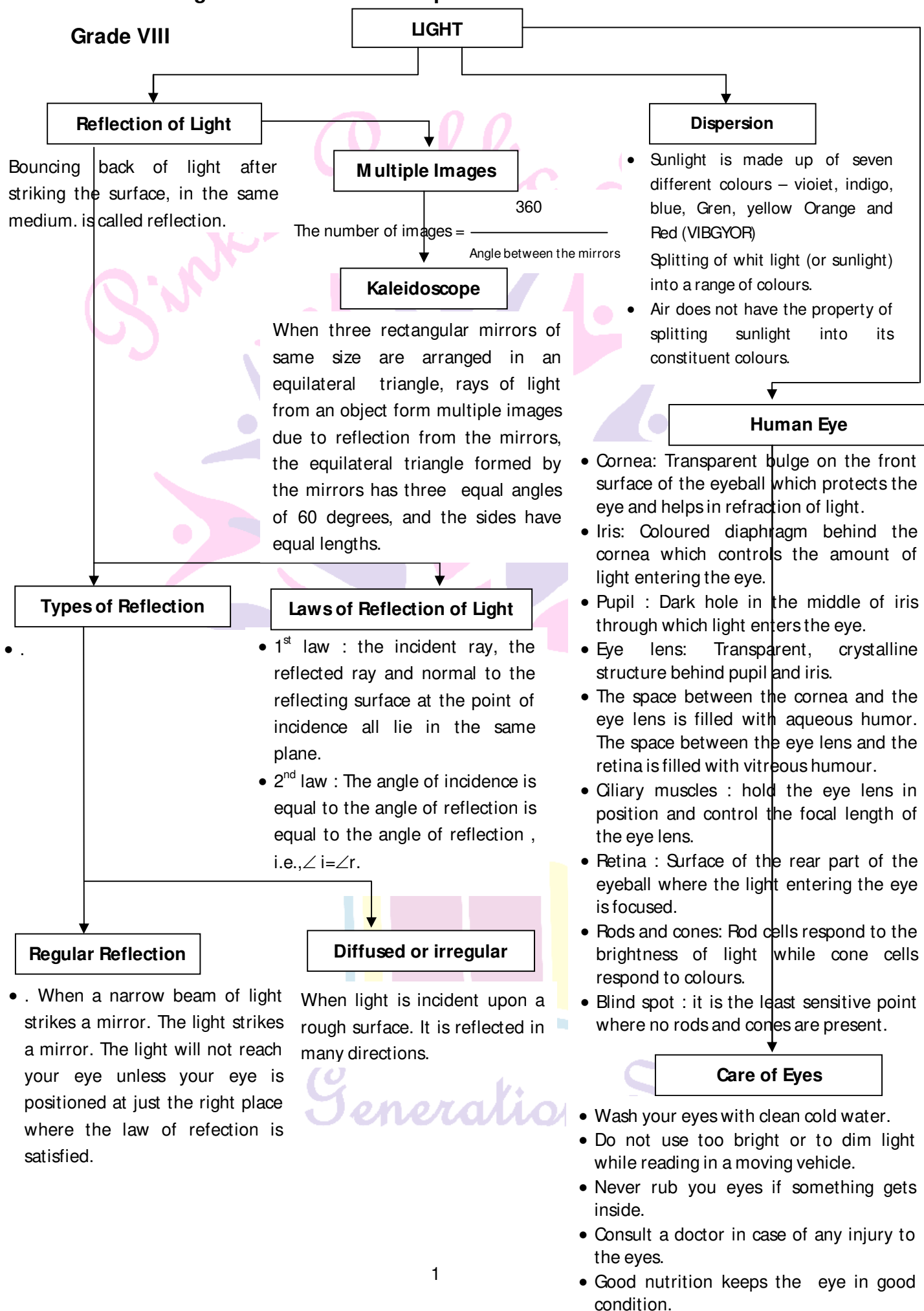


Lesson 16. Light

Basic concepts – A Flow Chart

Grade VIII



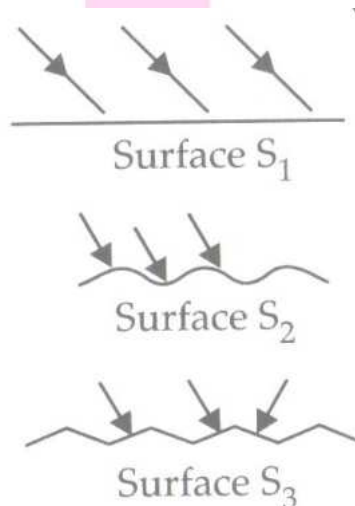
Know the Terms

- **Reflection** : The mirror surface or a shiny surface scatters back a beam of light falling on it. This scattering back light by mirror or shiny surface is known as reflection.
- **Luminous Object** : The objects which shine in the light of other object are called illuminated objects. The object which emit their own light are known as luminous objects.
- **Dispersion** : Splitting of light into its constituent colours is called dispersion. The sunlight is referred to as white light that consists of seven colours.

Objective Type Questions

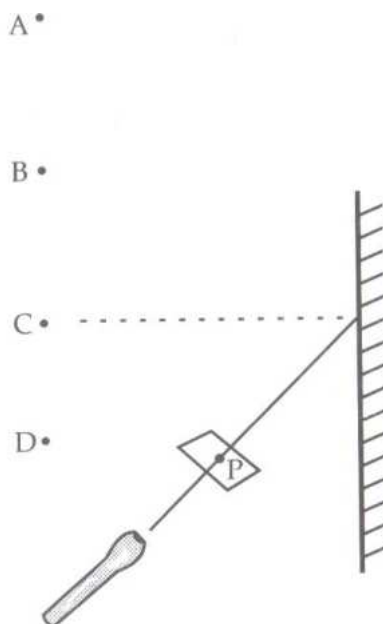
I. Multiple Choice Questions

1. Part of the eye which controls the light entering is called : (NCERT Exemplar)
(a) iris (b) lens (c) cornea (d) retina
2. We can see a non-luminous object when light : (NCERT Exemplar)
(a) emitted by the object falls on the eye. (b) is reflected from the object towards our eye. (c) completely passes through the object. (d) gets completely absorbed by the object.
3. Light is falling on surfaces S₁, S₂, S₃ as shown in fig. (NCERT Exemplar)



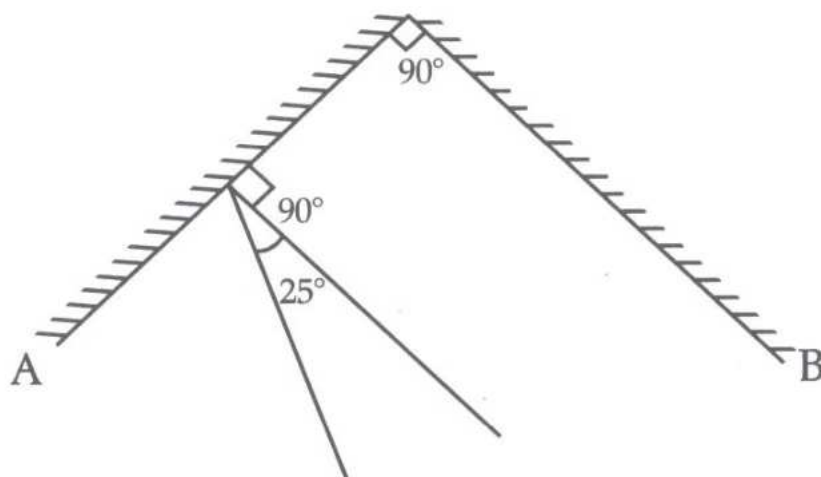
- Surface(s) on which the angle of incidence is equal to the angle of reflection is/ are
(a) S₁ only (b) S₂ and S₃ (c) S₁ and S₂ only (d) all the three surfaces

4. A small hole P is made in a piece of cardboard. The hole is illuminated by a torch as shown in fig. The pencil of light coming out of the hole falls on a mirror. (NCERT Exemplar)



At which point should the eye be placed so that the hole can be seen?

- (a) A (b) B (c) C (d) D
5. Two mirrors A and B are placed at right angles to each other as shown in Fig. below : (NCERT Exemplar)



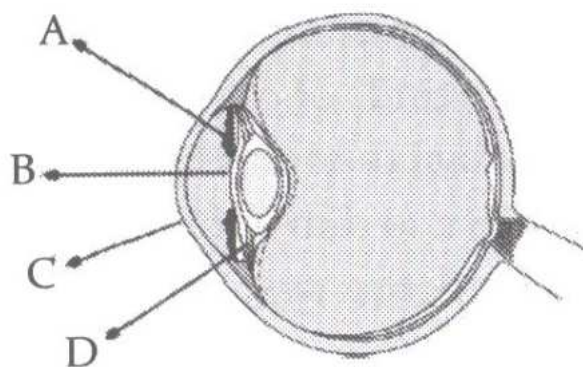
A ray of light incident on mirror A at an angle of 25° falls on mirror B after reflection. The angle of reflection for the ray reflected from mirror B would be :

- (a) 25° (b) 50° (c) 65° (d) 115°
6. Which of the following statements is correct regarding rods and cones in the human eye? (NCERT Exemplar)

- (a) Cones are sensitive to dim light (b) Rods are sensitive to bright light

- (c) Cones are sensitive to bright light (d) Rods can sense colour

7. In the figure of the human eye the cornea is represented by the letter : (NCERT Exemplar)



(a) A

(b) B

(c) C

(d) D

1. (a)	2. (b)	3. (d)	4. (a)	5. (c)	6. (b)	7. (c)
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II. Multiple Choice Questions

- The ray of light striking at the reflecting surface is called
 - Incident ray
 - Reflected ray
 - Normal
 - None of these
- The angle of incidence is always _____ to the angle of reflection.
 - Greater
 - Smaller
 - Equal
 - None of these
- There are _____ laws of reflection.
 - Two
 - Three
 - Four
 - Five
- The process of banding of seven colours is called
 - Dispersion
 - Spectrum
 - Reflection
 - Normal
- The image formed by plane mirror is
 - Real and inverted
 - Real and erect
 - Virtual and inverted
 - Virtual and erect
- The image that can be obtained on the screen is called
 - Real
 - Virtual
 - Both
 - None

7. Reflection from a smooth surface is

- a. Regular
- b. Irregular
- c. Diffused
- d. None

8. Angle between normal and incident ray is called

- a. Angle of reflection
- b. Angle of incidence
- c. Both a and b
- d. None

9. An example of luminous object is

- a. Star
- b. Smooth surface
- c. Mirror
- d. Cloth

10. An example of night bird is

- a. Crow
- b. Sparrow
- c. Bat
- d. Owl

1. a	2. c	3. a	4. a	5. d
6. a	7. a	8. b	9. a	10. d

I. Fill in the blanks

- _____ is reflected from all surfaces.
- _____, _____ takes place when light is incident on smooth, polished and regular surfaces.
- Images formed in a plane mirror undergo _____ inversion.
- Beautiful patterns are formed in _____ because of _____ reflections.
- Splitting of light into its constituent colours is known as _____.
- Important parts of the eye are _____, _____, _____ and _____.
- A normal eye can see _____ and _____ objects clearly.
- Visually challenged person can read and write using the _____ system.



9. The most comfortable distance at which one reads with a normal eye is about _____ cm.

10. If advised, use suitable _____ to correct your eyesight.

11. The impression of an image lasts for _____ second.

1. Light	2. Regular reflection	3. lateral	4. kaleidoscope, multiple
5. dispersion	6. cornea, iris, pupil, lens, retina, optic nerve	7. nearby, distant	8. braille
9. 25 cm	10. spectacles	11. 1/16	

II. Fill in the blanks

- The ray which strikes any surface is called _____ ray.
- The ray which returns after striking the surface is called _____ ray.
- A line drawn perpendicular to the incidence point is called _____.
- The image formed by plane mirror is called _____ image.
- Reflection from a smooth and shiny surface is called _____ reflection.
- Reflection from a rough surface is called _____ reflection.
- The objects which emit the light is called _____ objects.
- Plane mirror forms only a _____ image of an object.
- When two mirrors are set parallel to each other then they form _____ images of an object.
- Splitting of light into its colours is known as _____ of light.
- The size of the pupil is controlled by the _____.
- Kaleidoscope is based on the concept of _____.
- _____ are sensitive to dim and bright light.

1. Incident	2. Reflected	3. Normal	4. Virtual	5. Regular
6. Diffused	7. Luminous	8. Single	9. Numerous	10. Dispersion
11. Iris	12. Multiple reflection	13. Rods and cones		

I. Match the column

1. Match the items given in Column A with those in Column B suitably.

Column A		Column B	
(i)	Cornea	(a)	No image formed
(ii)	Pupil	(b)	Image formed
(iii)	Blind spot	(c)	Spectrum
(iv)	Rods	(d)	Front part of eye
(v)	Cones	(e)	Dispersion of light
(vi)	Iris	(f)	Small opening in the cornea
(vii)	Retina	(g)	Sensitive to dim light
(viii)	Rainbow	(h)	Sensitive to bright light
(ix)	Band of seven colours	(i)	Controls the size of pupil

(i) . (d)	(ii) . (f)	(iii) . (a)	(iv) . (g)	(v) . (h)
(vi) . (i)	(vii) . (b)	(viii) . (e)	(ix) . (c)	

2. Match the items given in Column A with those in Column B suitably.

Column A		Column B	
(i)	Normal Vision	(a)	Controlled by Iris
(ii)	Blind spot	(b)	25 cm
(iii)	Pupil	(c)	Kite, eagle
(iv)	Braille system	(d)	No sensory cells
(v)	Day light birds	(e)	Visually challenged

(i) . (b)	(ii) . (d)	(iii) . (a)	(iv) . (e)	(v) . (c)
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II. Match the column

Column I	Column II
1. Cornea	(i) No image formed
2. Pupil	(ii) image formed
3. Blind spot	(iii) Spectrum
4. Rods	(iv) Front part of eye
5. Cones	(v) Dispersion of light
6. Iris	(vi) Small opening in the cornea
7. Retina	(vii) Sensitive to dim light
8. Rainbow	(viii) Sensitive to bright light
9. Band of seven colours	(ix) Controls the size of pupil

1. (iv),	2. (vi),	3. (i),	4. (vii),	5. (viii),	6. (ix),	7. (ii),	8. (v),	9. (iii)
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I. True or False

- Too little or too much light is bad for eyes.
- An unpolished or dull surface can act as a mirror.
- Angle of incidence and angle of reflection can be varied.
- All the rays reflected from a plane surface are not parallel. Such reflection is called diffused reflection.
- An image formed by plane mirror is laterally inverted.
- On the blind spot a clear image is formed.
- Two mirrors inclined to each other give multiple images.
- Braille is used to make a blind person read and write.

1. True	2. False	3. False	4. True	5. True	6. False	7. True	8. True
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II. True or False

- Cones and rods are the light sensitive cells.
- Kaleidoscope is based on the principle of spectrum.



3. Rods are sensitive to bright light.
4. The image formed by plane mirror is laterally inverted.
5. Angle of incidence is greater than angle of reflection.
6. Cones of our eye are responsible for colour vision.
7. On blind spot there are no sensory cells.
8. If particles of dust enter our eyes then we should rub eye properly.
9. Two mirrors inclined to each other give multiple images.
10. Visually challenged persons can read and write using the Braille system.

1. True	2. False	3. False	4. True	5. False
6. True	7. True	8. False	9. True	10. True

Quiz Time

1. How are we able to see an object which is not self-illuminating like the Sun or the stars?
2. What are the laws of reflection?
3. What do you mean by a ray of light?
4. What would happen if we throw the light along the normal?
5. What is light?
6. Does angle of incidence always equal to angle of reflection?
7. How many mirrors are used in a Kaleidoscope?
8. Define dispersion.
9. What is the shape of our eye?
10. Which part of our eye controls the pupil?
11. Who developed the system for visually impaired persons?

Answers:

1. We can see an object when our eyes receive light reflected from an object.
2. There are two laws of reflection;
 - (i) Angle of incidence is equal to angle of reflection.
 - (ii) The incident ray, normal and reflected ray, all lie in the same plane.



3. The term ray is used for a narrow beam of light.
 4. Light will be reflected back along the normal.
 5. Light is a form of energy that gives us sensation of vision.
 6. No. It is not equal when this phenomenon takes place on an irregular surface.
 7. There are three rectangular mirrors used in a Kaleidoscope.
 8. The splitting of light into seven colours is called dispersion of light.
 9. Our eye is spherical in shape.
 10. The size of the pupil is controlled by the iris.
 11. Louis Braille in 1821.
-

NCERT CORNER

Intext Questions

1. What would happen if he threw the light on the mirror along the normal?

As in this case, angle of incidence is zero degree, so after reflection, light beam returns at same path i.e., along normal.

2. Can the reflected rays be further reflected if incident on another mirror?

Yes.

3. Do we see all objects due to reflected light?

Yes, nearly everything we see around us is due to reflected light, e.g., Moon receives light from the sun and reflects it, so we see the moon.

4. How could you see the hair at the back of your head?

With the help of two plane mirrors, we could see the hair at the back of our head. One mirror to the front side and another mirror is to the back of head, slightly above the level of head and the mirror should also bend slightly towards the head.

5. What kind of lens is thicker in centre?

Convex lens is thicker in centre.

Text book Questions

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

No, we cannot see any object placed inside a dark room, because there is no reflection of light from objects. If any object is outside the room, then we can observe the object because in this case our eye will perceive reflected light from outside objects.

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

Differences between regular and diffused reflection are

S.No.	Regular reflection	Diffused reflection
(i)	It is caused by the reflection from smooth and shiny surfaces.	It is caused by reflection from unpolished and rough surface.
(ii)	Reflected rays are parallel to each other.	Reflected rays are not parallel to each other.

No, the diffused reflection does not mean the failure of laws 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.

(i) A polished wooden table

(ii) Chalk powder

(iii) Cardboard surface

(iv) Marble stone with water spread over it

(v) A mirror

(vi) A piece of paper

(i) Regular reflection - as it is smooth surface.

(ii) Diffused reflection - as it has irregular surface.

(iii) Diffused reflection - as it has irregular surface.

(iv) Regular reflection - as it has regular & smooth surface.

(v) Regular reflection - as it has regular & smooth surface.

(vi) Diffused reflection - as it has surface with irregularities.

4. State the laws of reflection.

Following are the two laws of reflection :

(i) Incident ray, reflected ray and the normal drawn at the point of incidence to the reflecting surface lie in the same plane.

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

5. Describe an activity to show that the incident ray, the reflected ray and the normal at the point of incidence, all lie in the same plane.

An activity to show that the incident ray, the reflected ray and the normal at the point of incidence, all lie in the same plane is as follows :

(i) Fix a white sheet of paper on a drawing board or a table.

(ii) Take a comb and drain all its openings except one in the middle using a slack paper.

(iii) Hold the comb perpendicular to the sheet of paper.

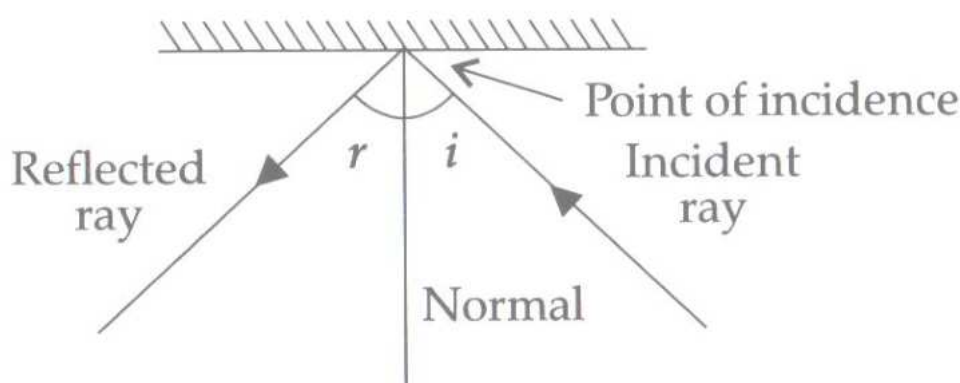
(iv) Throw light from a torch through the opening of the comb from one side.

(v) With the adjustment of the torch and comb, we see a ray of light along the paper strike the mirror.

(vi) After striking the mirror the ray of light is reflected in another direction. The ray that strikes any surface is called the incident ray.

(vii) The ray that comes back from the surface after reflection is called the reflected ray. Theoretically we can describe the above activity as follows :

(i) Draw a straight horizontal line with small slanted line on it showing the painted side of the mirror as shown in the figure below.



(ii) Draw the incident ray, reflected ray and normal as shown such that the angle of incidence is equal to the angle of reflection and all the three rays lie in the same plane.

6. Fill in the blanks in the following :

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



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

(iii) The muscles attached to the eye lens make it thicker to see _____ objects.

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

(i) 2 m	(ii) left, left	(iii) near	(iv) much fewer
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7. Angle of incidence is equal to the angle of reflection:

- (i) Always
- (ii) Sometimes
- (iii) Under special conditions
- (iv) Never

(i) Angle of incidence is equal to angle of reflection always.

8. Image formed by a plane mirror is :

- (i) virtual, behind the mirror and enlarged
- (ii) virtual, behind the mirror and of the same size as the object
- (iii) real at the surface of the mirror and enlarged
- (iv) real, behind the mirror and of the same size as the object

(ii) Image formed by a plane mirror is virtual, behind the mirror and of the same size as the object.

9. Describe the construction of a kaleidoscope.

The construction of a kaleidoscope :

- (i) Get three rectangular mirror strips each about 15 cm long and 4 cm wide.
- (ii) Join them together to form prism.
- (iii) Fix them in a circular cardboard tube or a tube of thick chart paper.
- (iv) Make sure that the tube is slightly longer than the mirror strips.
- (v) Close one end of the tube by a cardboard disc having a hole in the centre through

which we can see.

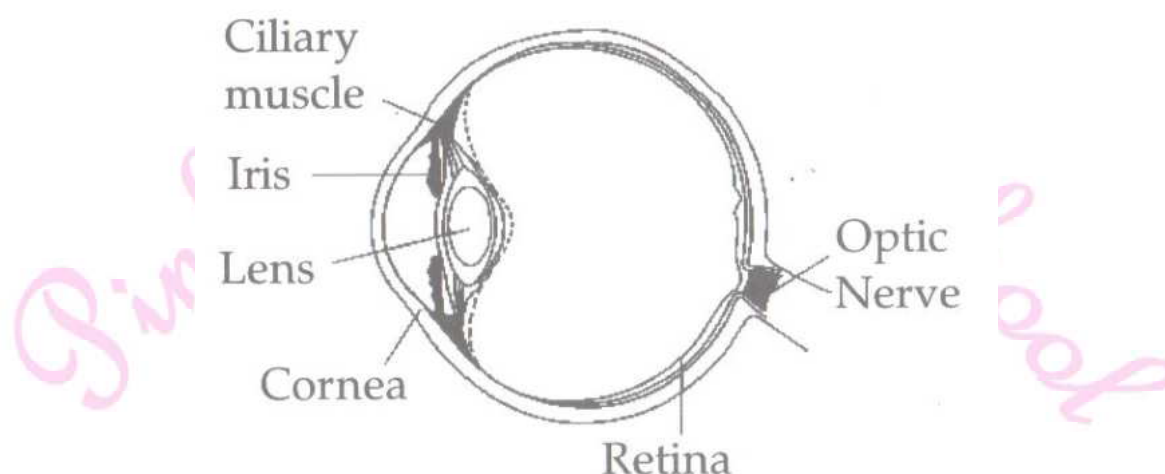
(vi) To increase durability paste a piece of transparent plastic sheet under the cardboard disc.

(vii) At the other end touching mirror fix a circular plane glass plate.

(viii) Place several small pieces of coloured glass bangles this glass plate.

(ix) Close this end of the tube by a ground glass plate. Keep enough space between the pieces to move around.

10. Draw a labelled sketch of human eye.



11. Gurmit wanted to perform activity using a laser torch. Her teacher advised her not to do so. Can you explain the basis of the teacher's advice?

Laser light comes from a very small hole and the lens of the laser light is also very small, so the light will penetrate into one part of the eye and it can injure the retina, whereas the normal torch spreads out the light which does not cause any harm to our eyes. So, the beam of laser light should not be used to perform an activity.

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

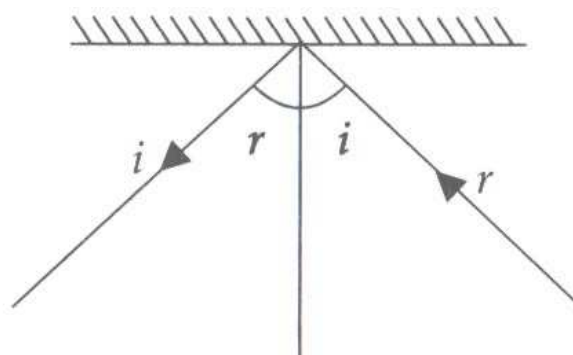
We can take care of our eyes in the following manner:

- (i) If advised, use suitable spectacles.
- (ii) Too little or too much light is bad for eyes. Insufficient light can cause eye strain and headache.
- (iii) Too much light like that of the sun, a powerful lamp or a laser torch can injure the retina.

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

We know that the angle of incidence is equal to the angle of reflection and the reflected ray is at an angle of 90° to the incident ray.

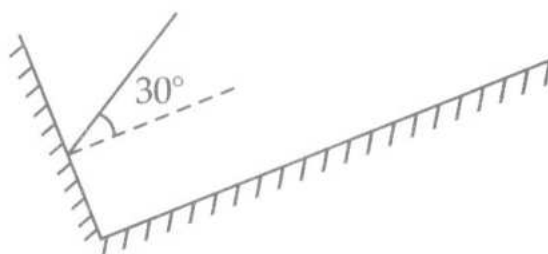
$$\text{So, } Z_i = Z_r = 45^\circ$$



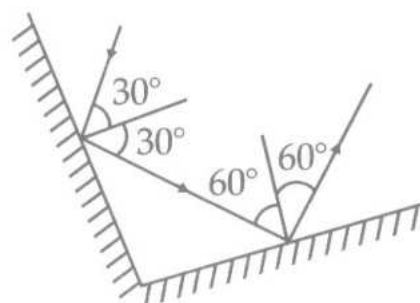
14. How many images of candle will be formed if it is placed between two parallel mirrors separated by 40 cm?

Infinite number of images will be formed due to multiple reflections of light.

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



Ans.



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 images of objects situated at P, Q and R?



Yes, Boojho can observe his image as well as images of P, Q, R.

I. Very Short Answer Type Questions.

1. What makes things visible?

Light.

2. Can you see an object in the dark?

No.

3. What is mirror?

A smooth and shiny surface is called a mirror.

4. What kind of image is formed by a plane mirror?

Virtual and erect image.

5. Where is the image formed by a plane mirror?

Behind the mirror.

6. Where does the image form in our eye?

At Retina.

7. Where is no image formed?

Blind spot.

8. For what time the image stays on the retina?

About $1/16^{\text{th}}$ of a second.

9. Which bird is called night bird?

Owl is called night bird.

10. Which surface shows regular reflection?

Smooth or regular surface.

11. Which surface shows diffused reflection?

Rough or irregular surface.

12. What size of image formed in a plane mirror?

Same size of the object.

13. How many mirrors are used in Kaleidoscope?

Three mirrors.

14. How many colours are there in spectrum of light?

Seven colours.

15. How many colours are there in white light?

Seven colours.



16. What is the shape of human eye?

Spherical shape.

17. What is the front transparent part of the eye called?

Cornea.

18. What is the small opening in the iris called?

Pupil.

19. Which part of eye is controlled by iris?

Pupil.

20. What is the coloured part of eye called?

Iris.

21. What is the function of iris?

Iris controls the amount of light entering into the eye through pupil.

22. Where is the image formed in the eye?

At retina.

23. Which part of the body sends the sensation felt to the brain?

Nerve cells.

24. How many kinds of nerve cells are there in the retina?

Two (cones and rods).

25. Which cells of the retina are sensitive to bright light and colour?

Cones.

26. Which cells of retina are sensitive to dim light?

Rods.

27. What is the distance of normal eye?

25 cm.

28. Who invented the system of reading for blind man?

Braille.

29. What is the relation in the size of image and object in case of plane mirror?

Both are of same size.

30. How do we see the objects?

We see the objects due to reflection of light.

31. What is the relation of angle of incidence and angle of reflection?

Both are equal.

32. What is the other name of diffused reflection?

Irregular reflection.

33. How many plane mirrors are required to form multiple images?

Two or more than two plane mirrors are required.

34. Are the shapes of eyes of all animals same?

No, animals have eyes of different shapes.

35. Write two sources of vitamin A.

Carrots, green vegetables.

II. Very Short Answer Type Questions.

1. Name the part of the eye which gives colour to the eyes. (NCERT Exemplar)

Iris has different colours, so the iris gives its colour to the eyes.

2. Boojho while waving his hand very fast in front of his eyes, observes that his fingers do not appear clear. Give the reason for it. (NCERT Exemplar)

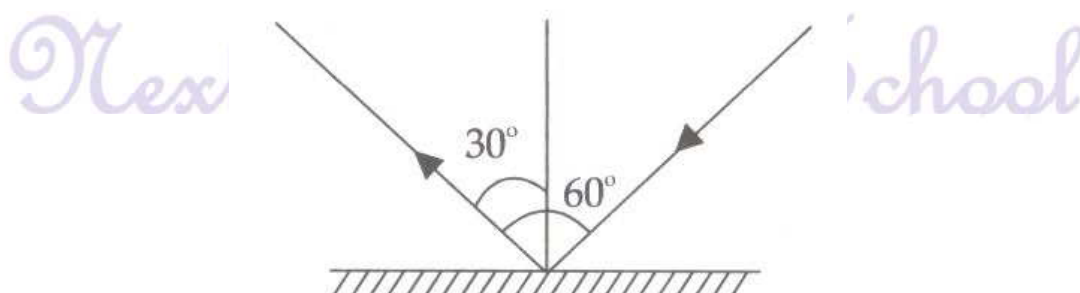
Our eyes are not so sensitive for a large speed and when any object is very near, the ciliary muscles cannot focus the object so early.

3. How many times is a ray of light reflected by two plane mirrors placed parallel and facing each other? (NCERT Exemplar)



The ray is reflected infinite times between the two plane mirrors placed parallel to each other.

4. The angle between incident ray and reflected ray is 60° . What is the value of angle of incidence? (NCERT Exemplar)





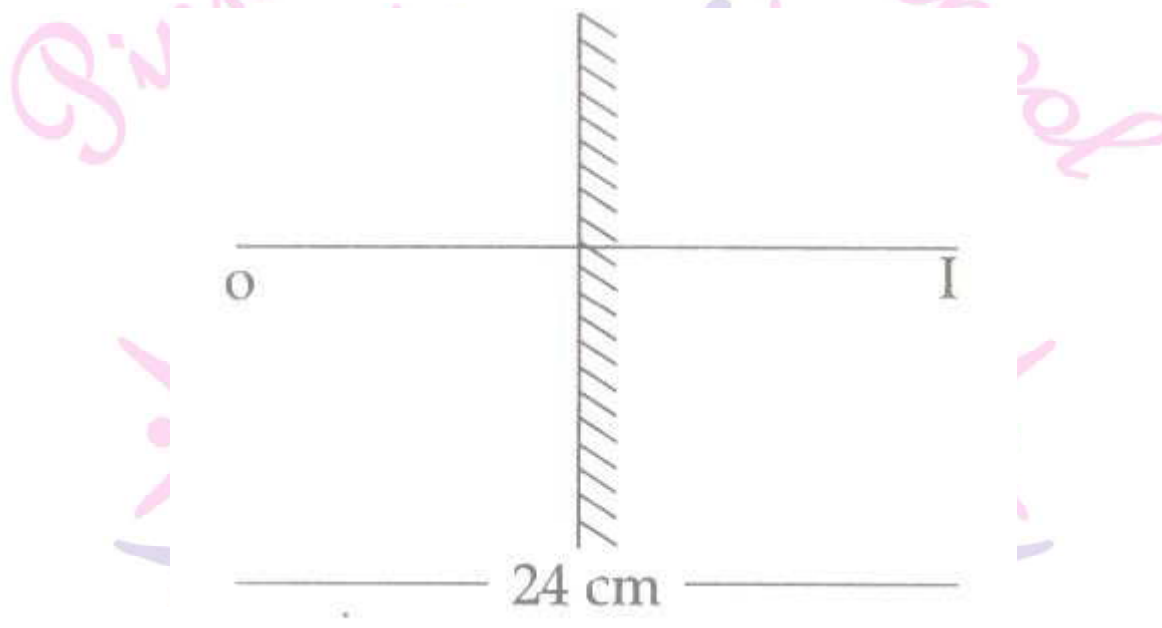
Since, angle of incidence = angle of reflection So, angle of incidence = $\frac{60}{2} = 30^\circ$.

- 5. Mention what kind of lens is there in our eyes. Where does it form the image of an object?** (NCERT Exemplar)

In our eyes convex lens is present. Image is formed at retina.

- 6. The distance between the object and its image formed by a plane mirror appears to be 24 cm. What is the distance between the mirror and the object?** (NCERT Exemplar)

Since, object distance from the mirror = Image distance from the mirror.



So, distance between the mirror and the object $\frac{24}{2} = 12 \text{ cm}$.

- 7. What makes things visible?** (NCERT Exemplar)

Light makes things visible.

- 8. What is mirror?**

A polished or a shiny surface can act as a mirror.

- 9. What is the relation between angle of incidence and angle of reflection?**

The angle of incidence is always equal to angle of reflection.

- 10. What is lateral inversion?**

In an image formed by a mirror the left side appears on the right side and the right side appears on the left side, this is known as lateral inversion.

- 11. What are multiple images?**

Images formed by mirrors placed at an angle to one another are called multiple images.

- 12. What is sunlight? How many colours it consists of?**

The sunlight is referred to as white light. It consists of seven colours.



13. Where is image formed in human eye?

Image is formed on retina in human eye.

14. What is the work of iris?

Iris controls the amount of light entering into the eye through the pupil.

15. How many kinds of nerve cells are there in retina?

There are two kinds of cells :

(i) Cones : Sensitive to bright light.

(ii) Rods : Sensitive to dim light.

16. Who invented the system of reading for blind people?

Louis Braille invented the system of reading for blind people.

17. At what angles are mirrors inclined in a kaleidoscope and a periscope respectively?

Kaleidoscope - 60°

Periscope - 45°

18. Mention the range of vision of a normal human eye.

From infinity to about 25 cm is the range of vision of normal human eye.

19. Why does banana appear yellow?

The banana appears yellow because it reflects red and green light but absorbs blue light.

20. State the function of rods and cones in our eye.

Rods are sensitive to dim light whereas cones are sensitive to the bright light.

III. Very Short Answer Type Questions.

1. Name the part of the eye which gives colour to the eyes.

Iris

2. Boojho while waving his hand very fast in front of his eyes, observe that his fingers appear blurred. What could be the reason for it?

Persistence of vision.

3. The angle between incident ray and reflected ray is 60° . What is the value of angle of incidence?

$$\angle i + \angle r = 60^\circ$$

$$\text{As } \angle i = \angle r$$

$$\text{So, angle of incidence} = 30^\circ$$

4. The distance between the object and its image formed by a plane mirror appears to be 24 cm. what is the distance between the mirror and the object?

12 cm

5. Look at figure given below. Can the image of the child in it be obtained on a screen?



No, the image of the child cannot be obtained on a screen.

6. What happens to light when it gets dispersed? Give an example.

Light is split into its constituent colours. Rainbow is an example.

7. What is Braille system?

It is system of raised dots that can be read with the fingers by blind people or people who have low vision.

8. What do you mean by dispersion of light?

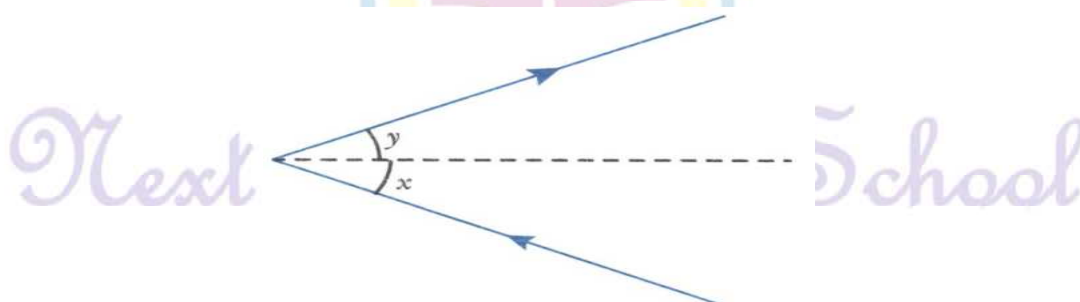
The splitting of white light into seven colours is known as dispersion of light.

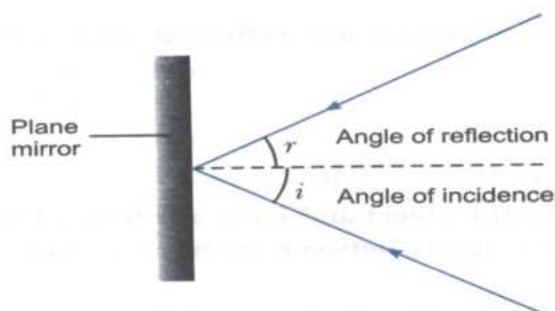
9. What is lateral inversion?

When an image formed by a plane mirror is such. That the left of the object appears on the right and the right appear on the left. This is known as lateral inversion.

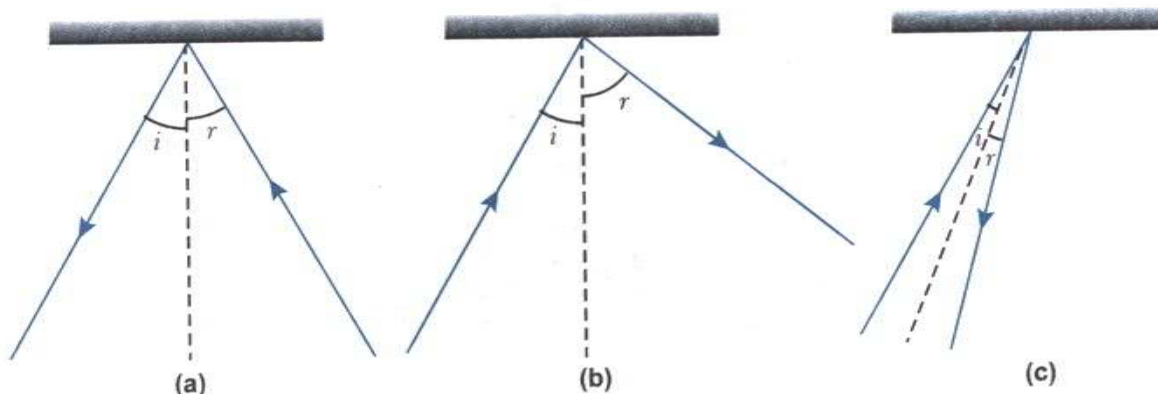
I. Short Answer Type Questions

1. Draw the figure given below showing the position of the plane mirror. Also label the angle of incidence and angle of reflection on it.

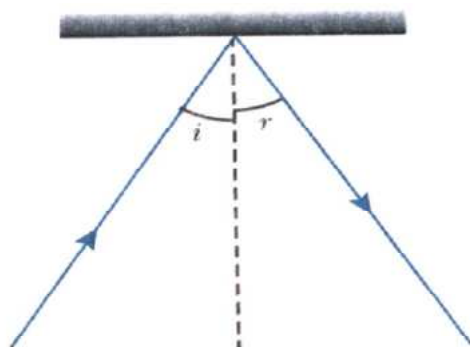




2. There is a mistake in each of the following ray diagrams given below as (a). (b). and (c). make the necessary correction (s)



The figure in all the three cases after correction should be as in the figure given below.



3. Explain the process which enables us to perceive motion in a cartoon film.

The cartoon film we see is actually the projection of static pictures on the screen in a specific order. Usually the static pictures are shown in a sequence at the rate of 24 pictures per second one after the other giving us the perception of movement.

4. How is the phenomenon of reflection used in making a kaleidoscope? What are the applications of a kaleidoscope?

The kaleidoscope gives a number of images formed by reflection from the mirrors inclined to one another. Designers and artists use kaleidoscope to get ideas for new patterns to design wallpapers, Jewellery and fabrics.

5. Figure given below shows the word REST written in two ways in front of a mirror. Show how the word would appear in the mirror.



6. Eyes of the nocturnal birds have large cornea and large pupil, how does this structure help them?

A large pupil and large cornea allows more light to enter their eyes and they can see objects even in faint light.

7. What kind of lens there in our eyes? Where does it form the image of an object/

The type of lens in our eyes is convex. It forms images on the retina.

8. Which part of the gets affected if someone is suffering from cataract? How is it treated?

In people suffering from cataract the eye lens becomes clouded. Cataract is treated by replacing the opaque lens with a new artificial lens.

9. What is meant by 'persistence of vision'?

Persistence of vision is the characteristic of human eye to capture image on the retina and this image is retained for $1/16^{\text{th}}$ of a second on the retina. If the time difference between the two pictures is less than one sixteenth of a second then our eyes will not be able to distinguish the two different pictures rather it will be seen as if the picture is moving.

10. Calculate the number of images formed when two plane mirrors are kept at following angles:

a. 45°

b. 60°

a. Number of images = $\frac{360}{\text{Angle between the mirrors}} = \frac{360}{45} = 8 \text{ images}$

b. Number of images = $\frac{360}{60} = 6 \text{ images}$

II. Short Answer Type Questions

1. What is reflection?

When rays of light return at some angle by striking a smooth surface, this phenomenon is called reflection of light.

2. What is incident ray?

The light ray, which strikes any surface is called the incident ray.

3. What is reflected ray?

The ray that comes back from the surface after reflection is known as the reflected ray.

4. Define normal.

A perpendicular line on the mirror at the point where incident ray strikes is called normal.

5. Define angle of incidence.

The angle between the normal and incident ray is called the angle of incidence.

6. Define angle of reflection.

The angle between the normal and reflected ray is called angle of reflection.

7. Write the laws of reflection.

There are two laws of reflection;

(i) Angle of incidence is equal to angle of reflection.

(ii) Incident ray, reflected ray and normal at the point of incidence, all lie in the same plane.

8. What is lateral inversion?

When an image is formed by a mirror the left of the object appears on the right and the right appears on the left, this is known as lateral inversion.

9. What do you mean by diffused or irregular reflection?

When all the parallel rays reflected from a rough or irregular surface are not parallel, the reflection is known as diffused or irregular reflection.

10. Define regular reflection.

When reflected rays from a smooth surface are parallel, it is known as regular reflection.



11. What do you mean by multiple images?

When two mirrors are kept parallel to each other then numerous images of an object are seen in these mirrors. This is known as multiple images.

12. What is the use of kaleidoscope?

Designers of wallpapers, fabrics, artists use kaleidoscope to get ideas for new patterns.

13. Define dispersion of light.

Splitting of light into its seven colours is known as dispersion of light.

14. Give an example of natural dispersion.

Rainbow is a natural phenomenon showing dispersion.

15. What is the function of rods and cones in our eye?

Cones are sensitive to bright light and colour whereas rods are sensitive to dim light.

16. What is blind spot?

At the junction of the optic nerve and retina, there are no sensory cells, so no vision is possible at the spot. This is called the blind spot.

17. What is the function of eyelids?

Eyelids prevent any object from entering the eye. They also shut out light when not required.

18. What is the Braille system?

Louis Braille developed a system for visually impaired persons. This is known as Braille system. He developed Braille code for common languages.

19. What is the difference between ray of light and Beam of light?

A ray of light is an idealisation. In reality, we have a narrow beam of light. Beam of light is made up several rays. For simplicity, we use the term ray of light for a narrow beam of light.

20. What are illuminated objects?

Normally we see the object due to reflection of light. Moon for example receive light from the sun and reflects it. That is how we see the moon. The objects which shine in the light of other objects are called illuminated objects for example moon is an illuminated object.

Next Generation School

III. Short Answer Type Questions- I

1. Which part of the eye gets affected if someone is suffering from cataract? How is it treated? (NCERT Exemplar)

In people suffering from cataract, the eye lens becomes clouded. Cataract is treated by replacing the opaque lens with a new artificial lens.

2. What happens to light when it gets dispersed? Give an example. (NCERT Exemplar)

Light is splitted into its constituent colours (seven colours) when it gets dispersed. e.g., rainbow formation is due to the dispersion of white light after passing through water droplets.

3. Write difference between regular and irregular reflection.

Difference between regular and irregular reflection :

S.No	Regular	Irregular
(i)	It takes place on a smooth and shining surface.	It takes place on rough surface.
(ii)	All rays are parallel after reflection.	Reflected rays are in different directions.

4. What is a blind spot?

At the junction of the optic nerve and the retina, there are no rods and cones. Hence, no vision is possible at the spot. This spot is called blind spot.

5. What is Cataract?

It is the eye disease in which eye lens becomes opaque and eyesight becomes foggy. This disease is treated by removing the opaque lens and inserting a new artificial lens.

6. What are the functions of eyelids?

Nature has provided eyes with eyelids to prevent any object from entering into them. Eyelids also shut out light when not required.

7. What is the comfortable distance to read, for a normal eye? What types of defects can a human eye have?

The comfortable distance to read objects is 25 cm. Some persons can see objects close to them clearly, but cannot see distant objects so clearly. On the other hand some persons can not see objects close by clearly but they can see distant objects quite well. These are called Myopia and Hypermetropia respectively.



8. Lack of which vitamin causes troubles in our eyes? Name some food stuff to cure this problem.

Lack of vitamin A in food stuff is responsible for many eye troubles. Most common among them is night blindness. One should, therefore, include in the diet components which have vitamin A. Raw carrots, broccoli, green vegetables and cod liver oil are rich in vitamin A. Eggs, milk, curd, cheese, butter and fruits such as papaya and mango are also rich in vitamin A.

9. Name few famous visually challenged Indians with great achievements to their credit.

Some visually challenged Indians have great achievements to their credit :

Diwakar : A child prodigy (singer).

Ravindra Jain : Sangeet Prabhakar degree from Allahabad. (Lyricist, singer, music composer).

Lal Advani : Established an association for special education and rehabilitation of disabled in India.

III. Short Answer Type Questions-II

1. Eyes of the nocturnal birds have large cornea and a large pupil. How does this structure help them? (NCERT Exemplar)

The size of the eyes of nocturnal birds is large. Large eyes with a wider pupil, larger lens and increased retinal surface can collect more ambient light which helps them to see the objects even at night easily.

2. Explain the process which enables us to perceive motion in a cartoon film.

(NCERT Exemplar)

In a cartoon film, the movement of cartoons is completely perceived by brain after getting signals from optic nerve since, persistence of vision is completely brain centred. The image is formed on retina which changes continuously and through optic nerve, signals reach to the brain and brain orders eyes to watch it in continuous motion.

3. What is Kaleidoscope? How can it be made? What are its uses? (NCERT Exemplar)

Kaleidoscope is an instrument used to make numerous beautiful patterns. To make a kaleidoscope get three rectangular mirror strips. Join them together to form a prism. Close one end of tube by cardboard disc having a hole in the centre. Paste a piece of transparent plastic

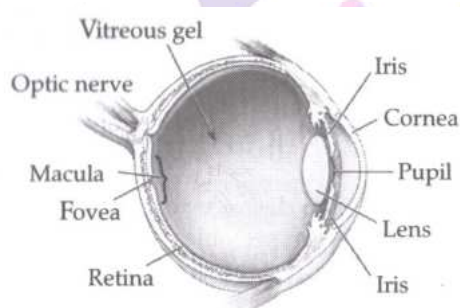


sheet at the other end. Put several small pieces of coloured glass bangles. Allow enough space for the coloured pieces to move around.

Numerous beautiful patterns will be formed. It is used by designers of wall papers and fabrics and artists to get new ideas for new patterns.

4. Write the structure and function of human eye.

Human eye : The eye has a roughly spherical shape. The outer coat of eye is white. Its transparent front part is called cornea. Behind cornea a dark muscular structure is situated called iris. There is a small opening called the pupil. The size of the pupil is controlled by the iris. The iris controls the amount of light entering into the eye. The lens focuses light on the back of the eye, on a layer called retina. The retina contains several nerve cells. They transmit impulses to the brain through the optic nerve and hence, image is formed.



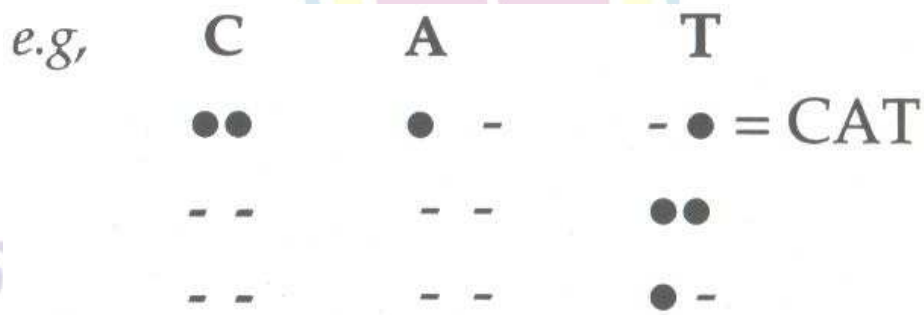
5. What is the Braille system?

The most popular resource for visually challenged person is Braille.

The present system was adopted in 1932. There is Braille code for common languages, mathematics and scientific notations.

It has 63 dots patterns or characters. Each character represents a letter, a combination of letters, common word or a sign.

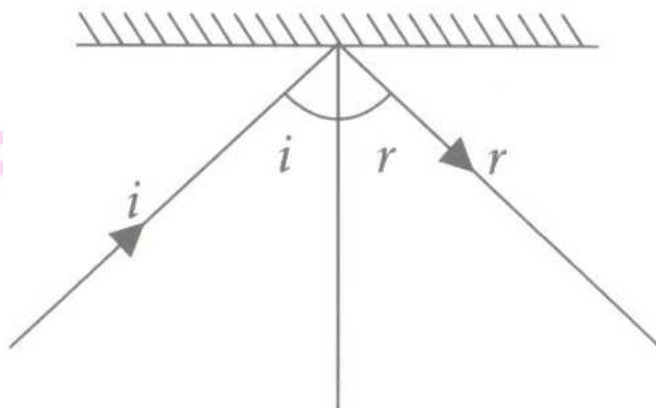
Dots are arranged in cells of two vertical rows of three dots each.



These patterns when embossed on braille sheets, help visually challenged person to recognize words by touching.

I. Long Answer Type Questions.

1. Boojho planned an activity to observe an object A through pipes as shown in fig. below so that he could see objects which he could not directly see.



- (i) How many mirrors should he use to see the objects?
- (ii) Indicate the positions of the mirrors in the figure.
- (iii) What must be the angle with respect to the incident light at which he should place the mirrors?
- (iv) Indicate the direction of rays in the figure.
- (e) If any of the mirrors is removed, will he be able to see the objects? (NCERT Exemplar)

- (i) Number of mirrors = 3
- (ii) Positions of the mirror are as shown in figure.
- (iii) Mirrors should be placed at 45° w.r.t. the incident light, so, that ray can move forward.
- (iv) Direction of rays is shown in figure.
- (v) He will not be able to see the objects if any of the mirrors is removed.

2. How is the phenomenon of reflection used in making a Kaleidoscope? What are the applications of a kaleidoscope? (NCERT Exemplar)

Kaleidoscope is a cylinder with mirrors containing loose coloured objects such as beads or pebbles and bits of glass. As the viewer looks into one end, light entering the other creates a colourful pattern due to reflection. Its application are given below :

- (i) It works on the principle of multiple reflection, where several mirror are placed at an angle (usually 60°) to one another. Typically there are three rectangular mirrors set at 60° to each other so that they form an equilateral triangle.

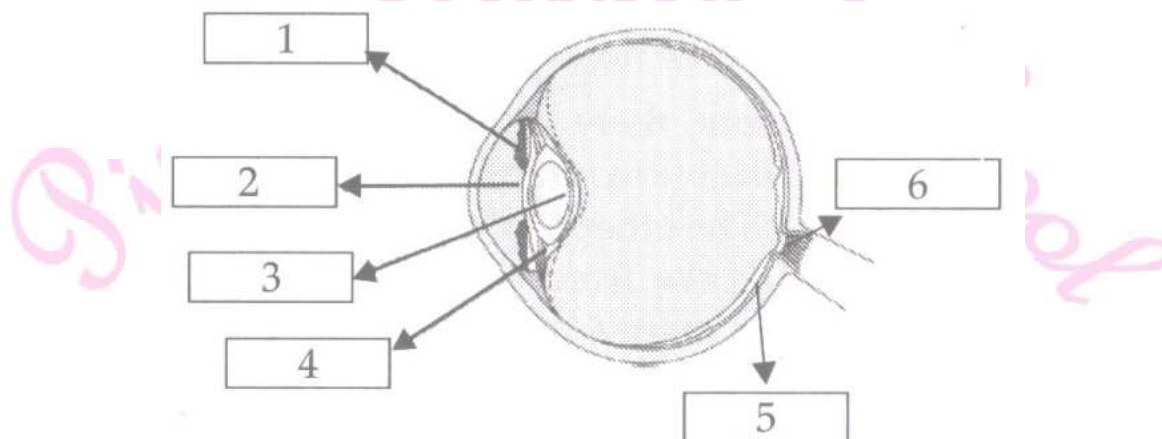


(ii) The 60° angle creates seven duplicate images of the objects, 5 at 60° and 2 at 90° .

As the tube is rotated, the tumbling of the coloured objects presents varying colours and patterns.

(iii) It is used in decoration purposes, toys etc.

3. Write down the names of parts of the eye in the blank spaces shown in fig. below.



4. How can you take care of the eyes?

Care of the eyes : It is necessary to take proper care of eyes. Few suggestions are as follows :

(i) If advised, use suitable spectacles.

(ii) Too little or too much light is bad for eyes. Insufficient light causes eye strain and headaches.

(iii) Do not look at the sun or a powerful light directly.

(iv) Never rub your eyes. If particles of dust go into your eyes wash your eyes with clean water.

(v) Always read at the normal distance for vision. Do not read by bringing the book too close to your eyes or keeping it too far.

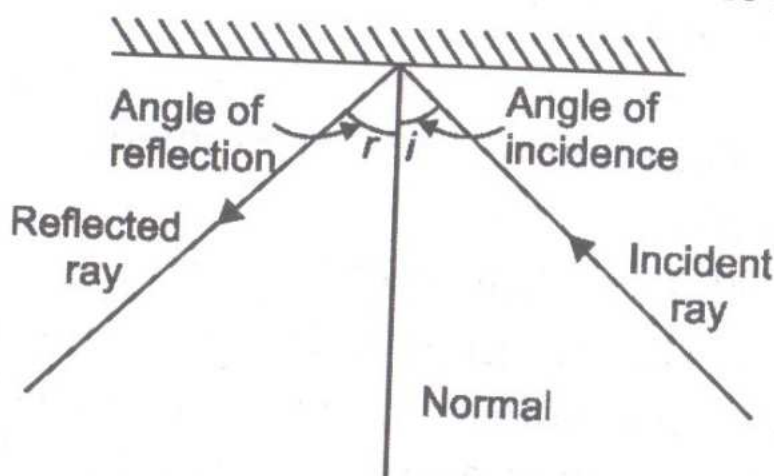
II. Long Answer Type Questions.

1. What is reflection of light? State the laws of reflection.

Reflection is a phenomenon in which a beam of light falls on some surface and returns back in different directions. It may be regular or irregular.

Following are the laws of reflection:

- (i) When a ray of light falls on a reflecting surface it is reflected back in such a way that the angle of incidence is equal to the angle of reflection, i.e. $\angle i = \angle r$.
- (ii) The incident ray, the normal and the reflected ray, all lie in the same plane.



2. What are the characteristics of image formed by plane mirror?

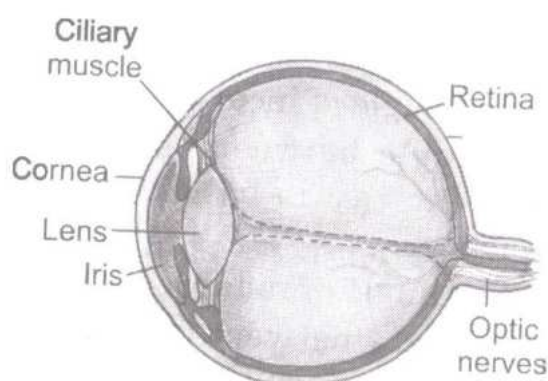
Characteristics of image formed by a plane mirror are;

- (i) Plane mirror forms virtual images.
- (ii) Plane mirror forms erect images.
- (iii) Image is laterally inverted.
- (iv) Image formed is of the same size as the object.
- (v) The distance of image from the mirror is equal to the distance of object from the mirror.

3. How will you prove that the angle of incidence is equal to the angle of reflection?

Draw lines showing the position of the plane mirror, the incident ray and the reflected ray on the paper with the help of your friends. Remove the mirror. Draw a line making an angle of 90° to the line representing the mirror at the point where the incident ray strikes the mirror. This line is known as the normal. The angle between the normal and incident ray is called the angle of incidence ($\angle i$). The angle between the normal and the reflected ray is known as the angle of reflection ($\angle r$). Measure the angle of incidence and the angle of reflection. Repeat the activity several times by changing the angle of incidence. You will see that at every time the angle of incidence is equal to the angle of reflection. This proves that the angle of incidence is equal to the angle of reflection.

4. Explain the structure and working of a human eye.



The eye has a roughly spherical shape. The outer coat of the eye is white. It is tough so that it can protect the interior of the eye from accident. Its transparent front part is called cornea. Behind the cornea, we find a dark muscular structure called iris. In this iris, there is a small opening called pupil. The size of the pupil is controlled by the iris. The iris controls the amount of light entering into the eye. Behind the pupil of the eye is a lens which is thicker at the centre. The lens focuses light on the retina. The retina contains several nerve cells. Sensations felt by the nerve cells are then transmitted to the brain through the optic nerves. There are two kinds of cells; cones and rods.

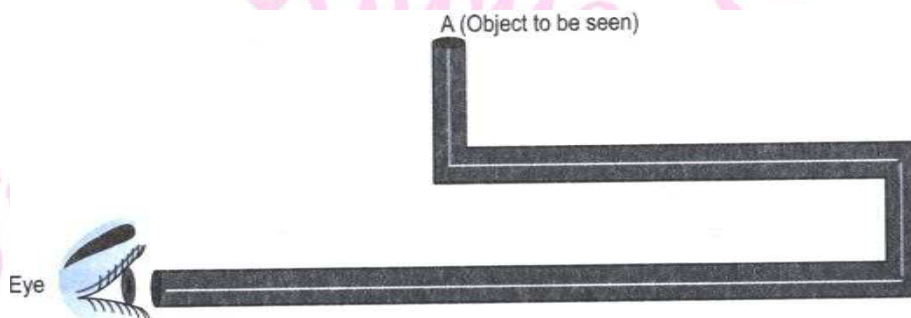
5. What is Braille system? Explain.

Braille is a method of writing for visually impaired person. This system was invented by Louis Braille in 1821 and adopted in 1932. He was also a blind person. In this method text is written on a thick paper using special symbols representing the letters of alphabet. Groups of dots are employed to write letters. There is Braille code for common languages. Mathematics and Scientific notation. Braille system has 63 dots patterns. Each pattern represents a letter, a combination of letters a common word or a grammatical sign. Dots are arranged in cells of two vertical rows of three dots each. Codes of music and mathematics are different. Any language can be read through the codes of Braille.

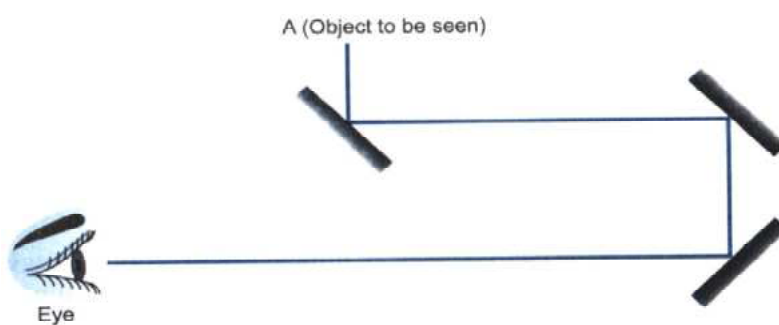


III. Long Answer Type Questions.

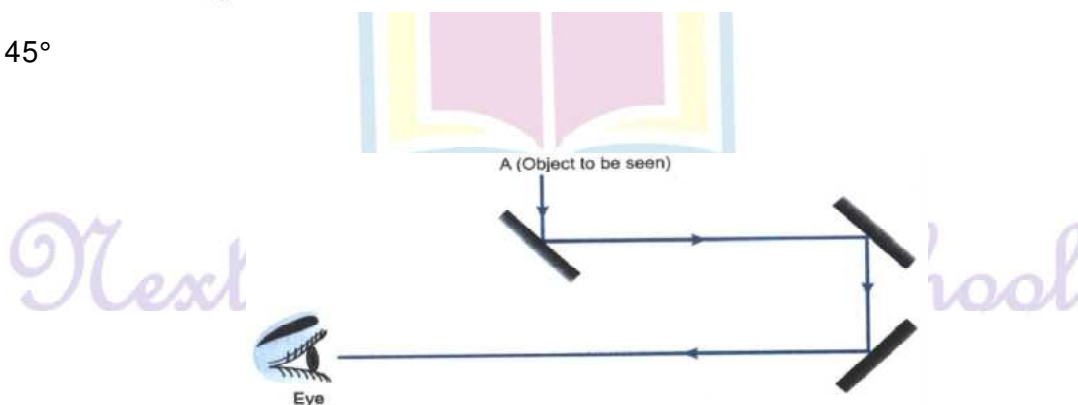
1. Boojho planned an activity to observe an object A through as shown in figure below, so that he could see objects which he could not directly see.



- How many mirrors should he use to see the objects?
- Indicate the positions of the mirror in the figure.
- What must be the angle with respect to the incident light at which he should place the mirrors?
- Indicate the direction of rays in the figure.
- If any of the mirror is removed, will he be able to see objects?
 - Three
 -



- 45°
-



- No, he will not be able to see the objects.

I. High Order Thinking Skills (HOTS) Questions.

1. What kind of lens is there in our eyes? Where does it form the image of an object?

Convex lens is present in our eyes. It forms the image of an object at retina.

2. Mention the name of device that is generally used by the designers of wall papers and fabrics.

Kaleidoscope is a device that is generally used by the designers of wallpapers and fabrics.

3. Light travels fastest in vacuum. Why?

Light travels fastest in vacuum because there is no obstruction to the passage of light in vacuum.

4. Why are we able to see the tap water in the glass even though it is colourless?

Tap water reflects the light into our eyes. As long as an object reflects light into our eyes, we can see it.

5. A safety vest helps keep the workers who are working by the roadside safe. This is especially seen during the nights. Why?

The reflectors on the safety vest reflect light into the motorists' eyes. This helps to alert the motorists of the wearer's presence on the road.

6. "Though the image formation on retina is inverted but still we are able to see the erect objects". Explain how.

Yes, it is very true to say because the formation of image on the retina is conveyed to brain in the form of electrical impulses with the help of optical nerve. So, brain is able to perceive an erect image of object with the help of electrical impulses.

7. Explain the reason for the following statement. We usually take some time to see the objects in a dim light room, when we enter into the room from bright sunlight outside.

Since, when we are in the bright sunlight at that moment iris causes the pupil to become smaller so that a little amount of light can enter the eye. Moreover, the rods of retina are also made to get adjusted in the same manner. And when a person enters into dim light room, then iris takes sometime to increase the pupil diameter, due to which large amount of light enters the eye, so that's why when we enter into the room from bright sunlight outside then we usually take some time to see the objects in a dim light room.

8. Rohan visited a lake on two days. On the first day, the reflection of the surrounding mountains could be seen clearly in water of the lake. On the second day, he was not able to see the reflection of the mountains clearly. Give one possible reason for this phenomenon and explain your answer clearly.

The unclear image of the mountains on the second day is probably due to wind blowing across the lake causing it to lose its calmness. When the lake is calm the surface of the lake is smooth and regular reflection occurs, allowing a clear image of the mountains to be formed. When the wind blows across the lake, the surface of the lake becomes rough and uneven causing a diffused reflection. Hence, the image formed of the mountains will be unclear and blurred.

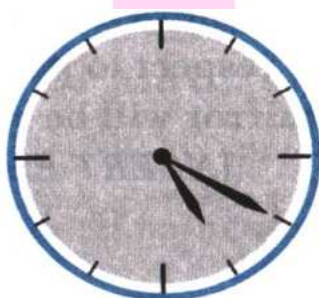
II. High Order Thinking Skills (HOTS) Questions.

1. Why is rainbow usually seen after heavy rainfall?

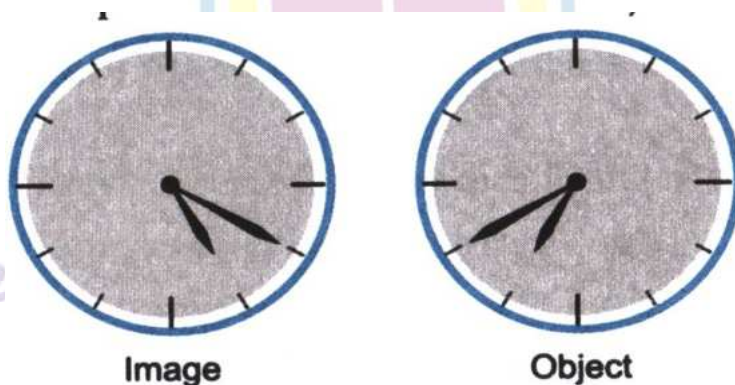
The rainbow is usually seen after heavy rainfall because after a rain shower, there are droplets of water in air, when sunlight passes through these water droplets, it splits into seven colours and forms rainbows.

2. What will happen if there were no photoreceptors in the eye?

If there are no photoreceptors. The brain will get no information about the image formed at retina and thus nothing could be seen.



The plane mirror forms laterally inverted image.



So, the time was 7.30.



4. What would happen if light incident on the mirror along the normal.

Angle of incidence = angle of reflection

And $\angle i$ (angle of incidence) = 0

So, $\angle r$ the light returns back to its path. = 0

So, the light returns back to its path.

Value Based Questions

1. Two students brought three big plane mirrors in their classroom for science fair. They fixed the three mirrors, one at the ceiling and the other two on the adjacent walls of the room. Since every student was able to see six images of himself/herself, students of other classes also came to see this and felt happy. A student of class VII was determined to know the reason behind it. He went to the library, consulted other students and next day came up with the correct answer.

(i) Mention the values depicted by the students of class VII.

(ii) Also, give the reason for seeing six images.

(i) The values depicted by the students of class VII are the determination and critical thinking.

(ii) As, the mirror on two adjacent walls inclined at an angle of 90° will form three images and the mirror on ceiling will form three images of the images formed by two perpendicular (90°) mirrors.

2. Vision is one of the wonderful gifts given to us by God. But most of the people never take care of their eyes. Care of eyes should be taken. Suggest some methods for proper eye care.

It is necessary to take proper care of our eyes. If there is any problem we should go to the eye specialist. Following are some precautions.

- i. Use suitable spectacles.
- ii. Too little and too much light is bad for eyes.
- iii. Do not look at the sun directly.
- iv. Never rub your eyes.
- v. Wash eyes with clean water.
- vi. Always read at the normal distance for vision.

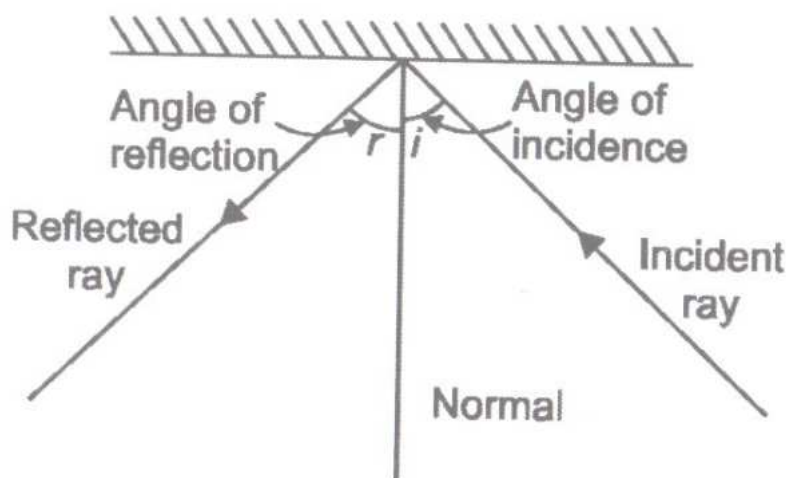
3. In a class room, there were four or five students who were not able to read the matter written on the blackboard. The other students of the class helped them to sit at the front seat, so that they could also read the matter written on the blackboard. What can be the reason behind it? What will you recommended to these students?

If students are unable to read the matter written on the black board, it indicates that they are suffering from short sightedness. These defect of the eyes can be corrected, by using suitable corrective lenses (spectacles of suitable power).

Skill Based Questions.

1. Draw a diagram to show the reflection of light and answer the following questions.

- What is angle of reflection(r)?
- What is angle of incidence (i)?
- What is the relation between angle of incidence and angle of reflection (i and r)?



- The angle between the normal and reflected ray is called the angle of reflection ($\angle r$).
- The angle between normal and incident ray is called the angle of incidence ($\angle i$).
- Angle of incidence = Angle of reflection or ($\angle i = \angle r$)

2. Draw a diagram to show image formation in a plane mirror and answer the following questions irrespective of plane mirror;

- What is the size of image of a 5 cm high object?
- What is the position of image if the object is placed at 10 cm far away from the mirror?
- What is the nature of image?

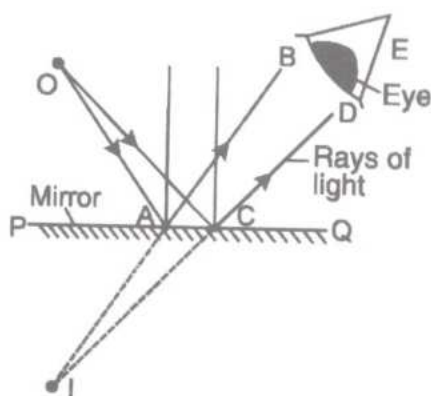


Image formation in a plane mirror.

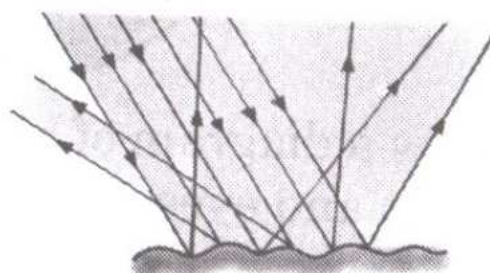
- (i) The size of image will be same as object i.e., 5 cm.
- (ii) The image is formed behind the mirror at 10 cm away from the mirror.
- (iii) The nature of image will be virtual and erect.

3. Draw the diagrams of;

(i) Irregular reflection

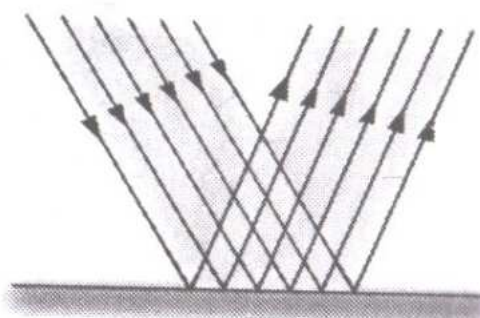
(ii) Regular reflection

(i)



Uneven surface
irregular reflection

(ii)



Even surface
regular reflection

4. Observe Fig 16.13, Page 205 of NCERT Textbook and answer the questions.

(i) What does this figure show?

(ii) Define the phenomenon.

(iii) Name the natural phenomenon due to this process.

(iv) How many colours are there in the sunlight? Name them.

(i) This figure shows the dispersion of light.

(ii) Splitting of white light into its constituent colours is known as dispersion of light.

(iii) The natural phenomenon is called rainbow.

(iv) There are seven colours in the sunlight. The names of the colours are;

Violet, Indigo, Blue, Green, Yellow, Orange, Red.

In short we know them by the word VIBGYOR.

5. Draw a diagram of human eye and label the following parts;

(i) Cornea

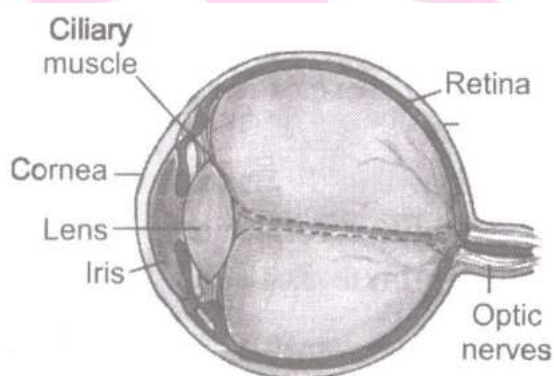
(ii) Lens

(iii) Iris

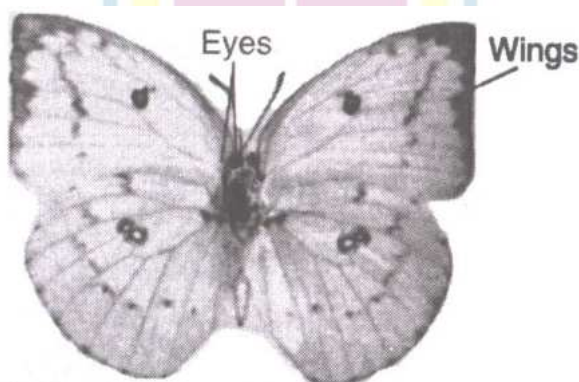
(iv) Ciliary muscles

(v) Retina

(vi) Optic Nerve

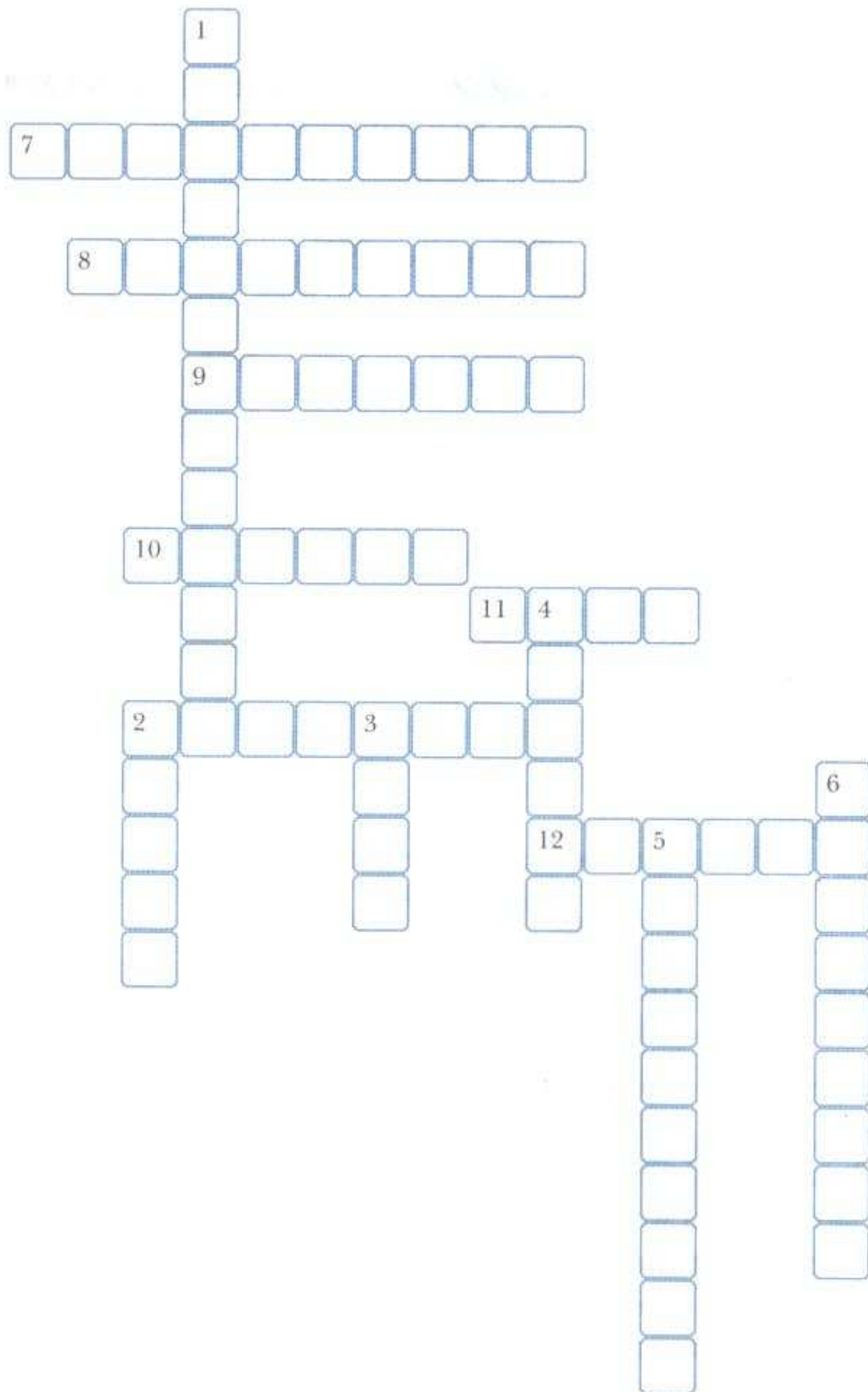


6. Draw a diagram of butterfly to show its wings and eyes.



A butterfly.

Cross word Puzzle





Across

2. The defect of the eye in which the eye fluid gets deposited on the lens
7. The splitting of white light into 7 colours
8. an instrument that is based on the application of multiple reflection
9. These protect the eyes from dust and bright light
10. The transparent cover of the front of the eye
11. Part of the eye that controls the amount of light entering the eye through the pupil.
12. A perpendicular to the surface of reflection.

Down

1. The inability to see near objects clearly
2. Photo receptors that help to detect colour
3. Photo-receptors that are sensitive to different
4. Part of the eye that behaves as a screen
5. The bouncing back of light in the same medium
6. The place on the retina where are no photo-receptors

Across

- | | | | |
|-------------|---------------|--------------|------------|
| 2. Cataract | 7. Dispersion | 8. Periscope | 9. Eyelids |
| 10. cornea | 11. Iris | 12. Normal | |

Down

- | | | | |
|------------------|--------------|---------|-----------|
| 1. Hypermetropia | 2. Cones | 3. Rods | 4. Retina |
| 5. reflection | 6. Blindspot | | |
-

Next Generation School