CHAPTER -13

LIGHT

EXERCISES

1 Mark Questions

Q1: Suppose you are in a dark room. Can you see objects in the room? Can you see objects outside the room? Explain.

Answer: When we are in a dark room then we cannot see objects in the room. We can see the objects outside the room, because out of the room the light is available and the rays of light can enter our eyes after reflection from the objects.

Q2: How many images of a candle will be formed if it is placed between two parallel plane mirrors separated by 40 cm?

Answer: Here, mirrors are placed parallel to each other 40 cm apart. Therefore, the infinite number of images will be formed.

Q3: Define dispersion of light.

Answer: Splitting up of white light into seven colors when it passes through a glass prism is known as dispersion of light.

Q4: What is meant by lateral inversion?

Answer: Lateral inversion is the phenomenon of the interchange of the left and right sides, between the object and its image.

Q5: What is meant by visually challenged people?

Answer: Visually challenged people have limited vision to see things

Q6: What are non-optical aids?

Answer: Non-optical aids include visual aids, tactual aids, auditory aids and electronic aids

Q7: What are tactual aids?

Answer: Tactual aids include Braille writer, slate and stylus. They help the visually challenged persons in taking notes, reading and writing and in learning mathematics.

2Mark Questions

Q1: Differentiate between regular and diffused reflection. Does diffused reflection mean the failure of the laws of reflection?

Answer:

Regular Reflection	**Diffused Reflection**
(i) All the reflected rays are parallel.	(i) The reflected rays are not parallel.
(ii) It occurs on a smooth and polished surface.	(ii) It occurs on the rough surface.
(iii) Reflected rays are in one direction.	(iii) Reflected rays are scattered in different directions.

Q2: State the laws of reflection.

Answer:

The laws of reflections are:

- The incident ray, the normal and the reflected ray, all lie in the same plane.
- The angle of incidence is equal to the angle of reflection.

Q3: Gurmit wanted to perform Activity 16.8 using a laser torch. Her teacher advised her not to do so. Can you explain the basis of the teacher's advice?

Answer:

Teacher has advised Gurmit not to do so because laser light is very harmful for her eyes and can cause a permanent defect in the eye. Person can even lose his or her eyesight if laser torch is directed over the eyes.

Q4: Explain how you can take care of your eyes.

Answer:

Eyes are very precious. We must take proper care of them. We must

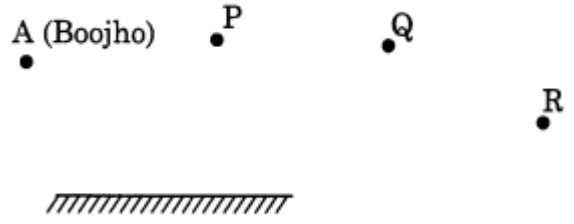
- Always sit straight while reading or writing.
- If advised, use suitable spectacles.
- Wash our eyes with clean water frequently.
- Not look at the sun directly.
- Always read or write in a proper light.

Q5: What is the angle of incidence of a ray if the reflected ray is at an angle of 90° to the incident ray?

Answer:

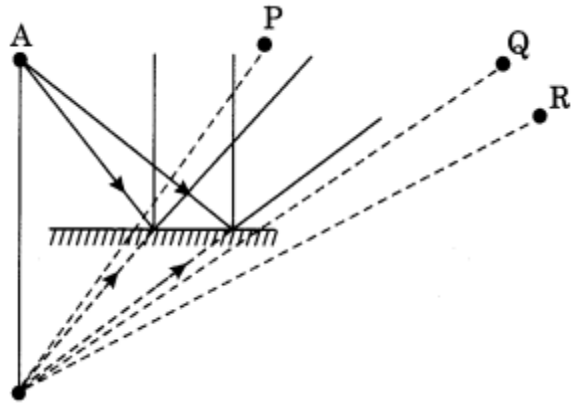
Here, the angle of reflection is 90°. As we know, according to the laws of reflection that angle of incidence is equal to angle of reflection.
Here, the angle between the incident ray and reflected ray is 90°.
i.e., $\angle i + \angle r = 90°$
since, $\angle i = \angle r$
we can write, $\angle i + \angle i = 90°$
$\Rightarrow 2\angle i = 90°$
$\Rightarrow \angle i = 45°$
Angle of incidence = 45°.

Q6: Boojho stands at A just on the side of a plane mirror as shown in Fig. 16.21. Can he see himself in the mirror? Also, can he see the image of objects situated at P, Q, and R?



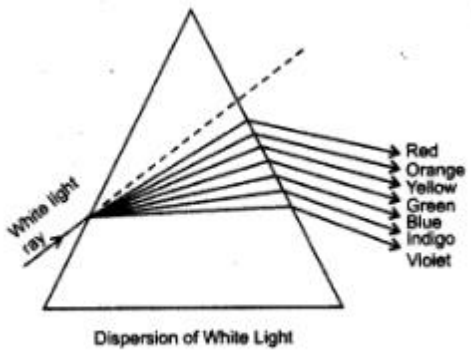
Answer:

No, Boojho can't see himself in the mirror. He can see the image of the object at P and Q but not of R.



Q7: Draw a diagram to show dispersion of light.

Answer:



Dispersion of White Light

5Mark Questions

Q1: Mention against each of the following whether regular or diffused reflection will take place when a beam of light strikes. Justify your answer in each case.

1. **Polished wooden table**
2. **Chalk powder**
3. **Cardboard surface**
4. **Marble floor with water spread over it**
5. **Mirror**
6. **Piece of paper**

Answer:

a) The wooden table that has a polished surface – Regular reflection

A surface that has been recently polished can be a good example of a smooth surface. The polished wooden table has a smooth surface.

b) White chalk powder that is used in school – Diffused reflection

Chalk powder spread on a surface is an example of an irregular surface because it is rough. Therefore, the diffused reflection will appear from chalk powder.

c) Cardboard surface – Diffused reflection

The surface of the cardboard is a kind of irregular surface. Hence, the diffused reflection will take place from a cardboard surface.

d) Marble floor – Regular reflection

A marble floor can be a good example of a surface that is regular. Since water makes the ceramic glossy, the reflections that are regular occur on this surface.

e) Mirror – Regular reflection

A mirror has a very smooth surface; hence it gives a regular reflection.

f) Piece of paper – Diffused reflection

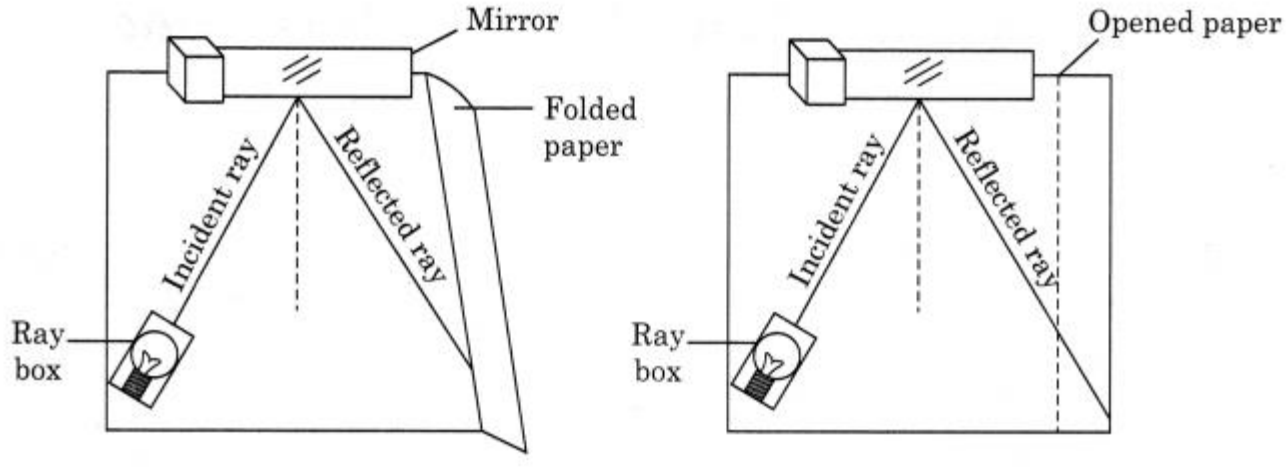
Although a piece of paper may look smooth, it has many irregularities on its surface. Due to this reason, it will give a diffused reflection.

Q2: Describe an activity to show that the incident ray, the reflected ray and the normal at the point of incidence lie in the same plane.

Answer:

Activity: To show that the incident ray, reflected ray and the normal at the point of incidence lie in the same plane.
Materials Required: Plane mirror, holder, ray box, etc.

Procedure: Fix sheet of white paper, a little beyond the edge of the board. Place a plane mirror strip vertically to the paper using a stand. Throw light from a ray box on the mirror. Look at the reflected ray. Mark the incident ray, normal ray and reflected ray. Fold the paper which is beyond the edge of the board. You will observe that the reflected ray is not seen in the folded portion of the chart paper. Now bring the folded portion back to its original position. The reflected ray of light is again seen on the page.
Conclusion: The sheet on the board can be considered as a plane. The incident ray, the reflected ray, the normal at the point of incidence lie in the same plane.

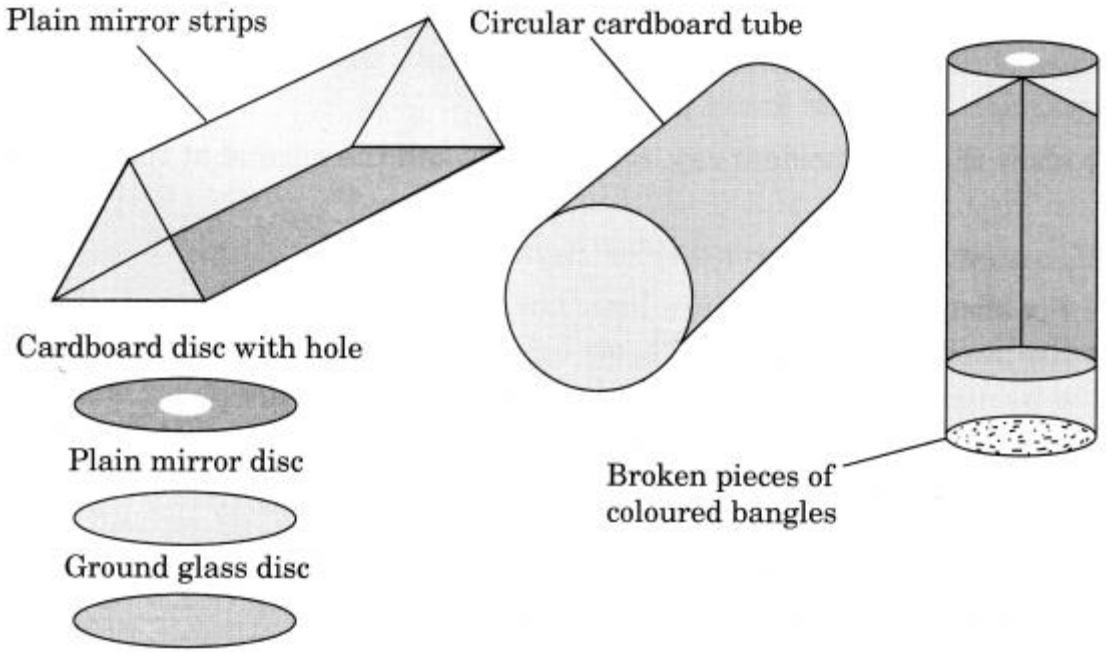


Incident ray, reflected ray and normal at the point of incidence lie in the same plane

Q3: Describe the construction of a kaleidoscope.

Answer:

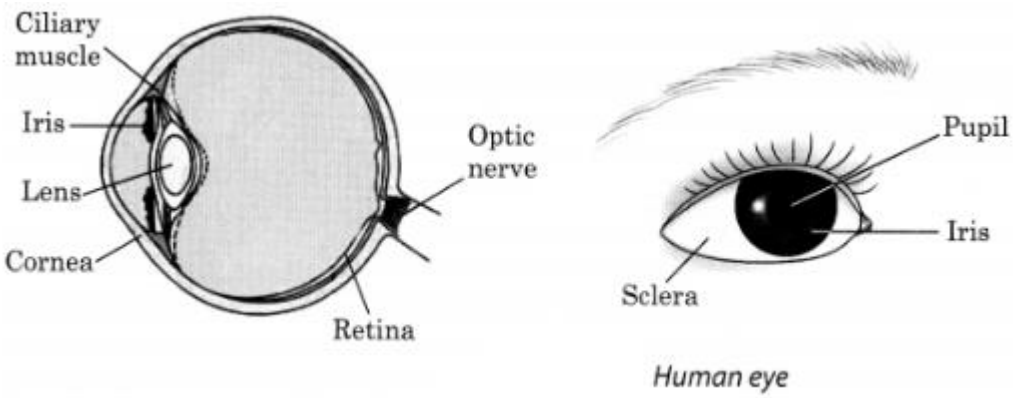
Kaleidoscope is a device based on the principle of multiple reflections. It consists of three long and narrow strips of plane mirrors inclined at an angle of 60° to one another forming prism. This is fitted in a tube. One end of this tube is closed by a cardboard disc having a hole at its centre. To the other end touching the mirrors plane glass plate is fixed on which broken pieces of colored bangles are placed. This end of the tube is closed by a ground glass plate.



Construction of Kaleidoscope

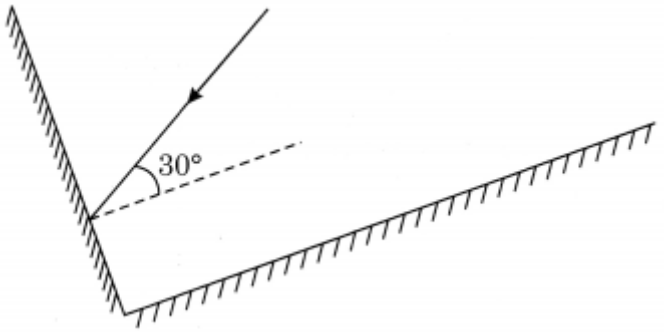
Q4: Draw a labeled sketch of the human eye.

Answer:

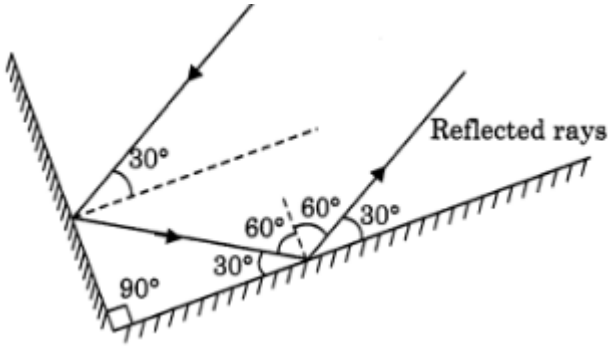


Human eye

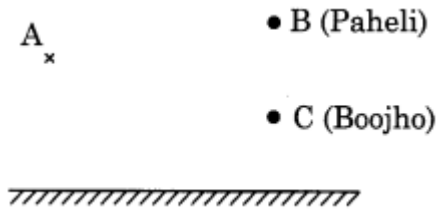
Q5: Two mirrors meet at right angles. A ray of light is incident on one at an angle of 30° as shown in Fig. 16.19. Draw the reflected ray from the second mirror.



Answer:

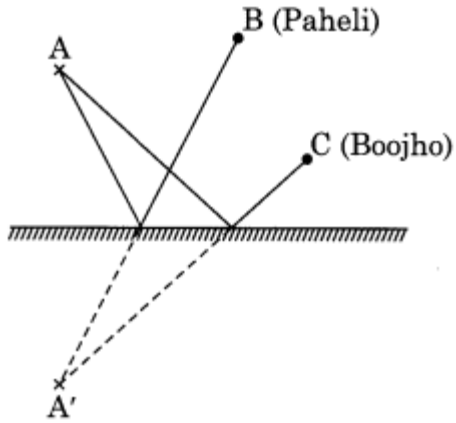


Q6: (a) Find out the position of the image of an object situated at A in the plane mirror (Fig. 16.23).
(b) Can Paheli at B see this image?
(c) Can Boojho at C see this image?
(d) When Paheli moves from B to C, where does the image of A move?



Answer:

(a) It is shown in the following figure.



(b) Yes, Paheli can see the image of A.
(c) Yes, Boojho can see the image of A.
(d) Image of the object at A will not move as an object is not moving.

Fill in the blank

1. A person 1 m in front of a plane mirror seems to be _____ m away from his image.

Answer: 2

2. If you touch your _____ ear with your right hand in front of a plane mirror, it will be seen in the mirror that your right ear is touched with your _____.

Answer: left, left hand

3. The size of the pupil becomes _____ when you see in dim light.

Answer: larger

4. Night birds have _____ cones than rods in their eyes.

Answer: lesser

Multiple Choice Questions

1. The angle of incidence is equal to the angle of reflection
(a) Always
(b) Sometimes
(c) Under special conditions
(d) Never

Answer: (a) Always

2. Image formed by a plane mirror is:
(a) virtual, behind the mirror and enlarged.
(b) Virtual, behind the mirror and of the same size as the object.
(c) Real at the surface of the mirror and enlarged.
(d) Real, behind the mirror and of the same size as the object.

Answer: (b) Virtual, behind the mirror and of the same size as the object.

3. Which of the following material cannot be used to make a lens?
(a) Plastics
(b) Water
(c) Clay
(d) Glass

Answer: (c) Clay

4. Which of the following would you prefer, to read very small letters printed on the pages of a dictionary?
(a) A convex lens of focal length 100 cm
(b) A concave lens of focal length 10 cm
(c) A concave lens of focal length 5 cm
(d) A convex lens of focal length 5 cm

Answer: (d) A convex lens of focal length 5 cm

5. A pond of water appears shallow because of
(a) reflection
(b) refraction
(c) dispersion
(d) none of these

Answer: (b) refraction

6. The phenomenon of the splitting of white light into seven colors is called as
(a) dispersion
(b) refraction
(c) reflection
(d) deviation

Answer: (a) dispersion

7. In air all colors propagate
(a) with different speed

(b) nearly same speed
(c) with minimum speed of red color
(d) with maximum speed of violet color

Answer: (b) nearly same speed

8. If the refractive index is more than optical density is
(a) more
(b) less
(c) equal
(d) independent of refractive index

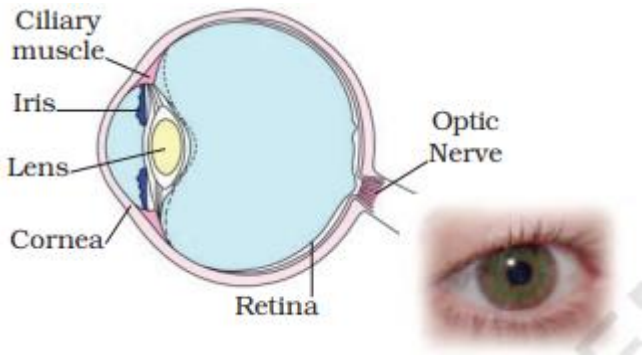
Answer: (a) more

9. On refraction through a parallel faced glass slab the emergent ray is
(a) parallel to incident ray
(b) displaced w.r.t. incident ray
(c) is not displaced w.r.t. incident ray
(d) both (a) and (b)

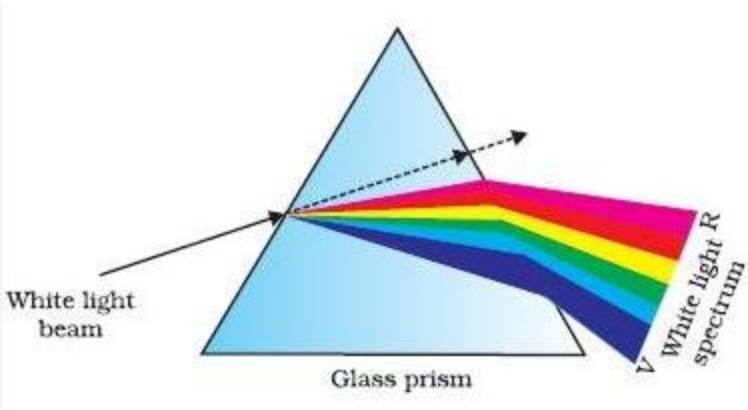
Answer: (d) both (a) and (b)

DIAGRAMS:

Human eye:



Dispersion of light:



SUMMARY

- The to and fro movement of light in the same medium after striking an opaque surface is called reflection. The angle made by the reflected ray with the normal at the point of reflection is called angle of reflection.
- Splitting of light into its constituent colors is known as dispersion.
- Two mirrors inclined to each other give multiple images. Kaleidoscope and instrument which uses the principle of multiple reflections
- The eye is natural optical instrument that forms an image of objects on a screen called the retina. The retina is covered by a large number of nerve cells sensitive to light which carry the impression to the brain by means of optic nerve