Reference Section

Sound travels at approximately 343 meters/sec at room temperature
Gravity on Earth is = 9.8 meters/sec^2

$$f = \frac{1}{2\pi}\sqrt{\frac{k}{m}} \qquad \frac{1}{2\pi}\sqrt{\frac{g}{l}} \qquad f_a = \frac{1}{2\pi}\sqrt{\frac{k}{m}} \qquad f_b = \frac{1}{2\pi}\sqrt{\frac{3k}{m}} \qquad f = \frac{v}{2\pi}\sqrt{\frac{a}{Vl}}$$

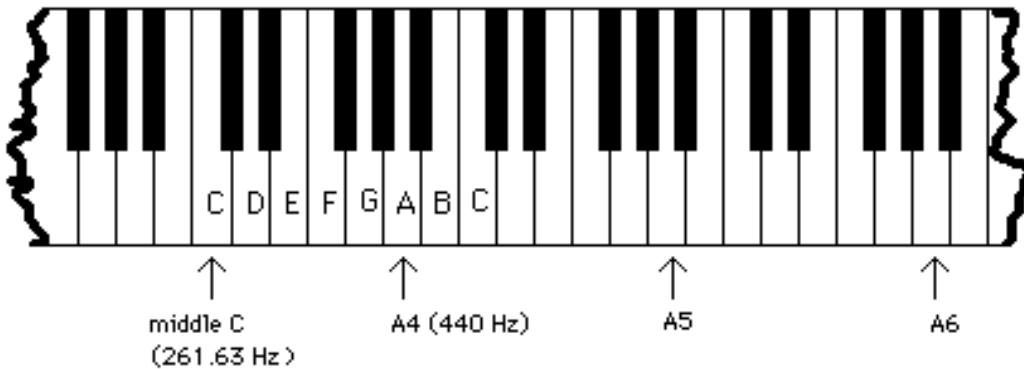$$v = 331 + 0.6t \; m/sec \qquad c = 0.61r \qquad v = f\lambda \qquad v = \sqrt{T/\mu}$$

$$\lambda_n = \frac{2L}{n} \; (n = 1,2,3 \ldots) \qquad \lambda_n = \frac{4L}{n} \; (n = 1,3,5 \ldots)$$

$$f_n = n\frac{v}{2L} = nf_1 \; (n = 1,2,3 \ldots) \qquad f_n = n\frac{v}{4L} = nf_1 \; (n = 1,3,5 \ldots) \qquad f_n = \frac{n}{2L}\sqrt{\frac{T}{\mu}} = nf_1$$

$$f' = f_s\left(\frac{v+v_0}{v}\right) \qquad f' = f_s\left(\frac{v-v_0}{v}\right) \qquad f' = f_s\left(\frac{v}{v-V_s}\right) \qquad f' = f_s\left(\frac{v}{v+V_s}\right)$$

$$\log(ab) = \log(a) + \log(b) \qquad \log(a/b) = \log(a) - \log(b) \qquad \log(x^n) = n\log(x)$$

Pinna, ossicles, hammer, anvil, stirrup (*malleus, incus, stapes)*, tympanic membrane, semicircular canals, oval window, round window, basilar membrane, organ of Corti, auditory nerve, endolymph

middle C
(261.63 Hz)   A4 (440 Hz)   A5   A6

(The piano goes down to A0, which is four octaves below A4)