

Chapter 4. Resonance

resonance quality:

$$Q = \frac{f_0}{\Delta f}$$

frequency on a string:

$$\lambda = 2L$$

$$f_1 = \frac{v}{2L}$$

$$\lambda = L$$

$$f_2 = \frac{v}{L} = 2f_1$$

$$\lambda = \frac{2L}{3}$$

$$f_3 = \frac{3v}{2L} = 3f_1$$

frequency in an open-open tube:

$$\lambda = 2L$$

$$f_1 = \frac{v}{2L}$$

$$\lambda = L$$

$$f_2 = \frac{v}{L} = 2f_1$$

$$\lambda = \frac{2L}{3}$$

$$f_3 = \frac{3v}{2L} = 3f_1$$

frequency in an open-closed tube:

$$\lambda = 4L$$

$$f_1 = \frac{v}{4L}$$

$$\lambda = \frac{4L}{3}$$

$$f_2 = \frac{3v}{4L} = 3f_1$$

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

$$f_3 = \frac{5v}{4L} = 5f_1$$

end correction for a tube:

$$L = l + l'$$

$$l' = 0.61r$$

acoustic impedance:

$$Z_A = \frac{p}{U} = \frac{\rho v}{S}$$

Chapter 6. Sound Pressure, Power, and Loudness

sound pressure level:

single source:

$$SPL = 10 \log \frac{p^2}{p_0^2} = 20 \log \frac{p}{p_0}$$

multiple sources:

$$SPL = 10 \log \frac{\sum p_i^2}{p_0^2}$$

reference pressure:

$$p_0 = 20 \mu\text{Pa} = 2 \times 10^{-5} \text{Pa}$$

Fletcher-Munson curves of equal loudness:

