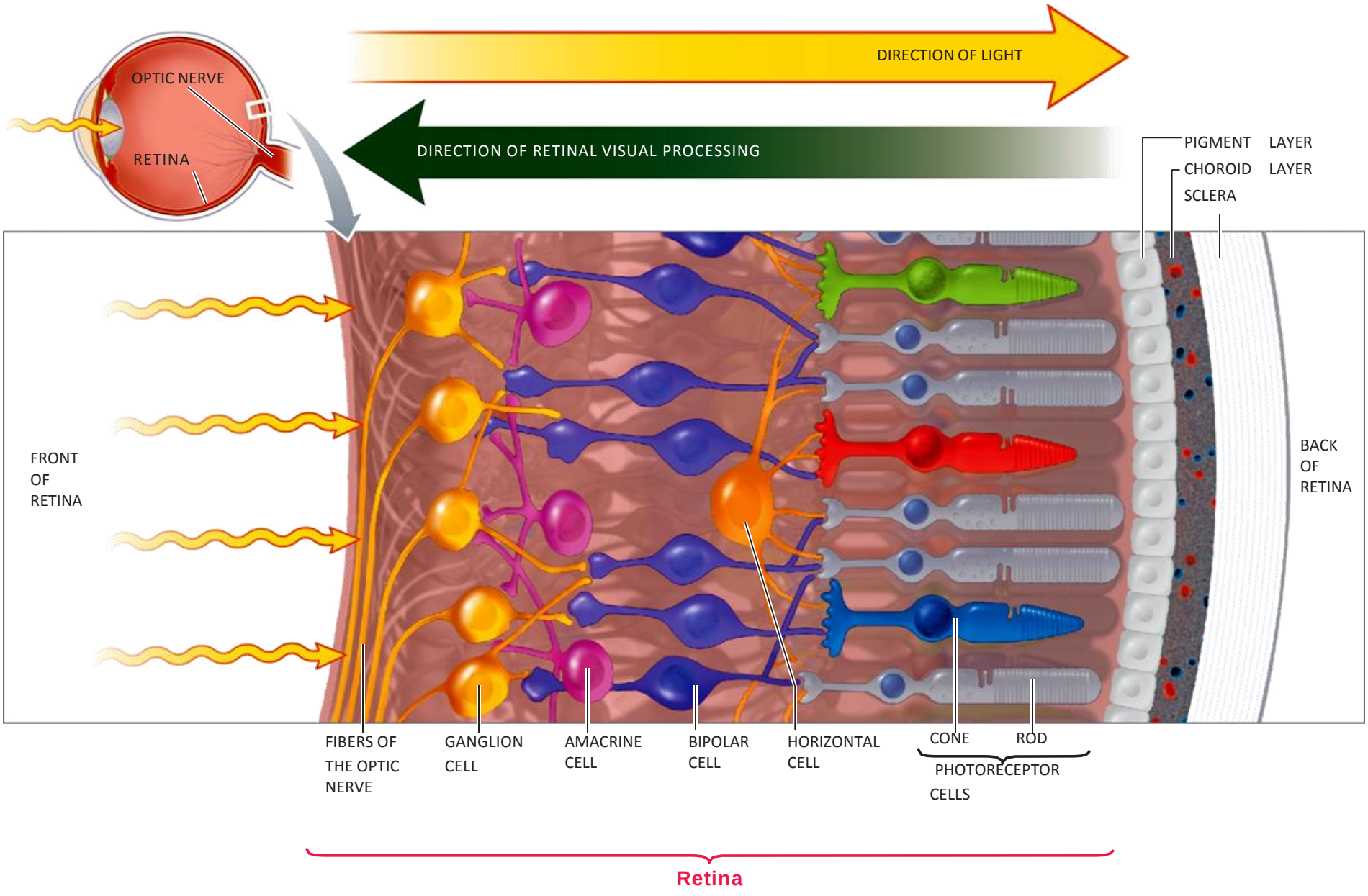
--Light absorbed by pigment cell layer that contain melanin pigment
- then impulses pass from rodes & cones to rest of layers finally to ganglion cell layer -to optic nerve

.

The visual acuity is decreased by this passage through such non- homogeneous tissue.

-However, in the *central foveal region of the retina,* the inside layers are pulled aside to decrease this loss of acuity.This allows light to pass unimpeded to the cones.




OPTIC NERVE
RETINA
DIRECTION OF LIGHT
DIRECTION OF RETINAL VISUAL PROCESSING
PIGMENT LAYER
CHOROID LAYER
SCLERA
FRONT OF RETINA
BACK OF RETINA
FIBERS OF THE OPTIC NERVE
GANGLION CELL
AMACRINE CELL
BIPOLAR CELL
HORIZONTAL CELL
CONE
ROD
PHOTORECEPTOR CELLS
Retina

Thank you for listening