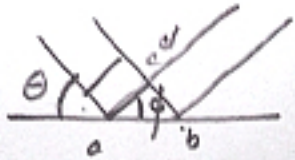
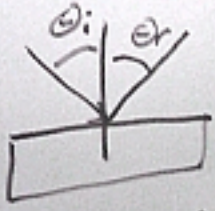
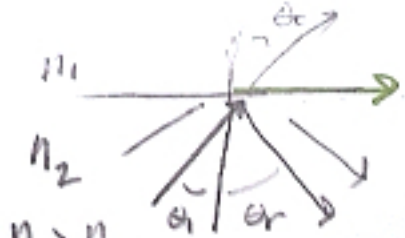
(250)





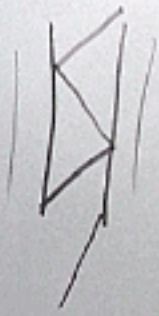
$\theta_i = \theta_r$

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



$n_2 > n_1$

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

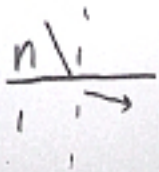


$\sin\theta_2 = \frac{n_1}{n_2}\sin\theta_1$

θ_1

~~$1 = \frac{n_1}{n_2}\sin\theta$~~

$\sin\theta_c = \frac{1}{n_2}$



$n_1 \sin\theta = n_2 \sin\theta_2$

$\sin\theta \approx \theta$

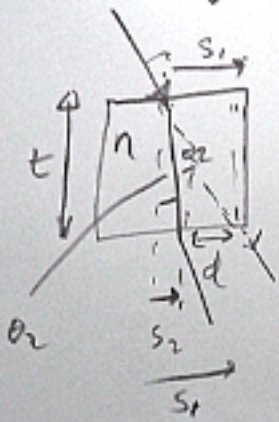
$n_1 \theta \approx n_2 \theta_2$

$+\lambda = V$

cl

λ, f

λ, f



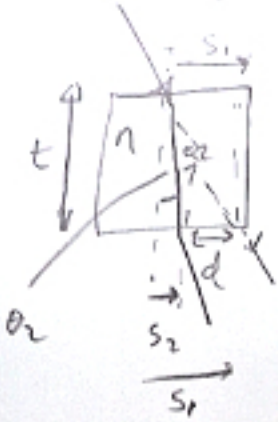
$s_2 = t \tan\theta_2$

$\tan\theta \approx \sin\theta_2$

$s_2 \approx t \sin\theta_2$

$s_1 \approx t \sin\theta_1$

$s_1 - s_2 = d$



$s_2 = t \tan\theta_2$

$\tan\theta \approx \sin\theta_2$

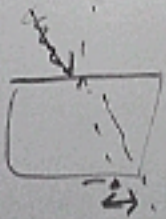
$s_2 \approx t \sin\theta_2$

$s_1 \approx t \sin\theta_1$

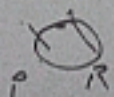
$s_1 - s_2 = d$

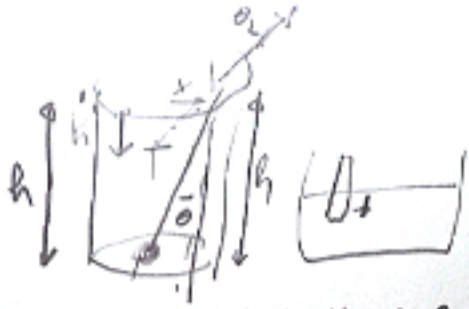
$$d = t[\sin\theta_1 - \sin\theta_2]$$

$$d = t \sin\theta_1 \left(1 - \frac{n_1}{n_2}\right)$$



$n_R < n_P$



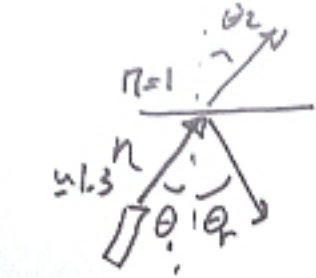


$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

$$\tan\theta_2 = \frac{x}{h} \qquad \tan\theta_2 = \frac{x}{h'}$$

$$n_1 \frac{x}{h} = n_2 \frac{x}{h'}$$

$$h' = \frac{n_2}{n_1} h$$



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

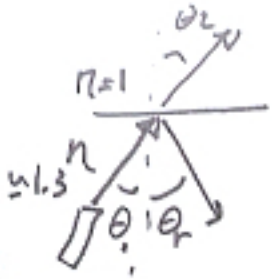
Sen

$$\sin\theta_2 = \frac{n_1}{n_2}\sin\theta_1$$

$\theta = 37^\circ \rightarrow \theta_2 = 53^\circ$

$\sin\theta_c = 1 \Rightarrow 1 = n\sin\theta_c$

$$\sin\theta_c = \frac{1}{n}$$



$$n_1 \sin\theta = \sin\theta_2 \, n_2$$

Sen

$$\sin\theta_2 = \frac{n_1}{n_2} \sin\theta_1$$

$\theta = 37^0 \rightarrow \theta_2 = 53^0$

$\sin\theta_2 = 1 \Rightarrow 1 = n \sin\theta_c$

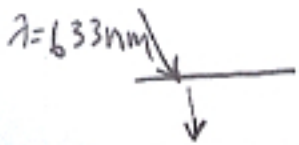
$$\sin\theta_c = \frac{1}{n}$$

$\theta_i = \theta_r$

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

$\sin\theta_c = \frac{1}{n}$

$f\lambda = v$



$f = \frac{c}{\lambda}$

$c = 3 \times 10^8 \, m/s$

$f = \frac{3 \times 10^8}{633 \times 10^{-9} \, m} = 4.7 \times 10^{19} \, Hz$

$\lambda = \frac{v}{f}$ $\quad n = \frac{c}{v}$

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

$\lambda = \frac{c}{nf}$.