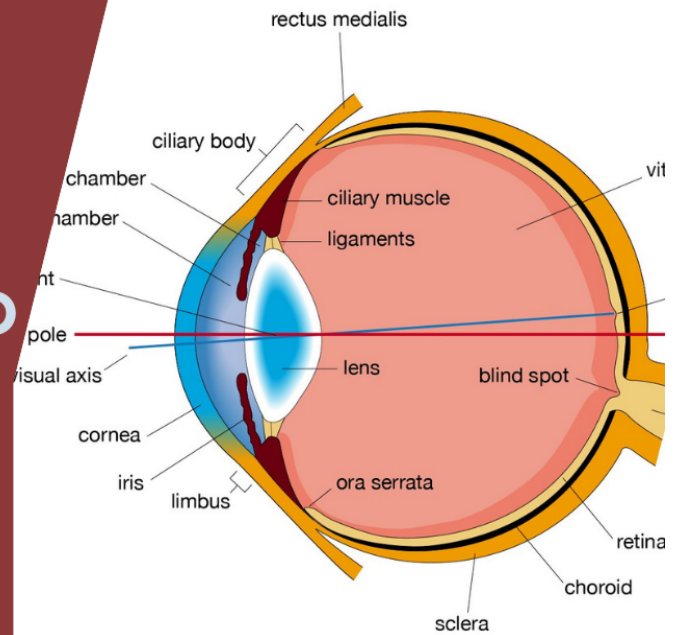


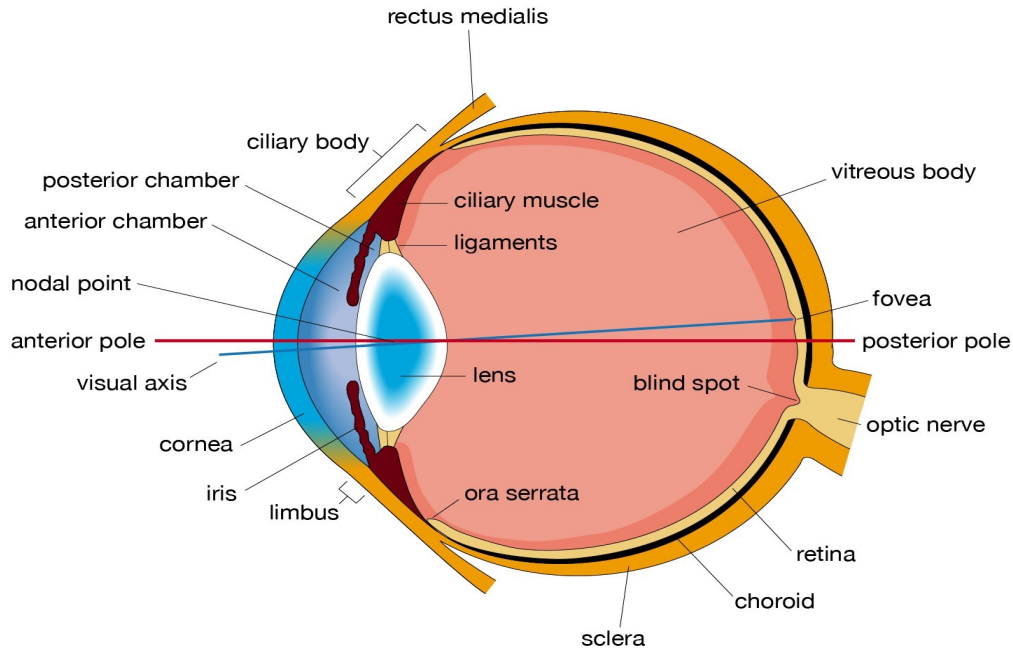
# NOTES ON THE HUMAN EYES AND ITS DEFECTS



## Notes on The Human Eyes and Its Defects

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

- The eyeball is approximately spherical in shape with a diameter of about 2.3 cm.
- The eye lens forms an inverted real image of the object on the retina.



**1) RETINA:** The retina is a delicate membrane having enormous number of light-sensitive cells.

**2) CORNEA:** Light enters the eye through a thin membrane called the cornea. It is the eye's outermost layer. It is the clear, dome shaped surface that covers the front of the eye. It plays an important role in focusing your vision.

**3) PUPIL:** The pupil is a hole located in the centre of the iris of the eye that allows light to strike the retina. It appears black because light rays entering the pupil are either absorbed by the tissues inside the eye directly, or absorbed after diffuse reflections within the eye. The pupil regulates and controls the amount of light entering the eye.

**4) IRIS:** It is a dark muscular diaphragm that controls the size of the pupil and thus the amount of light reaching the retina.

**5) AQUEOUS HUMOUR:** It is fluid which fills the space between cornea and eye lens.

**6) EYE LENS:** It is a convex lens made of transparent and flexible jelly like material. Its curvature can be adjusted with the help of ciliary muscles.

**7) CILIARY MUSCLE:** These are the muscles which are attached to eye lens and can modify the shape of eye lens which leads to the variation in focal lengths.

The light-sensitive cells get activated upon illumination and generate electrical signals. These signals are sent to the brain via the optic nerves. The brain interprets these signals, and finally, processes the information so that we perceive objects as they are.

8) **OPTICAL NERVES:** These are the nerves which take the image to the brain in the form of electrical signals.

- When the light is very bright: The iris contracts the pupil to allow less light to enter the eye.
- When the light is dim: the iris expands the pupil to allow more light to enter the eye. Thus, the pupil opens completely through the relaxation of the iris.
- A human being has a horizontal field of view of about  $150^\circ$  with one eye and of about  $180^\circ$  with two eyes.

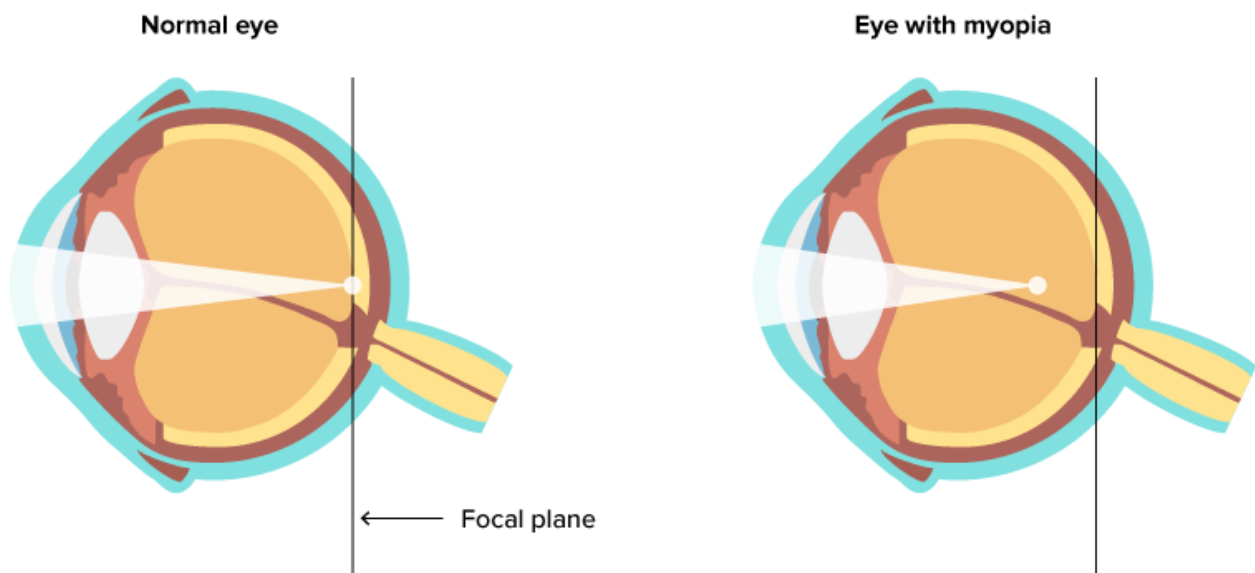
**A. Accommodation power:** The ability of eye to change the focal length of eye lens with the help of ciliary muscles to get the clear view of nearby objects (about 25 cm) and far distant objects (at infinity).

► **DEFECTS OF VISION AND THEIR CORRECTIONS:**

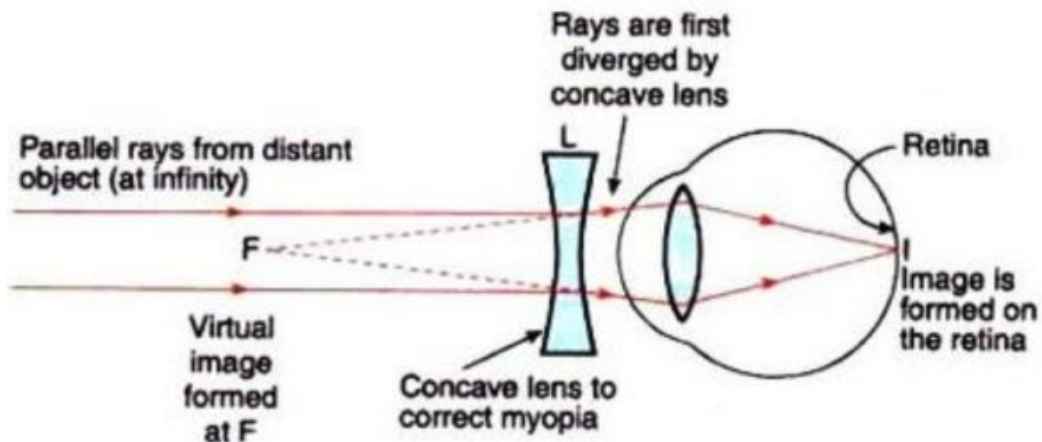
1. **Myopia (Short sightedness):** It is a kind of defect in human eye due to which a person can see near objects clearly but he cannot see the distant objects clearly. Myopia is due to

(i) Excessive curvature of cornea.

(ii) Elongation of eye ball.



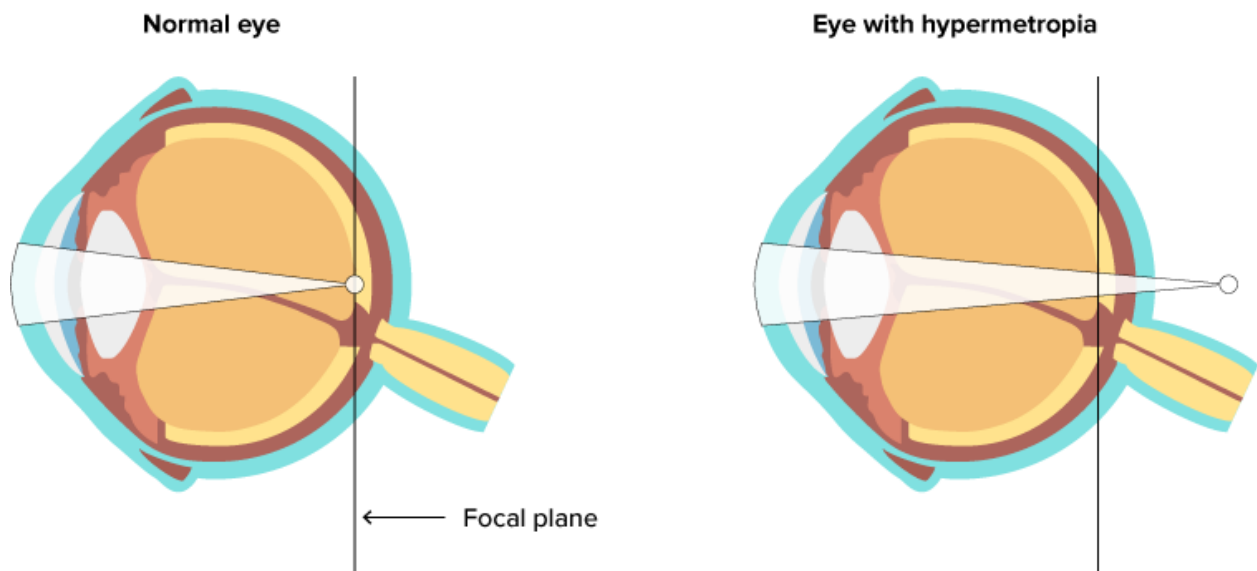
**Correction:** Myopia or short-sightedness can be corrected by wearing spectacles containing concave lens.



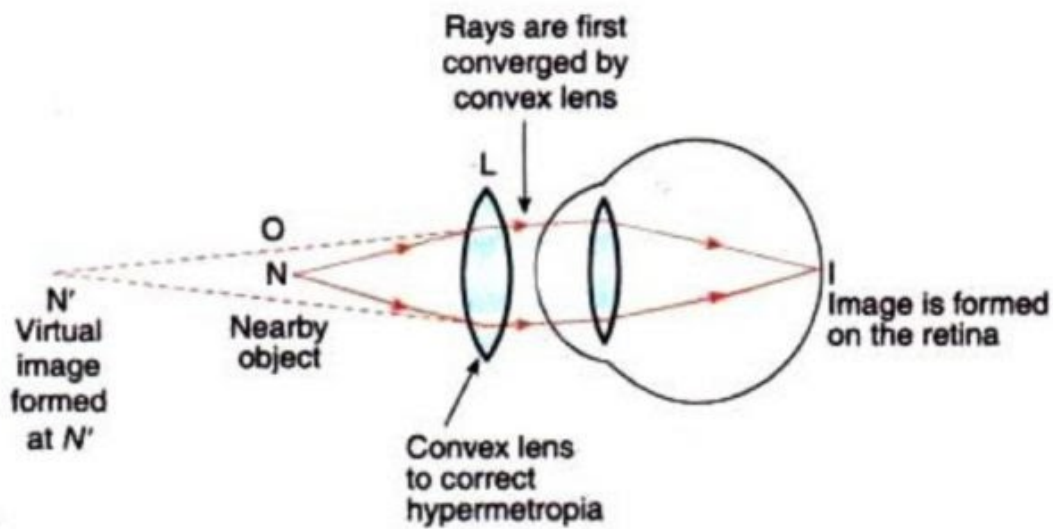
(c) *Correction of myopia.* The concave lens placed in front of the eye forms a virtual image of distant object at far point ( $F$ ) of the myopic eye

2. **Hypermetropia (Long sightedness):** It is a kind of defect in human eye due to which a person can see distant objects properly but cannot see the nearby objects clearly. It happens due to

- (i) Decrease in power of eye lens i.e., increase in focal length of eye lens.
- (ii) Shortening of eye ball.



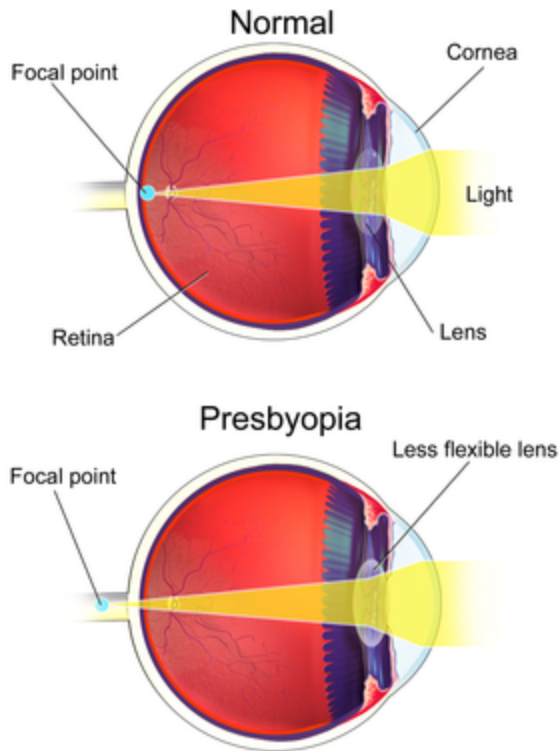
**Correction:** The near-point of an eye having hypermetropia is more than 25 cm. The condition of hypermetropia can be corrected by putting a convex lens in front of the eye.



(c) *Correction of hypermetropia.* The convex lens forms a virtual image of the object (lying at normal near point  $N$ ) at the near point  $N'$  of this eye.

3. Presbyopia: It is a kind of defect in human eye which occurs due to ageing. It happens due to

- (i) Decrease in flexibility of eye lens.
- (ii) Gradual weakening of ciliary muscles.



*The lens ages and stiffens, bringing the focal point behind the retina and causing blurry vision*

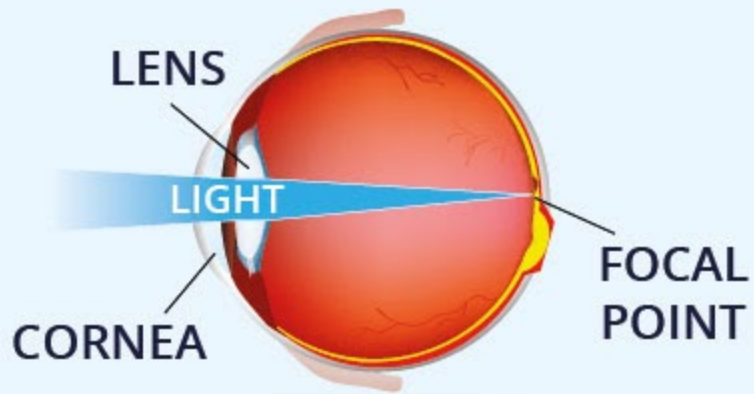
**Correction:** The near-point of an old person having presbyopia is much more than 25 cm. Presbyopia can be corrected by wearing spectacles having convex lens.

**Note:** A person can have both myopia and hypermetropia. In such a condition, spectacles having bifocal lens are worn. The upper part of bifocal lens is concave and lower part consists of convex lens.

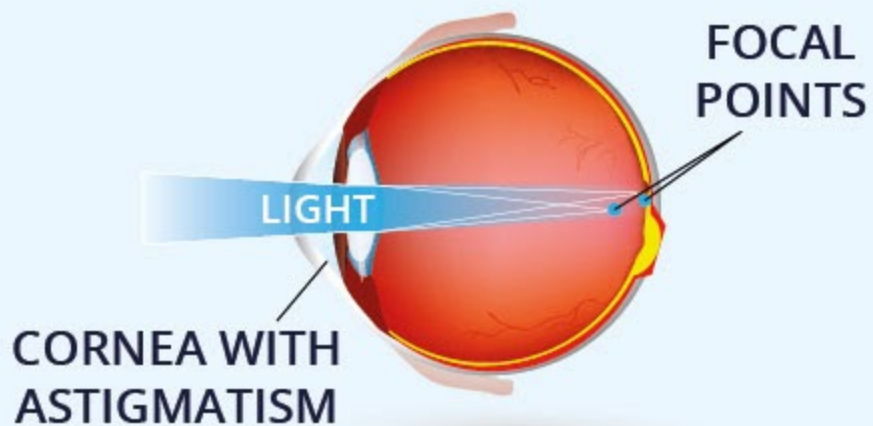
**4. Astigmatism:** It is a kind of defect in human eye due to which a person cannot see (focus) simultaneously horizontal and vertical lines both.

**5. Cataract:** Due to the membrane growth over eye lens, the eye lens becomes hazy or even opaque. This leads to decrease or loss of vision.

# SPHERIC EYE



# ASTIGMATISM



Correction: The problem is called cataract. It can be corrected only by surgery.