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Chapter- 16 Light

Exercise :-

Ques (i) Suppose you are in a dark room. Can you see objects in the room? Can you see objects outside the room. Explain.

As we know that we may see any objects only when the rays from that object comes to our eye by the process of reflection. As, a dark room does not have light, so none of the objects present inside the room are visible whereas objects outside the room are under the light rays, so by the process of reflection we may see that objects.

Ques (ii)

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

Regular reflection	Irregular reflection
(i) It takes place where light is incident on smooth polished and shiny surfaces.	(i) It takes place when light is incident on unpolished and rough surfaces.
(ii) The intensity of image formed here will be more, as reflected rays move parallel to each other.	(ii) The intensity of image formed here will be much less, as reflected rays do not move parallel.

(3)

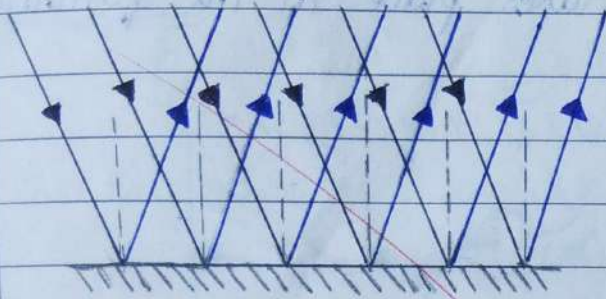


fig 16.8

(3)

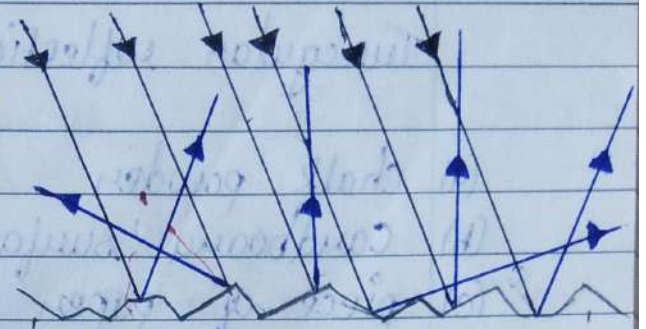


Fig - 16.7

No, diffused reflection does not violate the law of reflection.

Ques (3) Mention against each of the following whether regular or diffused reflection will take place when a beam of light strikes. Justify your answers 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 $\Rightarrow$ (1) Regular reflection - It takes place when light is incident on smooth, polished or shiny surfaces.

Regular reflection takes place in the following: :-

- (a) polished wooden table.
- (b) Marble floor with water spread over it.
- (c) Mirror

(2) Irregular reflection - It takes place when light is incident on unpolished and rough surfaces.

Irregular reflection takes place in the following :-

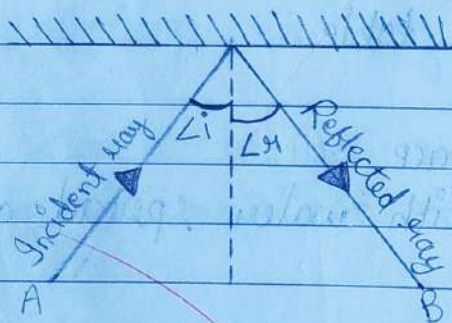
- (a) Chalk powder
- (b) Cardboard surface
- (c) piece of paper

Que (4) State the laws of reflection.

Two laws of reflection are as follows :-

- (i) The angle of incidence is equal to the angle of reflection.
- (ii) Incident ray, normal, reflected ray all will lie in the same plane.

Que (5) Describe

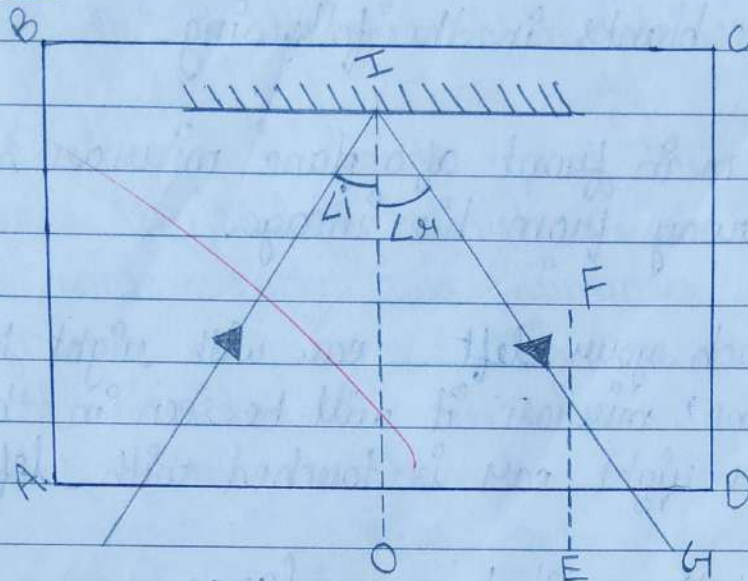


Que (5) Describe an activity to show that the incident ray, the reflected ray and the normal at the point of incidence lie in the same plane. Verified the law of reflection?

Ans (5) (i) Apparatus required :-

- (a) A torch
- (b) A drawing sheet
- (c) A mirror
- (d) cutter

(2) Diagram :-



(3) Working :-

- First of all spread the sheet of paper over the table.
- Now, fix the plane mirror at the centre of drawing sheet and keep it parallel to the larger side AD of drawing sheet.
- Take the centre part of the mirror [I] as a point of incidence.
- Now, by making the ~~touch~~ ^{touch} a point source we will incident the light on the plane at the point of incidence.
- we may see that the reflected light ~~pass~~ passes through point G.
- Now, we cut the portion on OD of drawing sheet and name it as EF.
- Now, we fold the portion FED.
- we see that reflected ray does not follow the rounded part of the sheet.

(4) Conclusion :-

By above activity we have verified the law of reflection.

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Ques (6) Fill in the blanks in the following.

- (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 right hand in front of a plane mirror it will be seen in the mirror that your right ear is touched with 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.

Ques (7) Angle of incidence is equal to the angle of reflection.

☒ (a) Always

☐ (b) Sometimes

☐ (c) under special conditions

☐ (d) Never

Ques (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.

Ques (9) Describe the construction of a Kaleidoscope.

Ans: A Kaleidoscope is made up of three rectangular mirror strips of about 15 cm ~~long~~ and 4 cm wide each. These mirrors are then joined to form a prism, this assembly may be housed inside a circular cardboard. The length of the cardboard is slightly larger than the mirror strips. One end of the tube is covered by a cardboard disk, 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 edges of mirror strips.

Now, put the several small pieces of colored glasses. Close this end of tube by a ground glass plate. The Kaleidoscope is ready.

Ques (10) Draw a labelled sketch of the human eye.

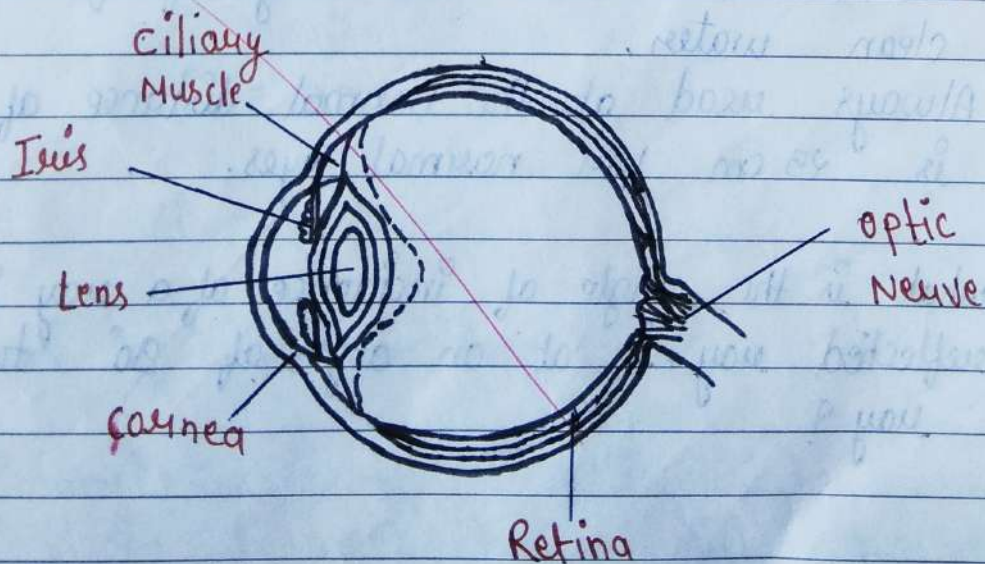


Fig 16.14 Human eye.

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Ques-(ii) Gruemit 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?

Ans As the intensity of laser light is extremely high, if we shine a beam of light from laser torch directly on the eyes, the eyes may get injured due to sudden contraction of pupil which interns may take away eyes towards blindness.

So, Gruemit should not use laser light to perform activity.

Ques-(i) Explain how you can take care of your eyes. Ways of caring for eyes are as follows :-

- (i) If advised, use suitable spectacles.
- (ii) Do not use dim as well as too much light while working.
- (iii) Do not look at the sun and different powerful sources of light directly.
- (iv) We should wash our eyes frequently with clean water.
- (v) Always read at the normal distance of vision that is 25 cm for normal eyes.

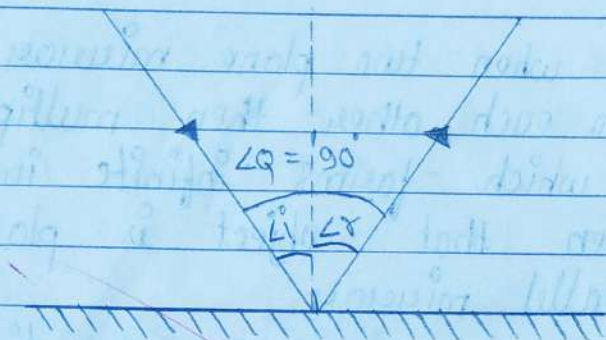
Ques-(3) What is the angle of incidence of a ray if the reflected ray is at an angle of 90° to the incident ray?

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Ans:-



Given,

$$\angle Q = 90^\circ$$

To find,

$$\angle i = ?$$

Solution :-

By law of reflection

$$\angle i = \angle r$$

Also mathematically

$$\angle Q = \angle i + \angle r$$

$$\angle Q = \angle i + \angle i$$

$$90^\circ = 2\angle i$$

$$2\angle i = 90^\circ$$

$$\angle i = \frac{90}{2}$$

$$\angle i = 45^\circ$$

So,

angle of $\angle i$ or incidence $= 45^\circ$

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

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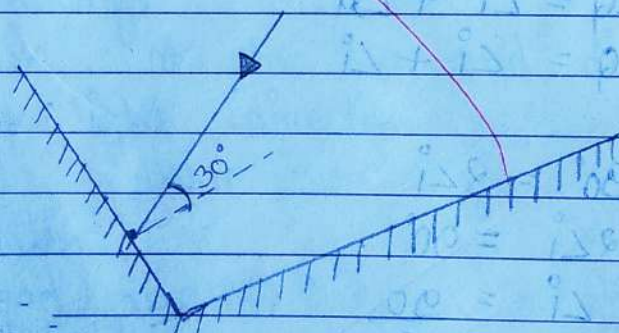
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Ans As we know when two plane mirrors are placed parallel to each other then multiple reflection occurs which forms infinite images of an object when that object is placed in between parallel mirrors.

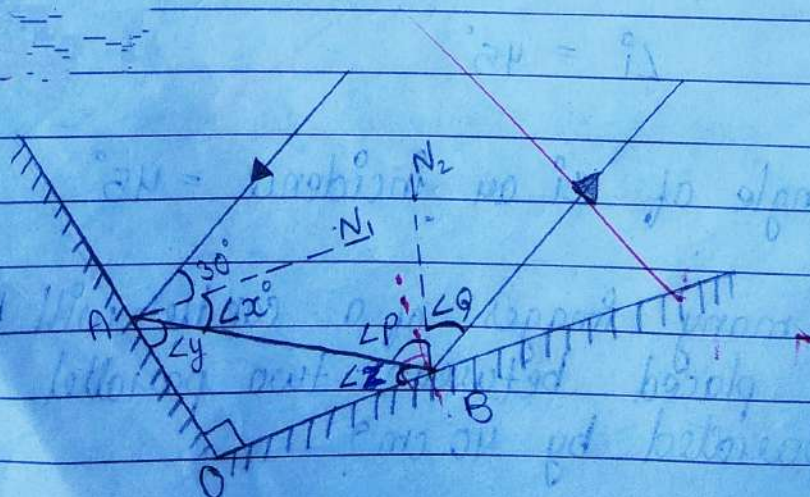
So, according to the question infinite images will be formed for a candle placed between 40 cm apart the plane mirrors.

~~Ques-14) How many images of an candle will be formed if it is placed between two parallel plane mirrors separated by 40 cm.~~

Que-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.



Ans



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Given :-

$$\angle O = 90^\circ$$

$$\angle i = 30^\circ$$

To find :-

$$\angle Q = ? \quad (\text{final angle of reflection})$$

calculation :-

Step 1 :-To find angle $\angle x$

Reflection at point A

$$\angle i = 30^\circ$$

Also $\angle i = \angle x$ (By law of reflection)

So,

$$\angle x = 30^\circ$$

Step 2 :-To find angle $\angle y$

At point A

$$\angle x + \angle y = 90^\circ$$

$$30^\circ + \angle y = 90^\circ$$

$$\angle y = 90^\circ - 30^\circ$$

$$\angle y = 60^\circ$$

Step 3 :-To find $\angle z$

By triangle AOB

$$\begin{aligned}\angle y + \angle AOB + \angle z &= 180^\circ \text{ (angle sum property)} \\ 60^\circ + 90^\circ + \angle z &= 180^\circ \\ \angle z &= 180^\circ - (60^\circ + 90^\circ) \\ \angle z &= 180^\circ - 150^\circ \\ \angle z &= 30^\circ\end{aligned}$$

Step 4 :-

To find $\angle p = ?$
At point B

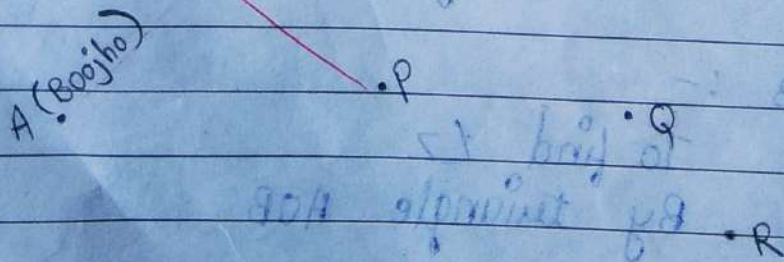
$$\begin{aligned}\angle p + \angle z &= \angle N_2 BO \\ \angle p + 30^\circ &= 90^\circ \\ \angle p &= 90^\circ - 30^\circ \\ \angle p &= 60^\circ\end{aligned}$$

Step 5 :-

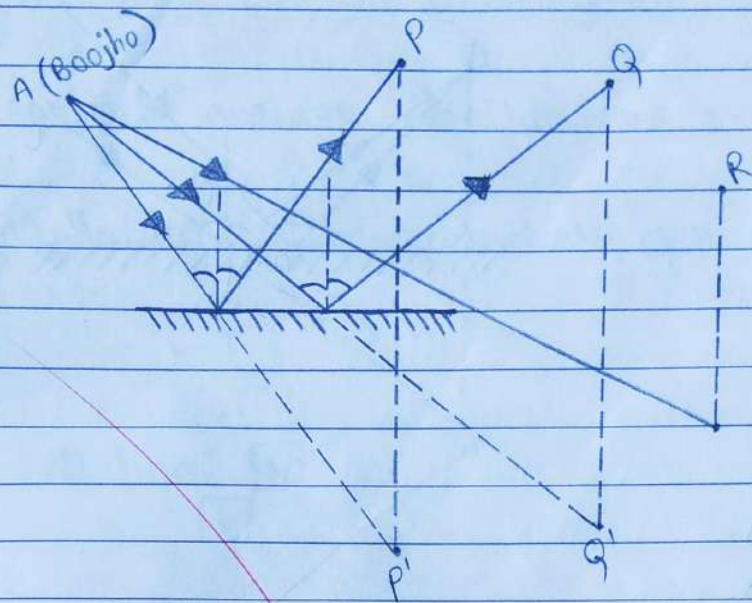
To find $\angle q = ?$
at point B

$$\begin{aligned}\angle p &= \angle q \text{ (By law of reflection)} \\ \angle q &= \angle p \\ \angle q &= 60^\circ\end{aligned}$$

Ques 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?



Ans



Boojho can not see himself in the mirror. Boojho can see the images of P, Q objects but he can not see the image of R as it is out of coverage area of plane mirror and no reflection is there through mirror for R.

~~Que (17)~~

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?

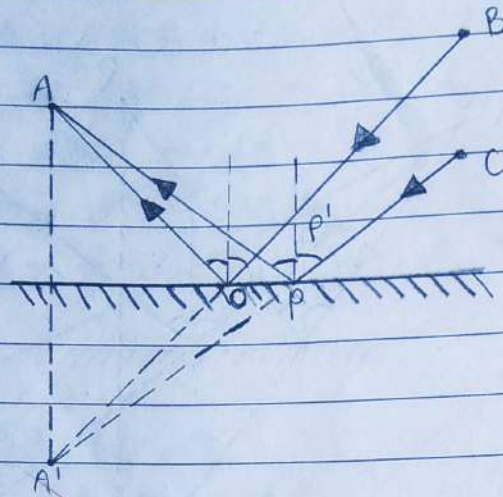
A x

B (paheli)

C (Boojho)

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Ans (a)



(b) yes

(c) yes

(d) The image of A will not shift anywhere when paheli shifts towards Boojho because we know the position of image ^{will be changed} only when the respective object will change its place.