Light

Q.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 cannot see the objects in a dark room however objects outside the room would be visible to us. Because objects visible only, when light reflected from the objects reaches to our eye. In a dark room, there is no light to fall on the object whereas outside the room, Light is reflected light from the object and reaches the eye and we can see the objects.

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

Sol: Regular reflection occurs from a smooth, polished and shiny surface. In regular reflection, all the reflected rays are parallel to each other. While diffused or irregular reflection occurs from a rough or irregular surface. In diffuse reflection, reflected rays are not parallel to each other.
Diffused reflection does not mean failure of the laws of reflection. Every type of reflection follows the laws of reflection. Due to irregularities in the surface, the reflected rays goes in different directions.

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

Sol:

(a) Polished wooden table → Regular reflection
Because the surface is very smooth, thus regular reflection occurs from the polished wooden table.

(b) Chalk powder → Diffused reflection
Here surface of chalk powder is irregular and rough. Thus, diffused reflection occurs from the Chalk powder.

(c) Cardboard surface → Diffused reflection
The surface of cardboard is rough, thus diffused reflection occurs from a cardboard surface.

(d) Marble floor with water spread over it → Regular reflection
The water spread over marble surface very smooth and plane. Thus, regular reflection takes place.

(e) Mirror → Regular reflection
The surface of mirror is very smooth and shiny. Thus, regular reflection takes palce.

(f) Piece of paper → Diffused reflection
A piece of surface is rough. Thus, diffused reflection takes place.

Q.4 State the laws of reflection.

Sol: The state of laws of reflection are:
(i) The angle of incidence (∠ i) and angle of reflection (**∠r**) are always equal. i.r **∠I = ∠r**
(a) The incident ray, the normal and the reflected ray all lie in the same plane.

Q.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: an activity to show that the incident ray, the reflected ray and the normal at the point of incidence lie in the same plane. Apparatus: Plane mirror, Holder, pencil and ray box.
Take a sheet of white paper and fix it little beyond the edge of the board. Now, fix plane mirror strip vertically to the paper using holder. Now, incident the light from a ray box on the mirror and observe the reflected ray. Mark the incident ray, normal ray and reflected ray with help of pencil. Now, fold the paper which is beyond the edge of the board. We will find that the reflected ray is not seen in the folded paper. Now bring the folded portion back to its normal position. The reflected ray of light is again visible on the page.
From this activity we can say that the incident ray, the reflected ray, the normal lie in the same plane.

Q.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) 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 **larger** when you see in dim light.
(d) Night birds have **lesser** cones than rods in their eyes.

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

(a) Always (b) Sometimes
(b) Under special conditions (d) Never

Sol: (a) Always

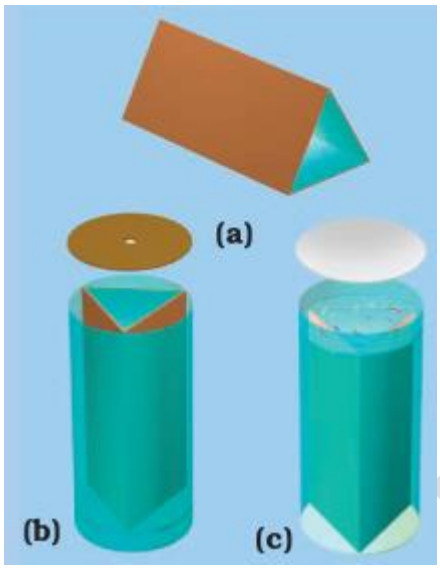
Q.8 Image formed by a plane mirror is

(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.

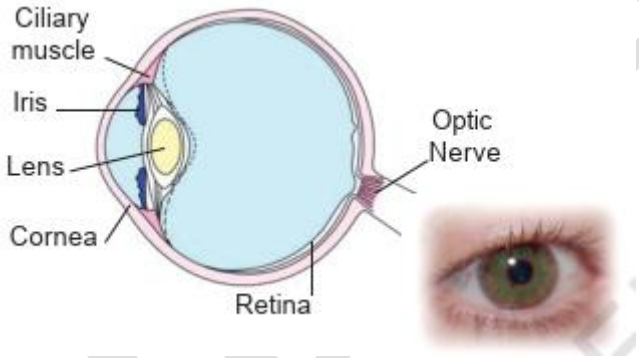
Q.9 Describe the construction of a kaleidoscope.

Sol: The construction of a kaleidoscope:
Take the three rectangular mirror strips each about 15 cm long and 4 cm wide. Now join these mirror strip together to form a prism. This prism is fixed in the circular cardboard tube. Make sure that this tube should be slightly longer than the mirror strips. Close the one end of the tube with cardboard disc having a hole in the center. Through this hole you can see. At the other end, touching the mirrors, fix a circular plane glass plate.



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

Sol:



Q.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?

Sol: Since, intensity of laser light is very high. It is harmful for eye and can cause a permanent defect in the eye. It can damage the retina of eye which could lead to blindness. So, it is advisable that do not look at a laser beam directly.

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

Sol: Our eyes are very precious. With our eyes, we cannot see this beautiful world. So, we must protect and take proper care of our eyes. We must:

(i) Avoid reading book and newspaper in dim and very bright light.
(ii) Always wash your eyes with cold water.
(iii) Don't look at the sun or light intensity light like laser directly.
(iv) Always maintain the distance for vision while reading or writing.
(v) Do not rub your eyes with dirty hand or cloth.

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

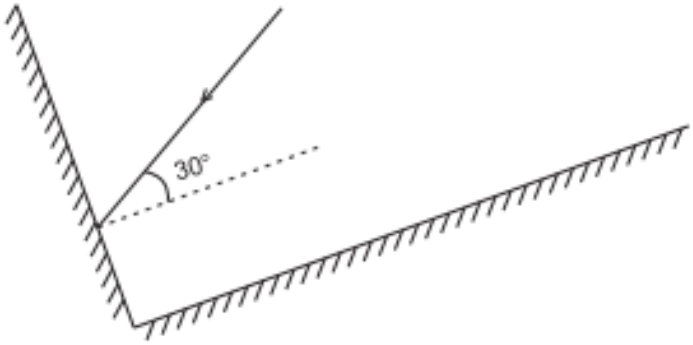
Sol: According to laws of reflection:
Angle of incidence = angle of reflection.
Given: the angle between the incident and the reflected ray = 90
∠i + ∠r = 90
∠i = ∠r
∠i + ∠i= 90
∠i+ ∠r = 90
i=90/2 = 45°

Thus, the angle of incidence = 45°

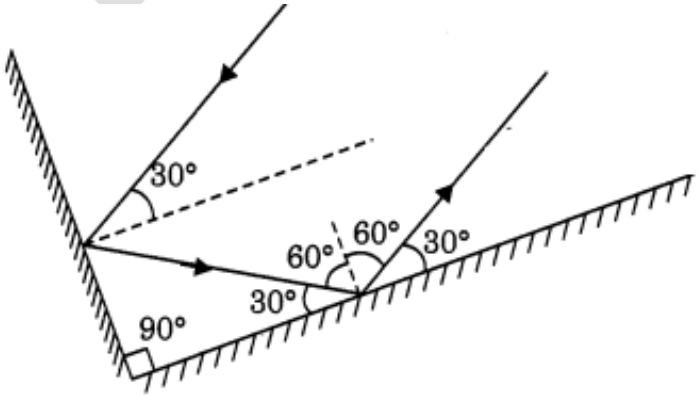
Q.14 How many images of a candle will be formed if it is placed between two parallel plane mirrors separated by 40 cm?

Sol: Since, Mirrors are parallel to each other 40 cm apart. So, Infinite no of images will be formed.
No of image = 360° / θ
No of image = 360° / 0 = ∞

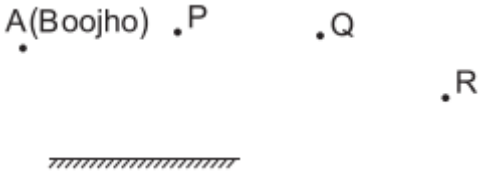
Q.15 Two mirrors meet at right angles. A ray of light is incident on one at an angle of 30° as shown in Fig. Draw the reflected ray from the second mirror.



Sol:



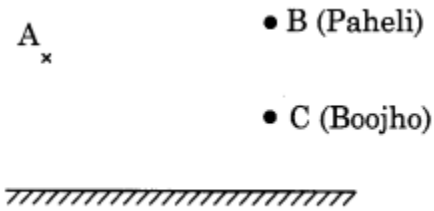
Q.16 Boojho stands at A just on the side of a plane mirror as shown in Fig. Can he see himself in the mirror? Also can he see the image of objects situated at P, Q and R?



Sol: No, boojho on A cannot see himself image in the mirror due to the length of the mirror is too short on his side. He can see the image of the objects at P and Q but cannot see the object at R.

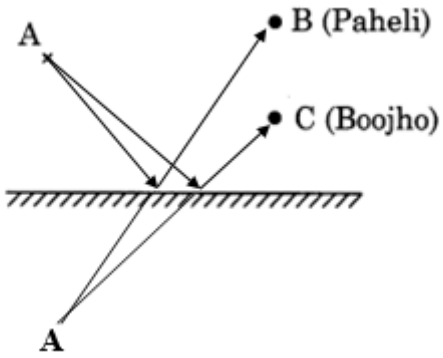
Q.17

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



Sol:

(a) Position of A



(b) Yes, Paheli at B can see the image of A.
(c) Yes, Boojho at C can see the image of A.
(d) Image of oject at A will not affected
(d) When Paheli moves from B to C.