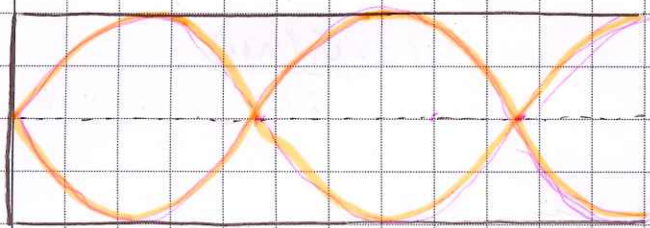
TSOKOS Wave HW #7 p. 256 #11-17 | Fecha:

(11) Draw a standing wave (3rd harmonic) in tube open at one end



(12) Glass tube closed at 1 end. L varies between 0.50 & 1.50 m
Tuning fork w/ frequency 306 Hz, at which lengths would resonance occur. $v_s = 330$ m/s $\lambda = \frac{v_s}{f} = \frac{330 \text{ m/s}}{306 \text{ Hz}} = 1.08$ m

fundamental $\lambda = \frac{4L}{1}$ or $L = \frac{\lambda}{4} = 0.27$ m too short

2nd harmonic $\lambda = \frac{4L}{3}$ or $L = \frac{3\lambda}{4} = 0.81$ m

3rd harmonic $\lambda = \frac{4L}{5}$ or $L = \frac{5\lambda}{4} = 1.35$ m

(13) Glass tube with 1 end open to determine v_{sound}. Tuning fork of $f = 427$ Hz and resonance occurs at 17.4 cm and 55.0 cm (L)
- fundamental $\lambda = 4L = .696$ m or ~~2.2~~ m

(a) What is speed of sound $v = f\lambda = (427\text{Hz})(.696\text{m}) = 297.$ m/s not accurate

(b) End correction $\frac{\lambda}{4} = L + e$

* Not required for 1B

$4(.174 + e) \times 427\text{Hz} = v_s$
set =
$\frac{4}{3}(.55 + e) \times 427 = v_s$

$(.696 + 4e)427 = v$ $\quad 297.19 + 1708e = 312.99 + 569.33e$

$(.733 + \frac{4}{3}e)427 = v$ $\quad 1138.67e = 15.8$

$e = .014$ m

So $v_s = 4(.174 + .014) \times 427\text{Hz} = 321 \frac{m}{s}$

$f = \frac{v_s}{\lambda} = \frac{v_s}{\frac{2L}{n}} = \boxed{\frac{v_s n}{2L} = f}$

Fecha:

(14) (a) Open tube $\lambda = \frac{2L}{n}$ look at 2 consecutive harmonics

$f = \frac{v_s \cdot n}{2L}$ $300 = \frac{v_s \cdot n}{2L}$ and $360 = \frac{v_s(n+1)}{2L}$

solve for L

$v_s = \frac{2L \cdot 300}{n}$ $v_s = \frac{360 \cdot 2L}{(n+1)}$ $4L \cdot 300 = 360\ 2L$

(b) Use $L = 2.75$ m $300 = \frac{v_s \cdot n}{2L}$ to get n $n = 5^{th}$ & 6^{th}

$300 = \frac{330 \cdot n}{2(2.75)}$ $\boxed{n = 5}$

$L = 0.50$ m

(15) Speed of waves on a string w/ $T = 90.0$ N (fundamental f)

(a)

$v = \sqrt{\frac{90.0}{\frac{3 \times 10^{-3}}{.50}}} = \boxed{122.5 \text{ m/s}}$

(b) $\lambda = 1.0$ m and $f = 122$ Hz Use $v_{sw} = 1500$ m/s to find λ_w

$v = \lambda f$ so $\lambda = \frac{v}{f} = \frac{1500 \text{ m/s}}{122 \text{ Hz}} \approx \boxed{12.0 \text{ m}}$

(a) L = 12 cm

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(16) At $f = 0.75$ Hz water splashes out of tank because of constructive interference → resonating

(b) $f = 0.75$ Hz $\quad \lambda = 2L = 2 \times 0.12 = 0.24$ m $\quad$ so $v_s = f \cdot \lambda$

$v_s = (0.75\text{ Hz})(2 \times .12\text{ m}) = \boxed{0.18\text{ m/s}}$

(17) (a) Lots of ripples / little splashes $\quad L = .08$ m $\quad \lambda = 2L$

(b) $v = 15$ m/s $\quad f = \frac{v}{\lambda} = \frac{15}{.16} = \boxed{94\text{ Hz}}$ with incorrect data

With correction $\quad f = \frac{v}{\lambda} = \frac{.15}{.16} \approx \boxed{1\text{ Hz.}}$

c) f is independent of spe