40. We observe that "third lowest ... frequency" corresponds to harmonic number $n = 3$ for a pipe open at both ends. Also, "second lowest ... frequency" corresponds to harmonic number $n = 3$ for a pipe closed at one end.

(a) Since $\lambda = 2L/n$ for pipe A, where $L = 1.2$ m, then $\lambda = 0.80$ m for this mode. The change from node to antinode requires a distance of $\lambda/4$ so that every increment of 0.20 m along the x axis involves a switch between node and antinode. Since the opening is a displacement antinode, then the locations for displacement nodes are at $x = 0.20$ m, $x = 0.60$ m, and $x = 1.0$ m.

(b) The waves in both pipes have the same wavespeed (sound in air) and frequency, so the standing waves in both pipes have the same wavelength (0.80 m). Therefore, using Eq. 18-38 for pipe B, we find $L = 3\lambda/4 = 0.60$ m.

(c) Using $v = 343$ m/s, we find $f_3 = v/\lambda = 429$ Hz. Now, we find the fundamental resonant frequency by dividing by the harmonic number, $f_1 = f_3/3 = 143$ Hz.