

32. Use Eq. 17-53 (for the resonant frequencies) and Eq. 17-25 ($v = \sqrt{\tau/\mu}$) to find f_n :

$$f_n = \frac{nv}{2L} = \frac{n}{2L} \sqrt{\frac{\tau}{\mu}}$$

which gives $f_3 = (3/2L)\sqrt{\tau_i/\mu}$.

(a) When $\tau_f = 4\tau_i$, we get the new frequency

$$f'_3 = \frac{3}{2L} \sqrt{\frac{\tau_f}{\mu}} = 2f_3 .$$

(b) And we get the new wavelength

$$\lambda'_3 = \frac{v'}{f'_3} = \frac{2L}{3} = \lambda_3 .$$