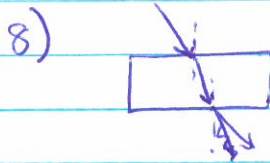


Optics #4

p 802 MC 8
 p 803 Concept 25, 26
 p 864 Problems 20, 21, 39
 Online Refracted Waves
 in Unknown material

- Multiple Choice

(8)

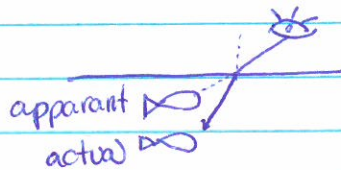


• Light ray in air then thru
 rectangle block. It exits

• // to original path

- Concept

25) Look at fish underwater



26) Take a pencil + touch penny in large pan
 water @ angle

• It is difficult to touch an object that
 is in water b/c light rays
bend at water-air interface, so that the
 light we receive from the object appears
 to originate from a different location
 in the water

- Problems

20) $n_1 = 1.58$ A) $n_1 \sin \theta_1 = n_2 \sin \theta_2$

$n_2 = 1.33$

$\theta_2 = 58.0^\circ$

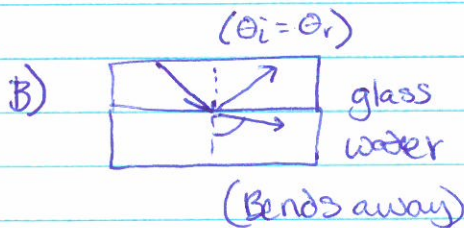
$$\theta_1 = \sin^{-1} \left(\frac{n_2 \sin \theta_2}{n_1} \right)$$

glasstowater

$$= \sin^{-1} \left(\frac{1.33 \sin 58.0^\circ}{1.58} \right)$$

$$= 45.6^\circ$$

(1)



21) air \rightarrow petroleum

$\theta_1 = 48^\circ$

$\theta_2 = 31^\circ$

$n_2 = ?$

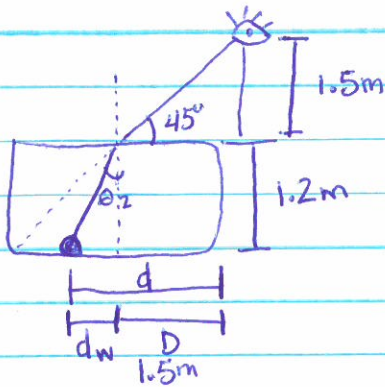
$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$n_2 = \frac{n_1 \sin \theta_1}{\sin \theta_2} = \frac{(1.00) \sin 48^\circ}{\sin 31^\circ}$$

$$n_2 = 1.44$$

(1)

39)



$$d_w = h_w \tan \theta$$

$$d_w = 1.2 \text{ m} \tan \theta_2$$

$$\textcircled{1} \theta_2 = \sin^{-1} \left(\frac{n_1 \sin \theta_1}{n_2} \right)$$

$$= \sin^{-1} \left(\frac{1.00 \sin 45^\circ}{1.33} \right)$$

$$\theta_2 = 32^\circ$$

(2)

$$\textcircled{2} d_w = 1.2 \text{ m} \tan \theta_2$$

$$= 1.2 \text{ m} \tan (32^\circ) = .75 \text{ m}$$

$$\textcircled{3} d = d_w + D = .75 \text{ m} + 1.5 \text{ m} = 2.25 \text{ m}$$

- Online - Refracted Waves in Unknown

A) monochromatic light through interface
b/t two unknowns, NO change in
direction. what can be said?

- The two materials have matching indexes of refraction

(1)

B) same monochromatic light through 2 other unknowns
Transmitted farther from normal

- The second material has lower index of refraction

↳ FAST
into faster
Away

- As the light passes into second material, speed increases