

Answers to Exercises

- A.
1. In case of diffuse reflection, the rays are reflected in different directions, and we see a hazy image or no image at all. This happens when a beam of light falls on an uneven surface.
 2. The image is formed 10 cm behind the mirror. In other words, the distances of the image and the object from the mirror are equal.
 3. Three images are formed. Each of the mirrors forms an image due to reflection. In addition, an image is formed at the edge where the mirrors meet.
 4. When lights of all colours are mixed in a certain proportion, the result is a colourless light, called white light. Sunlight is an example of white light. It is a mixture of lights of seven main colours.
 5. The splitting of light into its component colours on refraction is called dispersion of light.
 6. Light falling on the eye is refracted as it passes through the cornea, the lens of the eye and the fluids in the eye. These make up the converging lens system of the eye.
 7. A person with myopia, or near sightedness, is unable to see distant objects clearly, but has no difficulty in seeing nearby objects.
 8. In the first stage of nutritional blindness, a person is unable to see properly at night or in dim light. This condition is called night blindness.
- B.
1. Since the surface of a shiny metal utensil is not as smooth as that of a mirror, the rays reflected from it get diffused. Therefore, the image formed is not as clear and bright as that formed by a mirror.
 2. Reflection of light follows two laws.
 - (a) The angle of incidence is equal to the angle of reflection.
 - (b) The incident ray, the reflected ray and the normal at the point of incidence lie in the same plane.
 3. The image formed by a plane mirror is virtual, erect, laterally inverted, of the same size as the object, and at the same distance behind the mirror as the object is in front of it.
 4. In the image formed by a plane mirror, the left and right sides get reversed. This sideways (lateral) change is called lateral inversion.
 5. Each of the mirrors will form an image due to reflection. Each of these images is formed by a single reflection. These images are laterally inverted. In addition, an image is formed at the edge where the mirrors meet. This image is formed by rays that get reflected twice. As a result, this image is not laterally inverted.
 6. The iris controls the amount of light entering the inner part of the eye to ensure the best possible brightness of the image. In dim light, the iris automatically widens the pupil to let in more light. And in bright light, the iris contracts the pupil to keep out excess light.
 7. There are no sense receptors at the spot where the optic nerve leaves the eye. When an image is formed at this spot, information about it cannot be picked up. So, we cannot see the image formed there. This spot is, therefore, called the blind spot.
 8. The process by which the focal length of the lens of the eye is changed to ensure the formation of sharp images of objects at different distances is called accommodation. To ensure that images of objects at different distances are equally sharp, the ciliary muscles contract and relax to change the curvature, and thus the focal length, of the lens.
 9. Braille is a system of representing characters by raised dots. Combinations of raised dots in a six-dot 'cell' make up different characters. The characters are read by touching them with fingers. This system was invented by Louis Braille, who lost his sight as a child.

- C. 1. Draw a straight line XY on a sheet of paper. Stand a mirror upright, with its reflecting surface on the line. Let a ray of light from a ray box fall on the mirror. It will get reflected. Trace the incident and reflected rays, and remove the mirror. Draw a normal to XY at the point where the rays meet (O), and measure the angles of incidence ($\angle i$) and reflection ($\angle r$). Repeat this experiment a number of times, changing $\angle i$ every time by rotating the sheet with the mirror on it. In each case, $\angle i = \angle r$.

In this case, the incident ray, the reflected ray and the normal at the point of incidence lie on the plane of the sheet of paper. Now put the sheet at the edge of a table and fold down the sheet near O. This time the reflected ray will not fall on the folded part, because it is in a different plane.

2. The eye is enclosed in a nearly spherical eyeball. A white membrane called the sclera covers most of the eyeball. The eyeball has a small bulge at the front, with a transparent membrane over it called the cornea. Behind the cornea lies the iris, which has a small opening called the pupil. Light entering through the pupil falls on a flexible lens attached to a set of ciliary muscles. The space in front of the lens is filled with a watery fluid called aqueous humour. And that behind the lens is filled with a jellylike fluid called vitreous humour. Light entering the eye finally falls on the retina, which is at the back of the eyeball. There an image is formed.

Refer to Figure 12.16 on page 131.

3. Vitamin A is essential for good vision. When the diet lacks this vitamin, a series of eye problems occur. In the beginning, the patient is unable to see properly at night or in dim light. This condition is called night blindness. This is followed by extreme dryness of the eye, the softening and clouding of the cornea and other problems. These conditions finally lead to blindness.

- D. 1. parallel 2. reflections 3. iris 4. hypermetropia 5. cataract
6. spectrum
- E. 1. (b), (c), (d) 2. (b), (d) 3. (b), (d) 4. (b)
- F. 1. B, o 2. B, m, q, r, 3. A, n, p