

# Light

## Reflection

### Laws of Reflection

1. The first law of reflection states that the **incident ray, reflected ray**, and the **normal** at the point of incidence all lie in the **same plane**.
2. The second law of reflection states that the **angle of incidence,  $i$**  is **equal** to the **angle of reflection,  $r$** .

### Characteristics of an Image Formed by a Plane Mirror

1. It is **laterally inverted**.
2. It is the **same shape** and **same size** as the object
3. It is **upright**
4. It is **virtual**
  - A virtual image **cannot be formed on a screen**
  - (Real) light rays do not meet at the image position.
5. Its **image distance** from the mirror is the **same** as the **object distance** from the mirror.

### Types of Reflection

- For **both** regular and irregular surfaces, the laws of reflection apply to each ray.

## Regular Reflection

- On **smooth surfaces**, reflection is **regular**.
- Parallel incident rays have the same angles of incidence and reflection.
- The **reflected rays** travel in the same direction.

## Irregular (Diffuse) Reflection

- On \_\_\_rough / irregular surfaces, \_\_\_reflection is **diffused**. (Sometimes, the roughness may not be detectable by the naked eye.)
- The normal at different points of the surface are not parallel to one another.
- Thus, even if the incident rays are parallel, they have different angles of incidence and reflection. The **reflected rays** travel in **different directions**.
- The overall diffused image is made up of many image points at different locations.

## Refraction

- **Refraction** is the **bending** of light as it travels from one optical medium to another with a **different refractive index**.
- Refraction is caused by a **change in the speed of light** as light travels from one medium to another medium.
- **Normal** is an imaginary straight line that is perpendicular to the surface of the medium.
- **Angle of incidence ( $i$ )** is the \_\_\_angle \_\_\_between the **incident ray** and the **normal**
- **Angle of refraction ( $r$ )** is the **angle** between the **refracted ray** and the **normal**
- The **incident ray**, the **refracted ray**, and the **normal at the point of incidence** all lies in the **same plane**.