10 Light: Mirrors and Lenses

Fill in the Blanks

1. A mirror with a curved reflecting surface is called a _____ .
2. A _____ converges light rays.
3. A _____ always forms an erect and diminished image.
4. The angle of _____ equals the angle of reflection.
5. A _____ is a transparent material bounded by two curved surfaces.
6. A convex lens is _____ at the centre than at the edges.
7. A concave lens always forms an _____ and _____ image.
8. The magnifying glass is an example of a _____ lens.
9. The laws of reflection are true for all kinds of _____.
10. A _____ mirror is used in dentists' mirrors and headlights.

True or False

1. A convex mirror always forms an inverted image. _____
2. A concave mirror can form both real and virtual images. _____
3. The angle of reflection is always smaller than the angle of incidence. _____
4. Plane mirrors follow the laws of reflection. _____
5. Convex lenses converge light rays. _____
6. Concave lenses are thicker at the middle. _____
7. Convex mirrors are used as rear-view mirrors in vehicles. _____
8. The image formed by a concave lens is always inverted. _____
9. The human eye contains a convex lens. _____
10. Solar cookers use concave mirrors to concentrate sunlight. _____

Multiple Choice Questions (MCQs)

1. The mirror used in car headlights is —
(a) Plane (b) Convex (c) Concave (d) None

2. A convex mirror always gives an image that is —
(a) Real and enlarged (b) Erect and diminished (c) Inverted (d) Same size

3. The angle between the normal and the incident ray is called —
(a) Reflection angle (b) Refraction angle (c) Angle of incidence (d) None

4. Which lens is used as a magnifying glass?
(a) Concave lens (b) Convex lens (c) Cylindrical (d) Plane glass

5. The mirror used by dentists is —
(a) Plane (b) Concave (c) Convex (d) Cylindrical

6. A convex lens converges light because —
(a) It is thicker at edges (b) It is thicker at centre (c) It is flat (d) None

7. The reflection in a plane mirror is —
(a) Regular (b) Diffused (c) Curved (d) None

8. The image formed by a concave lens is always —
(a) Real (b) Enlarged (c) Inverted (d) Virtual

9. Which of these is used in telescopes?
(a) Concave mirror (b) Convex mirror (c) Plane mirror (d) None

10. When light strikes a mirror at 30°, the angle of reflection is —
(a) 15° (b) 30° (c) 45° (d) 60°

Short Answer Questions

Q1. What are spherical mirrors? Name their types.

Q2. What is the difference between concave and convex mirrors in image formation?

Q3. State the two laws of reflection.

Q4. Define the angle of incidence and angle of reflection.

Q5. Why are concave mirrors used in torches and car headlights?

Q6. Why are convex mirrors used as rear-view mirrors in vehicles?

Q7. What are lenses? Name the two main types.

Q8. Differentiate between convex and concave lenses based on image formation.

Q9. What happens when parallel rays of light fall on a concave mirror and a convex mirror?

Q10. Why does a pencil appear bent when placed in a glass of water?

Long Answer Questions

Q1. Explain the characteristics of images formed by concave and convex mirrors with examples.

Q2. Describe an activity to verify the laws of reflection.

Q3. What is the difference between concave and convex lenses? Explain their image formation with examples.

Q4. Describe how concave mirrors and convex lenses can be used to concentrate sunlight.

Q5. Write a note on the real-life applications of mirrors and lenses.

Answers

Fill in the Blanks

1. spherical mirror
2. concave mirror
3. convex mirror
4. incidence
5. lens
6. thicker
7. erect, diminished
8. convex
9. mirrors
10. concave

True or False

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

Multiple Choice Questions (MCQs)

1. (c) Concave
2. (b) Erect and diminished
3. (c) Angle of incidence
4. (b) Convex lens
5. (b) Concave
6. (b) It is thicker at centre
7. (a) Regular
8. (d) Virtual
9. (a) Concave mirror
10. (b) 30°

Short Answer Questions

Q1. What are spherical mirrors? Name their types.

Ans: Spherical mirrors are mirrors whose reflecting surfaces are part of a sphere.

They are of two types:

- Concave mirror – the reflecting surface is curved inward.
- Convex mirror – the reflecting surface is curved outward.

Q2. What is the difference between concave and convex mirrors in image formation?

Ans: Concave mirror: Forms enlarged or diminished, erect or inverted images depending on the distance of the object.

Convex mirror: Always forms erect and diminished images, irrespective of distance.

Q3. State the two laws of reflection.

Ans: The angle of incidence (i) is equal to the angle of reflection (r).

The incident ray, normal, and reflected ray all lie in the same plane.

Q4. Define the angle of incidence and angle of reflection.

Ans:

Angle of incidence (i): The angle between the incident ray and the normal at the point of incidence.

Angle of reflection (r): The angle between the reflected ray and the normal at the point of incidence.

Q5. Why are concave mirrors used in torches and car headlights?

Ans:

Concave mirrors converge light rays to form a strong parallel beam. When a bulb is placed at its focus, the reflected rays travel parallel, producing a bright beam suitable for torches and headlights.

Q6. Why are convex mirrors used as rear-view mirrors in vehicles?

Ans:

Convex mirrors diverge light rays and provide a wider field of view, enabling drivers to see more area behind them. They also produce erect and diminished images, which help in judging distance safely.

Q7. What are lenses? Name the two main types.

Ans:

A lens is a transparent material (usually glass or plastic) with one or two curved surfaces.

The two main types are:

- Convex lens – thicker at the centre, converges light rays.
- Concave lens – thinner at the centre, diverges light rays.

Q8. Differentiate between convex and concave lenses based on image formation.

Answer:

Lens Type	Image Nature	Size	Type
Convex lens	Erect (near), Inverted (far)	Enlarged or diminished	Real or virtual
Concave lens	Always erect	Always diminished	Always virtual

Q9. What happens when parallel rays of light fall on a concave mirror and a convex mirror?

Ans:

- Concave mirror: Converges the parallel rays to a single point (focus).
- Convex mirror: Diverges the parallel rays as if they are coming from a point behind the mirror.

Q10. Why does a pencil appear bent when placed in a glass of water?

Ans:

The pencil appears bent because of refraction of light.

When light travels from water to air, it bends away from the normal, making the submerged part of the pencil appear displaced from the real position.

Long Answer Questions

Q1. Explain the characteristics of images formed by concave and convex mirrors with examples.

Ans:

Concave Mirror:

- When the object is close, image is erect and enlarged (used by dentists or in makeup mirrors).
- When the object is far, image becomes inverted and smaller.
- Used in headlights, torches, and telescopes because it converges light.

Convex Mirror:

- Always forms erect and diminished images.
- Provides a wide field of view, making it ideal for rear-view mirrors in vehicles.
- Thus, the shape of the mirror determines the nature and size of the image formed.

Q2. Describe an activity to verify the laws of reflection.

Ans:

Materials: Plane mirror, white paper, torch, comb, protractor, and pencil.

Steps:

1. Place the mirror upright on a sheet of white paper.
2. Shine a thin beam of light (through a slit made in black paper) on the mirror.
3. Draw the incident ray, reflected ray, and normal at the point of incidence.
4. Measure the angle of incidence (i) and angle of reflection (r) using a protractor.
5. Observation: The two angles are equal.

Conclusion:

- The angle of incidence equals the angle of reflection.
- The incident ray, normal, and reflected ray lie in the same plane.
- Hence, both laws of reflection are verified.

Q3. What is the difference between concave and convex lenses? Explain their image formation with examples.

Ans:

Concave Lens:

- Thicker at edges and thinner at the centre.
- Diverges light rays.
- Always forms erect, virtual, and diminished images.
- Used in spectacles for short-sightedness.

Convex Lens:

- Thicker at the centre, thinner at the edges.
- Converges light rays.

- Image formed depends on distance:
  - Near: erect and enlarged (used as magnifier).
  - Far: inverted and smaller (used in cameras).
- Used in microscopes, telescopes, and eyeglasses for long-sightedness.

Q4. Describe how concave mirrors and convex lenses can be used to concentrate sunlight.

Ans:

- When sunlight falls on a concave mirror, it reflects and converges at a point called the focus. The concentrated light produces heat sufficient to burn paper.
- Similarly, a convex lens converges sunlight passing through it at its focus, generating intense heat.
- These principles are used in solar cookers, solar furnaces, and solar concentrators to utilize solar energy for heating and power generation.

Q5. Write a note on the real-life applications of mirrors and lenses.

Ans:

Concave Mirrors:

- Used in headlights, shaving mirrors, dentist mirrors, and reflecting telescopes.
- Provide enlarged and focused images.

Convex Mirrors:

- Used in rear-view mirrors, road safety mirrors, and security mirrors.
- Provide a wider field of view with small, erect images.

Convex Lenses:

- Used in magnifying glasses, cameras, microscopes, telescopes, and human eyes.

Concave Lenses:

- Used in spectacles for myopia (short-sightedness) and optical instruments.

Thus, mirrors and lenses are essential in scientific devices, safety systems, and everyday vision aids.