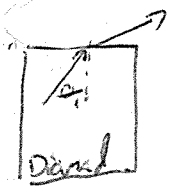
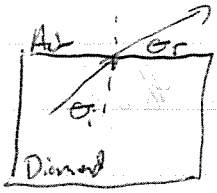
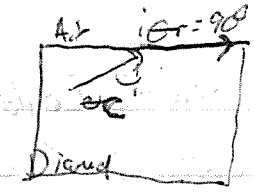


Critical Angle - Refraction

- We know as light passes from a more dense material to a less dense material, its angle of refraction will increase
- We also know that ↑θ_i will ↑θ refract





- Critical Angle is what angle of incidence is in order to get the angle of refraction to equal 90°

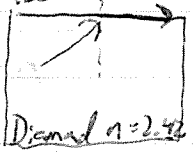
From Snell's Law $\sin 90° = 1$

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

$n_1 \sin\theta_c = n_2 \cdot 1$

$$\sin\theta_c = \frac{n_2}{n_1}$$

Example: Calculate the critical angle between a diamond & Lucite



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

$2.42 \sin\theta_c = 1.5 \sin 90$

$\sin\theta' = \frac{1.5}{2.42} = 38°$

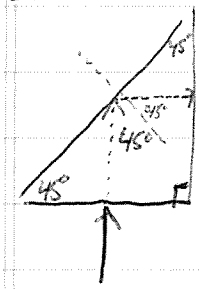
What happens if you make diamond incident angle at 39°

- Light no longer able to skim surface & boundary between media

Total Internal Reflection

- Light unable to escape, but is reflected back into media

Ex



Lucite n=1.5 Complete the path of the light ray

① Find Critical Angle

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

$1.5 \sin x = 1 \sin 90$

$\sin x = \frac{1}{1.5}$ $x = 41.8°$

45° > 41.8°

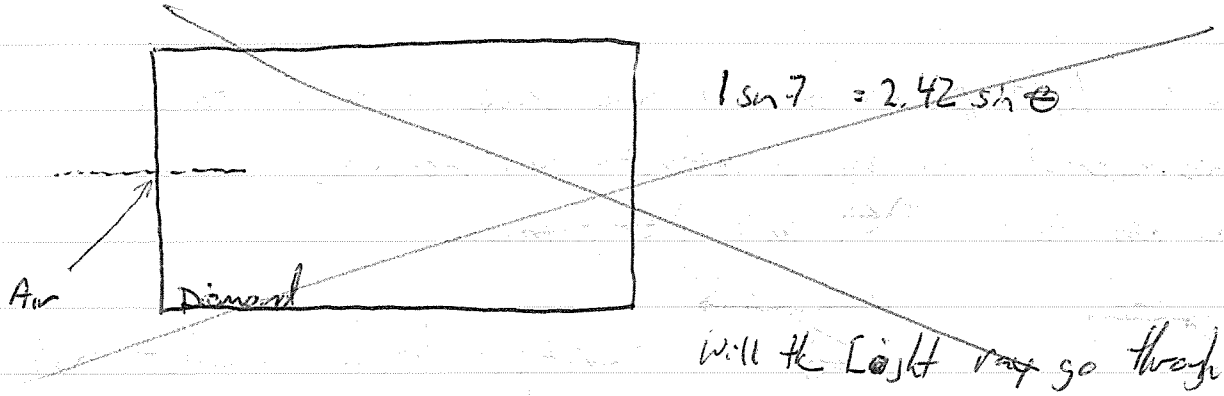
Critical Angle Exceeded

Total internal reflect

Reflected at 45°

n=1

$\theta_c = 24.4°$



$1 \sin 7 = 2.42 \sin\theta$ ②

Will the Light ray go through?

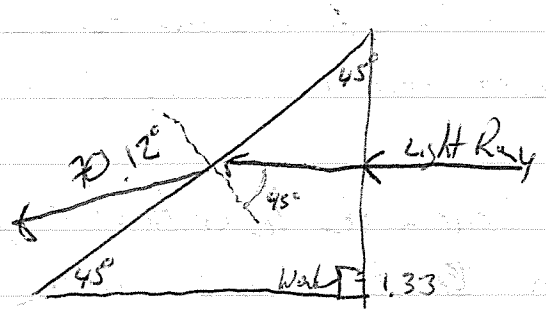
Critical Angle

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

$1.33 \sin\theta = 1 \sin 90$

$\theta = 48°$

θ_i ② $< \theta_c$, no total internal reflect



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

$1.33 \sin 45 = 1 \sin\theta$

②

$.9405 = \sin\theta$

$\sin\theta = 70.1°$