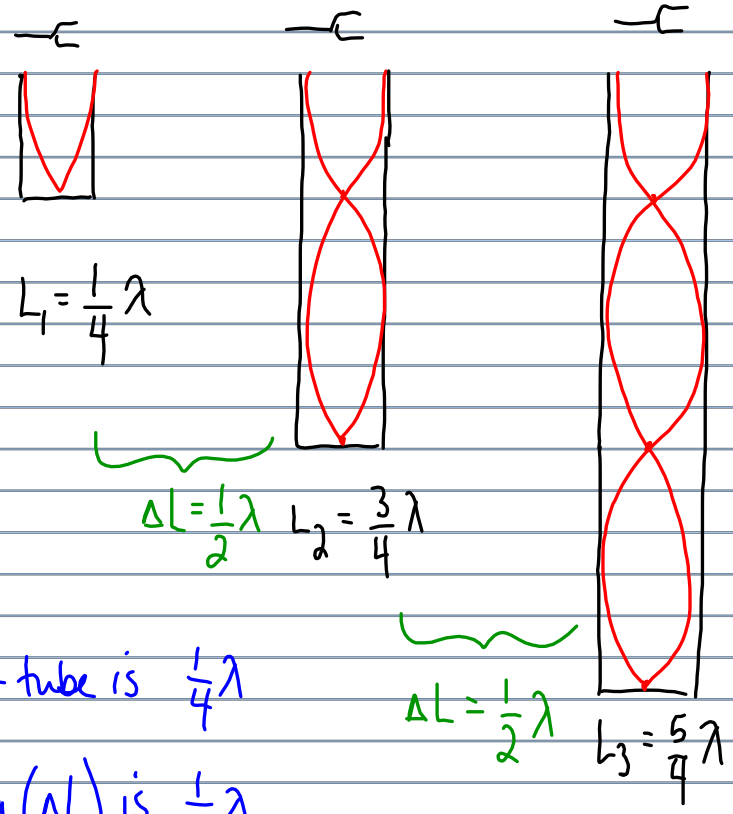
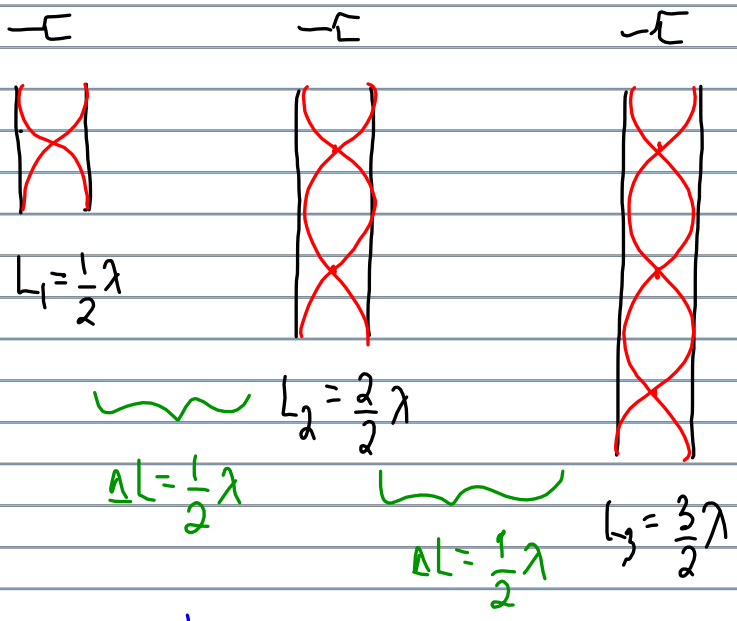
Closed Tube Resonance

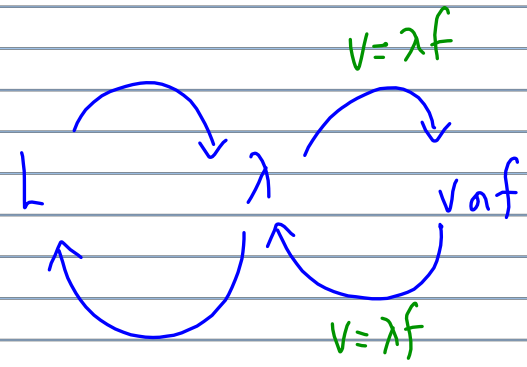


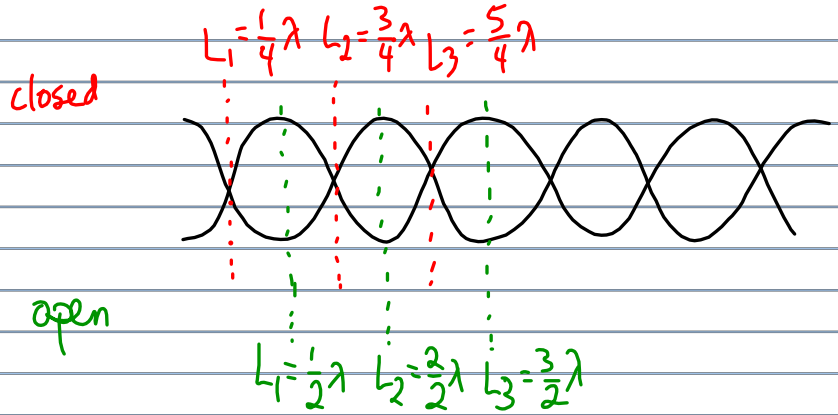
- Shortest tube is $\frac{1}{4}\lambda$
- Spacing (ΔL) is $\frac{1}{2}\lambda$

Open-Tube Resonance



- shortest tube is $\frac{1}{2}\lambda$
- spacing (ΔL) is $\frac{1}{2}\lambda$





MP|419

closed.

$L_1 = 9.0\,cm$

$T = 20° \rightarrow V = 343\,m/s$

a) $\lambda = ?$

b) L_2 and $L_3 = ?$

c) $f = ?$

a) $L_1 = \frac{1}{4}\lambda$ $\left(L_n = (2n-1)\frac{\lambda}{4}\right)$

$L_1 = (2(1)-1)\frac{\lambda}{4}$

$9.0\,cm = \frac{1}{4}\lambda$

$\lambda = 4(9.0\,cm)$

$\lambda = 36\,cm$

b) $L_2 = \frac{3}{4}\lambda$ $L_3 = \frac{5}{4}\lambda$

$L_2 = \frac{3}{4}(36\,cm)$ $L_3 = \frac{5}{4}(36\,cm)$

$L_2 = 27\,cm$ $L_3 = 45\,cm$

c) $V = \lambda f$

$f = \frac{V}{\lambda}$

$f = \frac{343\,m/s}{0.36\,m}$

$f = 9.5 \times 10^2\,Hz$

MP|425

open tube

$f_1 = 330\,Hz$

a) f_2 and f_3 = ?

b) If $v = 344\,m/s$, what is the tube length?

a) $f_n = nf_1$

$f_2 = 2f_1$

$f_2 = 2(330\,Hz)$

$f_2 = 660\,Hz$

$f_3 = 3(330\,Hz)$

$f_3 = 990\,Hz$

b) $f_1 = 330\,Hz$

$v = 344\,m/s$

$\lambda = ??$

$\lambda = \frac{v}{f}$

$\lambda = \frac{344\,m/s}{330\,Hz}$

$\lambda = 1.04\,m$

Since we use f_1, then we use L_1

$L_1 = \frac{1}{2}\lambda$

$L_1 = \frac{1}{2}(1.04\,m)$

$L_1 = 0.521\,m$