TSOKOS Wave HW #3 p. [redacted] #5, 7, 8, 10 | Fecha:

⑤ Red light of $\lambda = 6.8 \times 10^{-7}$ m enters glass w/ $n_2 = 1.583$ from air with an $\theta_i = 38°$ Find.

$f = \frac{c}{\lambda} = 4.41 \times 10^{14}$ Hz

(a) Angle of refraction θ_2 $\quad n_1 \sin(\theta_1) = n_2 \sin(\theta_2)$

$\sin(\theta_2) = \frac{n_1}{n_2} \cdot \sin(\theta_1) = \frac{1.00}{1.583} \cdot \sin(38°)$ $\quad \theta_2 = \sin^{-1}(\text{ans})$

$\theta_2 =$ [redacted]

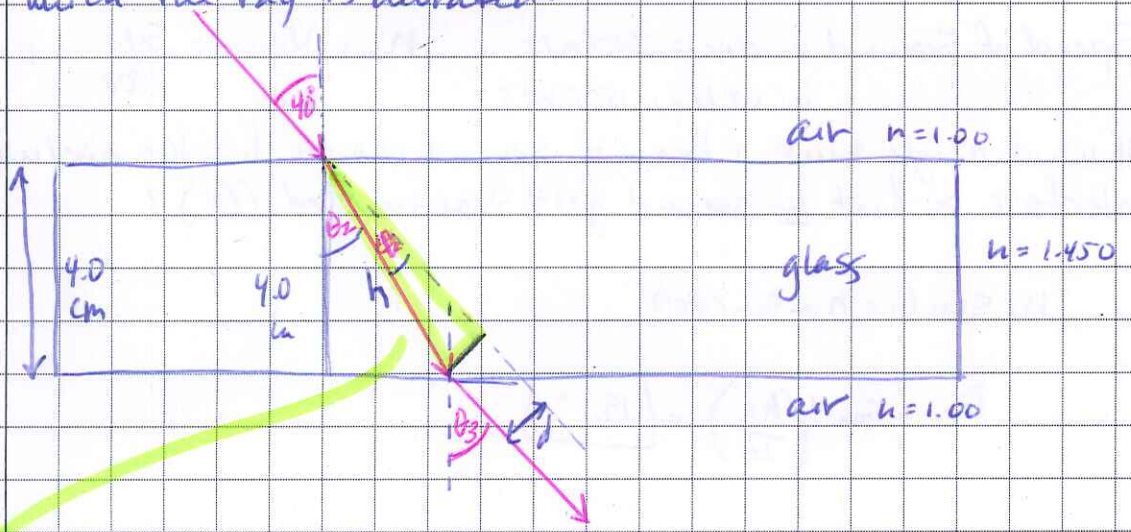
22.9°

b) $n = \frac{c_v}{c_g}$ $\quad c_g = \frac{c_0}{n} = \frac{3 \times 10^8 \text{ m/s}}{1.583}$

$c_g = 1.90 \times 10^8$ m/s

c) $\lambda_g = \frac{c_g}{f} =$ 4.30×10^{-7} m

⑦ Ray of light incident on rectangular block w/ $h = 1.450$ at an angle of $\theta_1 = 40°$ Block is 4.00 cm. Find amount by which the ray is deviated.



$\sin(\theta_2) = \frac{n_1}{n_2} \cdot \sin(\theta_1) = \frac{1.00}{1.450} \cdot \sin(40°)$ $\quad \theta_2 = 26.3°$

$\theta_3 = \theta_1 = 40°$

$\measuredangle$ angle $= 40° - 26.3° = 13.7°$

Length of side $h = \cos(26.3°) = \frac{4.0 \text{ cm}}{h}$

$h = 4.46$ cm.

$\tan(13.7°) = \frac{d}{h}$

(4.46)

$d = 1.09$ cm

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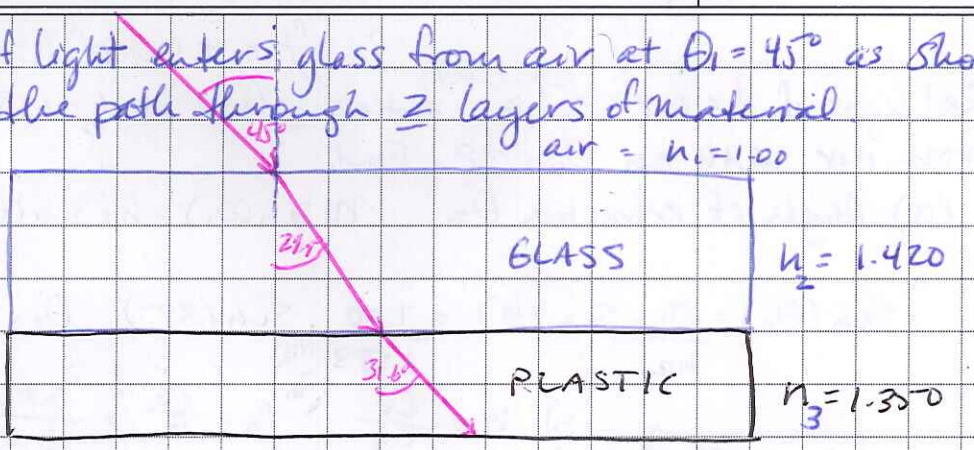
(8) Ray of light enters glass from air at $\theta_1 = 45°$ as shown. Draw the path through 2 layers of material



$\sin\theta_2 = \frac{n_1}{n_2} \cdot \sin\theta_1$ $\quad \boxed{\theta_2 = 29.9°}$

$\sin\theta_3 = \frac{n_2}{n_3} \cdot \sin\theta_2$ $\quad \boxed{\theta_3 = 31.6°}$

(10) Speed of Sound in air = 340 m/s in water = 1500 m/s $\quad n_w = \frac{v_{air}}{v_w} = \frac{340}{1500} = 0.23$

At what angle must a beam of sound waves hit the air/water interface so that no sound gets transmitted (θ_c)?

$n_1 \sin\theta_1 = n_2 \sin(90°)$

$\theta_c = \sin^{-1}\left(\frac{n_2}{n_1}\right) = \boxed{13.1°}$