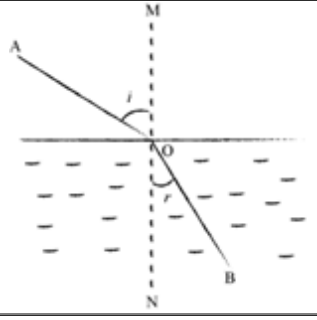
Light Energy

- **Refraction:** Bending or change in the direction of light as it passes from one medium to another
- Refraction of light occurs because of change in the speed of light due to a change in the medium.
- When light enters an optically denser medium from an optically rarer medium, the speed of light slows down and light bends towards the normal.
- The opposite happens when light enters an optically rarer medium from an optically denser medium.

- **Effect on various characteristics of light on reflection and refraction:**

Characteristics	Partially reflected light	Partially refracted light	
		Rarer to denser	Denser to rarer
Speed of light	No change	Decreases	Increases
Frequency of light (*f*)	No change	No change	No change
Wavelength of light (λ=vf)	No change	Decreases	Increases

- **Refraction Laws**

	AO, OB, and MON are co-planar $\frac{\sin i}{\sin r} = \text{constant}$ (Snell's law)	Incident ray, refracted ray, and normal to the interface at incident point are co-planar

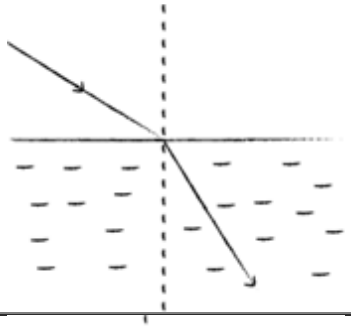
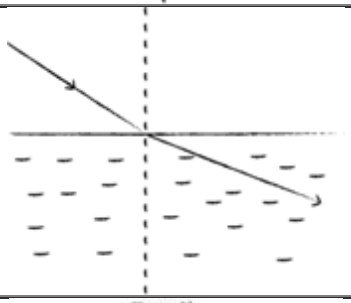
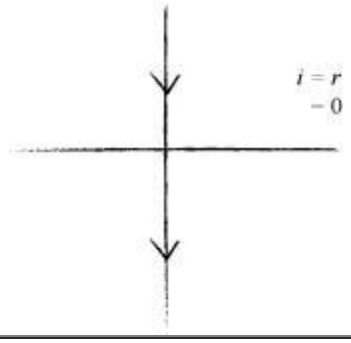
- **Refractive index (RI)**

μ12 (μ of 2 w.r.t 1)=Velocity of light in medium 1Velocity of light in medium 2=v1v2

(Absolute RI when medium 1 = Vacuum)

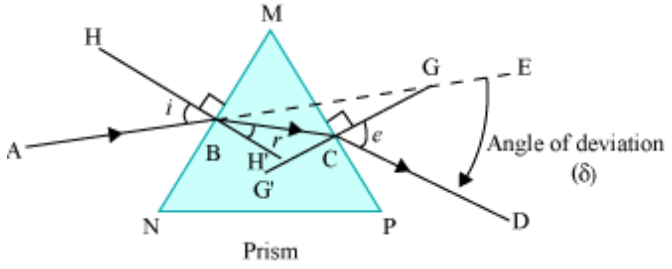
(Light speed in vacuum is = 3×10^8 m/s)

	Medium (Optically denser) = μ > 1

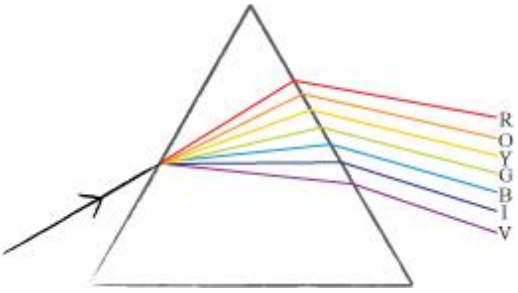
	
	Optically rarer = $\mu < 1$
For all 	path of a ray when there is no change in medium.

- Real and apparent depth of object placed in different medium
- Apparent bending of an object when partially placed in a different medium
- Sun appears a few minutes earlier before it actually rises above the horizon. Also, it is seen for a few minutes longer after it actually sets.

- **Refraction through a prism**
  - Light bends because of refraction that takes place at points **B** and **C .**
  - The extent of deviation of the light ray from its path BE to path CD is known as the angle of deviation (δ)



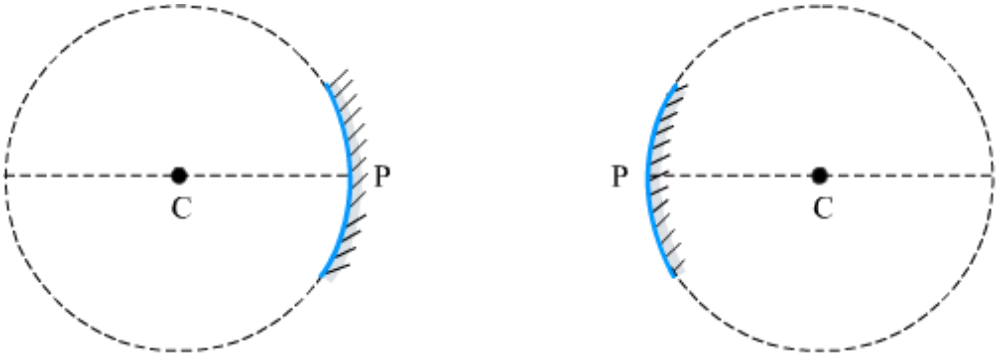
- The splitting of a beam of white light into its seven constituent colours, when it passes through a glass prism, is called the **dispersion of light.**



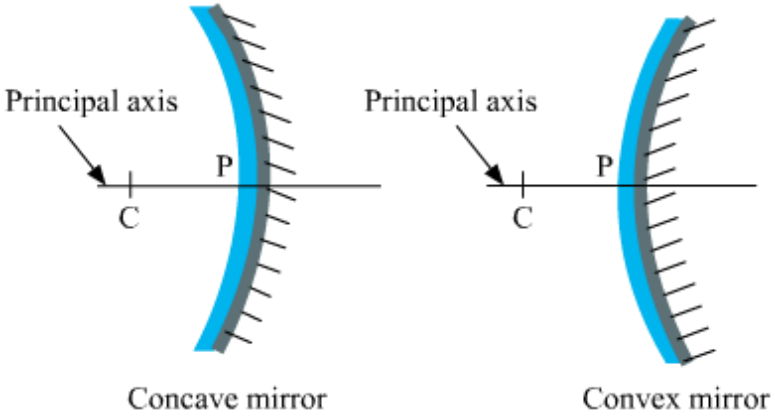
  - Red → Disperses least
  - Violet → Disperses most
  - Yellow → Average of all lights
- Formation of rainbow is a natural phenomenon in which white sunlight splits into beautiful colours by water droplets.

Spherical Mirror

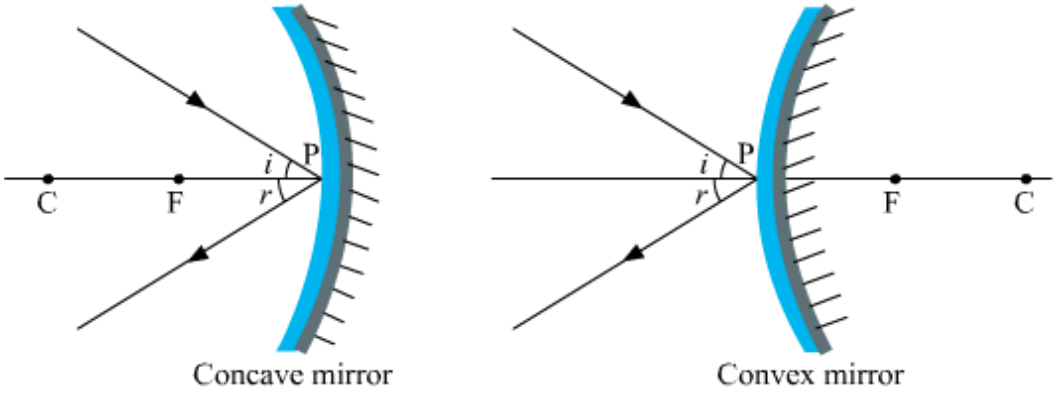
- Centre of curvature: Centre of the sphere of which the spherical mirror is a part



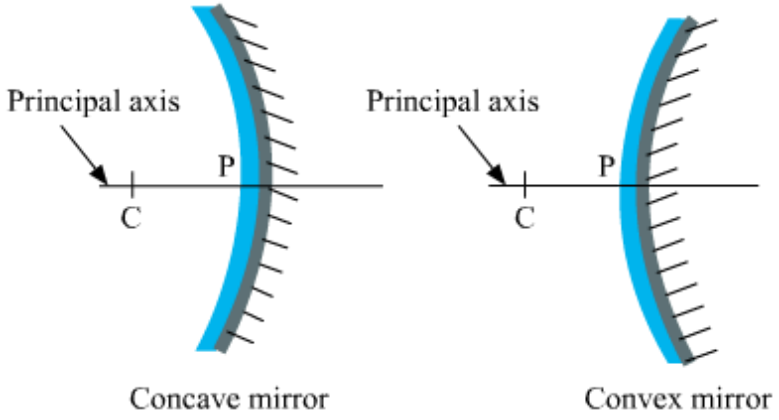
- Pole: It is the midpoint of the aperture of the spherical mirror or mirror centre.



- Focus: Where parallel rays (parallel to the principal axis) meet or appear to meet after reflection.
- Principal Axis: The imaginary line that runs through the pole and the center of curvature of a spherical mirror.
- Distance of focus from the pole is half the radius of curvature.



Two types of spherical mirrors



1. The image formed by a convex mirror is **erect** and **diminished**. It is formed behind the mirror.
2. The image formed by a concave mirror can be **erect as well as inverted**, **diminished as well as magnified**, behind the mirror as well as in front of the mirror, depending on the distance of the object from the mirror.
3. The image that can be obtained on a screen is called **real** image. The image that cannot be obtained on a screen is called **virtual** image.
4. The image formed by a **convex** mirror is always **virtual**. The image formed by a **concave** mirror can be **real** as well as **virtual**.

1. Concave mirror is used as the reflector of a torch, dentist mirror, etc. It is also used in solar furnaces.
2. Convex mirror is used as a rear view mirror in vehicles. It also used road safety mirrors.