

Problems

1. An old flute plays “A” at a frequency of 420 Hz instead of 440. How many cents flat from the standard A 440 is this? What frequency would the “E” below this “A” sound at (assuming a 12-tone tempered scale)?
2. Suppose you want to make a flute (a pipe open at both ends) that plays at a fundamental frequency of 220 Hz. when all the holes are closed. How long does it need to be? If opening a hole raises its pitch by a half tone what should the effective length then be?
3. A mass-on-a-spring vibrates at “A” 440. The spring is ten centimeters long. Suppose you wanted to cut the spring to a different length so that you would hear 220 Hz. instead (keeping the mass the same). How short would you cut the spring?
4. Light travels at $3 \cdot 10^8$ meters/second. A particular shade of red light has a wavelength of 700 nanometers ($7 \cdot 10^{-7}$ meters.) What is its frequency? Would a sound at this frequency be audible?
5. A periodic tone has harmonics at 1308.13 and 1569.75 Hz. What is one possible value for the fundamental frequency?