Refraction

It is a surface phenomenon in which there is a change in the direction of path of light when it passes from one media to another

Cause of Refraction

When a ray of light passes from one media to another it deviates because of the change in the speed of the light.

Laws of Refraction

1) The incident ray, refracted ray and the normal, all lie in the same plane.

2) The ratio of sine of the angle of incidence to the sine of angle of refraction is constant.

Snell's Law

$\sin i / \sin r = \mu$

Refractive Index

The refractive index of a medium refers to the ratio of the sine of the angle of incidence to the sine of angle of refraction. It can also be defined as the ratio of speed of light in vacuum/a medium to the speed of light in another medium.

μ = speed of light in vacuum / speed of light in a medium

$^{\text{medium 1}}\mu^{\text{medium 2}}$ = speed in medium 1 / speed in medium 2

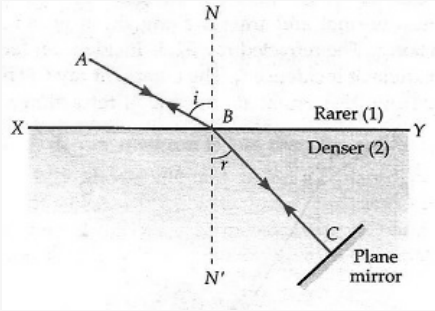
$^{\text{med 1}}\mu^{\text{med 2}} = V1 / V2 = \mu^{\text{med 2}} / \mu^{\text{med 1}}$

Med = Medium. The stuff in superscript is supposed to be in subscript.

Factors Affecting Refractive Index

1) Density of the medium	μ∝Density
2) Temperature	μ∝1/Temp.
3) Wavelength	μ∝1/λ

Principle of Reversibility



The Principle of Reversibility states that a path of a light ray is reversible.
It implies $^{1}\mu^{2} \times {}^{2}\mu^{1} = 1$

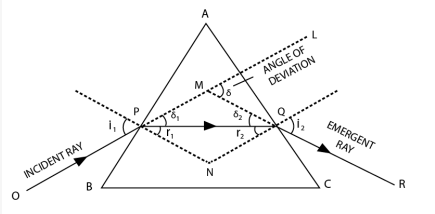
Lateral Displacement

The perpendicular distance between the path of the emergent ray and the direction of the incident ray is called Lateral displacement.

Factors Affecting Lateral Displacement

1) Thickness of medium	LD∝Thickness
2) Angle of incidence	LD∝Angle i
3) Refractive Index	LD∝μ
4) Wavelength	LD∝1/λ

Angle of Deviation in Prism

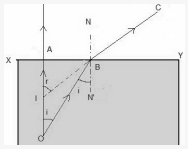


The angle formed between the direction of incident ray and the emergent ray is called the angle of deviation. It is represented by δ. δ = (i1 + i2) - (r1 + r2). δ + A = i1 + i2.

Factors affecting Angle of Deviation

1) Angle of incidence	Varies
2) Refractive Index	δ∝μ
3) Angle of Prism	δ∝A
4) Wavelength	δ∝1/λ

Real & Apparent Depth



An Object placed in a denser medium when viewed from a rarer medium appears to be at a lesser depth. This is because of refraction of light. μ=RD/AD

Factors affecting Shift

1) Refractive Index	S∝μ
2) Thickness	S∝T
3) Wavelength	S∝1/λ

Consequences of Refraction of Light

A star appears as if it is twinkling- this is because of change in refractive index due to the change in temp. or density.

Bending of a pencil half underwater- this is due to the refraction of light that the pencil appears to bend towards the surface of the water.

A coin kept in a vessel is not visible when seen from just below the edge of the vessel but can be viewed from the same position if water is added.

A Pond appears shallower than its actual depth.