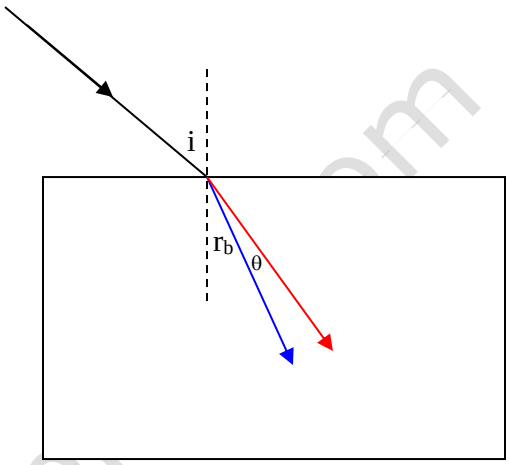
Q- A beam of light with red and blue components of wavelengths 670 nm and 425 nm, respectively, strikes a slab of fused quartz at an incident angle of 30°. On refraction, the different components are separated by an angle of 1.31 X 10^{-3} rad. If the index of refraction of the red light is 1.4925, what is the index of refraction of the blue light?



Angle of incidence for both rays i = 30^0

Let angle of refraction for blue is r_b

Angle of dispersion for the two rays

$\theta = 1.31*10^{-3}$ rad. = 0.07506^0

Thus, angle of refraction for red is $r_b = r_r - \theta$

As the refractive index for red light is

$\mu_r = 1.4925$ using Snell's law we get

$$\mu_r = \frac{\sin i}{\sin r_r}$$

Or $$1.4925 = \frac{\sin i}{\sin r_r}$$

Or $$1.4925 = \frac{\sin 30^0}{\sin r_r}$$

Or $\sin r_r = 0.5/1.4925 = 0.33501$

Gives $r_r = 19.57305^0$

Hence the angle of refraction for blue light will be

$r_b = r_r - \theta = 19.57305 - 0.07506 = 19.49799$

hence refractive index for blue light is given by

$$\mu_b = \frac{\sin i}{\sin r_b}$$

Or $$\mu_b = \frac{\sin 30^0}{\sin 19.49799} = 1.49802$$

Hence the index of refraction of quartz for blue light is **1.49802.**