

# CHAPTER-10

## HUMAN EYE AND COLOURFUL WORLD

### Topic-1

### Human eye, Defects of vision and its corrections

**Concepts Covered** • Human eye, • Defects of vision and its Corrections.



### Revision Notes

#### Human Eye

- ▶ Eye is a natural **optical** device using which human could see objects around him. It forms an inverted, real image on a light sensitive surface called retina.
- ▶ Rods and cones are the cells in retina, which are light sensitive. Rods respond to the intensity of light. Cones respond to the **illumination** of colours. There are around 125 million rods and cones cells. The cells generate signals which are transmitted to the brain through optic nerve.

#### Parts of Human Eye

- ▶ **Cornea** : It is the outermost, transparent part. It provides most of the refraction of light.
- ▶ **Lens** : It is composed of a fibrous, jelly like material. It provides the focused, real and inverted image of the object on the retina. This convex lens converges light at retina.
- ▶ **Iris** : It is a dark muscular diaphragm that controls the size of the pupil.
- ▶ **Pupil** : It is the window of the eye. It is the central aperture in iris. It regulates and controls the amount of light entering the eye.
- ▶ **Retina** : It is a delicate membrane having enormous number of light sensitive cells.
- ▶ **Ciliary muscles** : These muscles change the shape and size of the eye lens for focussing.
- ▶ **Far point** : The maximum distance at which object can be seen clearly is far point of the eye. For a normal adult eye, its value is infinity.

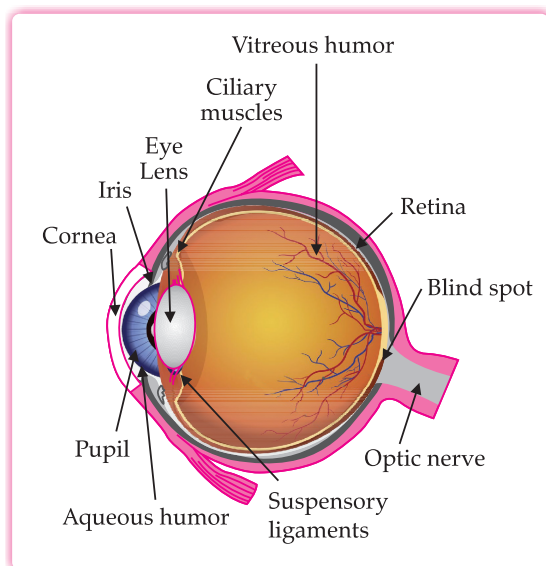
### Key Words

**Optical**: Relating to sight.

**Illumination**: To make shining or luminous.

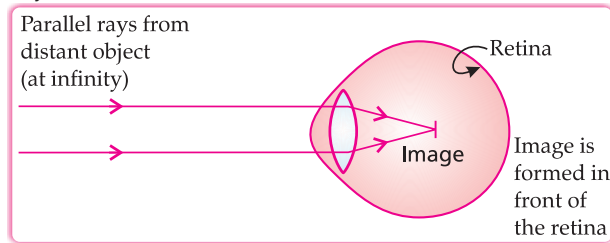
- ▶ **Optic Nerve** : The optic nerve sends the electrical impulses from the retina, at the back of the eyes to the brain.
- ▶ **Near point or Least distance of distinct vision**  
The minimum distance at which objects can be seen most distinctively without strain.
  - For a normal adult eye, its value is 25 cm.
  - Range of human vision is 25 cm to infinity.
- ▶ **Accommodation** : The ability of the eye lens to adjust its focal length is called accommodation. Focal length can be changed with the help of ciliary muscles.

Structure of an Human Eye :

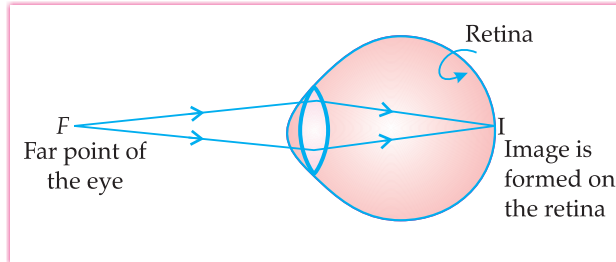


**Myopia (Nearsightedness) :**

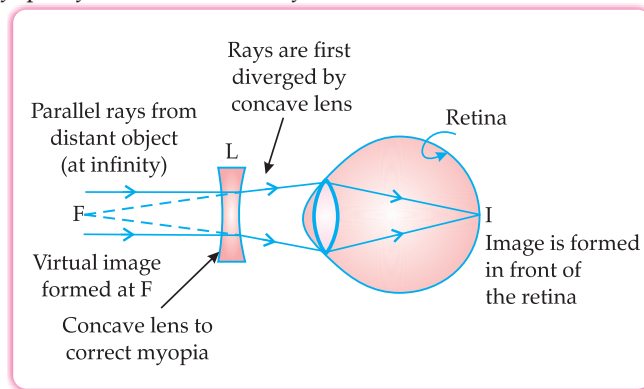
- ▶ Distant objects are not clearly visible.



- ▶ In a myopic eye, image of distant object is formed in front of the retina (and not on the retina)



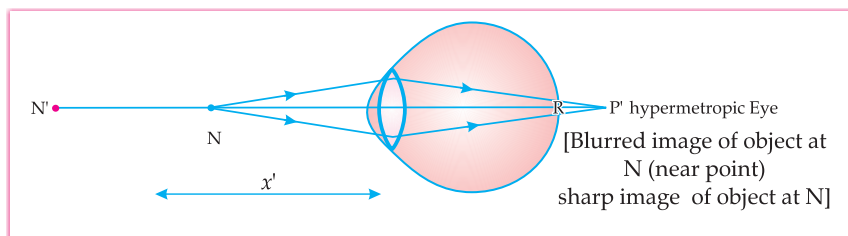
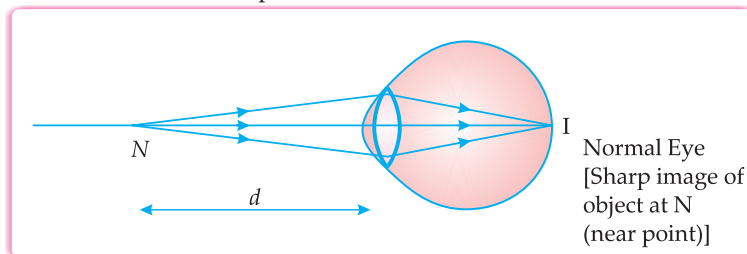
- ▶ The far point (F) of a myopic eye is less than infinity.

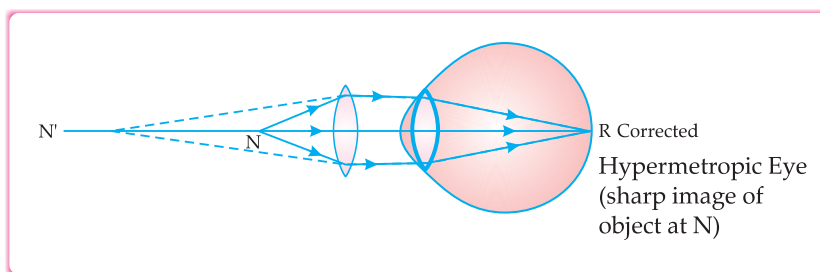


- ▶ **Correction :** The concave lens placed in front of the eye forms a virtual image of distant object at far point (F) of myopic eye.

**Hypermetropia (Farsightedness) :**

- ▶ Affected person can see far objects clearly but cannot see nearby objects clearly.
- ▶ The near point of the eye moves away from 25 cm.
- ▶ Image is formed behind the retina.
- ▶ **Correction :** Use of convex lens of suitable power can correct this defect.





### Presbyopia (Old age Hypermetropia) :

- ▶ It is the defect of vision due to which an old person cannot see the nearby objects clearly due to less power of accommodation of the eye.
- ▶ The near-point of old person having presbyopia gradually recedes and becomes much more than 25 cm.

## Topic-2

## Refraction of light through prism, Dispersion of Light and Scattering of Light

**Concepts Covered** • Dispersion of light, • Atmospheric refraction, • Refraction of light using prism, • Scattering of light.



### Revision Notes

- ▶ The phenomenon of splitting of white light into its constituent colours on passing through a glass prism is called **dispersion of light**.  
**Spectrum:** Band of colored components of a light beam is known as spectrum.
- ▶ Different colours undergo different **deviations** on passing through prism.
- ▶ If a second identical prism is placed in an inverted position with respect to the first prism, all the colours recombine to form white light.
- ▶ **Atmospheric refraction** is the phenomenon of bending of light on passing through the Earth's atmosphere.
- ▶ As we move above the surface of the Earth, density of air goes on decreasing.
- ▶ Light travelling from rarer to denser layers always bends towards the normal.
- ▶ Stars twinkle on account of **atmospheric refraction**.
- ▶ The sun appears to rise two minutes earlier and set two minutes later due to atmospheric refraction.
- ▶ The phenomenon in which a part of the light incident on a particle is redirected in different directions is called **scattering of light**.
- ▶ Very small particles scatter light of shorter **wavelengths** better than longer wavelengths.
- ▶ The scattering of longer wavelengths of light increases as the size of the particle increases.

### Key Words

**Wavelength:** The distance between two successive crests or troughs of a light wave

**Scattering:** Throwing in various random directions

**Deviation:** Action of departing from the original path

- ▶ Larger particles scatter light of all wavelengths equally well.



### Mnemonics

**Concept:** Colors of spectrum

**Interpretation:**

**V:** Violet

**I:** Indigo

**B:** Blue

**G:** Green

**Y:** Yellow

**O:** Orange

**R:** Red

A prism causes dispersion, Stars twinkle due to refraction, Scattering causes redirection, All have their own attraction.

## Key Diagrams

Difference in refraction of light by a glass slab and a glass prism:

