6 Deformation of solids – Part 1 — Answers

Answers

6.1 $F = kx = 25 \times 0.20 = 5.0$ N.

6.2 Elastic: the material returns to its original shape when the force is removed. Plastic: it stays permanently deformed.

6.3 $\sigma = F/A = 32/(4.0 \times 10^{-7}) = 8.0 \times 10^{7}$ Pa.

6.4 $\varepsilon = x/L = (2.0 \times 10^{-3})/2.5 = 8.0 \times 10^{-4}$.

6.5 $E = \sigma/\varepsilon = (8.0 \times 10^{7})/(8.0 \times 10^{-4}) = 1.0 \times 10^{11}$ Pa.

6.6 $E = \frac{1}{2}kx^2 = \frac{1}{2}(25)(0.20^2) = 0.50$ J.

6.7 The longer wire stretches more. With the same force, area and material the *strain* (extension per unit length) is the same; but the actual extension is strain × length, so the longer wire — having more length — extends about twice as much.