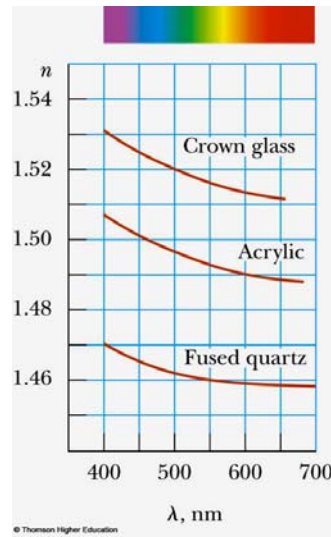


35.7 Dispersion

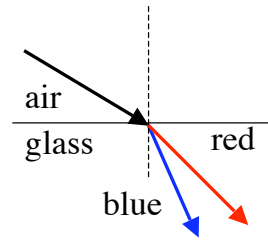
- For a given material, the index of refraction varies with the wavelength of light passing through it.

i.e., $n = n(\lambda)$ is a function of wavelength.

- Snell's law indicates that lights of different wavelength are bent at different angles even when the incident angles are the same.



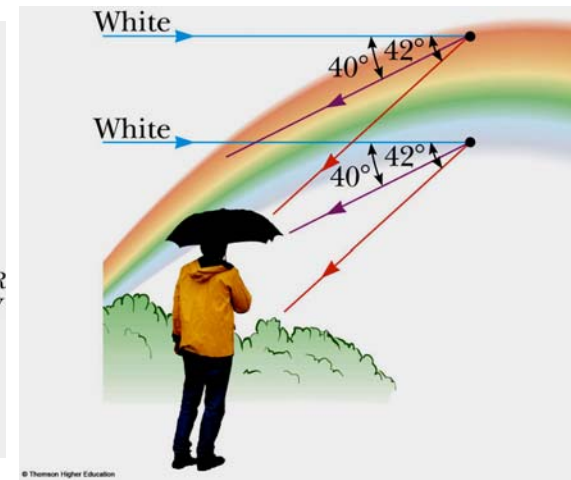
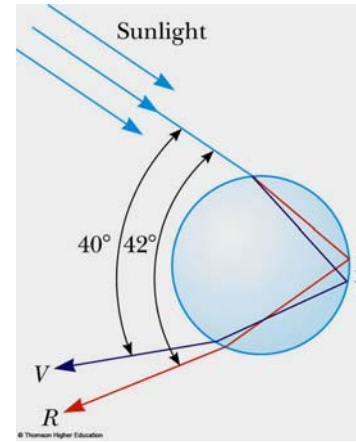
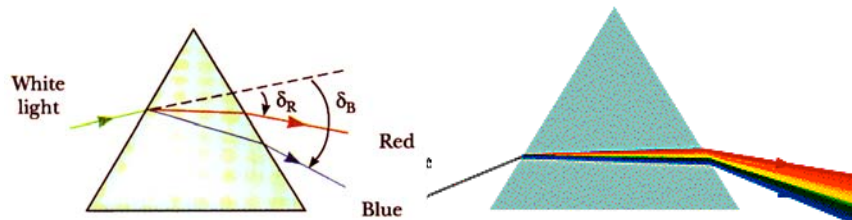
If $n(\text{blue}) > n(\text{red})$



Dispersion:

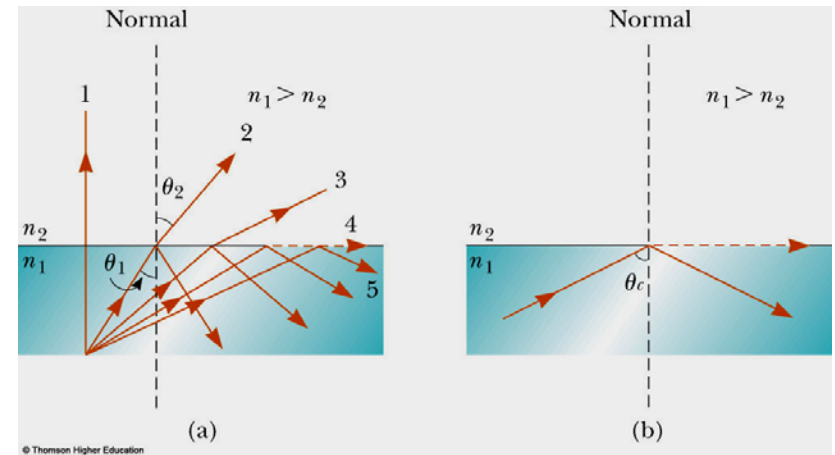
Various wavelengths are refracted at different angles.

White light passing through a prism:



35.7 Total Internal Reflection

TIR can only occur when light travel from a high index of refraction medium to a lower one ($n_1 > n_2$).



- At the critical angle θ_c , The refracted light ray moves parallel to the interface.
- At $\theta > \theta_c$, there is only reflected beam, no refraction beam.



At the critical angle, using Snell's law:

$$n_1 \sin \theta_c = n_2 \sin 90^\circ = n_2$$

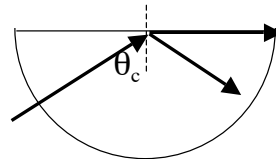
$$\boxed{\sin \theta_c = \frac{n_2}{n_1}} \quad (\text{for } n_1 > n_2)$$

θ_c : diamond 24° , crown glass 41° .

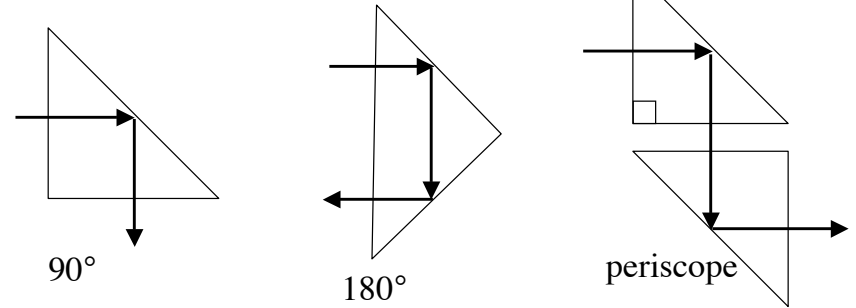
Application of total internal reflection:

- Measure the index of refraction:

$$n = \frac{n_{air}}{\sin \theta_c} \approx \frac{1}{\sin \theta_c}$$



- Internal reflection in a prism:



- Fiber Optics:

