

Sound in a bottle

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Solution: We know $c = \lambda_n \nu_n$ and,

$$\left(\frac{1}{4} + \frac{n}{2}\right)\lambda_n = L_n ,$$

for $n = 0, 1, 2, \dots$, where L_n is the height of the air column. Therefore,

$$c = \frac{2\Delta L}{\left(n + \frac{1}{2}\right)\left(\frac{1}{\nu_1} - \frac{1}{\nu_2}\right)} .$$

With $n = 0$ we have $c = 340$ Hz, what is the known sound velocity. Hence, the fundamental mode is excited.