Physics 1C
Quiz 1 (Form A)

1) 

$\lambda = 2L$

$V = \sqrt{\frac{F}{\mu}}$

$f = \frac{V}{\lambda} = \frac{1}{2L}\sqrt{\frac{F}{\mu}}$

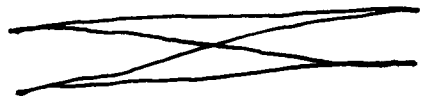
when the tension on the string is increased $F' = 1.1F$ and L and μ are not changed.

the new frequency is $f' = \frac{1}{2L}\sqrt{\frac{F'}{\mu}}$

$$\frac{f'}{f} = \sqrt{\frac{F'}{F}} = \sqrt{\frac{1.1F}{F}} = \sqrt{1.1}$$

$$f' = \sqrt{1.1}\, f = \sqrt{1.1}\, 440 = \boxed{462\ Hz}$$

2) standing waves



L

$n = 1 \quad \lambda_1 = 2L$

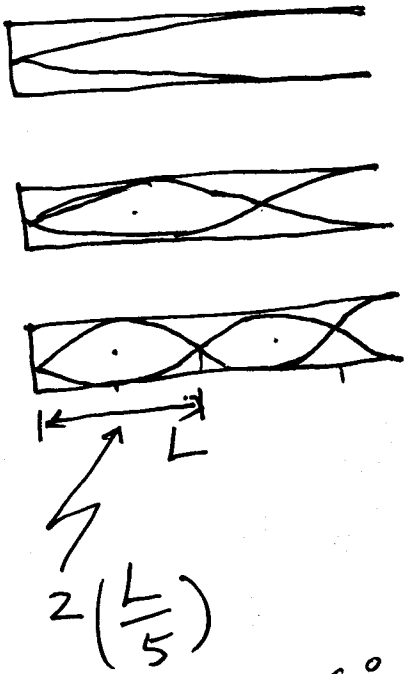
$n = 2 \quad \lambda_2 = L$

fundamental frequency $f_1 = \frac{V}{2L} = \frac{340\ m/s}{2(0.85\ m)} = \boxed{200\ Hz}$

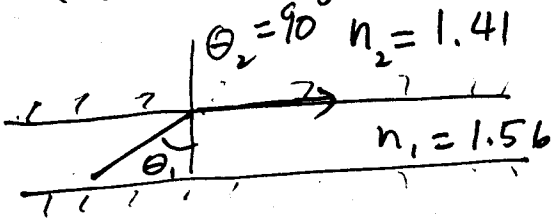
$$f_2 = \frac{V}{L} = \frac{340}{0.85} = \boxed{400\ Hz}$$

$$= 2f_1$$

3) Standing waves in an air column.
for one end open & one end closed -



only odd harmonics are allowed.

4) 

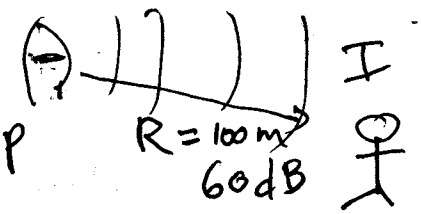
Light pipe

$n_1 \sin\theta_1 = n_2 \sin 90$ for total internal reflection

$$\sin\theta_1 = \frac{n_2}{n_1} = \frac{1.41}{1.56} = 0.9038$$

$$\theta_1 = \arcsin(0.9038) = \boxed{64.7^\circ}$$

5) A factory whistle



$$60\,dB = 10 \log \frac{I}{I_0}$$

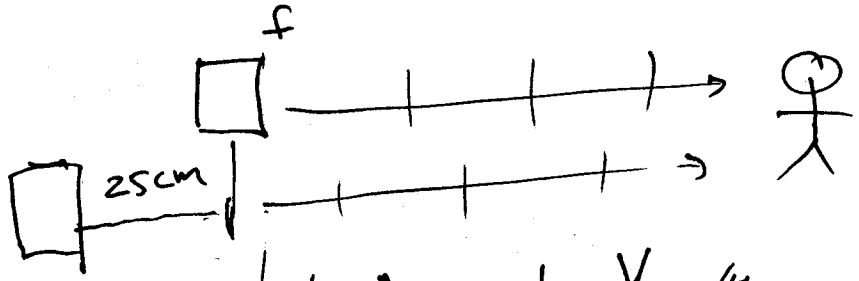
$$I = I_0 10^6 = 10^{-12}(10^6)$$

$$= 10^{-6}\ w/m^2$$

$$I = \frac{P}{A} = \frac{P}{4\pi R^2} \qquad P = 4\pi R^2 I = 4\pi (100m)^2 (10^{-6}\ w/m^2)$$

$$P = \boxed{0.126\ W}$$

6) Destructive interference occurs when the path difference from the two sources is a half integer no of wavelengths.



$= \Delta x = \frac{1}{2}\lambda = \frac{1}{2}\frac{V}{f}$

$f = \frac{1}{2}\frac{V}{\Delta x} = \frac{1}{2}\frac{340\ m/s}{0.25\ m} = \boxed{680\ Hz}$

7)

$k_0 = 120\ N/m$

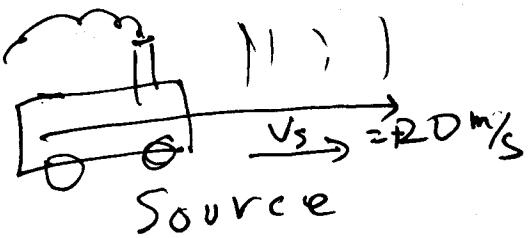
$k = \frac{k_0}{2}$ for two springs in series

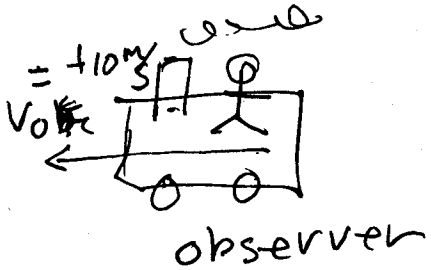
k_0

$f = \frac{1}{2\pi}\sqrt{\frac{k}{m}} = \frac{1}{2\pi}\sqrt{\frac{k_0}{2m}}$

$f = \frac{1}{2\pi}\sqrt{\frac{120\ N/m}{2(1.0\ kg)}} = \boxed{1.23\ Hz}$

8)

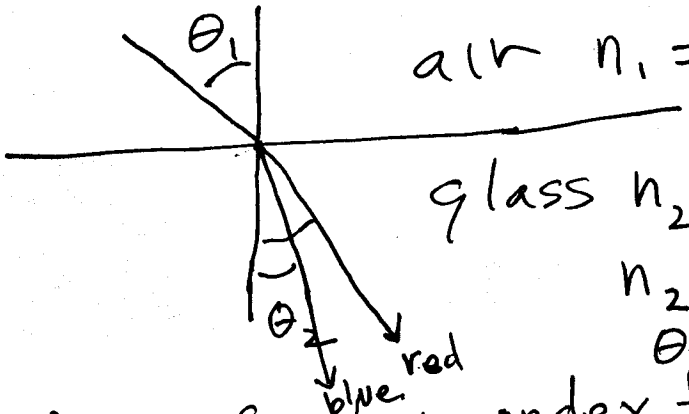




$f_o = \frac{V + V_o}{V - V_s} f_s = \frac{(340+10)}{(340-20)} 600 = \boxed{656\ Hz}$

9) Visible light is in the region 400–700 nm. or close to 1 micrometer (10^{-6} m)

10)



The refractive index for blue light is greater than that for red light. (The refractive index increases for decreasing wavelength). Since $n_{2\,blue} > n_{2\,red}$ then $\theta_{2\,blue}$ is less than $\theta_{2\,red}$. from Snell's Law - $n_1 \sin\theta_1 = n_2 \sin\theta_2$