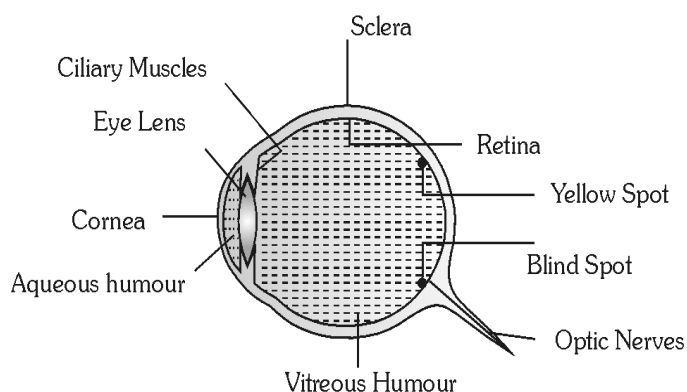


Human Eye



The human eye is like a camera. Its lens system forms an image on a screen called the retina

Eye lens : Overall behaves as a convex lens of $\mu = 1.437$

Retina : Real and inverted image of an object, obtained at retina, brain sense it erect.

Yellow spot : It is the most sensitive part, the image formed at yellow spot is brightest.

Blind spot : Optic nerves go to brain through blind spot. It is not sensitive for light.

Ciliary muscles : Eye lens is fixed between these muscles. Its both radius of curvature can be changed by applying pressure on it through ciliary muscles. When a person is looking at objects closer to the eye, the ciliary muscles contract. the focal length of the eye lens decreases to have the clear vision. When a person is looking at objects far away the ciliary muscles relax completely.

Power of accommodation : The ability of eye to see near objects as well as far objects is called power of accommodation.

Range of vision : For healthy eye it is 25 cm (near point) to ∞ (far point). A normal person's eye can see objects clearly that are between 25 cm and infinity

A normal eye can see the objects clearly, only if they are at a distance greater than 25 cm. This distance is called **Least distance of distinct vision and is represented by D .**

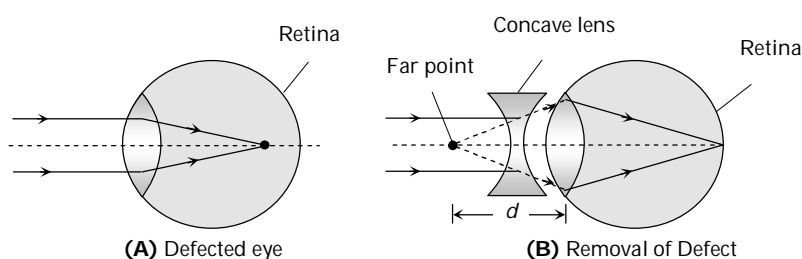
Persistence of vision : Is 1/10 sec. i.e. if time interval between two consecutive light pulses is lesser than 0.1 sec., eye cannot distinguish them separately.

Binocular vision : The seeing with two eyes is called binocular vision.

Defects of Vision

Myopia (short sightness) : A short-sighted eye can see only nearer objects. Distant objects are not seen clearly.

In this defect image is formed before the retina and Far point comes closer.



In this defect focal length or radii of curvature of lens reduced or power of lens increases or distance between eye lens and retina increases.

This defect can be removed by using a concave lens of suitable focal length.

If defected far point is at a distance d from eye then

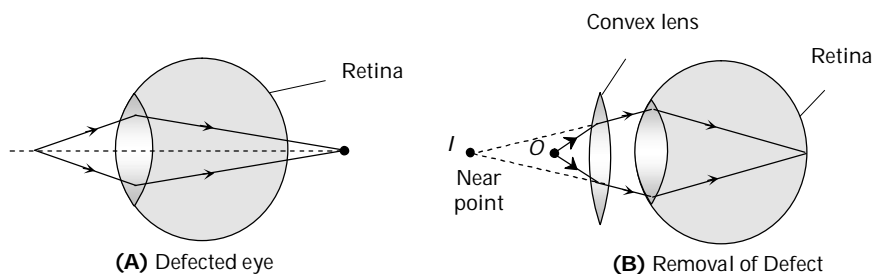
Focal length of used lens $f = -d = -(\text{defected far point})$

A person can see upto distance $\rightarrow x$, wants to see distance $\rightarrow y$ ($y > x$) so

$$f = \frac{-xy}{x-y} \text{ or power of the lens } P = \frac{x-y}{xy}$$

Hypermetropia (long sightness) : A long-sighted eye can see distant objects clearly but nearer objects are not clearly visible.

Image formed behind the retina and near point moves away



In this defect focal length or radii of curvature of lens increases or power of lens decreases or distance between eye lens and retina decreases.

This defect can be removed by using a convex lens.

If a person cannot see before distance d but wants to see the object placed at distance D from eye so $f = \frac{dD}{d-D}$ and power of the lens $P = \frac{d-D}{dD}$

Presbyopia : In this defect both near and far objects are not clearly visible. It is an old age disease and it is due to the loosing power of accommodation. It can be removed by using bifocal lens.

Astigmatism : In this defect eye cannot see horizontal and vertical lines clearly, simultaneously. It is due to imperfect spherical nature of eye lens. This defect can be removed by using cylindrical lens (Torric lenses).