

## Summary

### CHAPTER FIVE: REFLECTION OF LIGHT

#### LIGHT AS INVISIBLE ENERGY

Light is a form of energy. Light is required to see things around us. We are able to see the beautiful world around us because of light. We can see buildings, people, read books and watch television due to the existence of light. It is light which makes us to see our image in a looking mirror. We detect light with our eyes. Though we see the various objects around us with our eyes but eyes alone cannot see any object. We also need a source of light to make objects visible.

**For Example:** When we enter a dark room, the objects present there are not visible. However, if we light a candle or switch on an electric lamp, everything in the room becomes visible. It shows that for vision, the presence of light is essential.

**Definition:** Light is an invisible energy which causes in us sensation of sight (vision).

#### Sources of Light

**A) Primary source:** Sun

**B) Secondary source:** Stars, luminous bodies.

- ✓ **Luminous bodies:** The bodies which give out light energy on their own.  
**Examples of luminous bodies:** The sun, the stars, the burning candle, etc.
- ✓ **Non-luminous bodies:** The bodies which do not give light energy of their own but reflect the light energy falling on them.  
**Examples of non-luminous bodies:** In universe or space all planets, comets, moons, etc; are non-luminous bodies. They shine on account of the sunlight falling on them. On the surface of earth, wood, houses, furniture, stones, etc., are non-luminous bodies.

#### **General terms of pertaining to light:**

- a. **Optical medium:** Anything (material or non-material) through which light energy passes wholly or partially is called.  
**Examples:** Vacuum, air, all kinds of gases, water, glass, diamond, etc.
- b. **Homogeneous optical medium:** An optical medium, which has a uniform composition throughout.  
**Examples:** Vacuum, distilled water, pure alcohol, glass, clear plastics, diamond, etc.
- c. **Heterogeneous optical medium:** An optical medium, which has different composition at different points.

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**Examples:** Air, muddy water, fog, mist, smoke, etc.

- d. **Transparent medium:** An optical medium, which allows most of the light energy to pass through.

**Examples:** clear air, diamond, certain kinds of clear plastics, etc.

- e. **Translucent medium:** An optical medium which partially allows the light energy to pass through, in such a medium we cannot see clearly.

**Example:** Butter paper, oiled paper, deep water, fog, mist.

- f. **Opaque bodies:** Those bodies which do not allow the light energy to pass through them. These bodies can either absorb light energy or reflect light energy.

**Examples:** Bricks, stones, trees, wood, all kind of metals, certain kinds of plastics, etc.

- g. **Ray of light:** The path along which light energy travels in a given direction

- h. **Beam of light:** A collection (or bundle) of adjacent rays of light.

- i. **Parallel beam:** When the rays of light travel parallel to each other in the same direction, such a bundle of rays.

Example: Sun rays entering into a room through a ventilator

- j. **Convergent beam:** When the rays of light coming from different directions, get closer and meet at a point, such a bundle.

**Examples:** The rays of sun on reflection from a concave mirror.

- k. **Divergent beam:** When the rays of light originating from a point travel in different directions, such a bundle.

**Examples:** The rays coming out of a car headlamp, or a burning candle.

### Common Characteristics of Light

1. Light is an invisible energy which on rebounding from the surface of matter causes sensation of vision.
2. Light travels along a straight-line path, but is an electromagnetic wave which is transverse in nature.
3. Light produces shadows, when obstructed by opaque objects.
4. Light gets reflected back from polished or smooth surfaces, such as mirror, polished metals, still water, etc.
5. Light gets refracted when it travels from one medium to another medium.
6. The velocity of light in vacuum is  $3 \times 10^8$  m/s.
7. Medium to another transparent medium.
8. During the change in velocity of light, its frequency remains same, but the wavelength changes.

### Reflection of light

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**Definition:** The phenomenon due to which a beam of light travel through a certain medium on striking some surface, bounces off from it in some other direction.

Or **Reflection of light:** is the return of wave in the same direction due to hitting a reflecting surface.

### Kinds of Reflection

There are two kinds of reflection, depending upon the nature of surface on which the light falls.

**(a) Regular reflection or specular reflection:** is the reflection of light from smooth surface.

**Note:** The reflection taking place from surface of mirror, highly polished objects, still water, etc.

**(b) Irregular reflection or diffused reflection:** is the reflection of light that occurs on rough surface

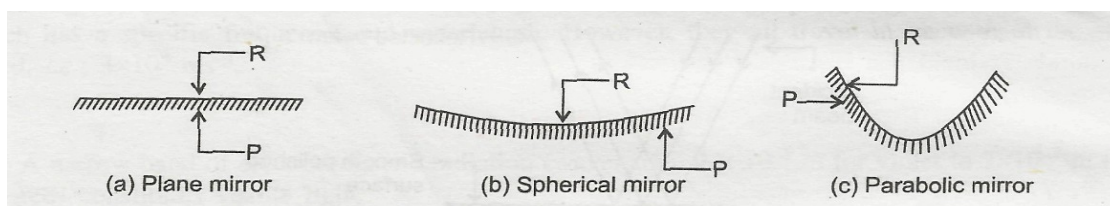
### General definitions about reflection

**(a) Mirror:** A smooth polished surface from which regular reflection can take place.

### Kinds of mirrors

There are two kinds of mirrors.

1. **Plane mirror:** A highly polished plane surface.
2. **Curved mirror:** A highly polished curved surface.  
Curved mirrors can either be spherical mirrors or parabolic mirrors.



**Note:** All mirrors have two surfaces. The surface **P** is called polished surface and Surface **R** is reflecting surface.

**(b) Incident ray:** A ray of light which travels toward a mirror.

**(c) Reflected ray:** A ray of light which bounces off the surface of mirror.

**(d) Point of incidence:** The point on the mirror surface where an incident ray strikes.

**(e) Normal:** A perpendicular drawn at the point of incidence to the surface of mirror is called normal.

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**(f) Angle of incidence:** The angle made by the incident ray with the normal.

**(g) Angle of reflection:** The angle made by the reflected ray with the normal.

**(h) Glance angle of incidence:** The angle which the incident ray makes with the mirror.

## LAWS OF REFLECTION

1. The incident ray, the reflected ray and the normal (at the point of incidence) all lie on the same plane at the point of incidence.
2. The angle of incidence is always equal to angle of reflection ( $\angle i = \angle r$ ).

**Note:** When a ray of light falls normally (perpendicularly), angle of incidence will be **zero**.