

Consider waves traveling along two wires which are made of an identical material.

wire	$\frac{\text{mass}}{\text{length}}$	tension	diameter	length	speed
#1	μ_1	T_1	d_1	L_1	v_1
#2	μ_2	T_2	d_2	L_2	v_2

Given $d_2 = 2 d_1$, $L_2 = 2 L_1$. The ratio $\frac{\mu_1}{\mu_2}$ is given by

A) $\frac{\mu_1}{\mu_2} = \frac{1}{4}$.

B) $\frac{\mu_1}{\mu_2} = \frac{1}{2}$.

C) $\frac{\mu_1}{\mu_2} = 1$.

D) $\frac{\mu_1}{\mu_2} = 1$.

$$\text{linear mass density} = \frac{\text{density} \times \text{volume}}{\text{length}} = \text{density} \times \text{cross section}.$$

For two identical materials the densities are the same, so

$$\frac{\mu_1}{\mu_2} = \frac{\pi \left(\frac{d_1}{2}\right)^2}{\pi \left(\frac{d_2}{2}\right)^2} = \left(\frac{d_1}{d_2}\right)^2 = \frac{1}{4}$$

Answer A.

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