CH-08

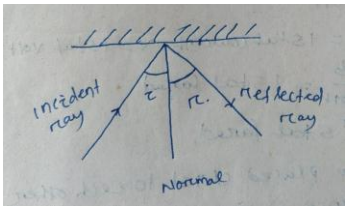
OPTICS

REFLECTION OF LIGHT & ITS LAW.

When two medium separated from each other, if light travelling from one medium to other medium is sent back being obstructed then Reflection occur.

1st law - The incident ray, reflected ray & the normal at the point of incidence all lie on same plane.

2nd law - The angle of incidence is equal to angle of reflection. $\angle i = \angle r$



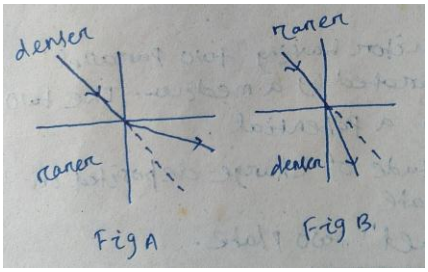
REFRACTION OF LIGHT & ITS LAW.

when light travels from one transparent medium to other medium transparent separated from each other the path of the light is deviated from its original path. This phenomenon of light is called Refraction.

Case-1 If light travel from denser medium to rarer medium, the refracted ray is away from the normal (Fig A)

Case-2 if light travels from rarer medium to denser medium, the refracted ray is closer to the normal (fig B)

Case-3 Light goes without any deviation if it incident normaly to the interface of two mediums.



1st LAW - The incident ray & refracted ray & the normal at the point of incidence all lie on same plane .

2ND LAN or SNELL'S LAW - It states that the ratio of sine of angle of incidence to sine of angle of refraction for a particular Pair of medium is always constant. This constant quantity is known as refractive index of medium 2 w.r.t medium 1. It is denoted by μ.

Mathematically

$\boxed{\frac{\sin i}{\sin r} = {}_1^2\mu = \frac{\mu_2}{\mu_1}}$ Snell's law

where μ_2, μ_1 = absolute refractive index of medium 2 & medium 1 respectively

$\mu_1 = \frac{c}{v_1}$ and $\mu_2 = \frac{c}{v_2}$

PROBLEM.

Find the velocity of light in glass if its refractive index is 3/2.

Given μ_g = 3/2

$v_g = \frac{c}{3/2}$ or $v_g = 3 \times 10^8 \times \frac{2}{3} = 2 \times 10^8$ m/sec

CRITICAL ANGLE, TOTAL INTERNAL REFLETION

When a ray passes from denser to rarer medium the refracted ray is away from the normal.it means that angle of refraction (r) is greater than angle of incidence (i).If we increase angle of incidence then angle of refraction also increased. At a certain value of angle of incidence the angle of refraction become 90° . The angle of incidence corresponding to which angle of refraction become 90^0 is called critical angle (C)

If we increased further angle of incidence then entire light is reflected back into same medium from which it comes. This is called total internal reflection.

Mathematically $\frac{\sin i}{\sin r} = \frac{\mu_2}{\mu_1} = \frac{1}{\mu}$

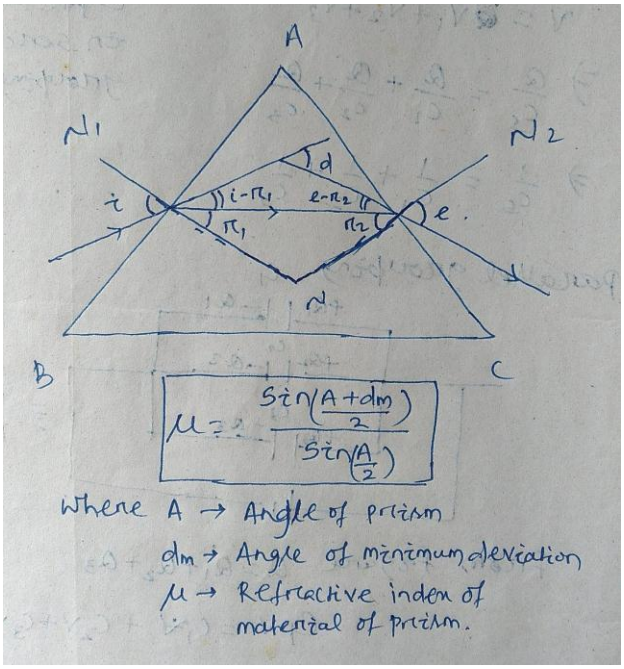
Whereμ_2 = 1 = Refractive index of air andμ_1 = μ = refractive index of any medium

Hence $\frac{\sin C}{\sin 90°} = \frac{1}{\mu}$

Or sin C = 1/μ

Or $\boxed{C = \sin^{-1}(1/\mu)}$

REFRACTION THROUGH PRISM



ELEMENTARY IDEAS ABOUT OPTICAL FIBER & ITS APPLICATION

An optical fiber is very thin fiber made up of glass or Plastics having radius of the order of few micrometer (10^{-6} met). A bundle of such thin fiber forms a light Pipe .As the radius of the fiber is very Small light going into it makes angle of incidence greater than critical angel and hence total internal reflection takes Place .Thus light is transmitted along the light pipe.

I)Light Pipes using optical fiber may be used to see inside of a human body.

ii) It is used to transmit communication signal through light pipes.