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DEFECTS OF VISION – DEFINITION

A defect of vision is the loss of power of accommodation of the human eye. The ability to see is called vision. It is also called eyesight. Sometimes the eye of a person cannot focus the image of an object on the retina properly. In such cases the vision of a person becomes blurred and he cannot see either the distant objects or nearby objects (or both) clearly and comfortably. The person is said to have a defect of vision. The defects of vision are also known as defects of eye.

 MYOPIA AND HYPERMETROPIA

1. In myopia (short-sightedness), the image is formed in front of the

Retina and can be corrected by using a concave (diverging) lens.

Myopia/ near-sightedness: The person can see nearby objects clearly but is unable to see objects beyond some distance. For such a person, far

Point changes to infinity to some finite distance. It is corrected with the help of a concave lens. The power of the lens is set so that its focal length is equal to the far-point of the eye.

 The defect of eye called myopia (or short-sightedness) is caused

(a) Due to high converging power of eye-lens (because of its short focal length)

In an eye suffering from myopia, the ciliary muscles attached to the eye-lens do not relax sufficiently to make the eye-lens thinner to reduce its converging power. So, due to the greater converging power of the eye-lens in myopic eye, the image of a distant object is formed in front of the retina and hence the eye cannot see it clearly.

(b) Due to eye-ball being too long

In the eye suffering from myopia, the eye-ball is too long due to which the retina is at a larger distance from the eye-lens. This condition also results in the formation of the image of a distant object in front of the retina (even though the eye-lens may have correct converging power)

1. Hypermetropia/ far-sightedness: The person can see far objects clearly but

is unable to see nearby objects clearly. For such a person, near point

Increases to a distance greater than 25cm. It is corrected with the help of a convex lens.

A person with hypermetropia can see distant objects clearly but cannot see nearby objects distinctly. The near point, for the person, is farther away from the normal near point (25 cm).

This is because the light rays from a close by object are focused at a point behind the retina as shown in Fig. This defect arises either because (i) the focal length of the eye lens is too long, or (ii) the eyeball has become too small. This defect can be corrected by using a convex lens of appropriate power. Eye-glasses with converging lenses provide the additional focusing power required for forming the image on the retina.

 The defect of eye called hypermetropia (or long-sightedness) is caused

(a) Due to low converging power of eye-lens (because of its large focal length)

The ciliary muscles attached to the eye-lens become weak and cannot make the eye-lens thicker to increase its converging power. So, due to the low converging power of eye-lens in an eye suffering from hypermetropia, the image of nearby object is formed behind the retina and hence the eye cannot see it clearly.

(b) Due to eye-ball being too short

In an eye suffering from hypermetropia, the eye-ball is too short due to which the retina is at a smaller distance from the eye-lens. This condition also results in the formation of the image of a nearby object behind the retina.

The diverging rays of light coming from a nearby object O placed at the normal near point N are converged to form an image I behind the retina due to which the eye cannot see the nearby object clearly. The image is formed behind the retina either due to low converging power of eye-lens or because of eye-ball being too short.