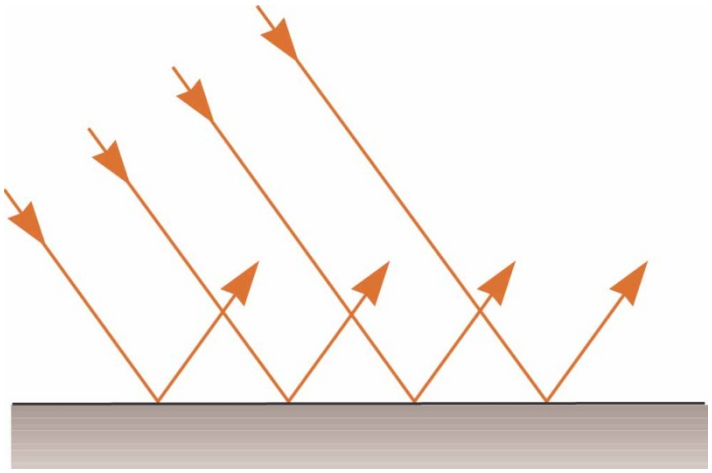
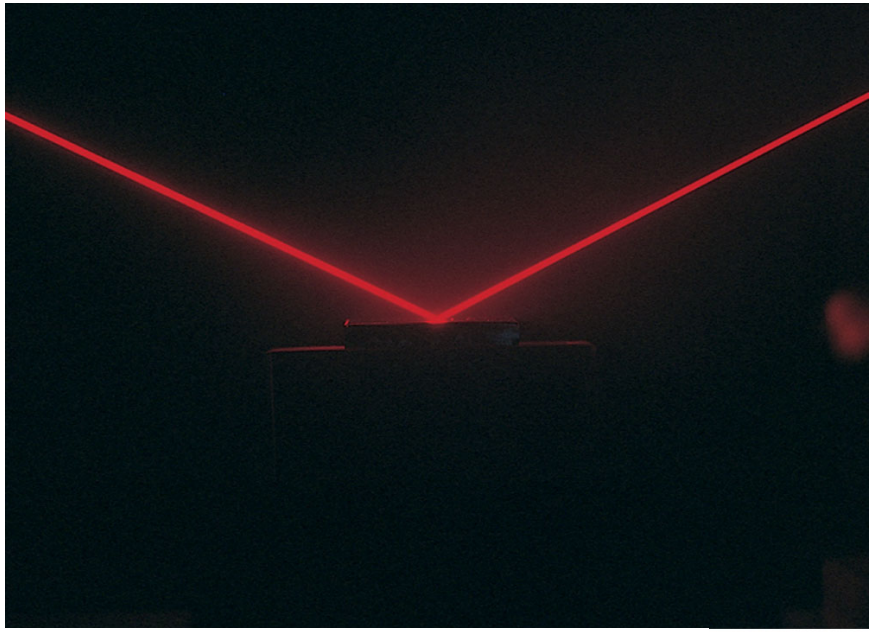
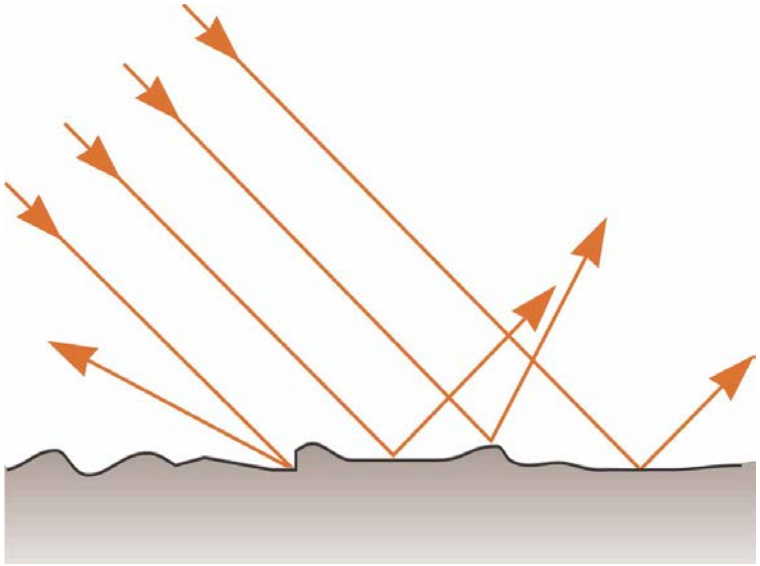
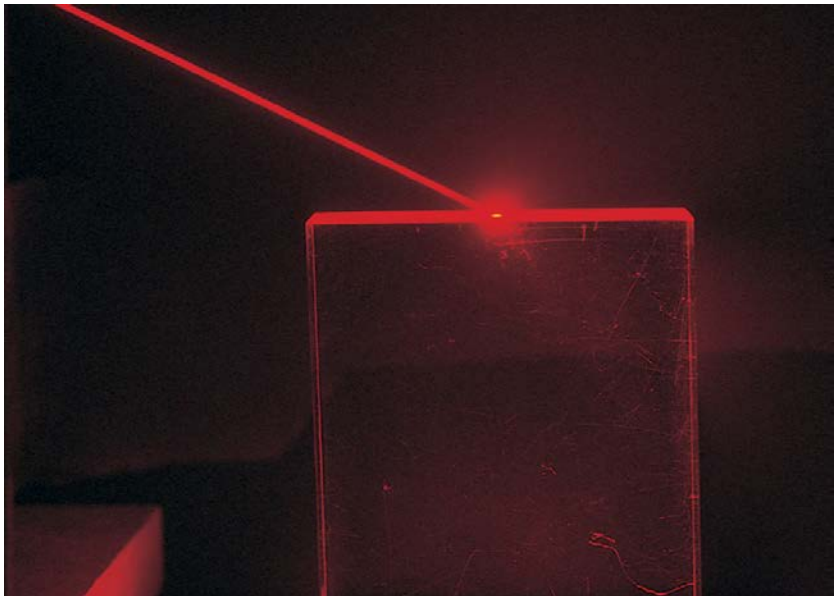
Specular Reflection



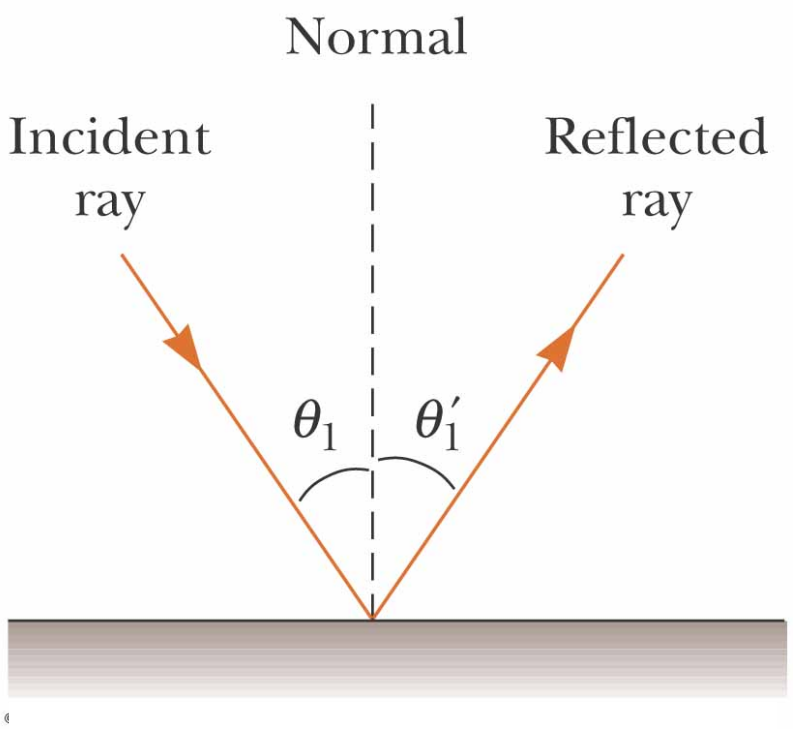


Diffuse Reflection

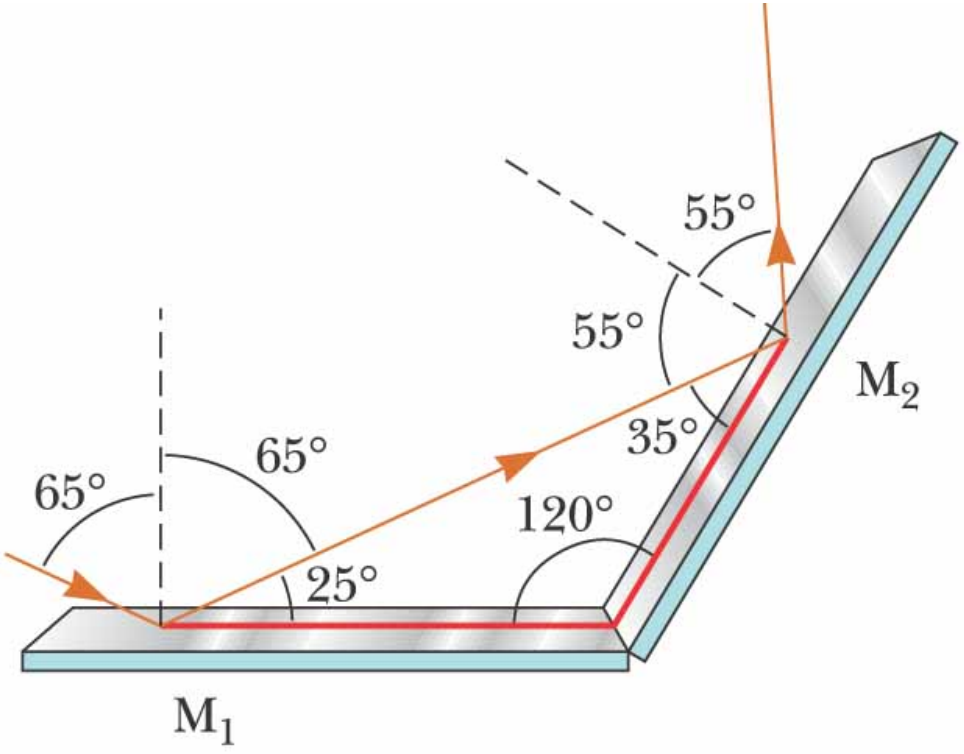




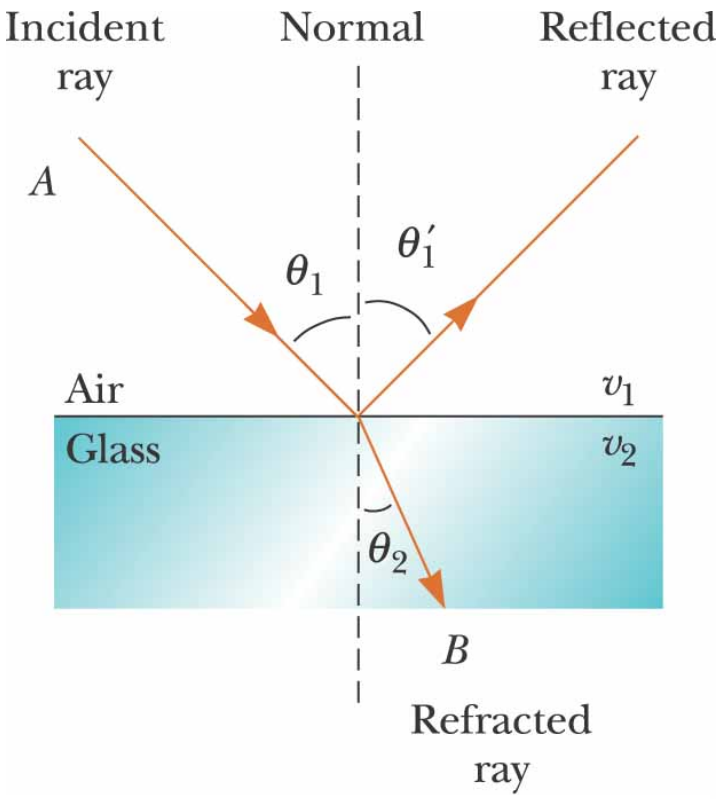
Law of Reflection

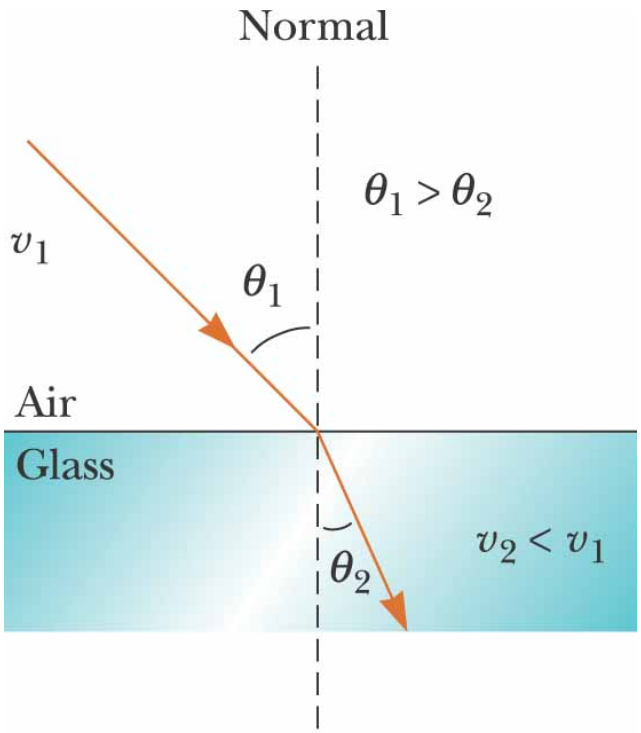


Multiple Reflections

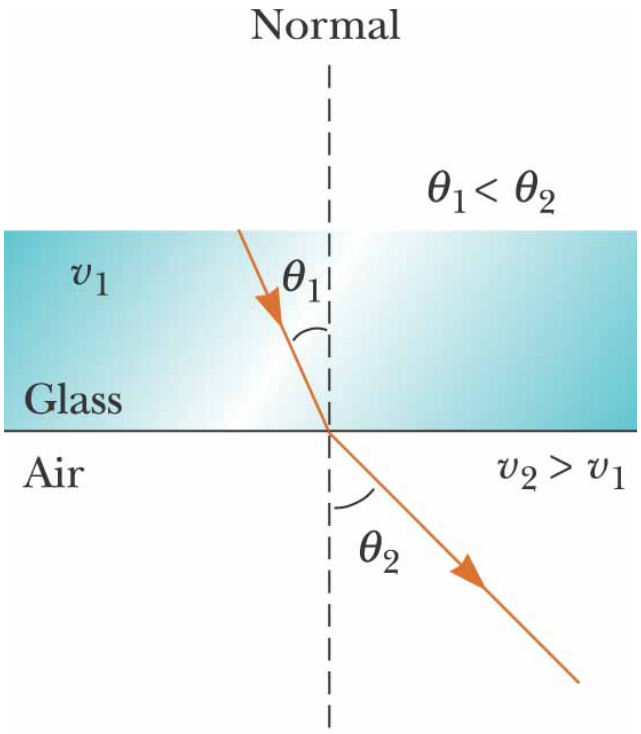


Refraction


Incident ray
Normal
Reflected ray
A
θ_1
θ_1'
Air
v_1
Glass
v_2
θ_2
B
Refracted ray

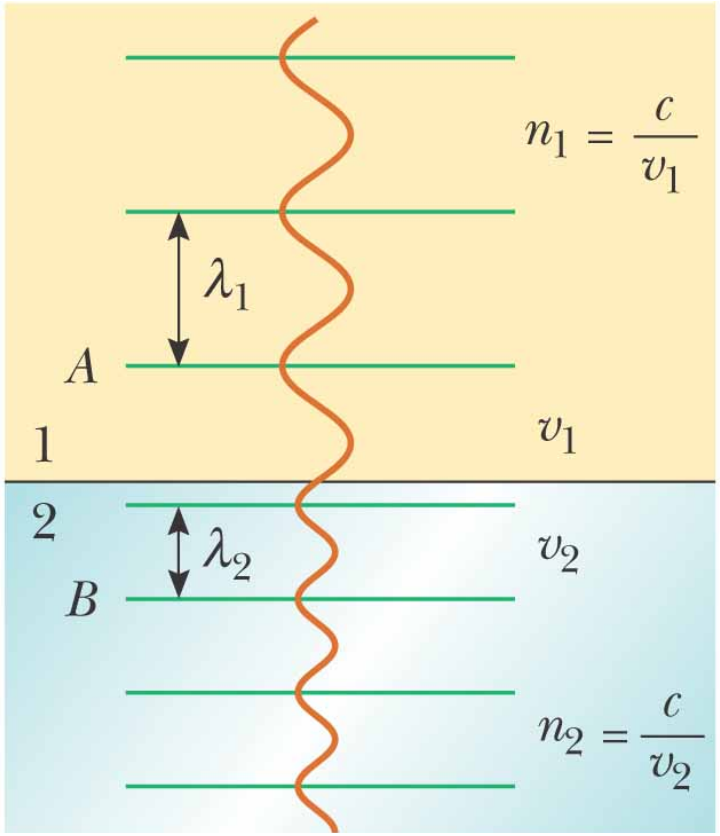

Normal
$\theta_1 > \theta_2$
v_1
θ_1
Air
Glass
$v_2 < v_1$
θ_2

Refraction



Frequency remains unchanged

$$v = \lambda f$$

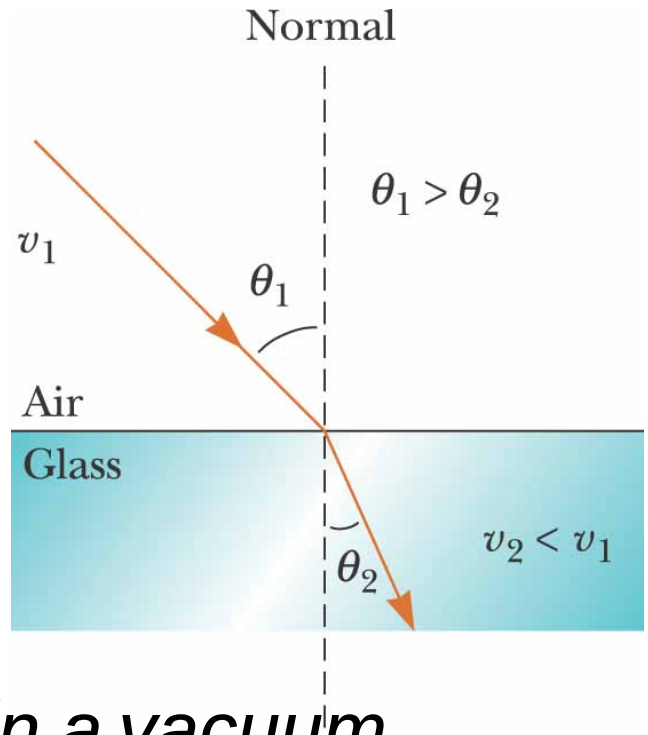


Snell's Law of Refraction

$n_1 \sin \theta_1 = n_2 \sin \theta_2$

– θ_1 is the angle of incidence

– θ_2 is the angle of refraction



$$n \equiv \frac{\textit{speed of light in a vacuum}}{\textit{average speed of light in a medium}}$$

$v = f \lambda$

$$n = \frac{c}{v}$$

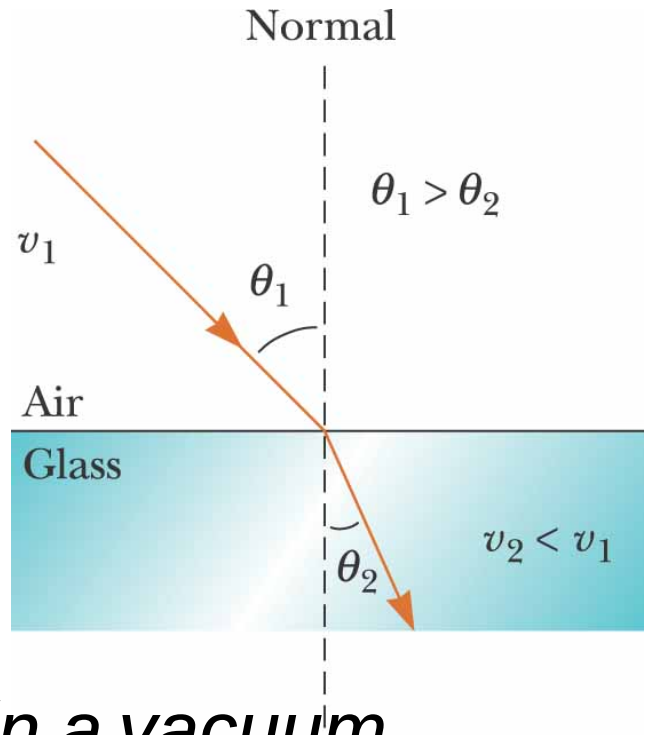
Index of refraction

Snell's Law of Refraction

$n_1 \sin \theta_1 = n_2 \sin \theta_2$

– θ_1 is the angle of incidence

– θ_2 is the angle of refraction

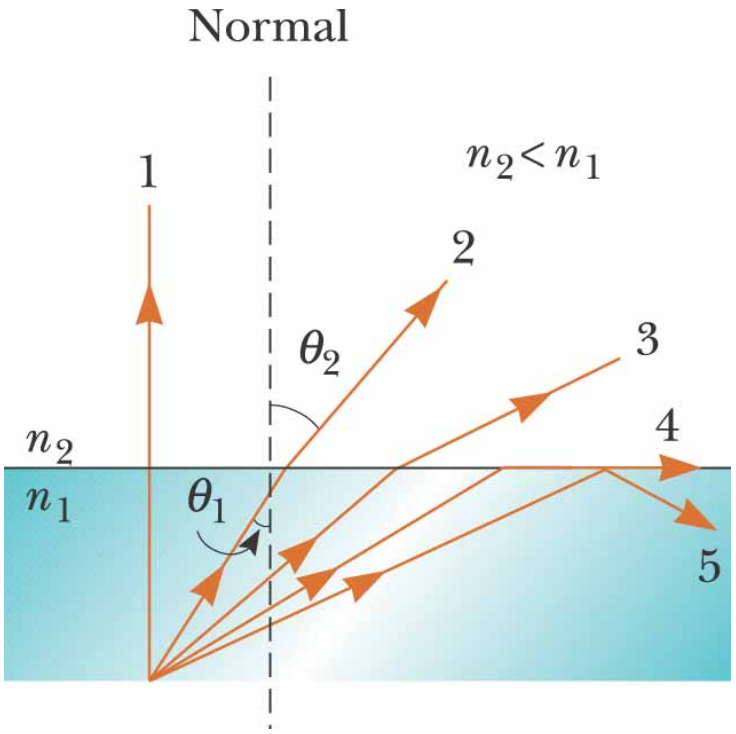


$$n \equiv \frac{\textit{speed of light in a vacuum}}{\textit{average speed of light in a medium}}$$

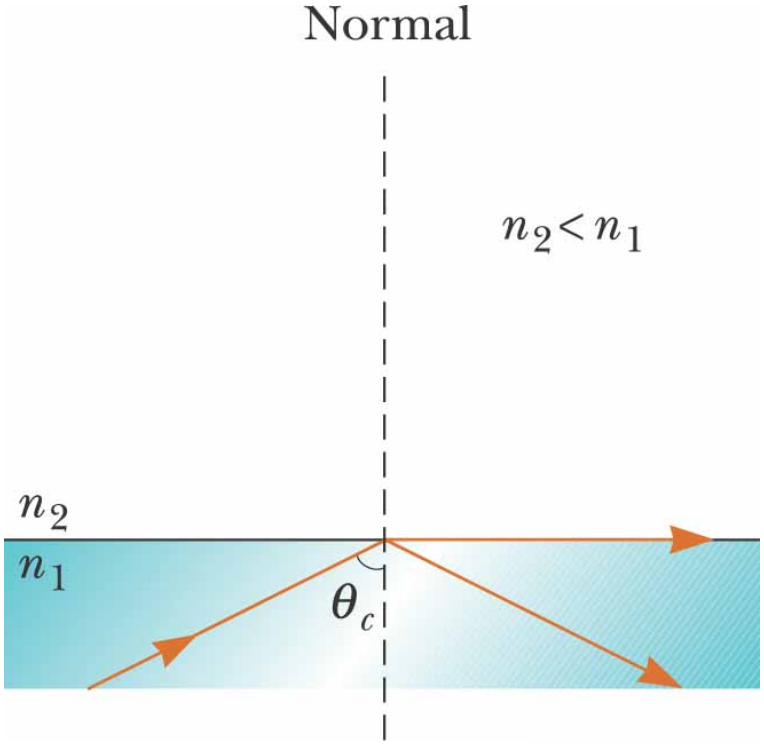
$v = f \lambda$ $\qquad$ $n = \dfrac{c}{v}$


LIFE

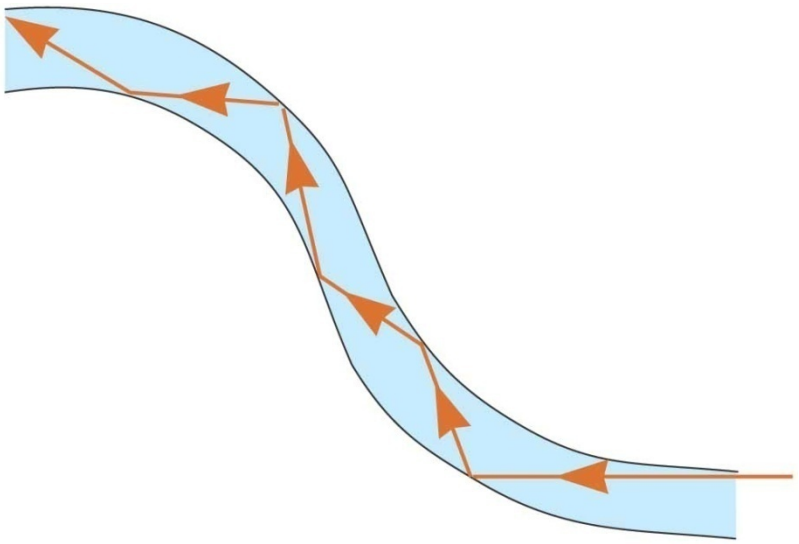
Possible Beam Directions



Total Internal Reflection



Fiber Optics



Angle of Deviation