Light

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

Answer:

No, I can not see the objects in the room. An object becomes visible when light reaches our eye after being reflected from the object.

Yes. If there is light present outside the room, then we can see the objects outside the room.

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

Answer:

Regular reflection	**Diffused reflection**
Regular reflection takes place from a smooth or a regular surface.	Irregular or diffused reflection takes place from an irregular surface or rough surfaces.
In regular reflection, all reflected rays are parallel to each other for parallel incident rays.	In diffused reflection, the reflected rays are not parallel to each other for parallel incident rays. This happens because of the presence of irregular microscopic surfaces. Hence, parallel incident rays reflect in different directions.
Law of reflection obeys in regular refection.	Laws of reflections are not violated in diffused or irregular reflections.

3. **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

Answer:

Objects	regular or diffused reflection	Justify Answer
Polished wooden table	Regular reflection	A polished surface is an example of a smooth surface. Hence, reflections from the polished table will be regular.
Chalk powder	Diffused reflection	It is not smooth surface. Therefore, diffused reflection will take place from chalk powder.
Cardboard surface	Diffused reflection	Cardboard surface is also an example of an irregular surface. Hence, diffused reflection will take place from a cardboard surface.
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.
Mirror	Regular reflection	Mirror has a smooth surface. Therefore, it will give a regular reflection.
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.

4. State the laws of reflection.

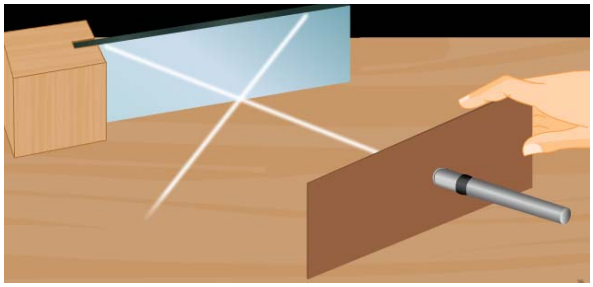
Laws of reflection:

(i)The angle of reflection is always equal to the angle of incidence. This is known as the first law of reflection.

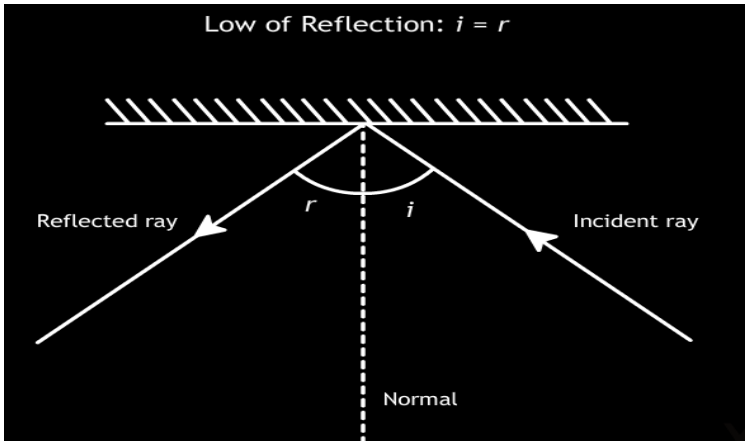
(ii) The incident ray, the normal at the point of incidence and the reflected ray all lie in the same plane. This is second law of reflection.

5. **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.**

Place a plane mirror on the table. Take a paper sheet and make a small hole in its centre. Make sure that the light in the room is not bright. Hold the sheet normal to the table. Take another sheet and place it on the table in contact with the vertical mirror. Draw a normal line on the second sheet from the mirror. Now, light a torch on the mirror through the small hole such that the ray of light falls on the normal at the bottom of the mirror. When the ray from this hole is incident on the mirror, it gets reflected in a certain direction.



You can easily observe the incident ray, reflected ray and the normal to the mirror at the point of incidence on the sheet placed on the table. This shows that the incident ray, the reflected ray, and the normal to the surface at the point of incidence all lie in the same plane.



6. **Fill in the blanks in the following.**

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

(b)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 _____.

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

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

Answer:

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

(b) If you touch your **left 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 **left hand**.

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

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

7. **Angle of incidence is equal to the angle of reflection.**

(a) Always (b) Sometimes

(c) Under special conditions (d) Never

Answer: (a)

The angle of incidence is always equal to the angle of reflection. This is the first law of reflection.

8. **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)

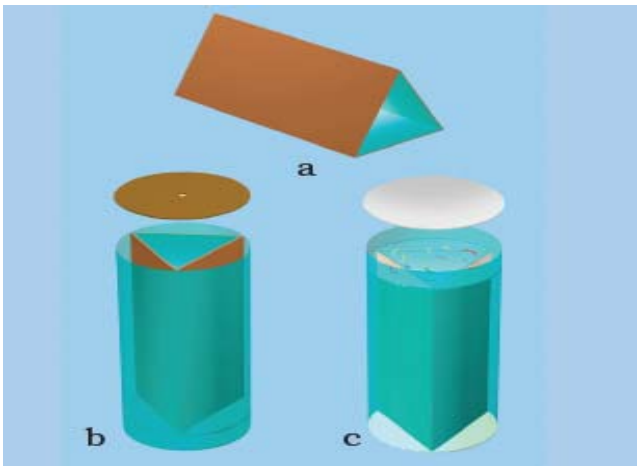
The image formed by a plane mirror is of the same size as the object. The image is formed behind the mirror. The image cannot be obtained on a screen. Hence, it is a virtual image.

9. **Describe the construction of a kaleidoscope.**

Answer:

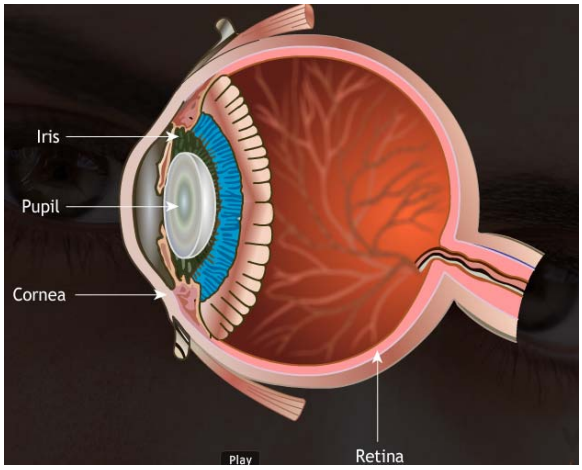
Construction of a kaleidoscope:

Take three rectangular mirror strips about 15 cm long and 4 cm wide each. Join them together to form a prism as shown in Fig. (a). Fix them in a circular cardboard tube or tube of a thick chart paper. Make sure that the tube is slightly longer than the mirror strips. Close one end of the tube by a cardboard disc having a hole in the centre, through which you can see in Fig. (b). To make the disc durable, paste a piece of transparent plastic sheet under the cardboard disc. At the other end, touching the mirrors, fix a circular plane glass plate in Fig (c). Place on this glass plate several small pieces of coloured glass (broken pieces of coloured bangles). Close this end of the tube by a ground glass plate. Allow enough space for the colour pieces to move around. Your kaleidoscope is ready. When you peep through the hole, you will be able to see a variety of patterns in the tube.



10. **Draw a labelled sketch of the human eye.**

Answer:



11. **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:

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.

12. **Explain how you can take care of your eyes.**

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

(i) Visit an eye specialist regularly.

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

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

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

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

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

If the reflected ray is at an angle of 90° to the incident ray, then the angle of incidence is 45 °. According to the law of reflection, the angle of incidence is equal to the angle of

reflection. Therefore, the angle of incidence and the angle of reflection both are $\frac{90°}{2}$ = 45°.

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

Answer:

Infinite or multiple images of the candle will be formed because of multiple reflections between the mirrors. When two mirrors are placed parallel to each other, then infinite numbers of images are formed.

15. 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.

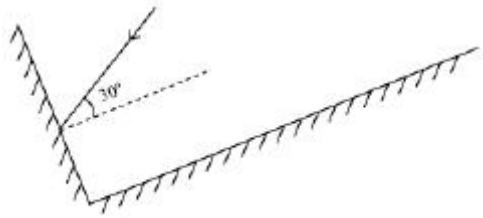
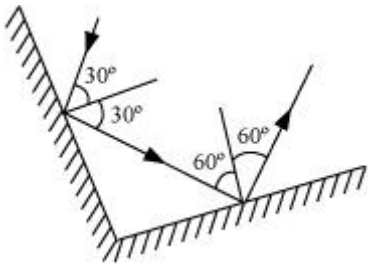


Fig. 16.19

Answer:

The first law of reflection is used to obtain the path of reflected light.



It can be observed that the given ray of light will reflect from the second mirror at an angle 60°.

16. **Boojho stands at A just on the side of a plane mirror as shown in Fig. 16.20. Can he see himself in the mirror? Also can he see the image of objects situated at P, Q and R?**

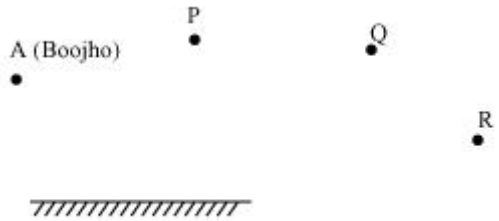
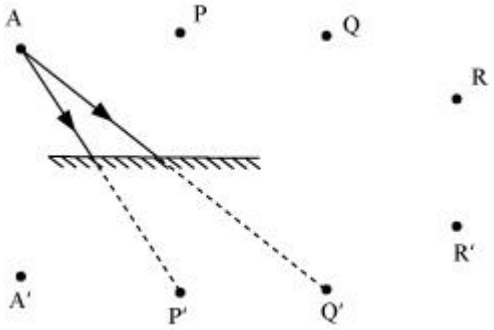


Fig. 16.20

Answer:

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).



(a) Find out the position of the image of an object situated at A in the plane mirror (Fig. 16.21).

(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?

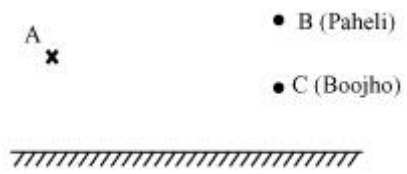
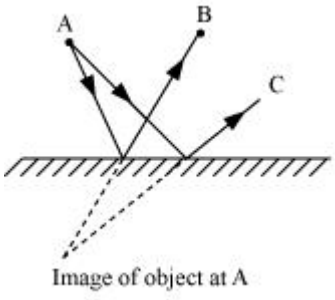


Fig. 16.21

Answer:

(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.

(c) Yes. Boojho at C can see this image.

(d) Image of the object at A will not move. It will remain at the same position when Paheli moves from B to C.

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