

## Chapter 15. Light

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### Very Short Q&A:

**Q1:** Give an example to show that the path of light is always straight and never curved.

**Ans:** Light emitted by a torch light and light emitted from the headlights of a vehicle.

**Q2:** The bouncing of light by any smooth surface, like a mirror, is called \_\_\_\_\_.

**Ans:** Reflection of light.

**Q3:** What is image of an object?

**Ans:** Due to the reflection of light, the impression of an object formed in a mirror is called the image of the object.

**Q4:** As the distance of the object from the mirror increases, the distance of the image also increases. True/ False.

**Ans:** True

**Q5:** Placing a mirror near lights, and table lamps reflects the light over a larger area, and makes the room appear brighter. True/ False.

**Ans:** True.

**Q6:** Images that cannot be captured on a screen are called \_\_\_\_\_.

**Ans:** Virtual images.

**Q7:** Ravi is looking in a mirror; his right hand will appear to be at \_\_\_\_\_ in its image in the mirror.

**Ans:** Left side

**Q8:** Why the word 'AMBULANCE' is painted left-right inversed on the vehicle?

**Ans:** So that when the driver of a vehicle in front looks into his rear - view mirror, can read ambulance written on it quickly and give way to it.

**Q9:** The image formed by a plane mirror is

- a. The same size as that of the object
- b. Left-right inversed
- c. Erect and virtual
- d. All of the above

**Ans:** All of the above.

**Q10:** State the principle used in creating a mirror image.

**Ans:** Principle of reflection

**Q11:** Name the mirror having curved reflecting surface.

**Ans:** Spherical mirror

**Q12:** Name the two types of spherical mirror.

**Ans:** Concave mirror and convex mirror.

**Q13:** State uses of concave mirror.

**Ans:** Concave mirrors are used by dentists to obtain a magnified image of the teeth. They are also used in solar heaters or solar concentrators, and as reflectors in flashlights, and headlights of cars and scooters.

**Q14:** State uses of convex mirror.

**Ans:** Convex mirror are used as reflectors at sharp turns and tricky or 'blind' corners and in parking lots, and as rear-view mirrors in cars and on motorcycles.

**Q15:** What is virtual image?

**Ans:** The image formed by a plane mirror cannot be captured on a screen, and is called a virtual image.

**Q16:** What is real image?

**Ans:** Images that can be captured on a screen are known as real images.

**Q17:** Give an example of real image.

**Ans:** In a camera, images are real and can be captured on the negative, which acts as a screen.

**Q18:** In an opaque spherical surface, the silvered surface acts as a mirror. True/ False.

**Ans:** True

**Q19:** What happens when light rays are incident on a concave lens?

**Ans:** When light rays are incident on a concave lens, they bend outwards or diverge.

**Q20:** What is the name for concave lens?

**Ans:** Diverging lens

**Q21:** What kind of image is formed by concave lens?

**Ans:** Upright, virtual and smaller than the object.

**Q22:** Name an object made from concave lens.

**Ans:** Peep holes contain concave lenses.

**Q23:** A convex lens converges light rays. Therefore, it is also called a \_\_\_\_\_.

**Ans:** Converging lens

**Q24:** What kind of image is formed by convex lens?

**Ans:** Virtual, erect and magnified.

**Q25:** State various applications of lenses.

**Ans:** Lenses are used in magnifying glasses, peep holes, cameras, bioscopes, binoculars, telescopes, microscopes and projectors.

**Q26:** A refracting telescope uses a concave and a

- a. Concave mirror
- b. convex lens
- c. Both a and c
- d. Convex mirror

**Ans:** Both a and c.

**Q27:** How rainbow is formed in the sky?

**Ans:** A rainbow is formed by the refraction and reflection of the sun's rays through raindrops.

**Q28:** When does rainbow appear in the sky?

**Ans:** When it is raining in one part of the sky and sunny in another, a rainbow appears.

**Q29:** Although sunlight appears white, it is composed of \_\_\_\_\_ colours.

**Ans:** Seven

**Q30:** The colours in a rainbow are not the colours of sunlight. True/ False.

**Ans:** False.

**Q31:** An image formed by a \_\_\_\_\_ mirror is always of the same size as that of the object.

**Ans:** Plane

**Q32:** A concave mirror always forms a real image. True/ False.

**Ans:** False

**Q33:** Which type of lens forms always a virtual image?

**Ans:** A concave lens always forms a virtual, erect and smaller image than the object.

**Q34:** What is the focal length of a plane mirror?

**Ans:** Infinite

**Q35:** State the relation between radius of curvature and focal length of spherical mirrors.

**Ans:** Radius of curvature = 2 X focal length.

$$R = 2f.$$

**Q36:** Out of convex mirror and concave mirror, whose focus is situated behind the mirror?

**Ans:** The focus of convex mirror is situated behind it.

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## Short Q&A:

**Q1:** What are the laws of reflection?

**Ans:** The two laws of reflection are:

- a. Angle of incidence is equal to angle of reflection.
- b. Incident ray & the normal lie on the same plane.

**Q2:** Differentiate between real & virtual image?

**Ans:** Real image can be obtained on a screen Image e.g.- Plane Mirror. But virtual Image cannot be obtained on a screen e.g. – Pinhole Camera, Photograph Camera.

**Q3:** Why concave mirror is called a converging mirror and a convex mirror is called a diverging mirror?

**Ans:** Concave mirror is called a converging mirror because parallel rays of light fall on the mirror they converge at a point called focus. Convex mirror is called a diverging mirror because parallel rays of light fall on it they diverge after reflection.

**Q4:** Explain the nature of image formed in a concave mirror.

**Ans:** The nature of image formed in a concave mirror depends on the position of the object in front of the mirror. If the object is very close to the mirror the image is virtual, erect & magnified. As the distance increases image becomes real, inverted & its size keeps changing.

**Q5:** What are the uses of concave mirror?

**Ans:** mirror Following are the uses of concave:

- Used by the ENT Specialists, dentists.
- Used as Shaving mirror.
- Used by makeup artists.
- Used in torches & Car headlights to get a parallel beam of light.

**Q6:** What is a lens?

**Ans:** A piece of transparent material bound by curved surfaces. There are two types of lens concave lens and convex lens. Convex lens is thick at the centre and thinner at edges, it is called converging lens concave lens is thin at the center and thicker at edge, it is called diverging lens.

**Q7:** How is the rainbow formed?

**Ans:** A rainbow is formed by the refraction and reflection of the sun's rays through raindrops. When it is raining in one part of the sky and sunny in another, a rainbow appears. The centre of the rainbows arc is always directed away from the sun.

**Q8:** Apart from rainbow where else we can see seven colours of sunlight?

**Ans:** You can see Seven colours of Sunlight when it falls over Soap bubbles, oil films, Shiny surfaces of CD etc.

**Q9:** State the characteristics of the image formed by a plane mirror.

**Ans:** Characteristics of the image formed by a plane mirror:

- Image is Virtual
- It is behind the mirror
- Image is erect (means not inverted)
- Image is of same size as the object
- Image is at same distance from the mirror as the object is from the mirror.

**Q10:** What is a virtual image? Give one situation where a virtual image is formed.

**Ans:** An image which cannot be obtained on a screen is called a virtual image. A virtual image can be formed by a plane mirror, convex mirror, concave mirror, convex lens and concave lens. Polished Metallic surface or liquid surface such as lakes or water bodies can also form a virtual image.

**Q11:** Differentiate between a convex and a concave lens.

**Ans:**

Convex Lens	Concave Lens
a. Convex lenses are thicker in the middle than at the edges.	a. Concave lenses are thinner in the middle than at the edges.
b. A convex lens can forms real and inverted image. When the object is	b. A concave lens always forms erect, virtual and smaller image than the

placed very close to the lens, the image formed is virtual, erect and magnified.

- c. A convex lens can be used as a magnifying glass
- d. A convex lens converges (bends inward) the light generally falling on it

object.

- c. A concave lens cannot be used as a magnifying glass
- d. A concave lens diverges (bends outward) the light

**Q12:** What is rainbow?

**Ans:** A rainbow is an optical phenomenon that is caused by reflection of light in water droplets in the Earth's atmosphere, resulting in a spectrum of light appearing in the sky. It takes the form of a multi-coloured arc. Rainbows caused by sunlight always appear in the section of sky directly opposite the sun. Rainbows can be observed whenever there are water drops in the air and sunlight shining from behind at a low altitude angle, the colour of rainbow are Red, Orange, Yellow, Green, Blue, Indigo, Violet.

**Q13:** A rotating disc has a pencil that serves as a rotator. The disc is covered with violet, indigo, blue, green, yellow, orange and red coloured papers. When the disc is rotated, it appears white instead of the individual colours. Why?

**Ans:** This is because a mixture of colours of the rainbow in proper proportions produces white colour.

**Q14:** Take a glass prism. Allow a narrow beam of sunlight to pass through a small hole in the window of a dark room to fall on one face of the prism, what will happen to the light?

**Ans:** The light will bend when it passes through the prism.

**Q15:** Allow the light coming out of the other face of the prism to fall on a white sheet of paper or a white wall. Explain your observation.

**Ans:** Different component colours of white light bend differently, and so the constituent colours can be seen separately. And the colours are said to have dispersed after passing through the prism.

**Q16:** What is the relation between reflection of light and the image of an object?

**Ans:** The bouncing of light by any smooth surface, like a mirror, is called reflection of light. Due to the reflection of light, the impression of an object formed in a mirror is called the image of the object.

**Q17:** Images in a mirror are located at the same distance behind the mirror as the object in front of it. Explain the importance of this property of mirror.

**Ans:** Images in a mirror are located at the same distance behind the mirror as the object in front of it is mainly used in interior decoration and in architecture to make rooms appear brighter and bigger. Moreover, placing a mirror near lights, chandeliers and table lamps reflects the light over a larger area, and makes the room appear brighter. Images that cannot be captured on a screen are called virtual images.

**Q18:** What do you mean by left right inversed?

**Ans:** Images are inversed, i.e. the right part of an object appears on the left in its images, and the left part of the object appears to the right. For example, the word 'AMBULANCE' is painted left-right inversed on the vehicle so that when the driver of a vehicle in front looks into his rear - view mirror, he can make out the word AMBULANCE quickly and give way.

**Q19:** How you can create a mirror image?

**Ans:** Mirror maze is created based on the principle of reflection in plane mirrors. The maze has several plane mirrors placed at fixed angles to each other. When a person enters a mirror maze, he finds several images of himself and several passages. There is only one passage that is real, while all the others are all just images.

**Q20:** Explain a spherical mirror.

**Ans:** Spherical mirror have curved reflecting surfaces and are also called curved mirrors. These mirrors are made from a hollow sphere. There are two types of curved surfaces at each hemisphere. The inner curved surface is termed as concave, while the outer is called convex. Spherical mirrors are different from plane mirrors due to their reflecting surface.

**Q21:** Explain a concave mirror. What is the nature of image formed by this mirror?

**Ans:** If the reflecting surface of a mirror is concave, then it is called a concave mirror. A concave mirror is also known as a converging mirror. It is used to magnify objects. Concave mirrors are used by dentists to obtain a magnified image of the teeth. They are also used in solar heaters or solar concentrators, and as reflectors in flashlights, and headlights of cars and scooters. The image formed by a concave mirror when the object is placed close to it is virtual, erect and magnified.

The image formed by a concave mirror when the object is moved away from it is real, inverted, and magnified.

The image formed by a concave mirror when the object is placed far away from it is real, inverted and diminished.

**Q22:** Explain a convex mirror. What is the nature of image formed by this mirror?

**Ans:** If the reflecting surface of a mirror is convex, then it is called a convex mirror. A convex mirror is also known as a diverging mirror or fish eye mirror. The image formed by a convex mirror is virtual, erect and diminished. It means that a larger area is visible in a convex mirror than in a plane mirror of the same size. That is why convex mirrors have a variety of applications – as reflectors at sharp turns and tricky or 'blind' corners and in parking lots, and as rear-view mirrors in cars and on motorcycles. Rear-view mirrors enable the driver/rider to watch the road behind them. They are also used in super markets, stores and ATM centres as a security measure. Objects like thumb tacks, Christmas baubles and sunglasses act as convex mirrors

**Q23:** Define the following:

- a. Real image
- b. Virtual image

**Ans:**

- a. Real image: Real images are those images that can be captured on a screen are known as real images. For example, in a camera, images are real and can be captured on the negative, which acts as a screen.
- b. Virtual image: The image formed by a plane mirror cannot be captured on a screen, and is called a virtual image

**Q24:** Define the following:

- a. Opaque Spherical Surface
- b. Transparent Spherical Surface

**Ans:**

- a. In an opaque spherical surface, the silvered surface acts as a mirror. So, a concave mirror will have its concave side silvered, while a convex mirror will have its convex side silvered.
- b. For a transparent spherical surface, if the concave surface is silvered and later coated with red oxide, then the mirror acts as a convex mirror. Also, if the convex surface is silvered and later coated with red oxide, then it acts as a concave mirror.

**Q25:** Explain concave lens and their application.

**Ans:** It is a lens that possesses at least one surface that curves inwards. When light rays are incident on a concave lens, they bend outwards or diverge. The rays diverge away from

each other. Thus, a concave lens is also called a diverging lens. A concave lens is thinner at its centre than at its edges, and is used to correct short sightedness. It does not focus at a single point. The image formed by a concave lens is upright, virtual and smaller than the object. For example, the images seen through a peephole are different from normal holes, because these peep holes contain concave lenses.

**Q26:** Explain convex lens and there application.

**Ans:** A convex lens makes the object magnified, when viewed through it. A convex lens is thick in the middle and thin at its edge. When light rays pass through a convex lens, they bend inwards and converge at a common point to form an image of the source of light. Rays from the sun converge to form its image as a bright spot. A convex lens converges light rays. Therefore, it is also called a converging lens. The image formed when the object is placed close to a convex lens is virtual, erect and magnified. Virtual images cannot be caught on a screen. Images that are caught on a screen are called real images. When the object is placed at a distance from a convex lens, the image formed is real, inverted and diminished.

### Long Q&A:

**Q1:** Describe the two types of lens and their role in our day to day life.

**Ans:**

Convex Lens	Concave Lens
<ul style="list-style-type: none"> <li>a. Convex lenses are thicker in the middle than at the edges.</li> <li>b. A convex lens can forms real and inverted image. When the object is placed very close to the lens, the image formed is virtual, erect and magnified.</li> <li>c. A convex lens can be used as a magnifying glass</li> <li>d. A convex lens converges (bends inward) the light generally falling on it</li> </ul>	<ul style="list-style-type: none"> <li>a. Concave lenses are thinner in the middle than at the edges.</li> <li>b. A concave lens always forms erect, virtual and smaller image than the object.</li> <li>c. A concave lens cannot be used as a magnifying glass</li> <li>d. A concave lens diverges (bends outward) the light</li> </ul>

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called converging lens concave lens is thin at the center and thicker at edge, it is called diverging lens.

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