

Physics 102  
Quiz # 1  
Chapter 17

Name :                      Solution                      Id :                      Sec. # :

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The speed of a traveling wave on a wire is 50 m/s. The wire is replaced by another wire with three times the linear density and twice the tension as that of the first wire. What is the speed of the traveling wave on the new wire?

Solution:

The speed of a traveling wave on a string is given by:

$$v_1 = \sqrt{\frac{\tau}{\mu}}$$

When the linear density is tripled and the tension is doubled, then

$$\mu_2 = 3\mu \quad \text{and} \quad \tau_2 = 2\tau$$

Thus the new wave speed is

$$v_2 = \sqrt{\frac{2\tau}{3\mu}} = \sqrt{\frac{2}{3}} \sqrt{\frac{\tau}{\mu}} = \sqrt{\frac{2}{3}} v_1$$

$$v_2 = \sqrt{\frac{2}{3}} \times 50 = 41 \text{ m/s}$$