9

LIGHT AND SOUND

The knowledge we get about the world around us, is gained either by seeing or by listening to us. Light is required to see, we cannot see anything in darkness. Similarly, to listen, we need sound, if there is no sound, will we listen? Think how the world would be if there was no light and sound? Neither the colors of flowers and butterflies, nor rainbow, nor the dance of peacocks, nor the greenery of the earth, nor the starry sky plate, nor the chirping of birds, nor the whirring of whirlpools, nor the thunder of clouds, nor the sound of rivers, nor the movement of waterfalls , Neither Ravindra Sangeet, nor Lata Mangeshkar's songs. Life would become so dull.

To understand this world full of light and sound, let us try to know light and sound.

OBJECTIVES

After reading this lesson you will be able to:

- know the sources of light;
- understand the reflection of light;

- understand the refraction of light;
- understand sound, source of sound and transmission of sound.

9.1 SOURCES OF LIGHT

We see different things around us. Some of these objects have their own light, such as the Sun. We call these objects astrological objects. Unlike them, objects which do not emit their own light are called lightless objects. Astrological objects are sources of light, we can see the lightless objects through the light that emanates from them.

The types of lightless objects

The objects which are made up of lightless objects, can be divided into three classes in terms of transmission of light

(a) Transparent: which means those materials that can be seen through. Light passes through materials easily. These materials are called medium of light. Examples of transparent substances are air, water, glass,etc.

(b) Permitter: materials which appear blurred across. Like grated glass, oiled paper etc.

(c) Opaque: means materials that cannot be seen through. They act as a barrier in the path of light. Like metals, wood, stones etc.

Sources of natural and artificial light

Seeing the shining moon at night and its moonlight spread all around, we may sometimes get the illusion that the moon is an

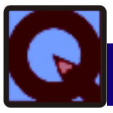
astrological body.But you know that there is a human movement on the surface of the moon. It does not have its own light. Moonlight is the sunlight reflected by the moon. All the stars in the sky, including the Sun, are natural sources of light and all the planets, satellites and planets shine through the light of the stars. To work in the dark, man has also created some artificial light sources such as electric bulbs, fluorescent tubes, kerosene lamps, gas fired lamps, etc.

Hot and Cold Light Sources

Most of the light sources have light as well as heat. All such sources are called hot light sources. Sun, electricity, bulbs, burning candles etc. are hot light sources. But in some light sources, most of the energy is released in the form of light. We can touch these, fluorescent tubes, firefly etc. are such light sources. These are called cold light sources.

Differences in the intensity of light sources

Not all light sources are equally bright. We cannot see anything in the light of a firefly, and many times more light comes out of an electric bulb than a candle. As the light source moves away from us, it starts to appear less bright. For this reason, many stars in the sky are bigger and brighter than the sun, but we see them as shining points.



INTEXT QUESTIONS 9.1

Fill in the blanks:

1. ..... is a transparent substance and ..... opaque.

2. If you apply oil on the paper, it becomes …….

3. The moon reflects sunlight, …….its own light

4. ..... is a cold light source.

9.2 MOVEMENT OF LIGHT

In a medium, light travels at a very fast speed from one place to another. Its speed is 2.25 lakh kilometers per second in water and 2 lakh kilometers per second in glass. Light can also run in vacuum.

After all, there is only a few hundred kilometers between the Earth and the Sun are vacuumed, yet the sunlight reaches the Earth. In fact, the speed of light in vacuum is 3 lakh kilometers per second. No object in our universe can move faster than this.

In one medium, light moves in a straight line from one place to another. You can easily understand this fact through an activity.

ACTIVITY 9.1

What you need to do: See that light moves in a straight line.

What you need: a candle, a given needle, a thin rubber tube.

How do you do: Burn the candle and place it on the table. Try to see the flame of the candle through the rubber hose giving it different shapes. Can you see the candle without shaping the rubber hose?

What You Seen: The candle is visible only when the rubber tube is straight. The flame of the candle does not appear even

when the tube is slightly shaped. From this we can conclude that light moves in a straight line.

Due to the movement of light in a simple line, we see many natural phenomena happening, such as the formation of shadows, solar eclipse and lunar eclipse etc.

Formation of shadows

If an opaque body is placed in the path of light spreading from a light source, then on the other side of that light-blocking body will form a black figure like it, which is called its shadow. Shadows (as depicted in the picture) are caused by light moving along a straight line. If the light source is not a point form, then a less black shadow is formed around the more black shadow formed in the middle.

If the light source is larger than the light-blocking body, the size of the shadow decreases by increasing the distance of the curtain and after a particular distance only the shadow is formed on the screen. That is why the shadow of a bird flying at very high height does not appear to be formed on the earth.

The size of shadow changes if the position of the light source is changed by keeping the light-blocking body and curtain in place. You may have also realized that your shadow is longer in the morning-evening and less in the afternoon. As the sun rises above the horizon, the length of the shadow decreases. In the afternoon when the sun is just above the head, the shadow does not appear. Later in the afternoon, as the sun sets, the length of the shadow increases.

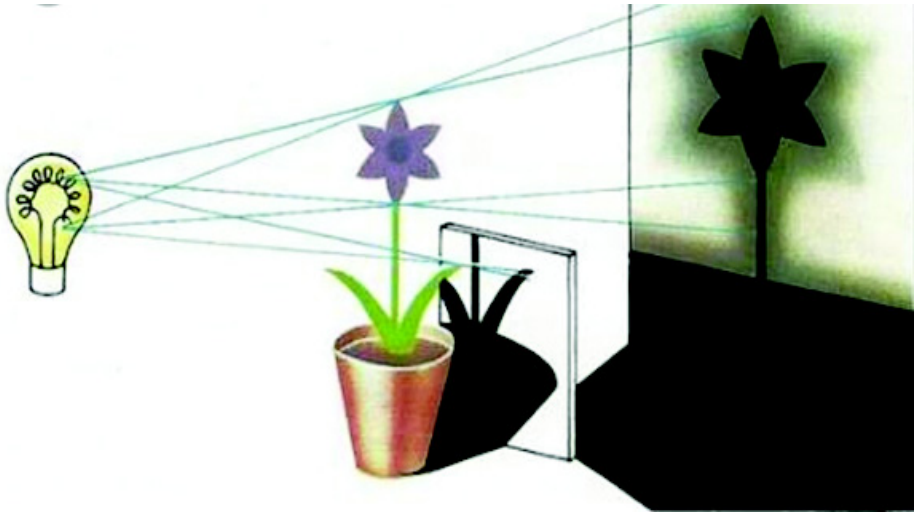


Fig. 9.1 Formation of shadow

When we compare the length of the shadow of different objects at any time of the day, we come to know that the higher the object is the longer its shadow becomes. We can use this fact to find the height of a tree or building, as explained in the activity below.

ACTIVITY 9.2

What you need to do: Find the height of the tree by comparing the length of the shadows.

What you need: a meter scale, a long straight rod, a shovel for digging.

How to do you: On a sunny day, straight away from the shadow of the tree, drive the vertical rod. Measure the height (AB) of the rod over the earth and the length of the rod and tree shadows with the help of meter scale.

Now since PQ and QR are proportional and AB and BC are proportional.

PQR - ABC So we can do that PQ = AB

OR BC

Hence the height of the tree PQ - AB X QR

BC

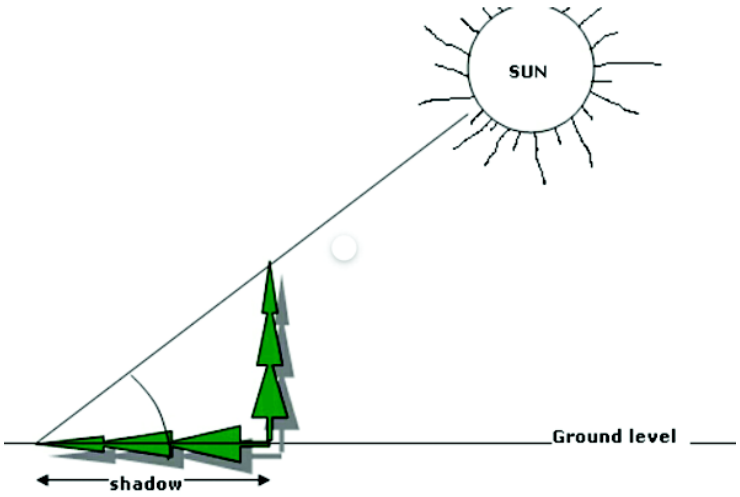


Fig. 9.2 Finding the height of the tree

Eclipse

You must have seen the solar eclipse and the lunar eclipse. These events happening in the sky are also a game of shadows. Let us know about them in some detail.

1. Lunar Eclipse

You know that the Earth revolves around the Sun on an elliptical path and the moon also revolves on a similar path around the earth. When the sun, earth and the moon come in a straight line and the earth is between the sun and the moon, the shadow of the earth falls on the moon, the part of the moon that shines with sunlight loses its luster, without the rays of the sun. This is called

lunar eclipse. Whenever the lunar eclipse occurs, it happens only on the full moon day because on this day the earth comes between the sun and the moon.

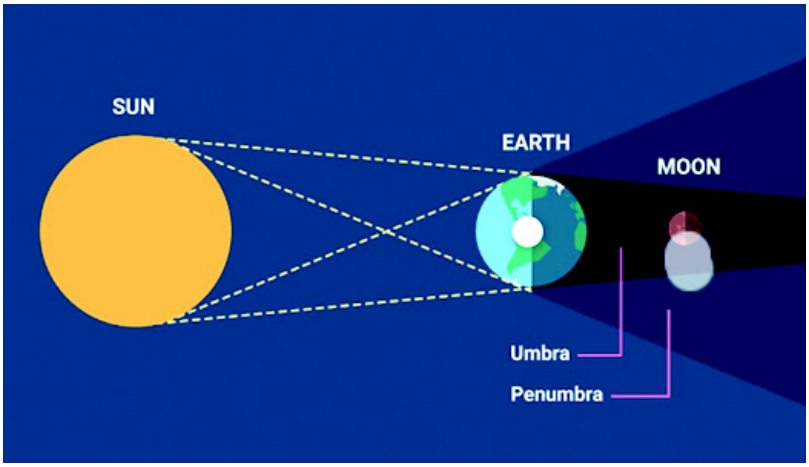


Fig. 9.3 Lunar Eclipse

2. Solar eclipse

When the sun, moon and earth come in a straight line and the moon is between the sun and the earth, the shadow of the moon falls on the earth. The sun is not fully visible to the people of the part of the Earth where the moon is cast. Then there is a solar eclipse for them. Whenever a solar eclipse occurs, it happens on the day of the new moon, because the moon comes between the earth and the sun on the new moon.

You must be wondering that when every full moon comes between the Earth, the Sun and the Moon, and every New Moon falls between the Moon, the Sun and the Earth, then why is there not a lunar eclipse on every full moon and a solar eclipse on every new moon? You probably know that the orbit of the earth and the moon is not in the same plane. These are somewhat bent relative to each other. Eclipses occur only when the moon is at

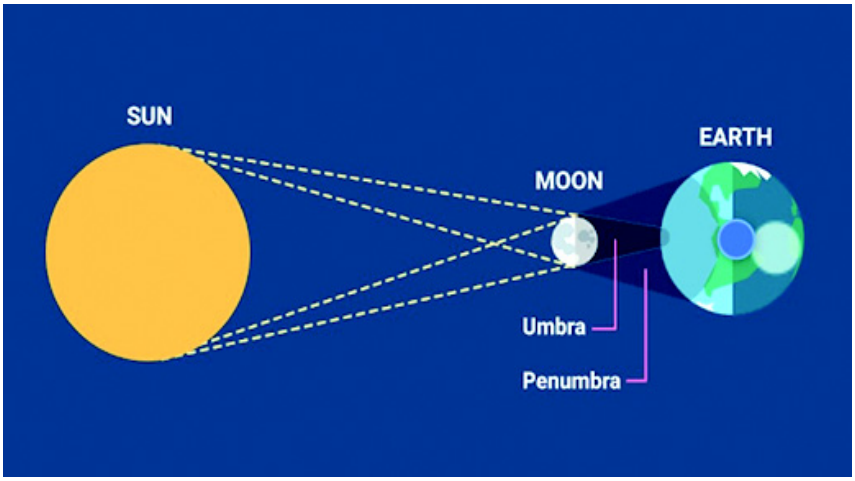


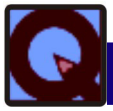
Fig. 9.4 Solar Eclipse

the intersection of these two bodies on the full moon or new moon day. It occurs only after a certain period of time, that can be calculated.

You must have also heard that a total solar eclipse, that is, a solar eclipse, in which the whole sun hides behind the moon, is an extremely rare event. Often a partial solar eclipse occurs, while solar lunar eclipse is a common occurrence. The reason for this is that the diameter of the Earth's shadow at the distance of the Moon is three times the diameter of the Moon, so the Moon completely covers the Earth's shadow and it takes time for the Moon to come out of it. The Moon is much smaller than the Sun. It looks much larger in size as the Moon is much closer to the Earth than the Sun. Such a situation is rare when the whole sun can hide behind the moon.

Scientists study them at the time of solar eclipse and lunar eclipse to get many types of information about the sun and the moon. But you should keep in mind that even at the time of solar eclipse,

one should not see the sun with naked eyes. Because even at the time of solar eclipse, very intense rays keep coming out of it, which can damage the eyes. If you want to see the sun at the time of solar eclipse, then clean a big piece of glass and apply kajal on it and then look at the sun from it.



INTEXT QUESTIONS 9.2

1. The formation of a shadow is based on which property of light?
2. On what days does solar eclipse and lunar eclipse occur?
3. Will the point form light source become shadow?
4. If the curtain is moved back while keeping the object and light source stable, does the size of the shadow decrease or increase?
5. What are the relative positions of the Sun Moon and Earth in a lunar eclipse?

9.3 REFLECTION OF LIGHT

Light moves in a medium, it moves in a straight line. So, to express the path of light, we can use a simple line with an arrow symbol above it. Such a simple line with an arrow symbol is called ray. The ray shows the direction of moving light. The collection of many rays is called a beam. There can be three types of beam:

(i) Parallel beam: A group of rays in which all the rays are parallel to each other.

(ii) Convergent beam: It is the beam in which different rays coming from different directions are concentrating towards a point.

(iii) Divergent beam: It is a beam from which different rays propagate from a point in different directions.

When the light travelling in a medium strikes an object then according to the tendency of the object, it may have the following speeds.:

- If the object is opaque, some part of the light collides with the object and it is absorbed into the object.
- But if the object is transparent, along with being absorbed and dispersed, a large part of the light passes through that object and passes to the other side.
- If the surface of the object is made smooth, shiny, and no light can pass through it, then most of the light falling on the object collides with it and returns as if the carrom pieces hit the wall of the carrom-board. This process of returning light after hitting the surface of the object is called reflection. Reflection of light is according to certain rules, which are called laws of reflection.

Laws of Reflection

1. The ray coming from the direction of light, which we call incident ray, strikes the reflecting surface (ie mirror) a ray showing the direction of going back of light i.e. reflected ray and point of incidence (the point above the mirror at which the incident ray strikes) the line above (the line angled 90 from the bottom of the mirror), are all in the same plane.
2. The angle of reflection (the angle between the normal and reflected ray) is equal to the angle of incidence (the angle between the incident ray and the normal).

Mirror and its types

Mirror in which you groom your hair everyday is a flat mirror. In the fairs, you will often see a room in which your ridiculously distorted pictures are made in the mirrors. These are curved mirrors. A special category of curved mirrors are spherical mirrors, which can be understood as a fraction of a hollow glass sphere.

Spherical mirrors are of two types:

(i) Concave mirrors - on which the polished silver is mounted in such a way that their suppressed internal surface acts as a mirror.

(ii) Convex mirrors - on which the silver is polished in such a way that their outer, embossed surface serves as a mirror.

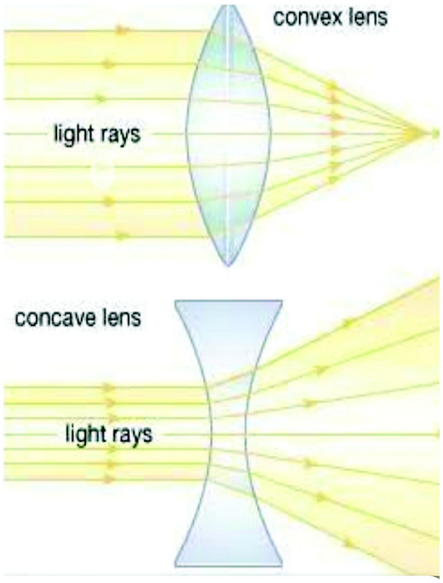


Fig. 9.5 (a) Concave Mirrors (b) Convex Mirrors

Properties of images made in mirrors- The study of the images made in different types of mirrors mentioned above will be interesting. Let us study the images made by these mirrors one by one.

ACTIVITY 9.3

What you need to do: Study of the image formed by a plane mirror.

What you need: makeup table, inch tape candle, rectangular piece of grinded glass.

How to do:

1. Draw a vertical line on the mirror of the makeup table and mark it at half-a-meter distance with the help of inch tape. Stand on the first half meter sign and see the position of your image. Half a meter back then look at the image position.
2. Measure the exact height of your friend. Standing in front of a mirror, get the height of the image.
3. Burn a candle in front of the mirror. And try to get the reflection of the converted light from the mirror on the worn glass screen.
4. Raise your right hand up and see which of your hands raises the reflection?
5. See whether the image head is up or it is upside down.

What you saw:

1. When we stand 1/2 a meter ahead of the mirror, the reflection is formed 1/2 a meter behind the mirror and when we stand 1 meter ahead the reflection is formed 1 meter back.

2. The height of the image in the mirror is exactly equal to the height of the friend.
3. The screen is shining on the worn glass screen, but the image is not formed.
4. When we raise our right hand up, the image of our left hand raises.
5. Our image also stands upright.

Conclusion: From all these observations we can conclude that the characteristics of the image formed in a plane mirror are as follows.-

1. The reflection of the mirror is formed as far back as the object is placed.
2. The image size is exactly equal to the size of the object.
3. The mirror image cannot be taken on screen, so it is an upcoming image.
4. It is turned to the left in the image which is on our right side, ie, the image gets lateralized.
5. Image is made straight.

ACTIVITY 9.4

What you need to do: To study images made of convex reflective surfaces.

How you need: a shiny steel ladle.

How to do:

1. See the Image of your face on the outer, embossed surface

of the ladle. Is it smaller than the actual size of your face? It is forming ahead or behind the surface. Is the image becoming erect or inverted?

2. Bring the ladle near the face and see if the size is small or big? Does the image come near or go away?

What you noticed:

1. Small, straight, reflection image is formed behind the surface from the convex surface. It is a virtual image.
2. By bringing the ladle close to the face, the size of the image increases somewhat and it comes close but the image can never be equal to the actual size of the object.

Conclusion: From this we can conclude that the surface in a convex mirror forms a small, straight virtual image behind the mirror. As we move the object towards the mirror, the image also comes towards the mirror and its size increases.

ACTIVITY 9.5

What you need to do: Study the reflection made of a concave surface.

What you need: a big spread steel ladle.

How to do:

1. Hold the ladle while keeping the inside of the ladle facing towards you and look at your face (keep the ladle at the maximum distance from you). What does the image look

like? small or big? Direct or reverse? Is it ahead or back? Try to touch it, can you touch it?

2. Bring the ladle slowly towards yourself. Image size is decreasing or increasing? Is it coming near or moving away? What are the other characteristics changing?
3. Keep your finger very close to the ladle and see its reflection. Is it small or big? Is it upside down or straight ahead of the mirror or at the back?

What you saw:

1. The inside surface of the ladle, which acts like a concave mirror, is initially a small, inverted image in front of the mirror. It can be touched, so it can be taken on screen and is a real image.
2. As the face approaches the ladle, the image gets far from the ladle and its size increases. But the image formed is always inverted and it is the real image.
3. When you place the finger very close to the ladle, its straight, big image is formed behind the ladle.

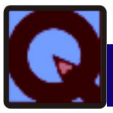
From this we conclude that:

1. A concave mirror has a particular distance, called the focus distance. When the object is placed in front of the mirror beyond this distance, the reverse image is formed in front of the mirror.
2. By increasing the distance of the object from the mirror, the image moves towards the mirror and it becomes smaller.

3. When placing the object between the focus distance and the mirror, its direct, virtual, large image is formed behind the mirror.

Uses of Mirrors

1. For viewing face, devices such as periscope cameras use flat mirrors to change the path of light.
2. Used for shaving, mirrors used by dental doctors, concave mirrors in vehicles headlight or search light etc.
3. The mirror that is placed near the bus driver to see the back traffic is a convex mirror.



INTEXT QUESTIONS 9.3

1. An incident light beam makes an angle of 30 ° on a plane mirror. What will be the value of its relative reflection angle?
2. If we moved one step towards the plane mirror, how many steps would be reduced between us and the reflection?
3. What image is formed in a plane mirror, virtual or real?
4. How to recognize plane, convex and concave mirrors without touching them, if they look alike?

9.4 REFRACTION OF LIGHT

In a medium, light moves along a simple linear path. But when it deviates from its simple linear path on a surface separating a medium. This divergence of light is called refraction and follows certain rules, called laws of refraction.

Laws of Refraction

1. The incident ray, reflected ray and the normal, to the interface of any two given mediums; all lie in the same plane.
2. When the light ray passes from rarer medium to denser medium it bends towards the normal and when the ray enters a denser medium to the rarer medium it moves away from the normal.

(A) Transmission of light in a rectangular piece of glass

When light passes through a rectangular piece of glass then two times refraction occurs. The first is when the light beam enters the glass from the air on the lateral AB. In this refraction, it turns towards the normal. And secondly when it exits the glass to air on lateral T then it moves away from the normal. It can be easily seen here that the output angle is equal to the incidence angle. That is, the output ray remains parallel to the incident ray. There is no angular deviation, only it diverges slightly from the path of the incident ray.

(b) Transmission of light in a glass prism

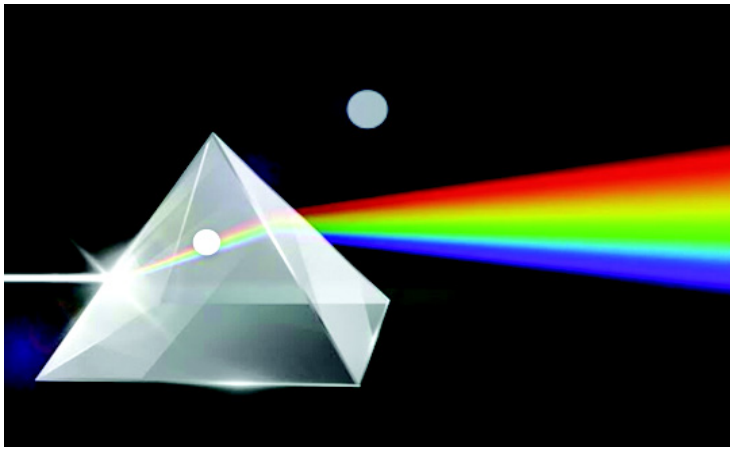


Fig. 9.6 Transmission of light in a rectangular piece of glass

Prism is a solid whose top and base are triangular and sides are rectangular. Even when passing through a prism, light refracts twice like a pellet. But the total result of these two refractions is that the output beam rotates at an angle relative to the incident ray, which is called the deviation angle. The result is that the incident ray rotates towards the top of the prism and proceeds towards the base of the prism.

Lens

A piece of transparent material, which has at least one spherical surface, is called a lens. Two types of lenses are commonly used:

(i) Convex lens - both of which have convex surfaces.

(ii) Concave lens - both surfaces of which are concave.

1. Refraction of light in lenses

We can consider lenses to consist of several prism segments. In the convex lens, the base of this prism segments is towards the principal axis if a parallel beam passes through it, on the other hand it will be released as a central beam due to the bending of the rays towards the base of the prism segments i.e. the main axis. Convex lens converts parallel beam into a point beam, hence is called a concentric lens.

In the concave lens, the bases of the prism-segments are beyond the principal axis, so a parallel light beam passing through them emanates as a divergent beam. Therefore a concave lens is called a divergent lens.

2. Use of Lenses

You have fitted lenses with microscopes, telescopes, glasses, cameras and projectors. Must have seen a variety of light-instruments have been developed by combining mirrors and lenses. The convex lens can be used as a magnifier.

INTEXT QUESTIONS 9.4

I. Fill in the blanks of the following sentences:

1. When a light beam moves from a dense medium to a rarer medium, the value of the angle of refraction is ..... from the reflection angle.
2. There is …….. the refraction of light in a rectangular glass tube, yet there is no angular deviation.
3. In passing through a glass prism, the light beam from the base of the prism moves towards the…….
4. A convex lens is a ..... lens and a concave lens is a ..... lens.
5. …….. Lenses can be used to burn paper.

9.5 EYE AND VISION DEFECTS

The human eye is an amazing spherical sense organ of about one inch in diameter. The main components of its structure are shown in the accompanying figure. The translucent layer in the front is a small hole in the black, blue, green or brown round iris just behind the cornea called the pupil. The iris shrinks into darkness and increases the size of the pupil and in lights it reduces its size.

The eye lens, made of fibrous transparent material behind the pupil, is controlled between the ciliary muscles. When looking at distant objects, the ciliary muscles reduce the thickness of the eye lens by remaining in a relaxed state. That is, the curvature increases the radius or focus distance, and when looking at a nearby object, they increase the thickness of the lens by putting pressure on it. That is, curvature reduces the radius or focus distance. Thus, irrespective of the distance the object is placed from the eye, the reflection of the lens becomes its image on the retina by adjusting the distance. The image of the retina is converted into electrical waves and reaches the brain through the light nerves.

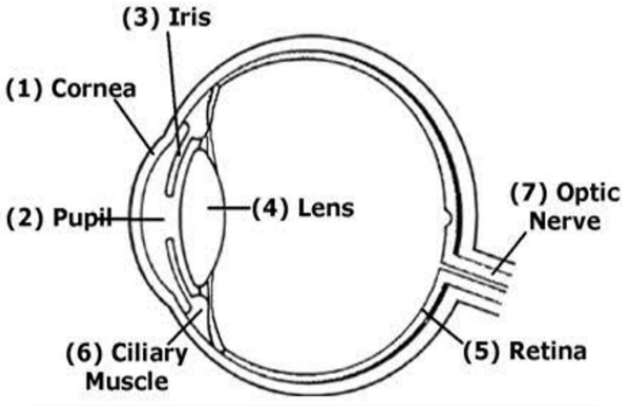


Fig. 9.7 Structure of the human eye

Visibility defect

If for some reason the thickness of the eye lens increases permanently, then the rays coming from a distant object focus on a point between the lens and retina, rather than focus on the retina and the object does not appear clear (Figure 9.19). This defect of vision is called myopia. To overcome this defect one has to apply glasses with a concave lens of suitable focus distance. (Fig. 9.19).

Ciliary muscles lose their ability to stress the lens with increasing age. Then the image of the object placed nearby is not formed on the retina instead it is formed at some point behind the retina and the object is not clearly visible (Figure 9.19). This defect of vision is called far-sightedness. A convex lens of suitable focus distance is used to correct this defect (Figure 9.19).

INTEXT QUESTIONS 9.5

1. Whether the focus distance of the eye lens changes automatically according to the distance of the object?
2. Why is nothing visible when you go from absolute light to dark?
3. If the image of a distant object becomes ahead of the retina, then is there an myopia defect in the eye?
4. Which lens is used to correct myopia?

9.6 Sound

Sound is the second important form of energy after light, which connects us to our environment and gives us a sense of the changes in it. Hearing the creaking of the door, we understand whether someone came in or went out. Sitting in the house, standing outside, the murmur of the leaves of the tree makes us understand that there is strong wind. Through the use of sounds, we talk to each other and convey our thoughts and feelings to each other. Some sounds relieve the tension of the mind and some increase the tension. How do these different kinds of sounds around us arise? How does it travel from place to place? How are you heard? What are the basic differences between different types of sounds? We will try to know all this in this section.

Sound source

The next time you sing or talk to someone, place a palm over your neck. What do you feel? There is vibration in the throat to make a sound. In fact, every source of sound is a vibrating object. Usually these vibrations do not appear. But they can be made visible or experienced. Touch the school bell immediately after hammer, you will be able to experience these vibrations. If you hit the drum by putting some thermocol pieces on the drum of the school band, you can see those bullets dancing up and down with the sound.

Vibration or oscillation

The movement of an object repeatedly around its middle position is called oscillation or vibration. Let us look at a simple oscillating motion and study it.

ACTIVITY 9.6

What you need to do: Study a simple oscillating motion.

What you need: A small piece of stone with a strong thread, a nail.

How to do you:

1. Tie a stone on one end of the thread.
2. Put a stone tied with a thread and hang it on the nail by knocking the nail in the wall.
3. Move the stone slightly aside and study its speed.

What you saw: Leaving the stone from position B, it crosses the middle position A to C and then returns to B. This type of motion is frequent and finally the stone stops at point A.

The stone hanging on the thread repeatedly comes to either side of a midpoint. Hence its speed is oscillation speed.

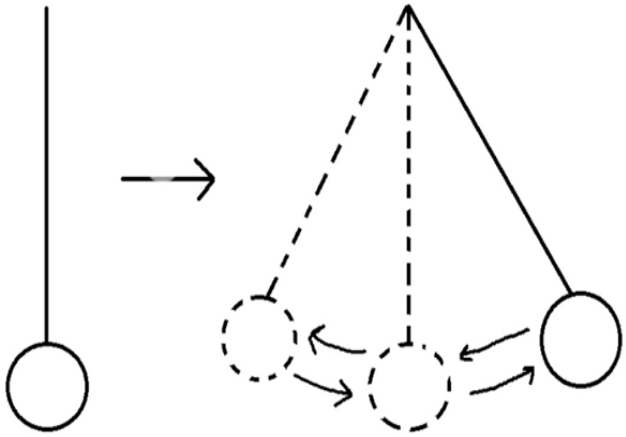


Fig. 9.8 Oscillation speed

The following facts are worth knowing about this motion.

1. Stone from A to B, B to A, A to C and C back to A, this whole cycle is called an oscillation.
2. The time taken by stone to complete an oscillation is called its oscillation period.
3. The oscillation that a stone completes in a second is its oscillation called frequency. The unit of frequency is hertz.
4. The maximum displacement of a stone from the middle position A to one side (AB or AC)is called oscillation.

Transmission of sound

When the source of sound vibrated, the molecules of air in its contact also start vibrating accordingly. These molecules generate vibrations in the molecules near to them and this cycle continues. In this way, the sound travels from one place to another. This means that a medium is needed for the sound to travel. Then the medium should be solid, liquid or gas. Sound in vacuum cannot travel from one place to another. There is no atmosphere on the moon, so we cannot talk directly to each other on the surface of the moon.

Characteristics helpful in identifying different types of sounds

Hit a drum gently first, then hit it again with force. In which case the vibrations have more amplitude? When does the sound get louder? Obviously, the higher the amplitude of the vibrations, the greater the intensity of the sound.

One end of a rubber band is stuck in the nail and hold the other end in the left hand. Listen to its sound by producing vibrations in it with the right hand. Pull the rubber band to increase tension and make it vibrate again and hear the sound. In which case a more loud sound is produced? Increasing the tension in the rubber band increases the frequency of its vibrations. As a result, the sound produced may be loud. This property of sound is called pitch. The voice of the girl is more than the voice of the boy.

The quality of sound that causes us to recognize a person by his voice is called Timbre.

Therefore: we can say that loudness, pitch and timbre are special properties that make sounds different from each other.

Music and noise

The sequence of sounds coming in a particular order which produces a pleasing effect on the ears is called music.

Noises that come in an intermittent order that are distasteful and cause tension are called noise.

Ultrasonic and Infrasonic Sounds

Normal human ears hear only the frequencies of 20Hz to 20000 Hz. Sounds of less than 20 Hz are infrasonic waves and sounds of more than 20,000 Hz are called ultrasonic waves.

Eye and ear protection

The eye and ear are our most important knowledge centers. Therefore, we should take special care of their safety. As a straw should not be placed in the ear, it can damage the eardrum. Eyes should be protected from strong sunlight and dust. Sunglasses should be worn. No medicine should be put in the eye or ear without doctor's advice. Eyes should be washed daily with cold water.

INTEXT QUESTIONS 9.6

1. An object vibrates 50 in 10 seconds. What is its frequency?
2. An oscillator runs 50 mm from one end to the other. What is its oscillation?
3. Why not put a straw in the ear?
4. Can you hear the sound of 60,000 () frequency?
5. Will there be difficulty in talking to each other on the moon?

WHAT HAVE YOU LEARNT

- Light is that form of energy that helps us see.
- The objects from which their own light is emitted are astrological bodies, called sources of light.
- There can be three types of non-light objects
  (a) Transparent through which they can be seen,
  (b) Translucent -who have blurred view
  (c) Opaque - through which one cannot see.
- Light, because it moves along a simple line, if an opaque object comes in its path, then its shadow is formed on the other side of the object.
- Lunar eclipse occurs from the shadow of the Earth on the moon and solar eclipse from the shadow of the moon on the Earth.
- Smooth bright surface is called a mirror, because most of the light falling on it gets reflected. Generally, three types of mirrors are used - plane, convex and concave.
- When placing objects in some special positions with a concave mirror, their inverted images are formed in front of the mirror, which can be taken on screen. Such an image is called image.
- The light beam deviates from its linear path upon entering from one medium to another. This deviation from the simple linear path of the light beam is called refraction.
- A convex lens is a concentric lens and a concave lens is a divergent lens.

- The eyes are the part of our body from which we see.
- If the eye does not see the distant object clearly, then there is a defect of myopia which is due to increased thickness of the eye-lens. To overcome this, use a concave lens.
- If the eye cannot see the nearby object clearly, then there is a defect of hyperopia. Convex lenses are used to correct this defect.
- The source of the sound is a vibrating object and a medium is needed for sound to travel.
- Ear is our second important knowledge after eye, we should be careful to protect it.
- Loudness, pitch, and timber are special properties that make sounds different from each other.

TERMINAL QUESTIONS

1. Write the names of the four natural sources of light.
2. Write the names of five man-made sources of light.
3. A 3m long shadow of a tree is formed in the sun. At the same time 1m long rods shadow of 50cm long is formed. What is the height of the tree?
4. At what time of day is the shadow size lowest?
5. Why is the moon not considered an astrological body?
6. Why do the shadows of birds flying at high altitudes not form on the earth?
7. Why do we not see a circular lunar eclipse?

8. Why is there no eclipse on every full moon or new moon day?
9. Why are some light sources are cold and some warm?
10. What is the difference between real and virtual images?
11. What does lateral change mean? Write any three letters in the English alphabet, whose images do not show any lateral changes?
12. What are the types of spherical mirrors? Which spherical mirror can make both real and virtual images?
13. Write three properties of the image formed by a plane mirror.
14. If a person's glasses have a concave lens, then his eye has which vision defect?
15. What is the difference between reflection and refraction?
16. Why do we not hear bats scream?
17. A whale fish says something to his friend located 75km away. How long will the voice reach its friend? (When the velocity of sound is 1500ms-1.)
18. Draw a nominated picture of the human eye and explain its working method.
19. Draw a nominated picture of the human ear and explain its working method.
20. Write one use of each of the following:

    (i) plane mirror (ii) convex mirror (iii) concave mirror (iv) convex lens (v) concave lens

Learn more

The story of Jals Verne in "Captain Haterus's Adventure Trips" ' In a 48° temperature condition, In order to overcome the discomfort of the troubled team when no means of burning the fire were found, the Dr. Clobony used to burn the fire by making the transparent section of ice in the form of a convex lens and focusing the sun's rays on dry wood and straw. The use of ice to light a fire seems strange, isn't it. But you too can try this experiment. Fill a large bowl with water and store it in the fridge. Take out the ice lens by heating the bottom of the bowl slightly, focus the rays of sun from this lens on a paper. Paper will start burning.

The famous scientist Archimedes was the courtier of King Hiero of Syracuse, a small country in Greece. It is said that when the neighboring country attacked Syracuse, Archimedes placed large mirrors on the Syracuse hills, sun rays focused on the boats of the enemy and burned their sails and dipped them by throwing stones with special slings. Can you tell which mirrors Archimedes would have used?

ANSWERS TO INTEXT QUESTIONS

9.1

1. glass, wood
2. translucent
3. it does not have
4. Firefly

9.2

1. On the quality of light moving in a straight line
2. Solar eclipse new moon and lunar eclipse-full moon
3. No
4. It is low
5. Earth, Sun and Moon are in a straight line.

9.3

1. 60
2. Two-step
3. virtual
4. The image of the object in front of the plane mirror will always be the same size as of the object. In a convex mirror, the image of the objects in front is formed small and straightened and the image of the object increases by bringing it close to the mirror but never equal to the actual size of the object.

   The image of the object in front of a concave mirror is large and inverted, but as the object is brought near it, the image becomes straight and small.

9.4

1. more
2. twice
3. and
4. convergent, divergent
5. convex

9.5

1. yes
2. because the pupil of the eye is very small at that time.
3. Yes,
4. Concave lens

9.6

1. 5 vibrations / second
2. 25 km
3. Eardrum may burst
4. No
5. Will not be able to talk due to lack of medium.