

Light

Formation of umbra and penumbra

In our day to day life umbra or shadow can be seen frequently.

The umbra is the innermost and darkest part or dark center portion of a shadow.

1).What is the difference between umbra and penumbra?

- Umbra, it is the portion of shadow where no light reaches from the source of light due to the opaque object. It is completely dark.
- Penumbra, it is the portion of shadow where portion of light from the source of light reaches the opaque object in between them. It is not completely dark.

Draw a Figure 9.2

- According to above Figure, the shadow or the umbra of the ball can be clearly observed on the screen due to the light emitted from the candle does not pass through the opaque ball.

Draw a Figure 9.4

- According to above Figure - A sharp umbra is formed on the screen when transparent glass sheet is placed before the ball due to light travel through a cardboard sheet.
 - A blurred umbra is formed when translucent glass sheet is placed due to light do not travel through a translucent sheet properly completely.
 - No umbra is forms when cardboard sheet is placed due to light do not travel through a cardboard sheet
- The length and the direction of shadows differ due to the angle and the direction of sunlight falling on objects.
- Various artistic creations can be done with umbra or shadows.

Draw a Figure 9.9

- According to above Figure, - When the ball and the electric torch are closer, the umbra on the screen is not sharp and clear due to penumbra also around the umbra.
 - When the distance between the ball and the torch is increasing, the penumbra gradually disappears.
 - When the torch is kept a considerable distance from the ball, only the umbra can be observed.

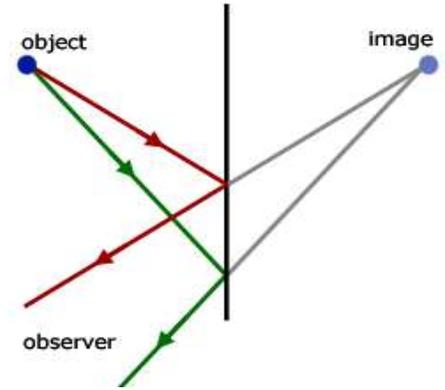
Conclusion- The light source should be far from the object to obtain a clear and sharp umbra.

Do the activity 9.4

Draw a Figure 9.11

Images formed by plane mirrors

- A plane mirror is a mirror with a flat shining (planar) reflective surface.
- **The phenomenon of returning the light rays in the same medium after falling on a surface is called reflection of light.**



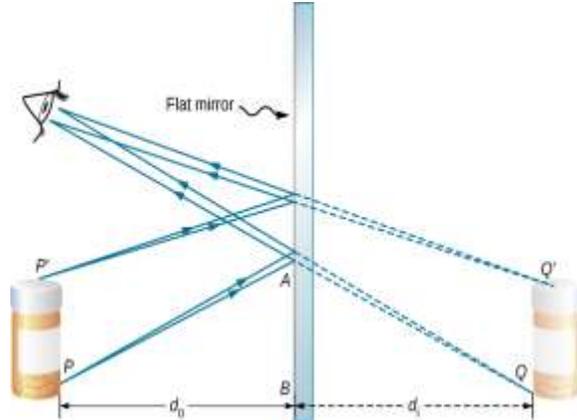
- Forming images by mirrors is a result of reflection of light.

Draw a Figure 9.16

Do the activity 9.5 and draw a Figure 9.19

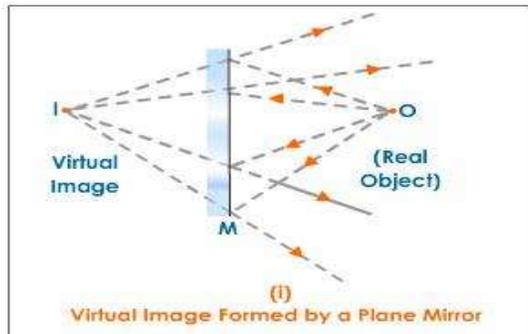
Complete the Table 9.2 is given by activity 9.6

- According to above activity, Features of an images formed by a plane mirror are,
 1. Virtual. (Cannot be obtained on to a screen or images that are formed in locations where light does not actually reach)
 2. Erect.
 3. Upright. (oriented in the same direction as the object)
 4. Size of the image is equal to the size of the object.
 5. Image is form behind the mirror. (d_o - distance from the mirror to the object $pp^1 = d_i$ - the distance from mirror to the image qq^1)



6. Show lateral inversion. (left and right sides of the image are interchanged)

- If the image can be obtained on to a screen is known as real image.



- Real images are formed by curved mirrors.

- Such images are formed on the same side of the mirror as the object and light passes through the actual image location.

Draw a Figure 9.21

Lateral inversion

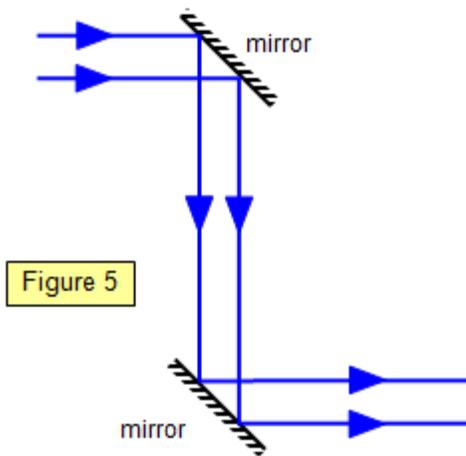
➤ The phenomenon of inverting right and left sides of an object, when observed through a plane mirror is known as lateral inversion.

- Symmetrical objects don't show lateral inversion. (Ex: O)

Multiple images

- If an object is situated front one or two mirrors, you may see images in both mirrors. In addition, the image in the first mirror may act as an object for the second mirror, so the second mirror may form images of the image.

➤ When two or more plane mirrors are kept at an angle or parallel to each other and object is kept between more than images are formed. Such a formation is known as multiple images.



Do the activity 9.8

➤ According to above activity, the numbers of images formed are increased when the angle between the two plane mirrors decreases.

Draw the Table 9.4

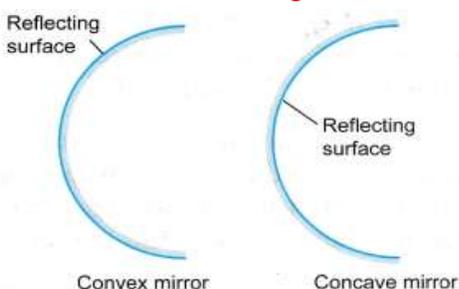
- Kaleidoscope is an instrument in which the formation of multiple images is used.

2) What are the instances where plane mirrors are used?

Do the activity 9.10

➤ According to above activity, periscope is another instrument made using the phenomenon of reflection of light through plane mirrors. Specially used in submarines and bunkers.

Do the Assignment 9.6 and 9.7



Images formed by curved mirrors

➤ There are two types of curved mirrors. (a mirror with a curved reflecting surface)

1. Convex mirror.
2. Concave mirror.

- A ray of light is denoted by a straight line.
- The direction is indicated by an arrow head.

Draw a Figure 9.32

Convergent and Divergent of Light

- **The collection of a parallel beam of light to a single spot in front of the mirror is known as convergence of light.** (Concave mirror)

Draw Figure 9.33

- **Light rays from a point source of light travel in all directions, moving away with time, such a beam of light is called divergent beam of light.** (Convex mirrors)

Draw Figure 9.34

Concave mirrors (Converging mirror)

- A concave mirror has a reflecting surface (smooth or shining surface) that is bent inward. They are used to focus light.
- According Figure 9.33 that the light beam collects to a spot (converged) in front of the concave mirror.

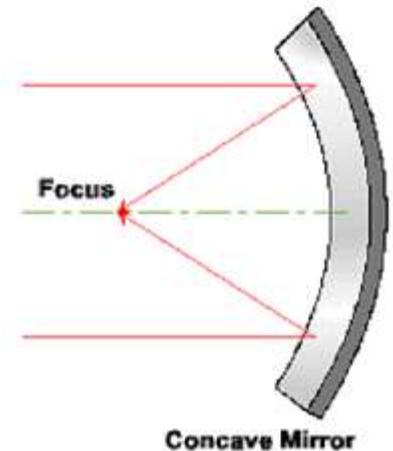
Images formed by concave mirror

Do the activity 9.13 and complete the Table 9.5

- Features of an images formed by a concave mirror.

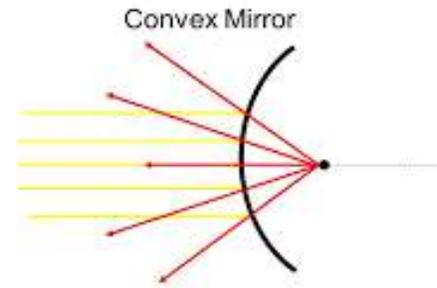
1. produced both real and virtual images.
2. They can be upright (if virtual) or inverted (if real).
3. They can be behind the mirror (if virtual) or in front of the mirror (if real).
4. They can also be enlarged, reduced or the same size as object.

3). what are the instances where concave mirrors are used in day to day life?



Convex mirrors (diverging mirrors)

- A convex mirror has a reflecting surface (smooth or shining surface) that is bent outward or towards the light source. They are not used to focus light.



Do the activity 9.14 complete the Table 9.7

- According to above activity that the nature of the image is does not change when the distance between the object and convex mirror changes.
- So location of the object does not affect the characteristics of the image.

Features of an images formed by a convex mirror

1. A virtual image
2. An upright image
3. Reduce in size (smaller than the object)

4). what are the instances where convex mirrors are used in day to day life?

1. Used in inside building.
2. Used in sunglass
3. Used in vehicle as side mirrors.
4. Used in securities.
5. Used as street light reflectors because they are able to spread light to over a bigger area.
6. Used in telescope.

Do the exercise.

Sound

Production of sound

We here various sound frequently during our life.

Do the activity 11.1

- According to above activity we can be observed that pieces of polystyrene are thrown up, only when the speakers is connected to the dry cell due to the **to** and **fro** movements of the speaker when they produced sound.
- These types of a speedy **to** and **fro** movements are known as vibration.

Do the activity 11.2

- According to above activity, it is observed that the polystyrene ball moves towards the vibrated turning fork, when it is brought closer.
- When we speaking slowly a light trembling is felt to the fingers due to the vibration of membrane in the throat (vocal cords).
- This trembling is increases when the voice is increased.
- **Conclusion: It means our vocal sound is produced by the vibrating of membranes in the vocal cord.**

Instruments that produced sound

Sound source/ Instrument	Part that vibrates
Guitar	Strings
Drum	Membranes
Flute	Air
Table	Membranes

- According to above Table, that various kind of musical instruments produce sounds in different ways.
- Musical instruments can be categorized according to the part that vibrates to produce sound.
- **Sound sources**
 - Vibrating of Strings (Guitar, Violin, Viola, Cello, Zither, Harp etc.)
 - Vibration of Membranes (Drum, Table, Side Drum etc.)
 - Vibration of Air (Flute etc.)

Do the Assignment 11.2, 11.3, 11.4

Propagation of Sound

Do the activity 11.5

- According to above activity, ringing of the electric bell can be heard, when the bell jar is filled with air. When the air in the bell jar gradually evacuates, the ringing of the bell gradually fades. If the bell jar is completely evacuated, ringing completely fades off.
- **Conclusion: Sound is not heard in a space where there is no air (in a vacuum). So sound is not propagated without medium. Then medium is essential for sound to propagate.**

1). Does sound travel only through air?

Do the activity 11.6

- According to above activity sound made in water, can be heard well through funnels A and B.
- **Conclusion is sound travels through liquid like water faster than through air.**

Ex: when shallow grounds are flooded, the sound of the vehicles travelling the nearby roads can be heard louder than other days.

Do the activity 11.7

- According to above activity, we can hear friend's voice is clearly due to sound propagates through thread.
- **Conclusion is sound travels through solid medium.**

Do the activity 11.8

- According to above activity the **tic** sound of clock can be heard through the Table more clearly than through the air.
- **Final conclusion is the sound propagates faster through solid medium than gaseous medium.**

E.g.: we can hear the sound emitted by dolphins more intensively when we are in under water. But the same sound emitted by them above water is heard very lightly.

Speed of sound according to medium.

Medium	Speed of sound (meters per seconds)
Air (gas)	330
Water (liquid)	1500
Steel (solid)	4500

According to above Table sound propagates very faster in solid medium than other mediums as well as in a liquid medium faster than gaseous medium.

So, Solid > Liquid > Air

E.g.: during the lightning, thundering sound and the light emit at the same time. But we hear the sound after few seconds of seeing light due to sound is slower than that of light.

Do the Exercises.

