Mirrors

Introduction

A mirror is a reflective surface that forms images by reflecting light. Mirrors are broadly classified into plane mirrors and spherical mirrors.

Plane Mirrors

A plane mirror is a flat, smooth reflective surface. It reflects light in such a way that the image formed is of the same size as the object and is located behind the mirror.

Working of a Plane Mirror

The light ray striking the mirror follows the law of reflection, which states:

- The angle of incidence = The angle of reflection.
- The incident ray, reflected ray, and normal to the surface at the point of incidence all lie in the same plane.

Image Formation by a Plane Mirror

- The image formed is virtual and cannot be obtained on a screen.
- The image is laterally inverted, meaning the left side appears as the right and vice versa.
- The image is the same size as the object.
- The image is located at the same distance behind the mirror as the object is in front of it.
- The image is upright (erect).

Activities to Observe Plane Mirror Properties

Lateral Inversion: Stand in front of a plane mirror and raise your left hand. In the mirror, it appears as your right hand.

Image Position and Size: Place a lighted candle in front of a plane mirror. Move it to different positions and observe that the image moves correspondingly, maintaining the same size and distance.

Uses of Plane Mirrors

- Used as looking glasses.

- Used in periscopes and kaleidoscopes.
- Used in solar cookers as reflectors.
- Used in scientific instruments like barometers.

Spherical Mirrors

Spherical mirrors are curved mirrors that are a part of a hollow sphere. They are of two types:

i. **Concave Mirror (Converging Mirror)**

ii. **Convex Mirror (Diverging Mirror)**

Concave Mirror

A concave mirror has an inward curved reflecting surface. It converges parallel rays of light to a point called the focus (F).

Image Formation by Concave Mirror

- The image can be real or virtual, depending on the object's position.
- The image can be diminished, same-sized, or enlarged.
- A real image is formed in front of the mirror, while a virtual image is formed behind the mirror.

Position of Object	Position of Image	Size of Image	Nature of Image
At Infinity	At Focus (F)	Highly Diminished	Real and Inverted
Beyond C	Between F and C	Diminished	Real and Inverted
At C	At C	Same Size	Real and Inverted
Between C and F	Beyond C	Enlarged	Real and Inverted
At F	At Infinity	Highly Enlarged	Real and Inverted
Between F and P	Behind Mirror	Enlarged	Virtual and Erect

Uses of Concave Mirrors

- Used in torches, vehicle headlights, and searchlights to focus light.

- Used as shaving mirrors and makeup mirrors to get a magnified image.
- Used by dentists and ENT doctors to examine patients.
- Used in solar concentrators.

Convex Mirror

A convex mirror has an outward curved reflecting surface. It diverges light rays and forms images that are always virtual, erect, and diminished.

Image Formation by Convex Mirror

- The image is always virtual and erect.
- The image is diminished and smaller than the object.
- The image is formed behind the mirror.

Position of Object	Position of Image	Size of Image	Nature of Image
At Infinity	At Focus (F)	Highly Diminished	Virtual and Erect
Between P and Infinity	Between P and F	Diminished	Virtual and Erect

Uses of Convex Mirrors

- Used as rear-view mirrors in vehicles for a wider field of view.
- Used as security mirrors in shops and supermarkets.
- Used at sharp turns and driveways to enhance visibility.

Important Parameters of Spherical Mirrors

Pole (P): The center of the mirror's reflecting surface.

Centre of Curvature (C): The center of the hollow sphere from which the mirror is a part.

Principal Axis: A straight line passing through the pole and center of curvature.

Radius of Curvature (R): Distance between the pole (P) and center of curvature (C).

Focus (F): The midpoint of the pole and center of curvature.

Focal Length (f): Distance between the pole and focus (F).