test 2 10-25-13 (4C) (1

CH. 16.
CH. 17.
CH. 32.
CH. 33. ← practice HERE TODAY + OLD notes
CH. 34 = E.C. assigned TODAY! review (#5,6,60)

3 sheets notes (2 sides)

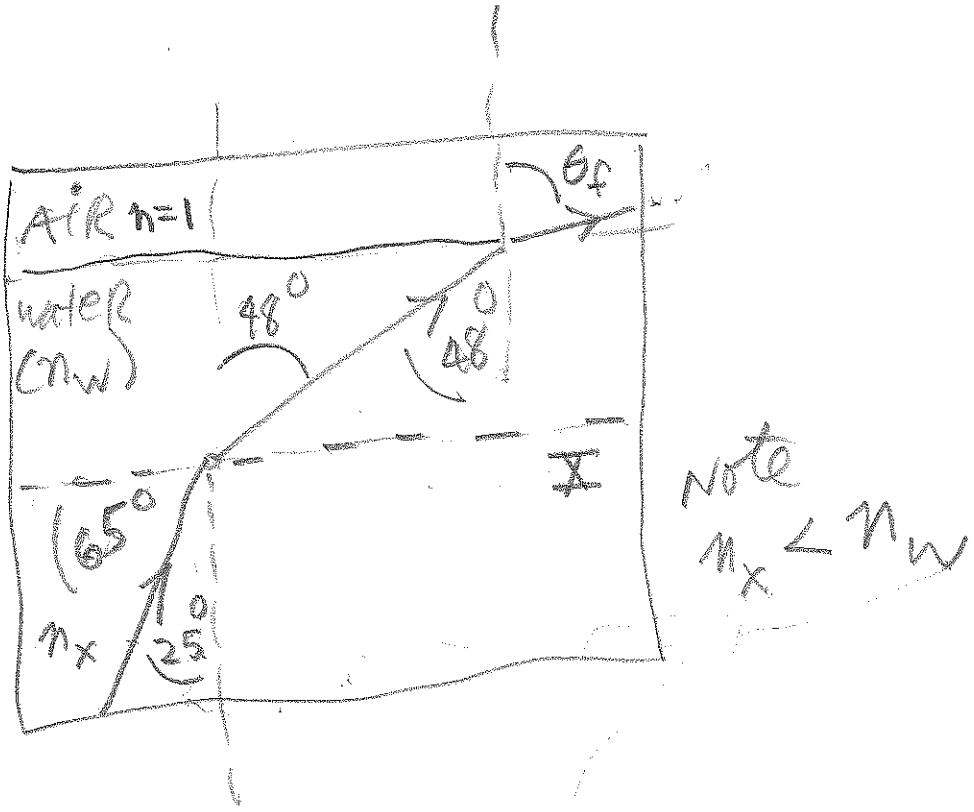
2:30 – 5:30 WED 10-30-13

expect start? → 2 – 5:30?

ALSO: study existing sample tests at nvaphysics.com. make a GRID-redly CROSS indexing sample test and online quiz problems. include CH 16, 17, 32, 33 [CH 17 not available at nvaphysics.com sample tests]

Q (33.)

(11.)



(a) $n_x \sin 25 = n_w \sin 48$

$n_x = \dfrac{(1.33)\sin 48^\circ}{\sin 25} > n_w = 1.33$

(b) $(1.33)\sin 48 = n_{AIR} \sin\theta_f$

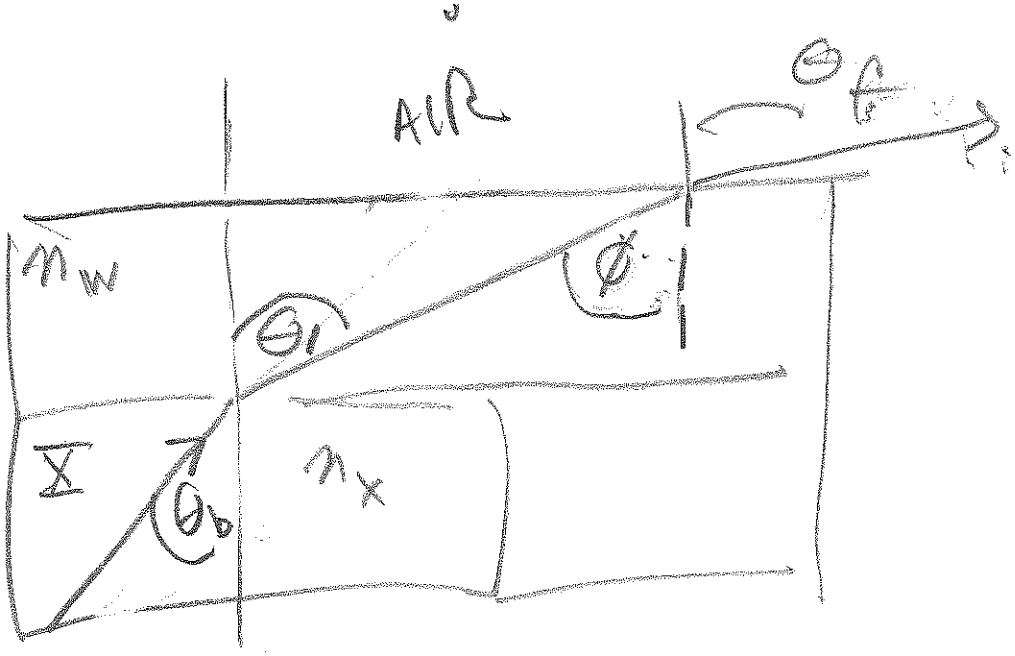
$\sin\theta_f = \dfrac{(1.33)\sin 48}{1} = 0.98838$

$\theta_f = 81^\circ$

(2

(11) CH 33

What if?



What if $\phi \geq \phi_c$

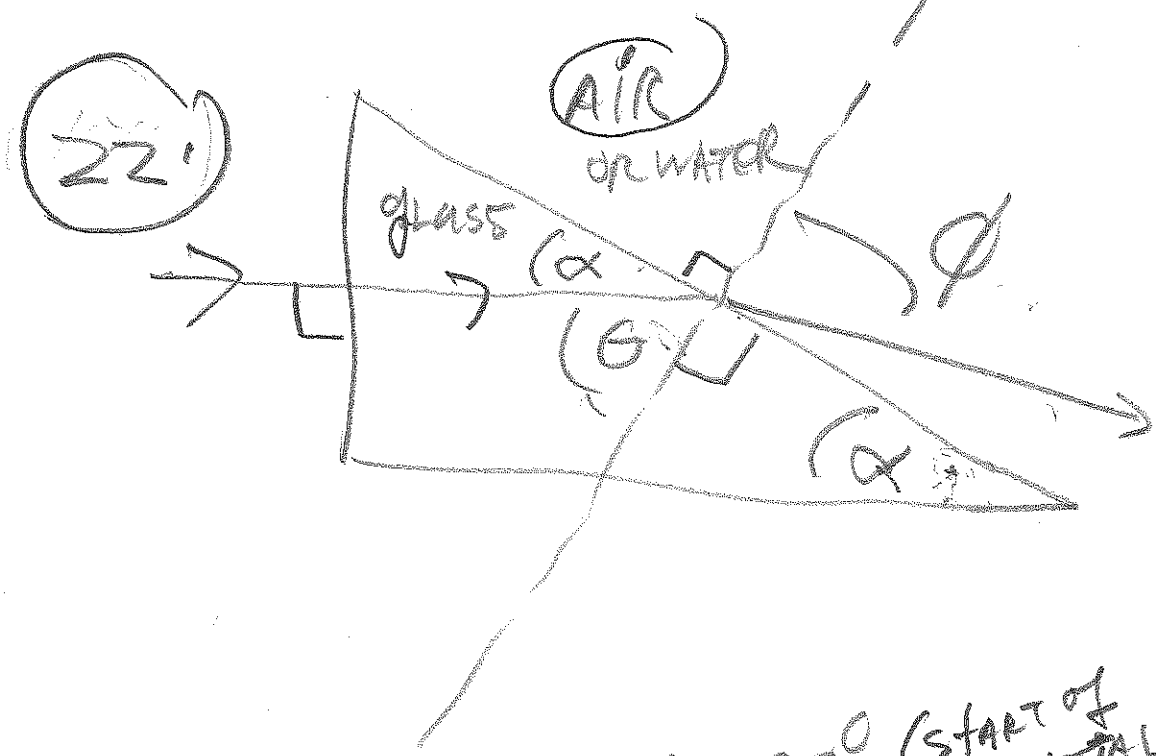
ϕ_c = critical angle

$n_w \sin\phi = (1)\sin 90^\circ$

$\phi_c = \sin^{-1}\frac{(1)}{1.33} = 48.75^\circ$

If $\phi > 48.75^\circ$, θ_f undefined

(4



(a) AIR $n_g \cdot \sin\theta = (1)\sin 90^\circ$ $\phi = 90^\circ$ (START OF TOTAL INTERNAL reflection)

immersed in AIR

$(1.55)\sin(90-\alpha) = 1$

TOTAL internal reflection

$(1.55)\cos\alpha = 1$

$\alpha < \cos^{-1}\left(\frac{1}{1.55}\right)$ ← $\alpha = \cos^{-1}\left(\frac{1}{1.55}\right)$ = cut off angle

(b) $\alpha = \cos^{-1}\left(\frac{1.33}{1.55}\right)$

CH 33

29.

$I_t = I_i \cos^2\phi$ ← AVERAGE OVER ALL angles

$\langle I_t \rangle = I_i \langle \cos^2\phi \rangle = I_i \frac{1}{2}$

$\langle \cos^2\phi \rangle = \frac{1}{2}$

I_0 → unpolarized

$I_1 = \frac{I_0}{2}$

60° $I_2 = I_1 \cos^2 60°$

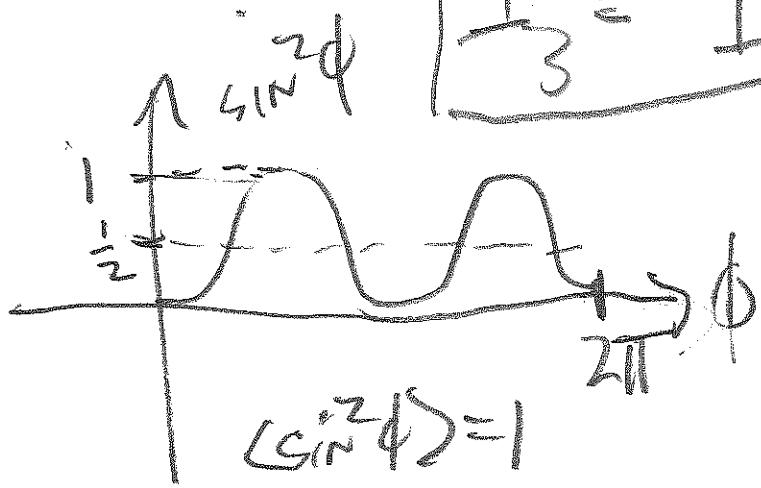
90° → I_3

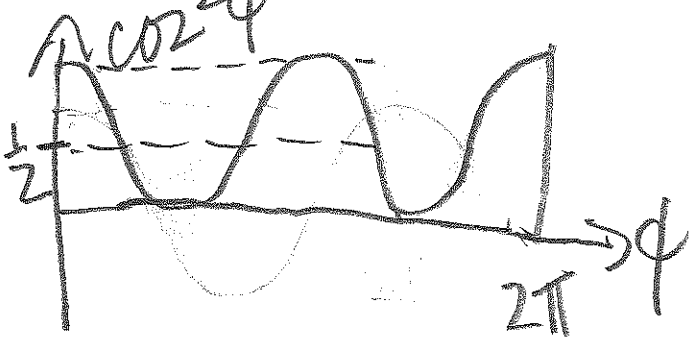
POLARIZING DIRECTION

$I_3 = I_2 \cdot \cos^2 30°$

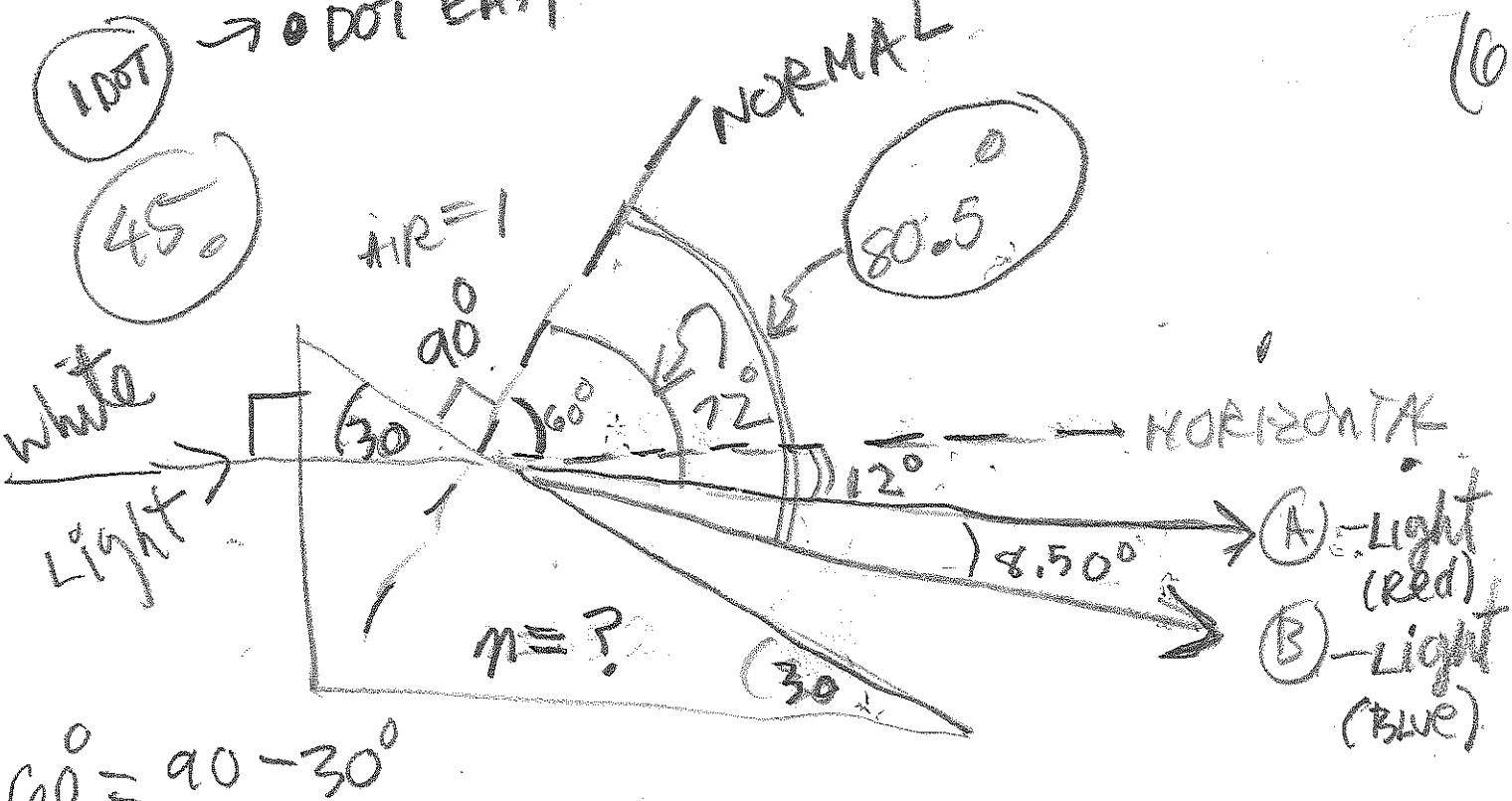
Be careful $30 = 90 - 60$

$\langle \cos^2\phi \rangle = \frac{1}{2}$





IDOT → DOT EASY IF YOU KNOW H.S. GEOMETRY + TRIG.



$60^\circ = 90 - 30^\circ$

$(n_A) \cdot \sin 30^\circ = (1) \sin 72 \Rightarrow$ FIND n_B

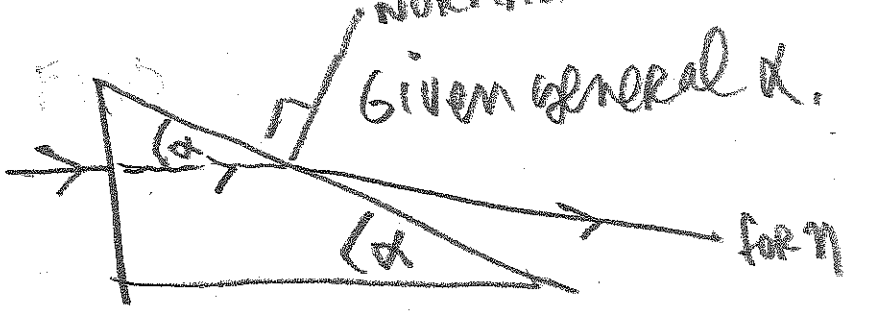
$(n_B) \cdot \sin 30^\circ = (1) \sin 80.5 \Rightarrow$ FIND n_A

$n_B > n_A$

$80.5^\circ > 72^\circ$

[See ALSO #58, 60, CH 5]

WHAT IF?



Test 2 review

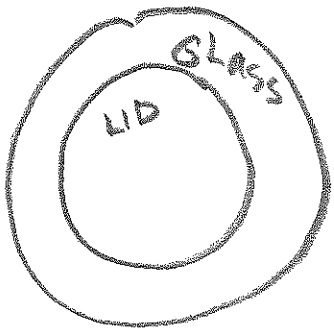
17.15
17.20
17.22
} Expansion

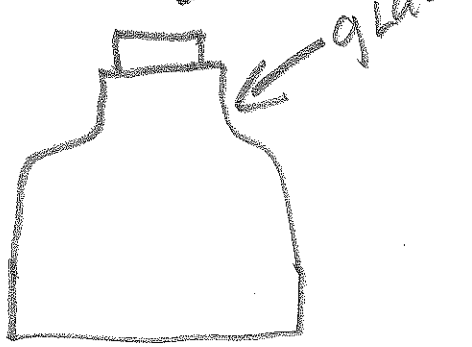
ch17

(15.) $\alpha_g = 0.4 - 0.9 \times 10^{-5}$

$\alpha_{Fe} \approx 1.2 \times 10^{-5}$

Top view (eye)





BOOK $D_0 = 0.725\ m$

GLASS: $\Delta D_g = 0$ → remains at 0.725 m

steel → LID: $\Delta D_L = \alpha_{st} \cdot D_0 \cdot \Delta T$

$\Delta D_L - \Delta D_g$ = Difference $= \alpha_{st} \cdot D_0 \cdot \Delta T - 0$

$= \alpha_{st} \cdot (0.725)(30)$

difference

$= (1.2\times10^{-5})(0.725)(30)\,(cm)$

$= 2.1\times10^{-4} = 0.21\times10^{-3}$

$= 0.21\,mm$

What if? (Test 2)

What if Both lid and glass are in THERMAL EQUILIBRIUM?

$DIFFERENCE = \Delta D_L - \Delta D_g$

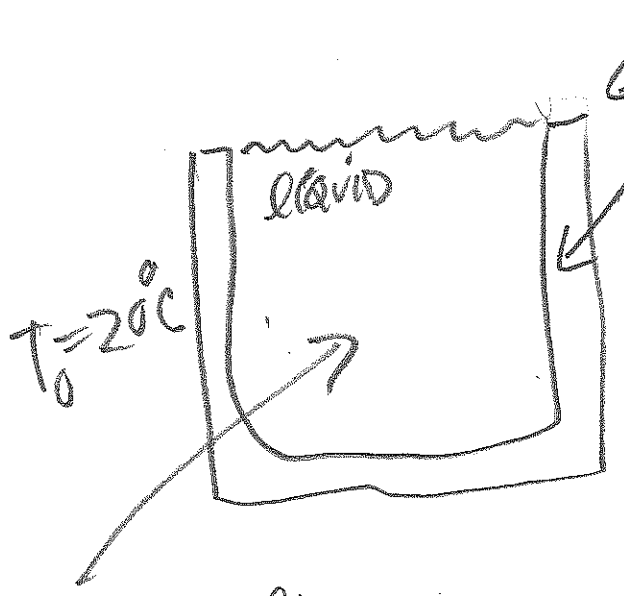
$= \alpha_{st} \cdot D_0 \cdot \Delta T - \alpha_g \cdot D_0 \cdot \Delta T$

$= D_0 \cdot \Delta T \cdot (\alpha_{st} - \alpha_g)$; $D_0 = 0.725\,(cm)$, $\Delta T = 30^\circ C$

$\alpha_g \approx 0.65\times10^{-5}$; $\alpha_{st} = 1.2\times10^{-5}$

Expansion:

Classical problem:



$\alpha_g = 0.65 \times 10^{-5} (^\circ C)^{-1}$

$\alpha_l = 49 \times 10^{-5} (^\circ C)^{-1}$

What happens when system temperature is increased to 90°C?

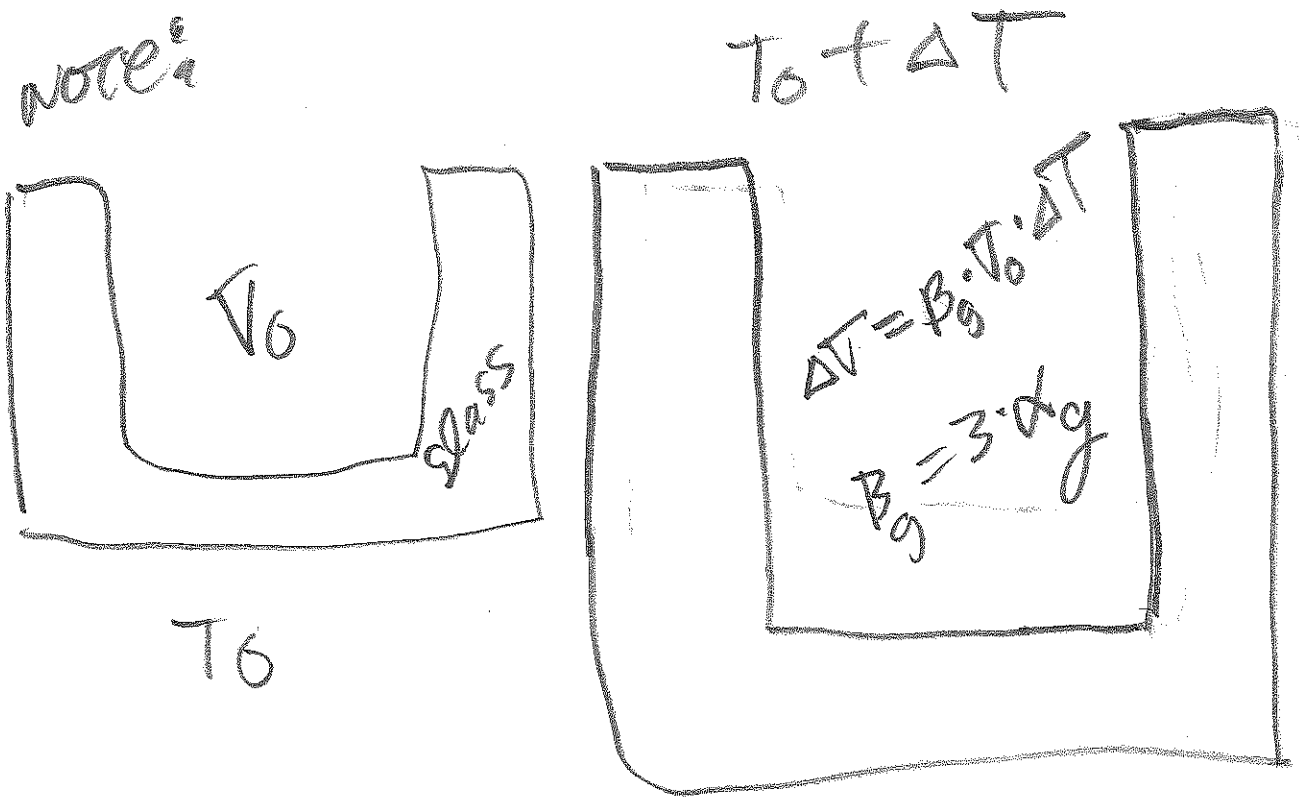
(ASSUME glycerine DOES NOT BOIL)

$70^\circ C$

ANSWER: OVERFLOW

HOW MUCH? $\Delta V = (\beta_l - 3\alpha_g) \cdot V_0 \cdot \Delta T$ see EQN. 17.8

NOTE:


$T_0 + \Delta T$
V_0
q_{gas}
$\Delta V = \beta_g \cdot V_0 \cdot \Delta T$
$\beta_g = 3 \cdot \alpha_g$
T_0

Sample Test Index (links at bottom)

CH

Sample test	#	CH	TOPIC / UNIT
1	4	16	Db
1	5	16	

$$I_A = \frac{1.2W}{4\pi \cdot 20}$$

$$I_B = \frac{1.6W}{4\pi \cdot 25}$$

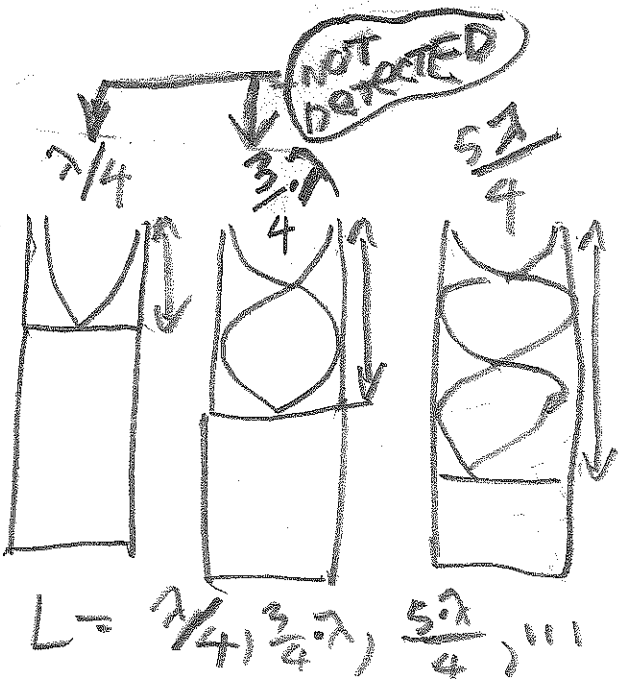
TOTAL (IN Db)

$$= 10 \cdot \log\left(\frac{I_A + I_B}{I_0}\right)$$

$$I_0 = 10^{-12}$$

$$\lambda = \frac{340 \frac{m}{s}}{512 s^{-1}}$$

$$= 0.664$$



$$L = \frac{\lambda}{4}, \frac{3}{4}\lambda, \frac{5\lambda}{4}, \ldots$$

SUBTEST TO test #1

Real test 1, spring 2009

See #4, ST1

#4, test 1

SAMPLE test	#	CH	TOPIC
2	1	16	

(a) interference

$d_2 = 1.518\,(m)$

constructive

$d_2 - d_1 = \lambda$

$\lambda = 1.518 - 1.000$

$= 0.518\,(cm)$

(b) $f = \frac{v}{\lambda}$

$= \frac{343\ m/s}{0.518m}$

$= 662.2\ Hz$

(c) $\lambda + \frac{\lambda}{2} + 1$

$0.518 + 0.259 + 1$

$= \boxed{1.777\,m}$

SAMPLE test	#	CH	WORK
2	2	22	

correction

$m_{bead} = \frac{4}{3}\pi r^3 \cdot \text{density}$

$m_{bead} \cdot g = \frac{\alpha \cdot I}{C} \pi r^2$

$\alpha = ?$

$\alpha = 2$ = perfectly reflects

$\alpha = 1$ = zero reflection (100% absorption)

r = bead radius

$\alpha = 1.9$

$m_{bead} \cdot g = \frac{1.9 I}{C} \cdot \pi r^2$

(14

SAMPLE test	#	CH	
2	3	33	EASY
2	4	34	E.C.

subtest for test 2:

#1 → CH1C

#2 → interference (CH1C)

#3 → CH32

#4 → CH33 (EASY)