Physics — Light

Chapter: Light

Key Definitions

- **Light**: Light is a form of energy that travels in waves and can be perceived by the human eye. It is part of the electromagnetic spectrum.
- **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, reflected ray, and the normal at the point of incidence 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

- **Law of Reflection**:

$$\angle i = \angle r$$

where:

- (\angle i) = angle of incidence
- (\angle r) = angle of reflection
- **Refraction Formula (Snell's Law)**:

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

where:

- (n_1, n_2) = refractive indices of the two media
- (\theta_1, \theta_2) = angles of incidence and refraction respectively
- **Lens Formula**:

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

where:

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

Diagrams

1. **Reflection of Light**: - A ray of light strikes a plane mirror at an angle of incidence (\angle i) and reflects off at an angle of reflection (\angle r).
2. **Refraction of Light**: - A ray of light passing from air into water bends towards the normal due to a change in speed.
3. **Lens Diagram**: - A convex lens converging parallel rays of light to a focal point.

Summary Table

Concept	Definition	Formula
Reflection	Bouncing back of light	$\angle i = \angle r$
Refraction	Bending of light when passing through mediums	$n_1 \sin\theta_1 = n_2 \sin\theta_2$
Convex Lens	Converges light rays	$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$
Concave Lens	Diverges light rays	N/A

Key Takeaways

- Light behaves both as a wave and a particle.
- Understanding the laws of reflection and refraction is crucial for optics.
- Lenses are essential tools in various optical devices, including glasses, cameras, and microscopes.
- The ability to manipulate light through reflection and refraction has numerous applications in technology and science.