The Human Eye & the Colourful World

Assess Yourself

Q. 1. What is the least distance of distinct vision of a normal human eye?

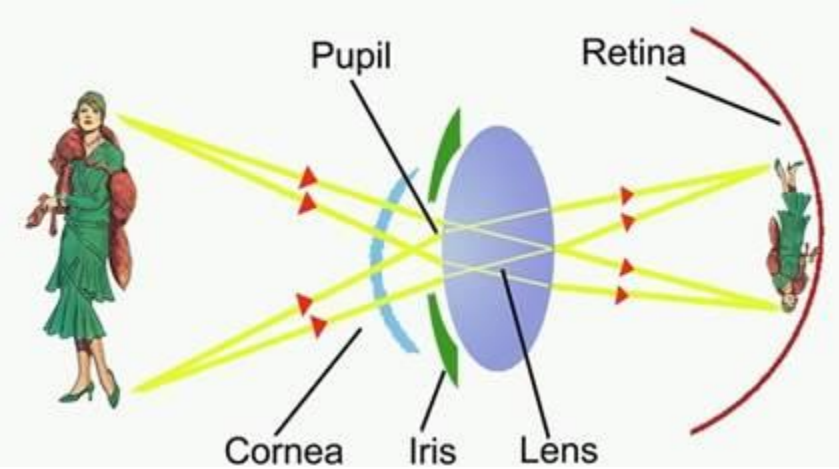
Answer: The least distance of distinct vision of a normal human eye is 25 cm, it means that an adult person with normal eyesight can view objects distinctly at a distance of 25 cm from the eye and if we reduce the distance between the object and eye than this, then the vision will become blurry and will experience headache.

Q. 2. State two properties of the image formed by the eye lens on the retina.

Answer: The two properties of the image formed are:–

1. The image formed is real and inverted.

2. The magnification of the image is always less than 1 because of least distance of distinct vision which is 25 cm (u) and the image distance is 23 cm (v) diameter of the human eye.



Q. 3. A person is advised to wear spectacles with concave lenses. What type of defect of vision is he suffering from?

Answer: Concave lens also called as diverging lens is used in the type of defects in which the eye is unable to see nearby objects because of the image formation in front of the retina rather than on the retina, hence the defect is Myopia or near sightedness.

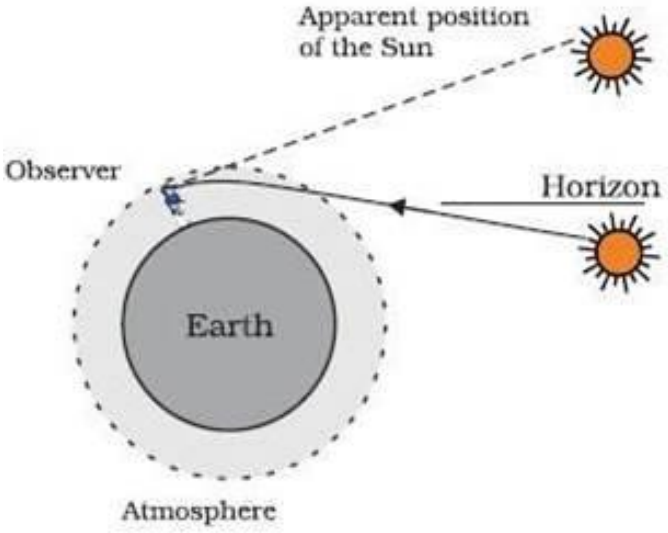
Q. 4. A person can comfortably read a book but finds it difficult to read the number on a bus parked 5 m away from him. Name the type of defect of vision he is suffering from. Which type of lens should be used in his spectacles to correct his vision?

Answer: When a person reads a book he keeps it near to its near point of distinct vision, so the person is not suffering from myopia or near sightedness and as the

person can't read a number at a distance of 5m far, so the person definitely has Hypermetropia which is also called far sightedness because he is not able to see far objects and to correct this type of defect convex lens is needed or converging lens is needed because the image is formed behind the retina.

Q. 5. Name the atmospheric phenomenon due to which the sun can be seen above the horizon about two minutes before actual sunrise.

Answer: The phenomena is called refraction of light. Due to change in refractive index (property of the medium) of the atmosphere of earth the light bends when it goes from one medium to another medium because the change in speed of light in different mediums and due to this it bends and we see the sun before and after actual sunrise and sunset.



Q. 6. Name the defect of vision caused by

(i) Excessive curvature of cornea
(ii) Power of accommodation of eye decreases.

Answer: The defects in eyes are caused by ageing and due to size changing of eyeball and due to the changing of curvature of eye lens.

i. Due to the excessive curvature of eye lens the focal length of the lens decreases and hence the image, of objects far from the eye, forms in front of retina rather than on the retina, so the defect is called near sightedness or Myopia because the person can only see nearby objects distinctly.

ii. The power of accommodation of eye decreases with time or ageing due to the weakness of ciliary muscles and due to their weakness the focal length of the eye lens cannot be changed properly, hence the defect is called Presbyopia.

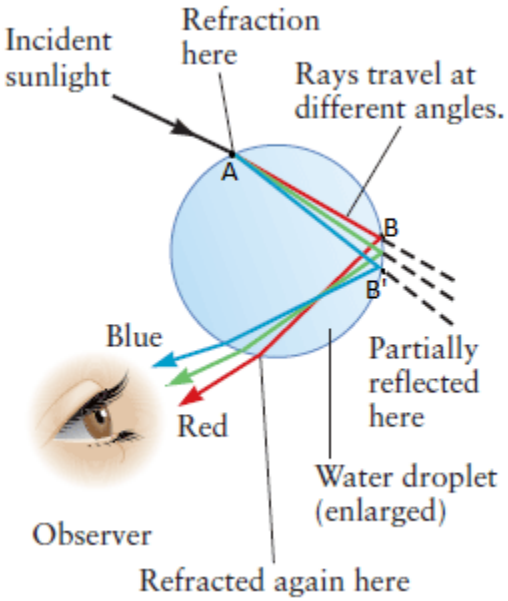
Q. 7. What is the colour of the clear sky during daytime? Give reason for it.

Answer: In daytime the colour of the sky is Blue because of the phenomena called scattering of light. Tiny particles present in the atmosphere which have size smaller than the wavelength of light scatter those colour of white light which has short wavelength which is blue in the visible range of light.

ADDITIONAL – Red has maximum wavelength in visible range and violet has minimum.

Q. 8. Draw a ray diagram to show the formation of rainbow and mark the point where (i) dispersion, (ii) internal reflection occurs.

Answer:



This is the diagram of formation of rainbow due to dispersion of light.

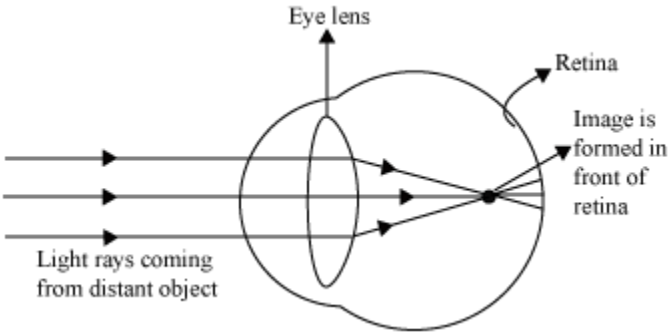
i. Dispersion occurs at the point 'A' because the splitting of colours of white light occurs at this point.

ii. Internal reflection occurs at the point(s) B and B' because the light gets divided into several colours or beams and gets reflected.

Q. 9. An old man cannot see objects closer than 1 m from the eye clearly. Name the defect of vision he is suffering from. How can it be corrected? Draw ray diagram for the (i) defect of vision and also (ii) for its correction.

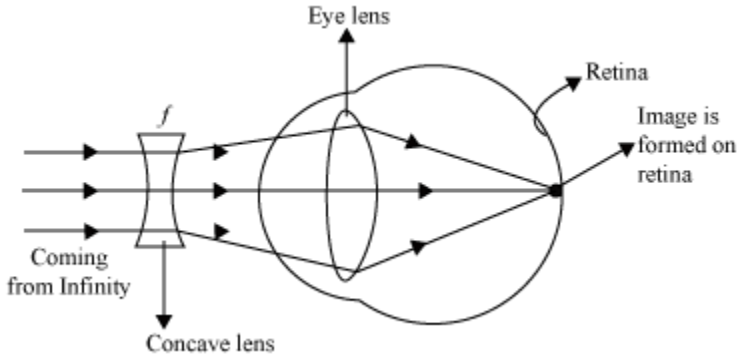
Answer: The person cannot see nearby objects and is able to see far objects clearly, so he is suffering from Myopia also called near sightedness also his least point of distinct vision is far than that of normal eye. To correct this type of defect concave lens or diverging lens are needed because image is formed in front of retina rather than on retina.

i. The ray diagram for the defect of vision of the eye is



The image is formed in front of retina.

ii. The ray diagram for correction of defect of vision is

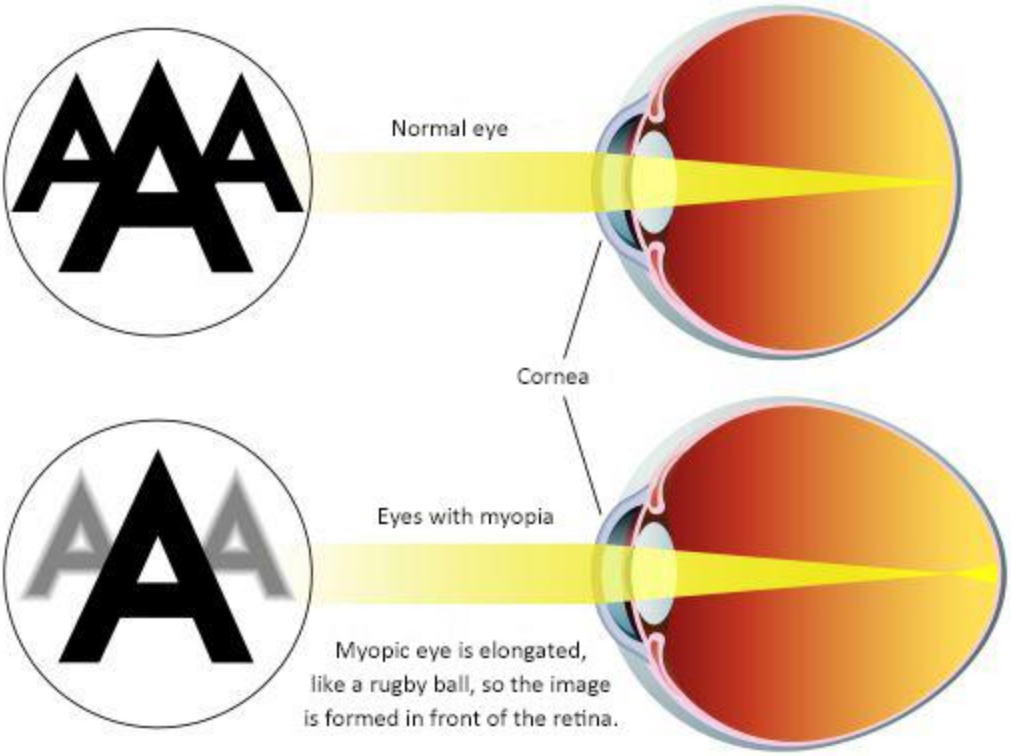


By correction, the image is formed on the retina, for correction we use concave lens or diverging lens.

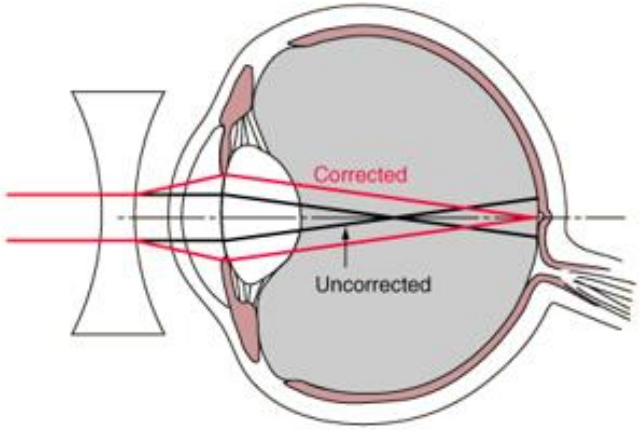
Q. 10. Draw a diagram to show why distant objects cannot be seen distinctly by a myopic eye. List two reasons due to which this defect of vision may be caused.

A person with a myopic eye cannot see objects clearly beyond a distance of 2 m. Name the type of corrective lens that would be needed to correct the defect of vision and draw a ray diagram to show how the defect gets corrected.

Answer: In order to see objects by the eye the image of the object should form on the retina, exactly on the retina. When a person is suffering from Myopia or near sightedness, the near point of distinct vision gets increases and an object placed at a distance less than this new near point has its image formed in front of retina.



If a person can't see the object clearly beyond 2m then he should use concave or diverging lens in order to correct his defect.

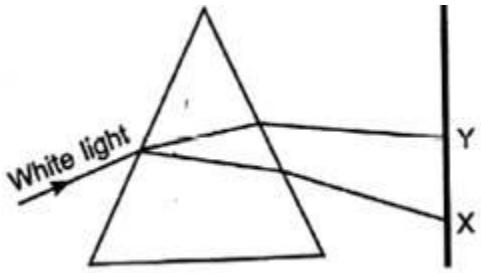


Q. 11. With the help of scattering of light, explain the reason for the difference in colours of the sun as it appears during sunrise/sunset and noon.

Answer: When there is sunrise or sunset the sun is near the horizon, so the light rays have to cover large distance and hence the blue colour scatters away and far from earth but the red colour scatters near the earth and lesser than blue colour because red has maximum wavelength.

At noon the sun is at least possible distance from earth, so the blue colour scatters very less due to that distance and hence we see sun as white in colour, and as blue has minimum wavelength, so the rest of the colours would also not get scattered.

Q. 12. A narrow beam of light produces a spectrum XY on passing through a triangular glass prism.



(a) State the colour at X and Y.

(b) Why do the different components of white light bend through different angles with respect to the incident beam of light?

Answer: The splitting of colours of white light is due to dispersion.

a) The colour of X is Violet and the colour of Y is Red.

b) Due to the difference in wavelength and speed of each colour they deviate at different angles.

Q. 13. State the function of each of the following parts of the human eye:

(i) Cornea (ii) Iris

(iii) Pupil (iv) Retina

Millions of people of the developing countries are suffering from corneal blindness. The disease can be cured by replacing the defective cornea with the cornea of donated eye. Your school has organized a campaign in the school and its neighborhood in order to create awareness about this fact and motivate people to donate their eyes after death. How can you along with your classmates

contribute to this noble cause? State the objectives of organizing such campaigns in schools.

Answer:

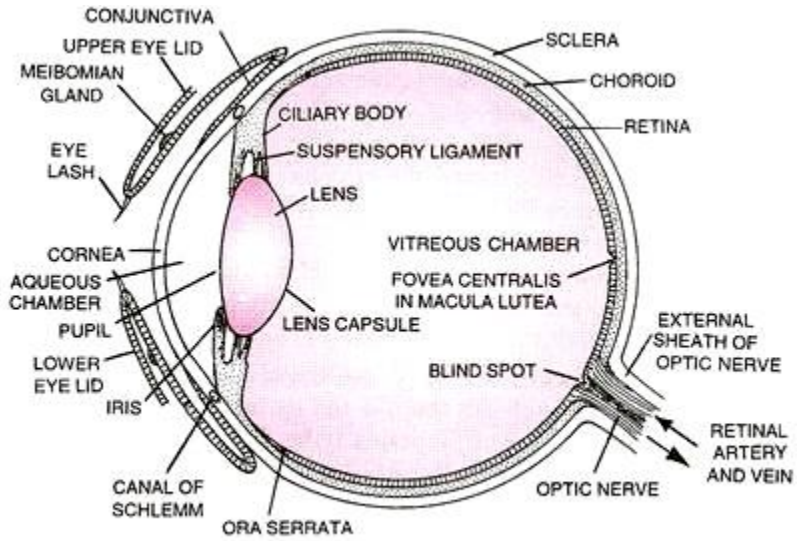


Fig. 21.24. V. S. Human Eye.

I. CORNEA – The cornea acts as protective layer through which light enters our eye, it is transparent. Most of the refraction occurs here.

II. IRIS – It is dark and behind the cornea. It controls the size of pupil according to the light entering with intensity. It determines eye colour.

III. PUPIL – It checks the amount of light entering the eye and changes its size with the help of iris accordingly.

IV. RETINA – The function of retina is to receive the light focused by the eye lens or crystalline lens and convert it to electrical signals that will be interpreted by the brain through optic nerve. It has enormous number of light-sensitive cells.