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

Sol. We can not see objects in the dark room without the presence of light or a lighted object it self . We may see an object only when, the light from an object enters our eyes.

The light may have been emitted by the object directly (luminous objects.), or may have been reflected by it (illuminated objects). Similarly, we can not see outside objects, sitting inside the darkroom, if there is no opening or passage for any incidental light from out side. How ever, out side the darkroom, in open, we can easily see the objects, due to either reflected light from the surface of illuminated objects or direct light from luminous objects such as Sun, candle, torch etc. Nearly everything we see around is seen due to reflected light.

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

Sol.

Regular reflection	***Diffused reflection***
When all the parallel rays reflected from a plane surface are parallel, the reflection is known as regular reflection.	When all the parallel rays reflected from a plane surface are not parallel, the reflection is known as diffused or irregular reflection.
Reflection from a smooth surface like that of a mirror is an example of regular reflection Images are formed by regular reflection.	Reflection from a rough surface, like that of a cardboard, is an example of irregular reflection. It is caused by the irregularities in the reflecting surface.
Images are formed by regular reflection.	Images are not formed by irregular reflection.
Laws of reflection are not violated in regular reflections.	In diffused reflection, parallel incident rays reflect in different directions but each ray obeys the law of reflection.

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

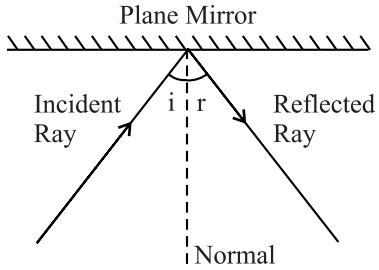
(c) Cardboard surface
(d) Marble floor with water spread over it
(e) Mirror
(f) Piece of paper

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

In case of objects with smooth, polished and shiny surfaces, like Polished wooden table, Marble floor with water spread over it and Mirror, when a incident beam of light strikes on their surfaces, regular reflection takes place. Whereas, in case of objects with rough surfaces, such as Chalk powder, Cardboard surface, Piece of paper etc, when a incident beam of light strikes on their surfaces, irregular reflection takes place. It is caused by the irregularities in the reflecting surface

4. State the laws of reflection.

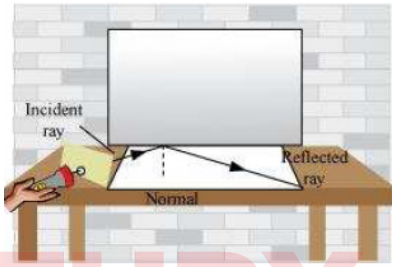
Sol. There are two laws of reflection as given below :
(i) The angle of incidence is equal to the angle of reflection.
(ii) Incident ray, reflected ray and the normal drawn at the point of incidence to the reflecting surface, lie in the same plane.



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.

Sol. 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 mirrot 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 rya, 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.

Sol. (a) 2 (b) left, left hand.

(c) large (d) small number of

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

(a) Always (b) Sometimes

(c) Under special conditions (d) Never

Sol. (a) Always

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.

Sol. (b) virtual, behind the mirror and of the same size as the object

9. Describe the construction of a kaleidoscope.

Sol. A kaleidoscope, is made up of three rectangular mirror strips about 15 cm long and 4 cm wide each. This mirrors, as shown in the figure, are joined together to form a prism. This assembly, may be housed inside a a circular cardboard tube or tube of a thick chart paper.

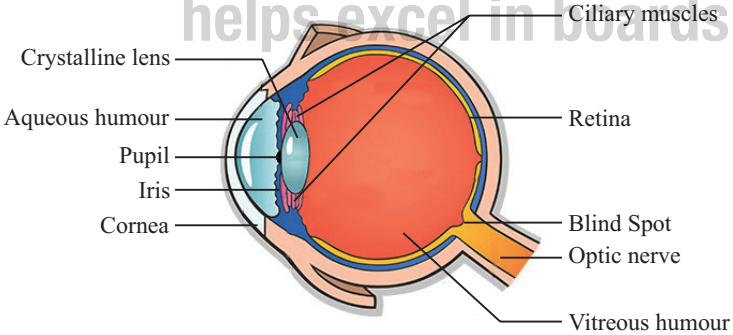
The length of tube is slightly longer than the mirror strips. One end of the tube is covered by a cardboard disc having a hole in the center, through which we can see. Other end of the cardboard tube is covered by a circular plane glass plate touching the edge of mirror strips.

Now several small pieces of coloured glass (broken pieces of coloured bangles) are put inside. Close this end of the tube by a ground glass plate. Allow enough space for the colour pieces to move around.

Now, our kaleidoscope is ready. When we peep through the hole, we will be able to see a variety of patterns in the tube. Interesting feature of a kaleidoscope is that we will never see the same pattern again.

10. Draw a labeled sketch of the human eye.

Sol.



11. Gurmit wanted to observe the size of pupil with a laser torch. Her teacher advised her not to do so. Can you explain the basis of the teacher's advice?

Sol. The intensity of laser light is extremely high. If we throw beam from laser torch directly on the eye, the eyes may be injured or blinded temporarily or partially due to sudden contraction of pupil and damage of retina.

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

Sol. We can take proper care of our eyes in following ways :

(a) In case of any problem we should go to an eye specialist. Besides, we should have a regular eye checkup.

(b) In case, after an eye checkup, if advised by an eye specialist, we should use suitable spectacles.

(c) We should avoid bright or dim light. Insufficient light causes eyestrain and headaches. Too much light, like that of the sun, a powerful lamp or a laser torch can injure the retina.

(d) We should not look at the sun or a powerful light directly.

(e) We should not rub our eyes. If particles of dust go into our eyes, we should wash our eyes with clean water. If there is no improvement then we should go to a doctor.

(f) We should wash our eyes frequently with clean water.

(g) We should always read at the normal distance for vision. Do not read by bringing our book too close to our eyes or keeping it too far.

(h) Our diet should include food items rich in vitamin A.

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

Sol. As per the laws of reflection,

The angle of incidence $\angle i$ = angle of reflection $\angle r$

Here as given $\angle i + \angle r = 90°$

$\therefore \quad \angle i + \angle i = 90°$

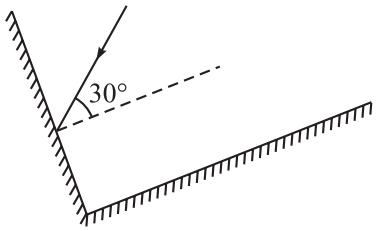
or $\quad \angle i = 90/2 = 45°$

Hence angle of incidence = 45°

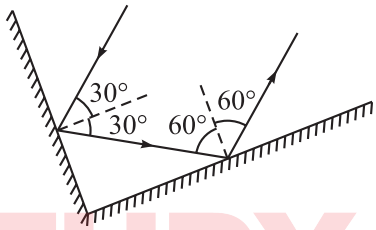
14. How many images of a candle will be formed if it is placed between two parallel plane mirrors separated by 40 cm?

Sol. If a candle is placed between two parallel plane mirrors, we will see an infinite numbers of images of candles because of multiple reflections between the mirrors.

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

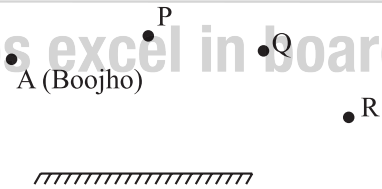


Sol. The first law of reflection is used to obtain the path of reflected light.

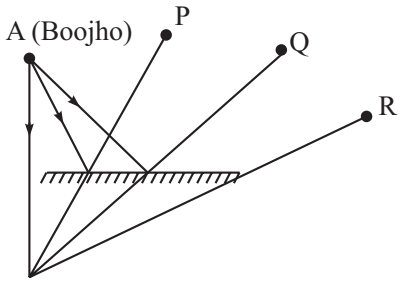


It can be observed that the given ray of light will reflect from the second mirror at an angle 60°.

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



Sol.



As Boojho is not standing in front of plane mirror, Incident ray, reflected ray and the normal drawn at the point of incidence to the reflecting surface, does not lie in the same plane, therefore he cannot see himself. He can see the image of objects situated at P, Q as Incident ray, reflected ray and the

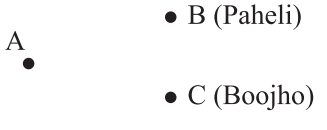
normal drawn at the point of incidence to the reflecting surface, lie in the same plane. Similarly, incidental ray from R, will not be reflected to reach point A, hence will not be seen by Boojho.

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

(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?



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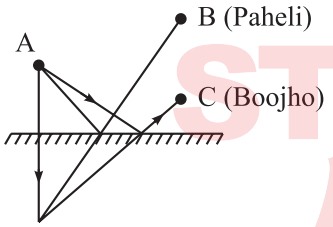

(a) A virtual and lateral image of an object situated at A, will be formed, behind the mirror surface. The image will be exactly at the same distance , as the distance of real object at position A and reflecting surface of the mirror.

(b) Yes, as incidental ray from object A, is reaching at B as reflected ray, therefore Paheli at B, can see this image.

(c) Boojho can also see this image, as reflected rays from object at A is reaching at C

(d) The point of convergence, of reflected rays reaching at point B and C, is same and at same distance behind the mirror. Therefore, when Paheli moves from B to C, the image of A will not change its position.