

### Answer on Question #46426 – Physics – Other

a wire of cross-section area of  $6 \times 10^{-5} \text{m}^2$  and length 50cm stretches by 0.2mm under a load of 3000N. calculate the young modulus for the wire

#### Solution:

$A_0 = 6 \times 10^{-5} \text{m}^2$  – cross – section area of the wire;

$L_0 = 50 \text{cm} = 0.5 \text{m}$  – length of the wire;

$\Delta L = 0.2 \text{mm} = 0.2 \times 10^{-3} \text{m}$  – amount by which the length of the wire changes

$F = 3000 \text{ N}$  – force;

Young's modulus,  $E$ , can be calculated by dividing the tensile stress by the extensional strain in the elastic (initial, linear) portion of the stress–strain curve:

$$E = \frac{\text{tensile stress}}{\text{extensional strain}} = \frac{\sigma}{\epsilon} = \frac{\frac{F}{A_0}}{\frac{\Delta L}{L_0}} = \frac{FL_0}{A_0 \Delta L} = \frac{3000 \text{N} \cdot 0.5 \text{m}}{6 \times 10^{-5} \text{m}^2 \cdot 0.2 \times 10^{-3} \text{m}}$$
$$= 1.25 \frac{\text{N}}{\text{m}^2}$$

**Answer:**  $E = 1.25 \frac{\text{N}}{\text{m}^2}$ .