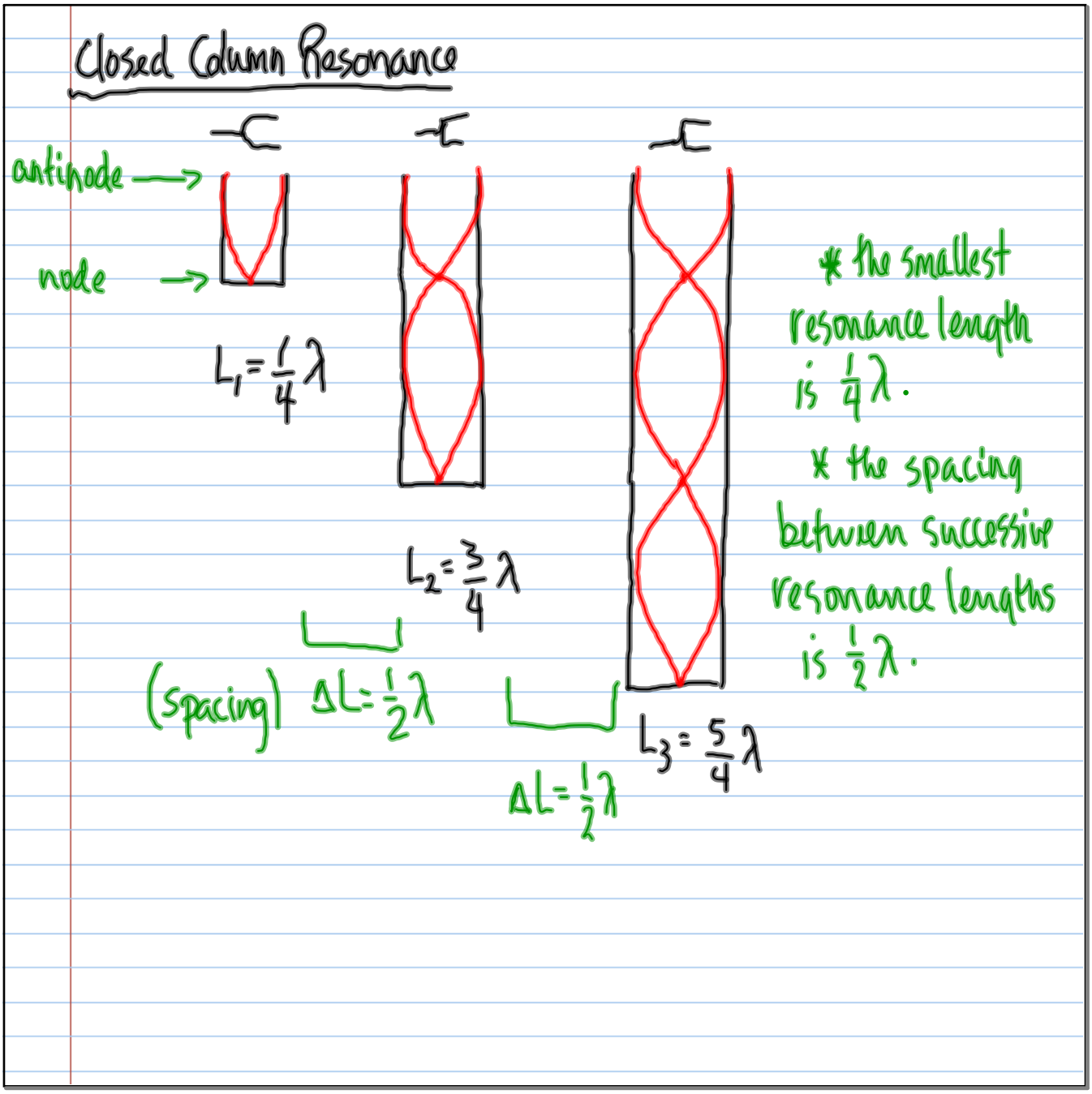
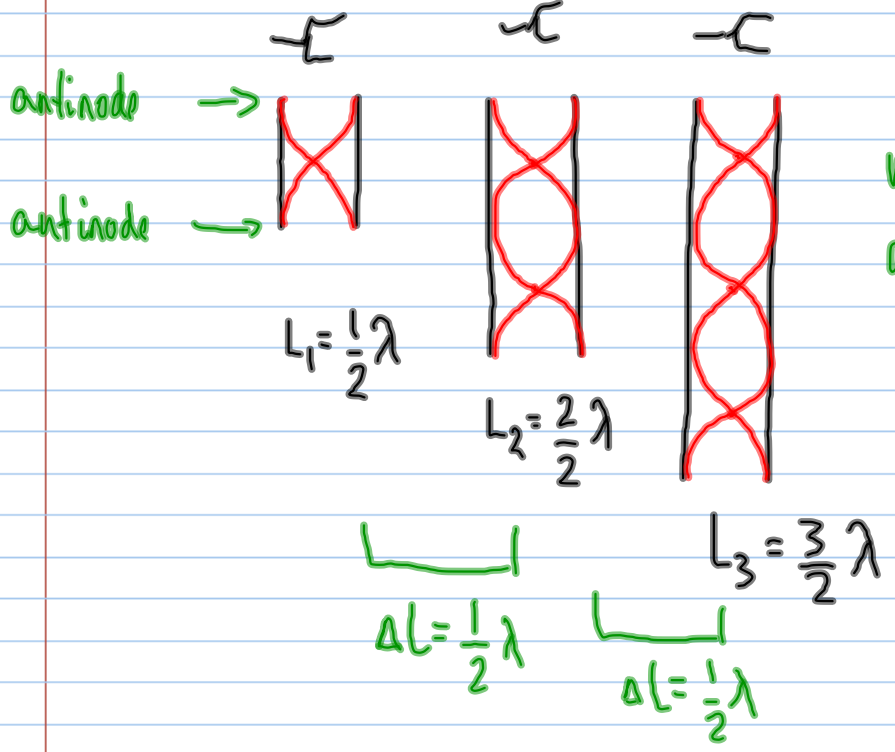
Closed Column Resonance



* the smallest resonance length is $\frac{1}{4}\lambda$.

* the spacing between successive resonance lengths is $\frac{1}{2}\lambda$.

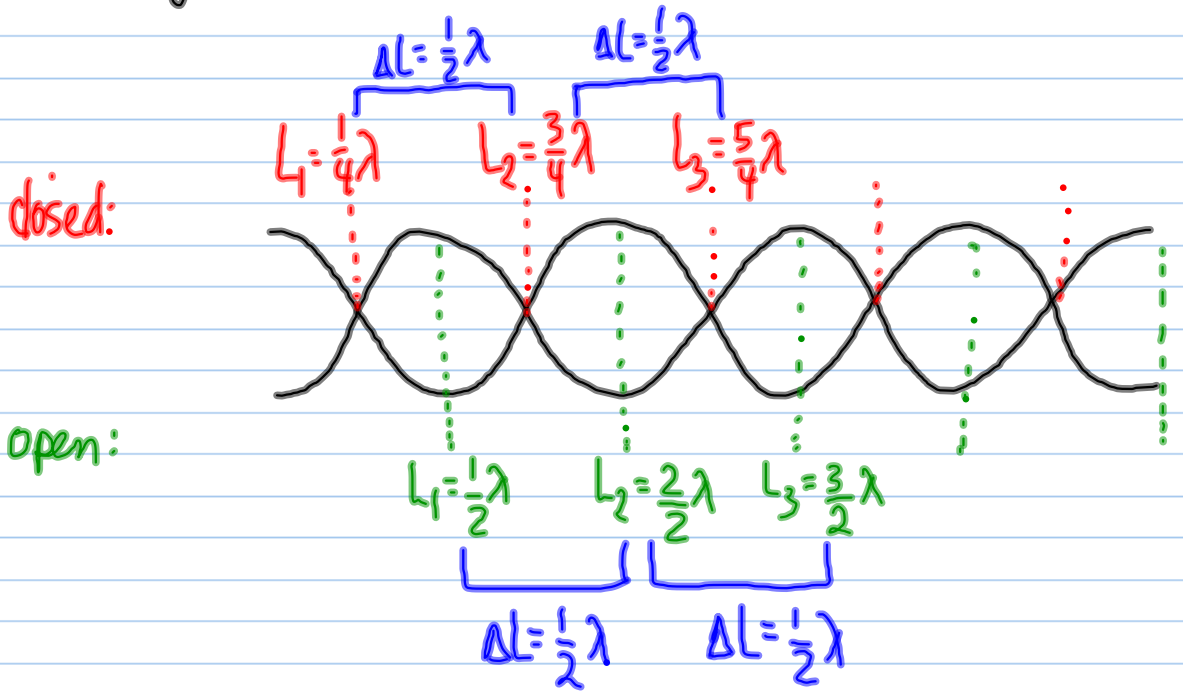
Open Column Resonance



* the shortest resonance length for an open tube is $\frac{1}{2}\lambda$.

* the spacing between successive resonance lengths is $\frac{1}{2}\lambda$.

Summary of Resonance:



Jan 14-2:26 PM

MP 14.9

closed tube

$L_1 = 9.0\text{cm}$

$T = 20^\circ C$

a) $\lambda = ?$

b) L_2 and $L_3 = ?$

c) $f = ?$

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

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

$L_1 = \frac{\lambda}{4}$

$\lambda = 4L_1$

$\lambda = 4(9.0\text{cm})$

$\boxed{\lambda = 36\text{cm}}$

don't REALLY need to use the formula .... look at a diagram instead.

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

$L_2 = \frac{3}{4}(36\text{cm})$

$\boxed{L_2 = 27\text{cm}}$

$L_3 = \frac{5}{4}\lambda$

$L_3 = \frac{5}{4}(36\text{cm})$

$\boxed{L_3 = 45\text{cm}}$

c) $T = 20^\circ C$

$\lambda = 36\text{cm}$

$f = ?$

$V = 331 + 0.59T$

$V = 331 + 0.59(20)$

$V = 331 + 11.8$

$V = 343\text{m/s}$ (342.8m/s)

$V = \lambda f$

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

$f = \frac{342.8\text{m/s}}{0.36\text{m}}$

$\boxed{f = 9.5 \times 10^2\ \text{Hz}}$

Jan 14-2:45 PM

MP|425

open tube

$f_1 = 330\,Hz$

a) f_2 and f_3 = ?

b) L_1 = ? (if $v = 344\,m/s$)

a) $f_n = n f_1$ (2n-1 (closed))

$f_2 = 2(330\,Hz)$

$f_2 = 660\,Hz$

$f_3 = 3(330\,Hz)$

$f_3 = 990\,Hz$

b) $v = \lambda f$

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

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

$\lambda = 1.04\,m$

$\frac{1}{4}$ (closed)

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

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

$L_1 = 0.521\,m$

PP|421

PP|427