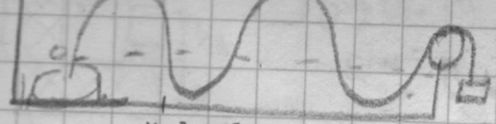


$x_1 = 0.5\,m$

$f = 40\,Hz$
$A = 0.25\,m$
$\mu = 0.02\,kg/m$
$T = 20.48\,N$

Displacement of piece at x_1 @ $t=0$, if piece @ $x=0$ is @ 0 moving

$\omega = 2\pi f = 2\pi \cdot 40 = 80\pi$ $\quad k = \frac{2\pi}{\lambda}$ $\quad v = \sqrt{\frac{20.48}{0.02}} = 32\,m/s$

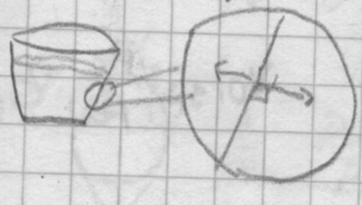
$k = \frac{2\pi}{0.8} = \frac{2\pi}{4/5} = \frac{5\pi}{2}$ $\quad 32\,m/s = \lambda f$ $\quad \lambda = 0.8\,m$

$y(x,t) = 0.25\cos(\frac{5\pi}{2}x - 80\pi t)$

$y(0.5m, 0) = 0.25\cos(\frac{5\pi}{4}) = 0.25(-\sqrt{2}/2) = -\sqrt{2}/8 \approx -0.1767$

Lecture 28 : Fluid statics

Pressure due to liquid or gas: Forces are caused by the movement + collisions of molecules.
Pressure is the Force per unit area due to these collisions.



$$\boxed{P = \frac{\text{Force}}{\text{Area}}}$$

Think like this: The pressure @ some depth is due to the weight of everything above that depth.

$$\boxed{P_2 - P_1 = \rho g h}$$

$P_C = P_D > P_A = P_B$

The pressure at the same depth is the same.

Ex:

Equal height and surface area. What are the comparitive magnitudes of the net force due to water?

$F_A = F_B$

Atmospheric Pressure: The weight of the atmosphere.

$P_{atm} = 1\times10^5\,N/m^2 = 14.7\,lbs/in^2$

Ex: sphere w/ $r = 0.1\,m$

$A = 4\pi r^2 = 0.125\,m^2 \rightarrow F = 12{,}000\,N$ (over 2,500 lbs)

Ex: Can you drink through a straw 40 feet long/high?

No, because $P = 1_{atm}$ for 10' of water.

$P_1 - P_2 = \rho g h$, so you would need pressure greater than 1atm, not possible naturally.

HW 2)

2) $\mu = 2\times10^{-4}$ kg/m $L = 1.09$ m $T = 103.5$ N

a) $v_{propogation} = \sqrt{\frac{T}{\mu}} = \sqrt{\frac{103.5}{2\times10^{-4}}} \approx \boxed{719 \text{ m/s}}$

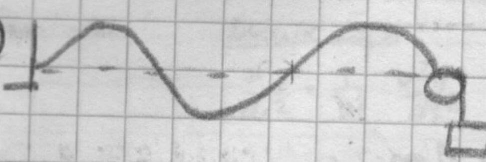
b) Fundamental frequency?

$v = \lambda f$

$\rightarrow 719 = 2L \cdot f = 2.18 f$ $f \approx 329.8\overline{8}$ Hz

c) Finger placed 0.172m from top of guitar.
Fundamental f?

$719 = 2(L - 0.172) f = 2(0.918 \text{ m}) f$ $\boxed{f = 391.6 \text{ Hz}}$

3) 

$\mu = 3\times10^{-4}$ kg/m
$f = 66$ Hz
$L = 0.56$m

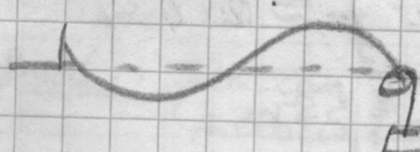
a) Wavelength?

$L \times \frac{2}{3} = 0.56\text{m} \cdot \frac{2}{3} = \boxed{0.37\overline{3} \text{ m}}$

b) $v = \lambda f = 0.37\overline{3} \cdot 66 = \boxed{24.64 \text{ m/s}}$

c) $24.64^2 = \frac{T}{\mu}$ $T = 607.1296 \cdot 3\times10^{-4} = \boxed{0.182 \text{ N}}$

d) $mg = T$, $m = 0.018566544$ kg

e)  f remains 66 Hz, only mass adjusted.

f) Wavelength? $L = 0.56$m

$v = \lambda f = 0.56 \cdot 66 = \boxed{36.96 \text{ m/s}}$

g) $(36.96)^2 = \frac{T}{\mu}$ $T = 0.4098$ N

h) $T = mg$ $m \approx 0.0418$ kg

i) Max m for coherent standing wave?

$\lambda = 2L$

$v = 0.739\overline{2}$ m/s $\rightarrow T \approx 1.639$ N

$m \approx 0.1671$ kg