29. (a) When the right side of the instrument is pulled out a distance d the path length for sound waves increases by $2d$. Since the interference pattern changes from a minimum to the next maximum, this distance must be half a wavelength of the sound. So $2d = \lambda/2$, where λ is the wavelength. Thus $\lambda = 4d$ and, if v is the speed of sound, the frequency is $f = v/\lambda = v/4d = (343\,\mathrm{m/s})/4(0.0165\,\mathrm{m}) = 5.2 \times 10^3\,\mathrm{Hz}$.

(b) The displacement amplitude is proportional to the square root of the intensity (see Eq. 18–27). Write $\sqrt{I} = Cs_m$, where I is the intensity, s_m is the displacement amplitude, and C is a constant of proportionality. At the minimum, interference is destructive and the displacement amplitude is the difference in the amplitudes of the individual waves: $s_m = s_{SAD} - s_{SBD}$, where the subscripts indicate the paths of the waves. At the maximum, the waves interfere constructively and the displacement amplitude is the sum of the amplitudes of the individual waves: $s_m = s_{SAD} + s_{SBD}$. Solve $\sqrt{100} = C(s_{SAD} - s_{SBD})$ and $\sqrt{900} = C(s_{SAD} + s_{SBD})$ for s_{SAD} and s_{SBD}. Add the equations to obtain $s_{SAD} = (\sqrt{100} + \sqrt{900})/2C = 20/C$, then subtract them to obtain $s_{SBD} = (\sqrt{900} - \sqrt{100})/2C = 10/C$. The ratio of the amplitudes is $s_{SAD}/s_{SBD} = 2$.

(c) Any energy losses, such as might be caused by frictional forces of the walls on the air in the tubes, result in a decrease in the displacement amplitude. Those losses are greater on path B since it is longer than path A.