

Physics — Light

Chapter: Light

Key Definitions

- **Light:** A form of electromagnetic radiation that is visible to the human eye. It travels in straight lines and can be reflected, refracted, and absorbed.
- **Reflection:** The bouncing back of light when it hits a surface.
- **Refraction:** The bending of light as it passes from one medium to another due to a change in speed.
- **Laws of Reflection:**
 - The angle of incidence is equal to the angle of reflection.
 - The incident ray, the reflected ray, and the normal to the surface all lie in the same plane.
- **Lens:** A transparent optical device that refracts light to converge or diverge rays.
- **Concave Lens:** A lens that diverges light rays that are initially parallel.
- **Convex Lens:** A lens that converges light rays that are initially parallel.

Important Formulas

- **Lens Formula:**

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

Where:

- (f) = focal length of the lens
- (v) = image distance from the lens
- (u) = object distance from the lens

- **Magnification (m):**

$$m = \frac{h'}{h} = -\frac{v}{u}$$

Where:

- (h') = height of the image
- (h) = height of the object

Diagrams

- **Ray Diagram for Convex Lens:** 1. Draw a convex lens. 2. Mark the focal points (F) on both sides. 3. Draw an object (arrow) on the left side of the lens. 4. Draw rays from the top of the object:
 - One ray parallel to the principal axis, refracting through the focal point on the opposite side.
 - One ray passing through the center of the lens, continuing straight.

- **Ray Diagram for Concave Lens:** 1. Draw a concave lens. 2. Mark the focal points (F) on both sides. 3. Draw an object (arrow) on the left side of the lens. 4. Draw rays from the top of the object:
 - One ray directed towards the focal point on the same side, refracting parallel to the principal axis.
 - One ray passing through the center of the lens, continuing straight.

Summary Table

Property	Convex Lens	Concave Lens
Focal Length	Positive	Negative
Image Formation	Real and inverted (if beyond F)	Virtual and upright
Uses	Magnifying glasses, projectors	Glasses for myopia

Key Takeaways

- Light behaves as both a wave and a particle.
- Reflection and refraction are fundamental properties of light.
- The lens formula and magnification are crucial for understanding image formation.
- Ray diagrams help visualize how lenses manipulate light to form images.