SCIENCE

DEFECTS OF VISION, SYMPTOMS AND REMEDY

DEFECTS OF VISION

The major defects of vision are :

- 1. Short sightedness or myopia.
- 2. Long sightedness or hypermetropia.
- 3. Presbyopia
- 4. Astigmatism.

1. Short sightedness or myopia

- Symptoms : This defect is a born defect. With this defect, the eye can see near very clearly and distinctly, but distance objects are not clearly visible. The defective eye cannot see clearly beyond a certain distance. It means that the far point of the defective eye has shifted from infinity to a finite distance ahead.
- Reasons : It is so because the image of distant objects is formed in front of the retina. It is shown in fig.



- **Causes :** It may be due to any one or both of the following two factors.
- (i) The lens may be thicker (more converging) that the normal eye lens.
- (ii) The eye ball may be elongated, as shown in fig. Due to elongation, distance between lens and retina becomes more than that for normal eye.

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Elongated eye

 Correction : The extra converging power of eye lens in compensated by using a concave (diverging) lens of proper power (focal length) as shown in fig.



Myopia corrected by a concave lens

Explanation : The concave lens kept just in front of the eye, receives distant parallel rays and diverges them. On eye lens the rays fall as if coming from far point F' of the defective eye. The eye lens focuses them at retina. In a way, the concave lens used makes a virtual image of distant (out of range) object within range of vision. The lens used must have focal length equal to the distance of the far point from the eye (-ve sign means concave lens).

2. Long sightedness or hypermetropia

- Symptoms : This defect is a born defect. With this defect, the eye can see distant objects very clearly and distinctly, but near objects are not clearly visible. The defective eye cannot see clearly within a certain distance. It means that the near point of the defective eye has shifted from 25 cm to some more distance behind (away).
- **Reason :** It is so because the image of near objects is formed behind the retina. It is shown in fig.

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(a) seeing objects at its near point N'
(b) seeing objects at normal eye near point N
Hypermetropic eye vision

Causes : It may be due to any one or both of the following two factors :

- (i) The eye lens may be thinner (less converging) than the normal eye lens.
- (ii) The eye ball may be oval as shown in fig. Due to oval shape, distance between lens and retina becomes less than that for normal eye.
- Correction : The deficiency in converging power of eye lens is compensated by using a convex (Converging) lens of proper power (focal length) as shown in fig.



Oval eye.

Hypermetropia corrected by a convex lens

3. Presbyopia

The power of accommodation of the eye usually decreases with ageing. For most people, the near point gradually recedes away. They find it difficult to see nearby objects comfortably and distinctly without corrective eye-glasses. This defect is called **Presbyopia**.

It arises due to the gradual weakening of the ciliary muscles and diminishing flexibility of the eye lens. Sometimes, a person may suffer from both myopia and hypermetropia.

Such people often require bi-focal lenses. A common type of bi-focal lenses consists of both concave and convex lenses. The upper portion consists of a concave lens. It facilitates distant vision. The lower part is a convex lens. It facilitates near vision. These days, it is possible to correct the refractive defects with contact lenses or through surgical interventions.

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4. Astigmation

A person suffering from this defect cannot simultaneously focus on both horizontal and vertical lines of a wire gauze.



Normal Wire Gauge





Wire gauge with distorted horizontal lines

This defect arises due to the fact that the cornea is not perfectly spherical This defect can be corrected by using cylindrical lens

Cylindrical lens