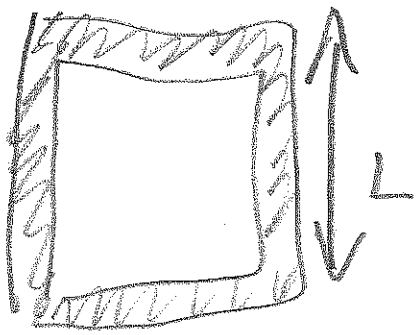
9-18-13

Sample B

(3.)



(a) $B \geq mg$

$B = \rho_w \cdot L^3 \cdot g = (1000)(1)^3 \cdot (9.8)$

$mg = (60\,kg)\left(9.8 \frac{m}{s^2}\right)$

$B > mg$ floats!

Sample B

(2)

(b)

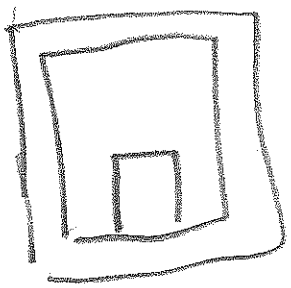
$$Ma = B - Mg$$

$$(60)a = 9800\,N - (60)(9.8)$$

$$a = \frac{9800 - 588}{60}$$

$$\boxed{a = 153\ m/s^2} \approx (15g)$$

(c)



$B = 9800N$

$(M+m)g$

$B > (M+m)g$ still rises $= (135)(9.8\ m/s^2)$

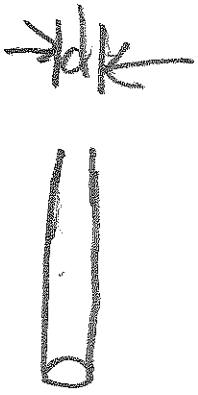
$= 1323\,N$

Sample B

(3) $(m+M)a = 9800N - 1323N$

$$a = \frac{9800N - 1323N}{135}$$

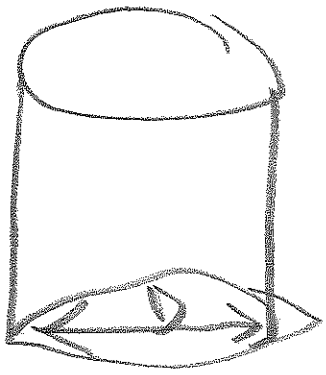
$$= \boxed{62.8 \frac{m}{s^2}}$$



(4) Easy: speed ← volume

$$A \cdot V = \frac{\Delta V}{\Delta t}$$

$$\Delta t = \frac{\pi D^2/4}{A \cdot V}$$



d = hose diameter

$$= \frac{3.14 \cdot (.1)^2/4}{\frac{3.14(0.03)^2}{4}} = \frac{1}{\frac{9}{9 \times 10}}$$

(5)

$18.5 min = \Delta t \approx \frac{10^9}{9} = \boxed{1111 s}$

Sample C

(1

(3.) (a) $f = 120 = \frac{nv}{2L}$

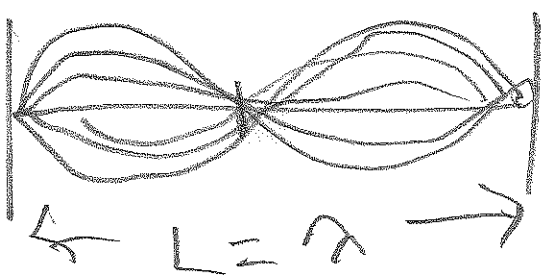
$v = \sqrt{\frac{(2.18)(9.8)}{6.6 \times 10^{-4}}} = \sqrt{3.23 \times 10^{4}}$

$= 179.92$

$120 = \frac{n \cdot 179.92}{(2)(1.5)}$

$n = \frac{(120)(2)(1.5)}{179.92}$

$= (2)$



(a) (2)

Sample C

(2)

(b) $= \frac{2\pi}{\lambda} \approx \frac{6.28}{1.5} = 4.186$

$= k$

(c) $\omega = 2\pi f = (6.28)(120)$

$= 753.6$ RAD/S

(d)

$$\frac{\partial y}{\partial t} = -2A\omega \sin\omega t \cdot \sin kx$$

$$= -2A\omega \sin(753.16 \cdot 0.002) \cdot \sin(4.186 \cdot 0.375)$$

$$= -2 \cdot 2.40 \cdot 753.16 \cdot (0.99)(0.99)$$

$$= -3.6 \times 10^{3} \frac{cm}{s}$$ MOVING ↓

(3.) sample C (2)

(e.) ↓ down

(f.) $y_2 = A\sin(kx - \omega t)$

$A\sin(kx + \omega t) + A\sin(kx - \omega t)$

$A[\sin kx\cos\omega t + \cos kx\sin\omega t + \sin kx\cdot\cos\omega t - \cos kx\cdot\sin\omega t]$

$= 2A\sin kx\cdot\cos\omega t$

(g.) $\frac{w}{r} = \frac{753.16}{4.186} = 179.92$ J

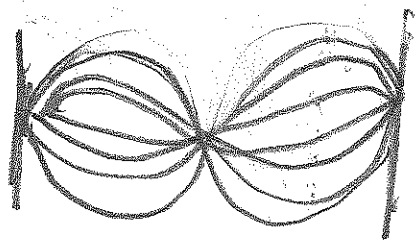
SUPPOSE!

Sample C

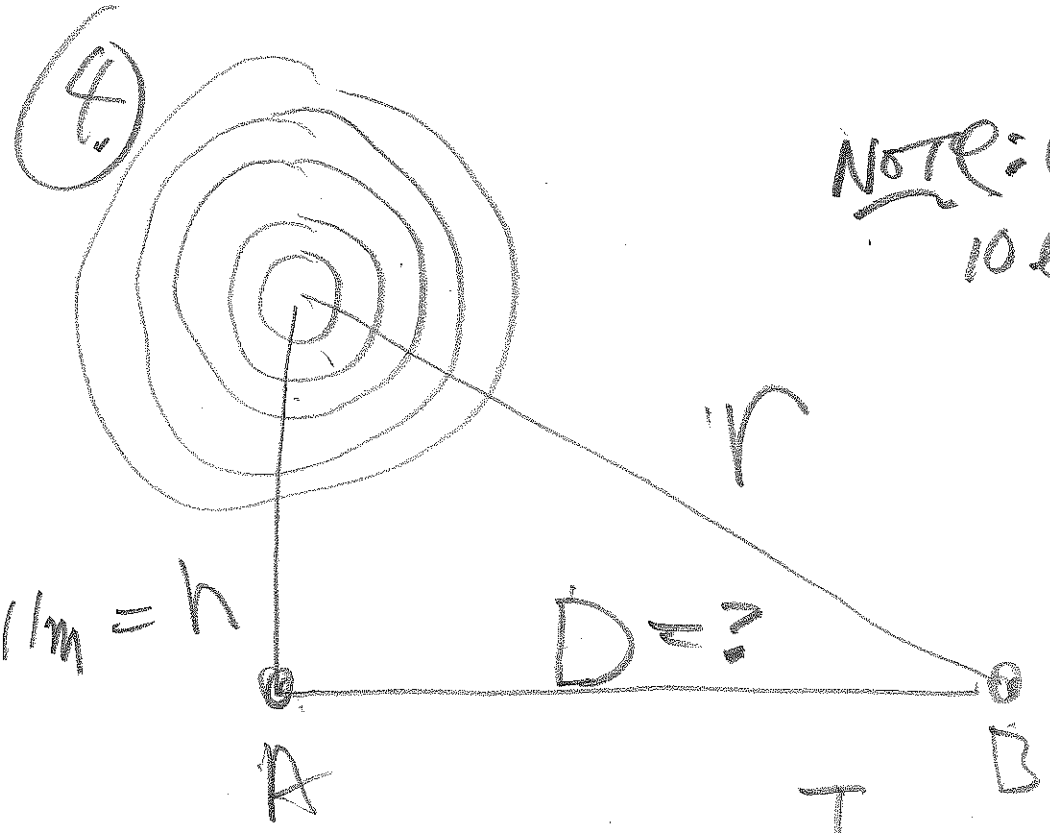
(4

(3.

(4.



Sample C



NOTE: use BASE 10 logs.

$$Db = 10 \log \frac{I}{I_0}$$

$$I = P/4\pi r^2$$

$$Db = 10 \cdot \log \frac{P/4\pi r^2}{I_0}$$

$$110 = Db_A = 10 \cdot \log \frac{P/4\pi h^2}{I_0}, \quad h = 111m$$

$$102 = Db_B = 10 \cdot \log \frac{P/4\pi r^2}{I_0}, \quad r^2 = D^2 + h^2$$

(a) Sample C

$110 - 102 = 8$

$$8 = 10\left[\log \frac{\frac{P}{4\pi h^2}}{I_0} - \log \frac{\frac{P}{4\pi r^2}}{I_0}\right]$$

$$r^2 = D^2 + h^2$$

$$0.8 = \log\left[\frac{D^2+h^2}{h^2}\right]$$

$$10^{0.8} = 10^{\log\left[\frac{D^2+h^2}{h^2}\right]}$$

$$10^{0.8} = \frac{D^2+h^2}{h^2}$$, FIND D^2 and D

Sample C

(10)

(c) $10^{0.8} = \dfrac{D^2 + h^2}{h^2}$

$10^{0.8} h^2 = D^2 + h^2$

$$\boxed{D = \sqrt{10^{0.8} - 1} \cdot h}$$

$D = \sqrt{6.31 - 1} \cdot 111\,m$

$D = 255.77\,m$ (5 sig. fig.)

(b) $\Delta t = \dfrac{r - h}{331\,m/s}$

Note: $r = \sqrt{D^2 + h^2}$

$r = \sqrt{255.77^2 + 111^2}$

$$\boxed{r = 278.82}$$

(1)

$\Delta t = \frac{278.82 - 111}{333}$

$= 0.505$

detectable by ear.