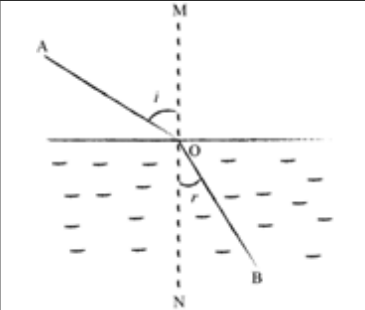


Light Energy

- **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 ($\lambda=vf$)	No change	Decreases	Increases

- **Refraction Laws**

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

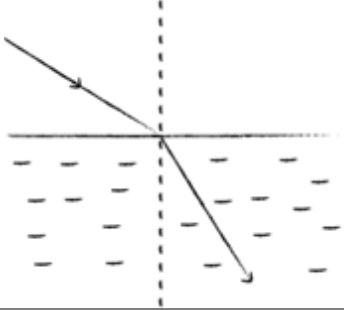
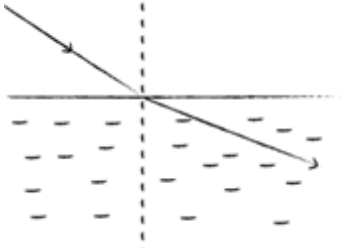
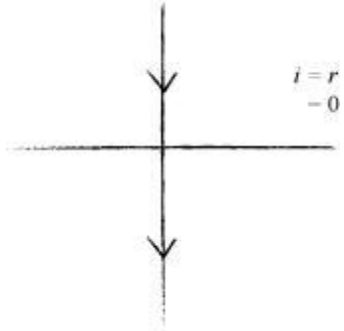
- **Refractive index (RI)**

$$\mu_{12} (\mu \text{ of } 2 \text{ w.r.t } 1) = \frac{\text{Velocity of light in medium 1}}{\text{Velocity of light in medium 2}} = \frac{v_1}{v_2}$$

(Absolute RI when medium 1 = Vacuum)

(Light speed in vacuum is $= 3 \times 10^8 \text{ m/s}$)

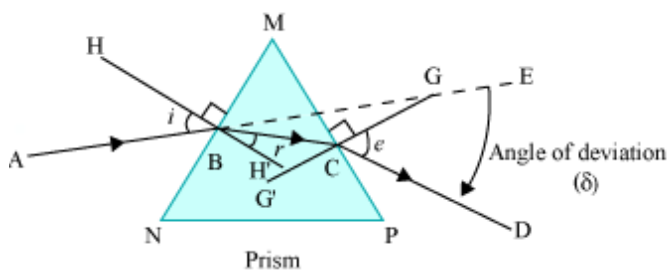
	Medium (Optically denser) $= \mu > 1$
--	---------------------------------------

	
	Optically rarer = $\mu < 1$
For all  $i = r = 0$	path of a ray when there is no change in medium.

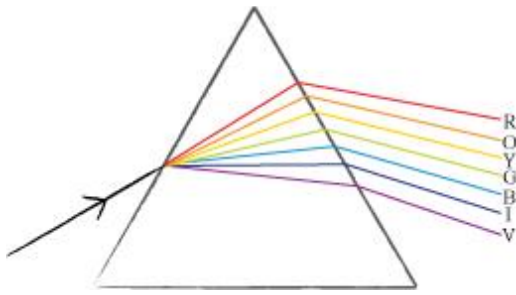
- Real and apparent depth of object placed in different medium
- Apparent bending of an object when partially placed in a different medium
- Sun appears a few minutes earlier before it actually rises above the horizon. Also, it is seen for a few minutes longer after it actually sets.

• 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)



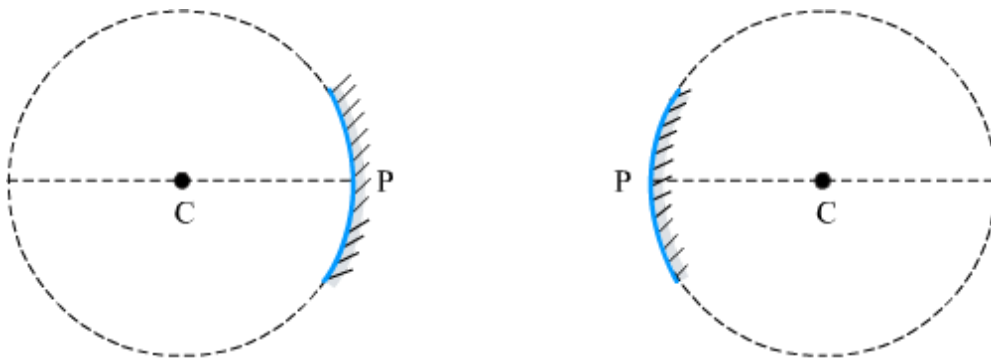
- The splitting of a beam of white light into its seven constituent colours, when it passes through a glass prism, is called the **dispersion of light**.



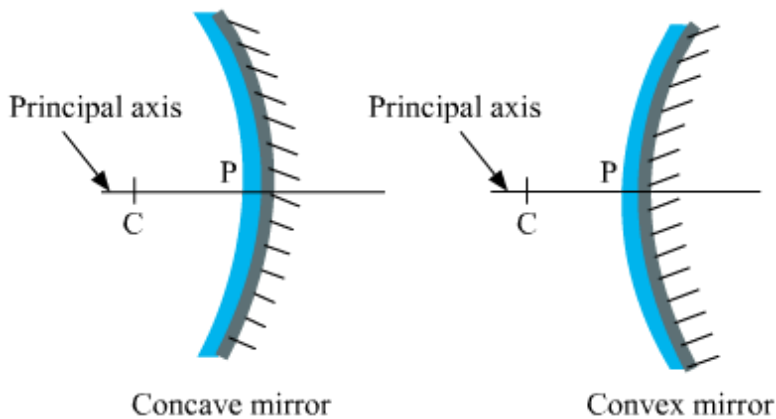
- Red → Disperses least
- Violet → Disperses most
- Yellow → Average of all lights
- Formation of rainbow is a natural phenomenon in which white sunlight splits into beautiful colours by water droplets.

Spherical Mirror

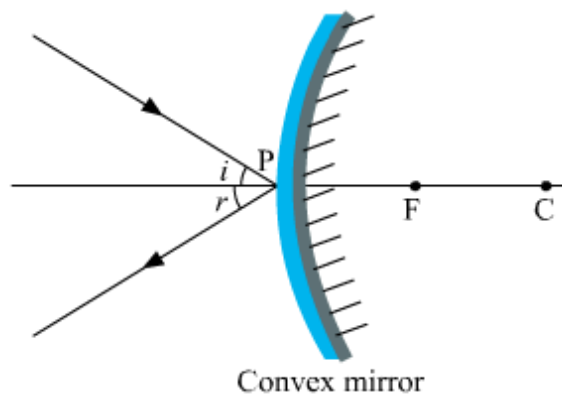
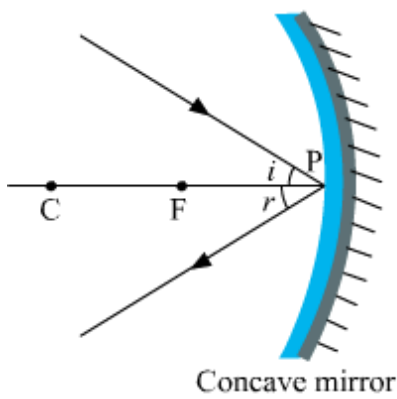
- Centre of curvature: Centre of the sphere of which the spherical mirror is a part



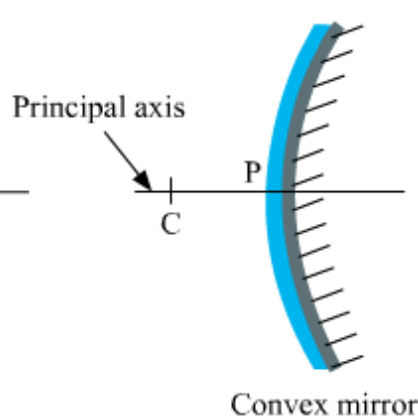
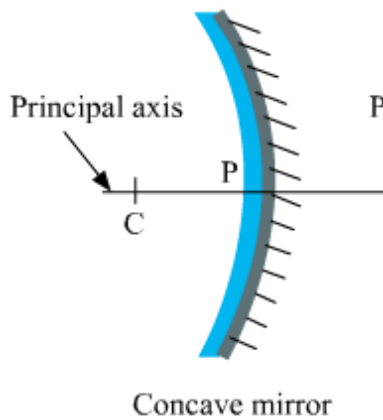
- Pole: It is the midpoint of the aperture of the spherical mirror or mirror centre.



- 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.