PHYSICS
FORM 5
REFRACTION

Refraction represents the bending of the direction of the wave as it travels from one medium to the next.

This bending is brought about by a change in the speed of the wave. The change in speed is caused by the change in density of the media.

When a wave travels from one medium to another of a different density, the wavelength changes. This causes a change in the speed of the wave which results in a change in direction of the wave (causing a bending in the wave).

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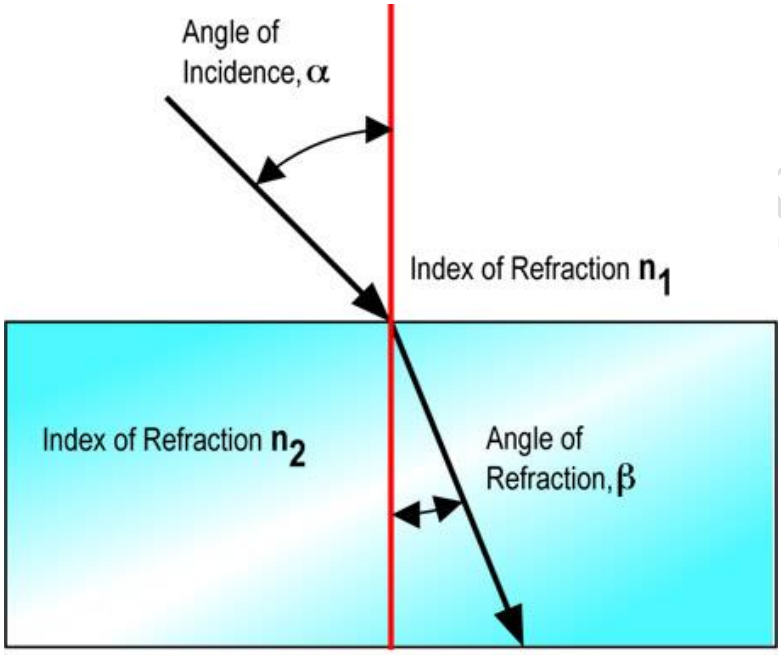
The refracted wave refers to the wave that has a changed direction after entering the second medium. The angle of refraction refers to the angle formed between the refracted wave and the normal.



$n_1 \sin\alpha = n_2 \sin\beta$

Refractive Index

The refractive index refers to the ratio of the sine of the angle of incidence to the sine of the angle of refraction. The refractive index is a constant for a given pair of media. The refractive index is denoted by the symbol, 'n'.

$$n = \frac{\sin i}{\sin r}$$

$$n = \frac{speed\ in\ medium\ 1}{speed\ in\ medium\ 2}$$

$$n = \frac{wavelength\ in\ medium\ 1}{wavelength\ in\ medium\ 2}$$

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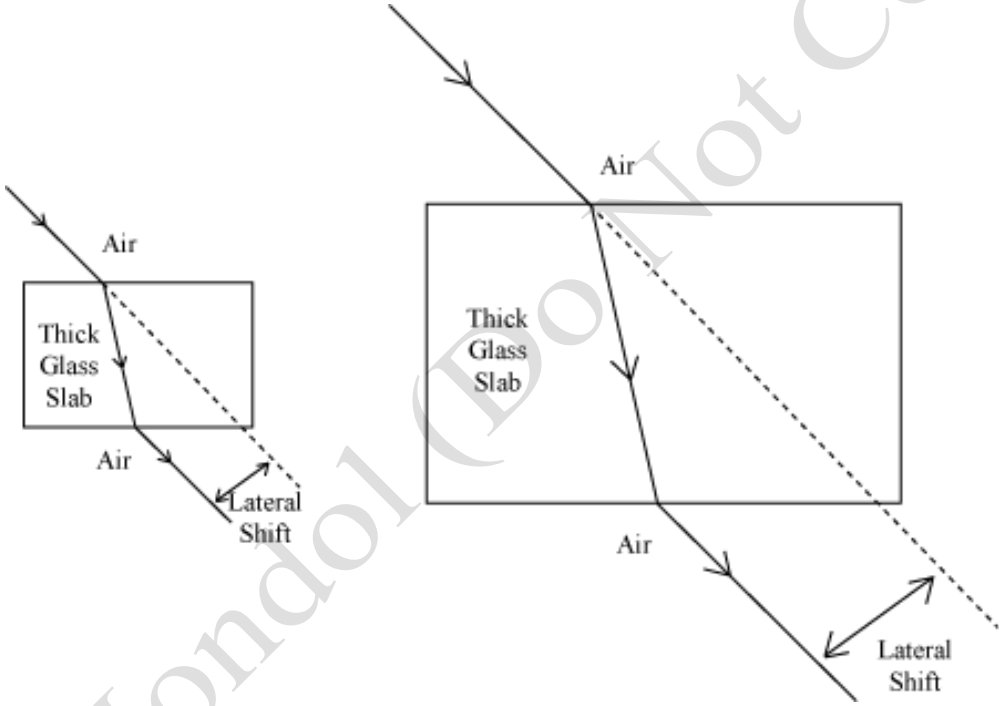
$$n = \frac{f \times \lambda_1}{f \times \lambda_2} = \frac{\lambda_1}{\lambda_2}$$

Laws of Refraction

1. The incident ray, the refracted ray and the normal all lie in the same plane at the point of incidence.
2. The ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant for a given pair of medium. This is known as Snell's Law.

Lateral Displacement



When a wave goes from a less dense medium to a more dense medium, the wave bends towards the normal. When the wave goes from a dense medium to a less dense medium it bends away from the normal.

When a ray of light passes through a glass box with parallel sides, the direction of travel after exiting the glass box is parallel to the original direction (before entering the glass box) but displaced to one side.

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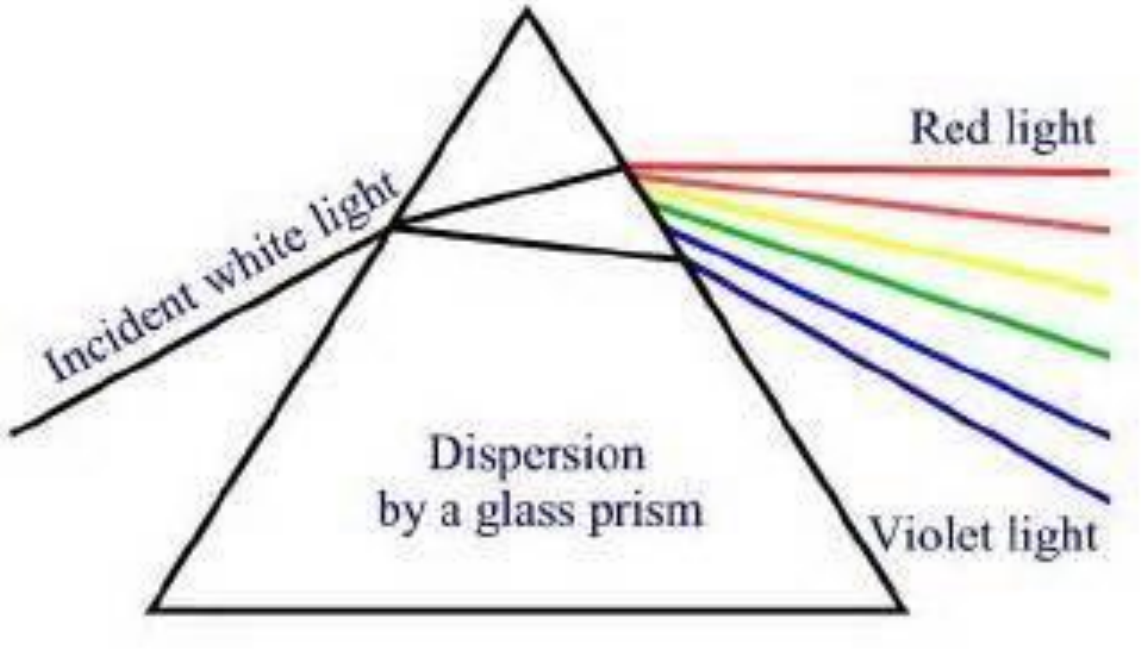
Dispersion



Dispersion is the process in which white light is separated into its component colours. The component colours each have a different wavelength and therefore produces different angles of refraction after passing through the prism.

A small hole is made in the first screen to allow one component of light to pass through. This component is then passed through another prism and onto another screen. No further separation is noted.