CLASS VIII: Science
Chapter 13: Light

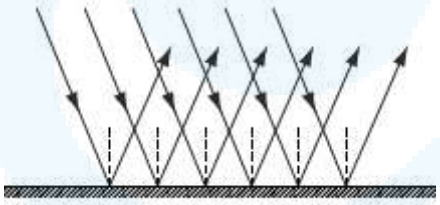
Questions and Solutions | Page 178 - NCERT Books

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

Ans. We can see an object if light reflected or emitted by it reaches our eyes. If we are in a dark room, no light will enter into our eyes. Thus, it is not possible for us to see objects in the room. But, objects outside the room may be visible to us. If there is a light present outside the room or an object is emitting its own light, then we can see the objects that are present outside the room.

Q2. Differentiate between regular and diffused reflection. Does diffused reflection mean the failure of the laws of reflection ?

Ans. The light falling on a flat, smooth, reflecting surface, such as a mirror, undergoes **regular reflection**. In regular reflection, a parallel beam incident on a smooth surface like mirror remains parallel after the reflection. For example, in the case of the smooth lake, the crisp, clear images that form are the result of many parallel incident rays that reflect as parallel reflected rays.



(Regular reflection)

The light falling on a rough surface undergoes **diffused reflection**. When all the parallel rays reflected from a plane surface are not parallel, the reflection is known as diffused or irregular reflection. For example, in the case of the rough lake, the blurred images that form are the result of many parallel incident rays that are scattered after reflecting in many different directions. This behaviour is called diffuse or irregular reflection.

(Diffused or irregular reflection)

The light rays strike the rough surface at many different angles of incidence. This is because all the normals are not parallel to each other on the rough surface. Thus, the light rays get reflected at many different angles. That is why, the rays of reflected beam become non-parallel to each other. Thus, laws of reflections are not violated in diffused reflections.

Q3. 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.

(a) Polished wooden table
(b) Chalk powder
(c) Cardboard surface
(d) Marble floor with water spread over it
(e) Mirror
(f) Piece of paper

Ans. (a) Polished wooden table → Regular reflection

A polished surface is an example of a smooth surface. A polished wooden table has a smooth surface. Hence, reflections from the polished table will be regular.

(b) Chalk powder → Diffused reflection

Chalk power spread on a surface is an example of an irregular surface. It is not smooth. Therefore, diffused reflection will take place from chalk powder.

(c) Cardboard surface → Diffused reflection

Cardboard surface is also an example of an irregular surface. Hence, diffused reflection will take place from a cardboard surface.

(d) Marble floor with water spread over it → Regular reflection

Marble floor with water spread over it is an example of a regular surface. This is because water makes the marble surface smooth. Hence, regular reflection will take place from this surface.

(e) Mirror → Regular reflection

Mirror has a smooth surface. Therefore, it will give a regular reflection.

(f) Piece of paper → Diffused reflection

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

Q4. State the laws of reflection.

Ans. (1) The incident ray, the reflected ray and the normal at the point of incidence, all lie in the same plane.

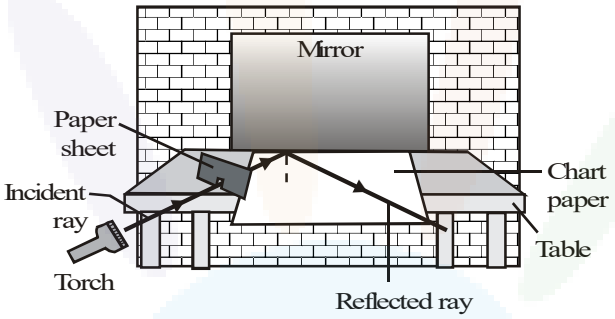
(2) The angle of incidence is equal to the angle of reflection.

$$\angle \mathbf{i} = \angle \mathbf{r}$$

Q5. Describe an activity to show that the incident ray, the reflected ray and the normal at the point

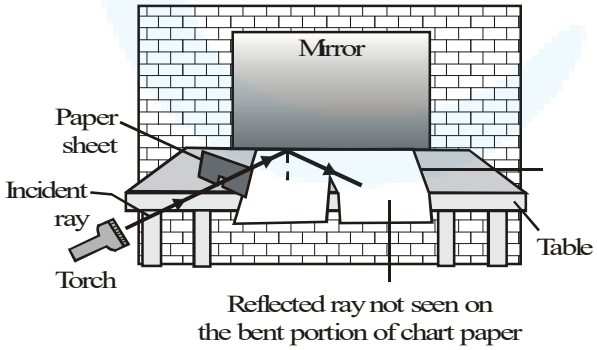
of incidence lie in the same plane.

Ans. Take a chart paper and fix it on a table such that the chart paper project a little beyond the edge of the table. Cut the projecting portion of the chart paper in the middle. Take a paper sheet and make a small cut at the bottom in the middle of the sheet. Hold the sheet perpendicular to the chart paper. Throw light from a torch through the opening of the comb from one side. With slight adjustment of the torch and the sheet, you will see a ray of light along the chart paper on the other side of the sheet. Keep the sheet and the torch steady. Place a plane mirror in the path of the light ray. You will observe that the light ray that falls on the plane mirror is reflected. Make sure that the reflected ray extends to the projected portion of the paper [see fig.(a)].



(a)

Now, bend that part of the projected portion on which the reflected ray falls. You will not see the reflected ray on the paper [see fig.(b)]. Bring the paper back to the original position. You can see the reflected ray again. When the whole sheet of paper is spread on the table, it represents one plane. The incident ray, the normal at the point of incidence and the reflected ray are all in this plane. When you bend the paper you create a plane different from the plane in which the incident ray and the normal lie. Then you do not see the reflected ray.



(b)

Thus, we can conclude that 'the incident ray, the normal at the point of incidence and the reflected ray all lie in the same plane'. This is another law of reflection.

Q6. Fill in the blanks in the following :

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

(b) If you touch your _____ ear with right hand in front of a plane mirror it will be

seen in the mirror that your right ear is touched with _____ .

(c) The size of the pupil becomes _____ when you see in dim light.

(d) Night birds have _____ cones than rods in their eyes.

Ans. (a) A person 1 m in front of a plane mirror seems to be **2** m from his image.

Object distance and image distance are the same from a plane mirror. The image of a person 1 m in front of a mirror is 1 m back to the mirror. Hence, the image is 1 + 1 = 2 m away from the person.

(b) If you touch your **left** ear with right hand in front of a plane mirror it will be seen in the mirror that your right ear is touched with **left hand**.

This is because of lateral inversion of images formed in a plane mirror.

(c) The size of the pupil becomes **large** when you see in dim light.

In dim light, the amount of light entering the eye is very little. To increase the amount of light, the pupil expands.

(d) Night birds have **less** cones than rods in their eyes.

Night birds can see in the night, but not in the day. They have on their retina a large number of rod cells and only a few cones.

Choose the correct option in Questions 7 – 8

Q7. Angle of incidence is equal to the angle of reflection

(a) Always

(b) Sometimes

(c) Under special conditions

(d) Never

Ans. Option (a) is correct. According to laws of reflection, 'the angle of incidence is always equal to the angle of reflection'.

Q8. 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.

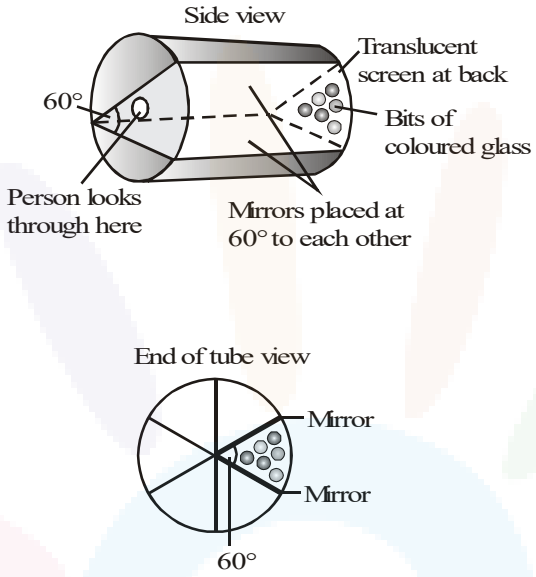
Ans. Option (b) is correct.

Image formed by plane mirror is always virtual and of same size.

Q9. Describe the construction of a kaleidoscope.

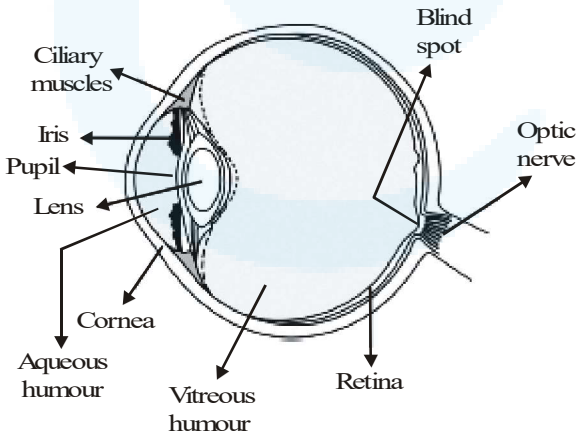
Ans. **Kaleidoscope** :

This child's toy is a visual delight of changing colours as the toy is rotated. The effects are produced by multi-coloured glass pieces that tumble around, when the toy is turned (see fig.). Here, two (or three) mirrors are positioned 60° to each other and five images of the object are produced for this orientation.



Q10. Draw a labelled sketch of the human eye.

Ans.



The human eye

Q11. Gurmit wanted to perform Activity 6.5 using a laser torch. Her teacher advised her not to do so. Can you explain the basis of the teachers advise ?

Ans. Laser light is harmful for the human eyes, because its intensity is very high. It can cause damage to the retina and lead to blindness. Hence, it is advisable not to look at a laser beam directly.

Q12. Explain how you can take care of your eyes.

Ans. To protect our eyes, the given points should be taken into account:

(1) Visit an eye specialist regularly.

(2) Avoid reading in dim light and very bright light.

(3) Avoid direct exposure of sunlight to the eye.

(4) Clean your eyes with cold water quickly if dust particles or small insects enter your eye. Do not rub your eyes.

(5) Maintain a distance of at least 25 cm between the book and your eyes while reading.

Q13. What is the angle of incidence of a ray if the reflected ray is at an angle of 90° to the incident ray ?

Ans. By law of reflection,

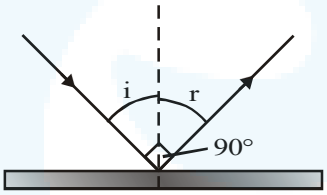
$\angle i = \angle r = x$ (let)

Given, $\angle i + \angle r = 90°$

or $x + x = 90°$

or $2x = 90°$

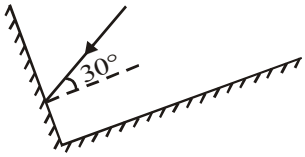
or $x = 90°/2 = 45°$



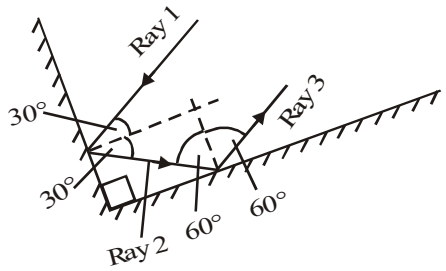
Q14. How many images of a candle will be formed if it is placed between two parallel plane mirrors separated by 40 cm ?

Ans. Infinite (very large) images of the candle will be formed because of multiple reflections between the mirrors.

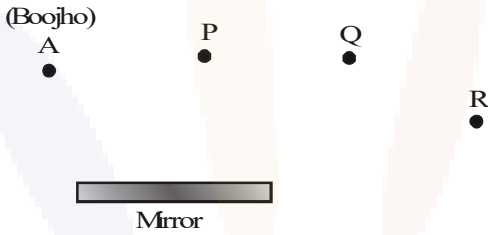
Q15. Two mirrors meet at right angles. A ray of light is incident on one mirror at an angle of 30° as shown in fig. Draw the reflected ray from the second mirror.



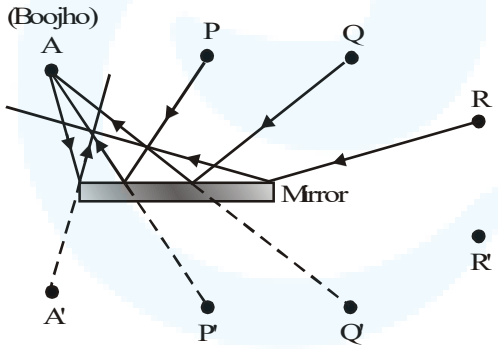
Ans. Incident ray 1 makes an angle of incidence of 30° with the mirror 1, thus the angle of reflection is also 30°. The ray 2 is reflected from mirror 1 and it acts as incident ray for the mirror 2. By geometry, we can find that angle of incidence that ray 2 makes at mirror 2 is 60°, thus, the angle of reflection is also 60°. The ray 3 is the reflected ray from the mirror 2.



Q16. Boojho stands at A just on the side of a plane mirror as shown in fig. Can he see himself in the mirror ? Also can he see the image of objects situated at P, Q and R ?



Ans. A plane mirror forms a virtual image behind the mirror. The image is as far behind the mirror as the object is in front of it. A cannot see his image because the length of the mirror is too short on his side. However, he can see the objects placed at points P and Q, but cannot see the object placed at point R (as shown in the given figure).

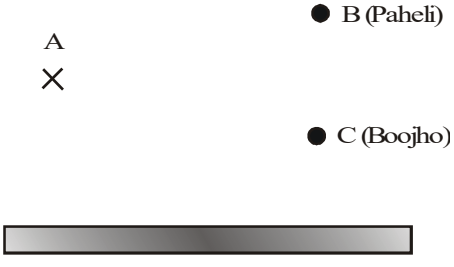


17. (a) Find out the position of the image of an object situated at A in the plane mirror (see fig.).

(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 ?



Ans. (a) Image of the object placed at A is formed behind the mirror. The distance of the image from the mirror is equal to the distance of A from the mirror. Image of A is shown in the given figure.

(b) Yes. Paheli at B can see this image (see fig.). The rays from A after reflection reaches to Paheli.

(c) Yes. Boojho at C can see this image (see fig.). The rays from A after reflection reaches to Boojho.

(d) Image of the object at A will not move. It will remain at the same position (A') when Paheli moves from B to C. This is because image of an object does not depend on the position of an observer.