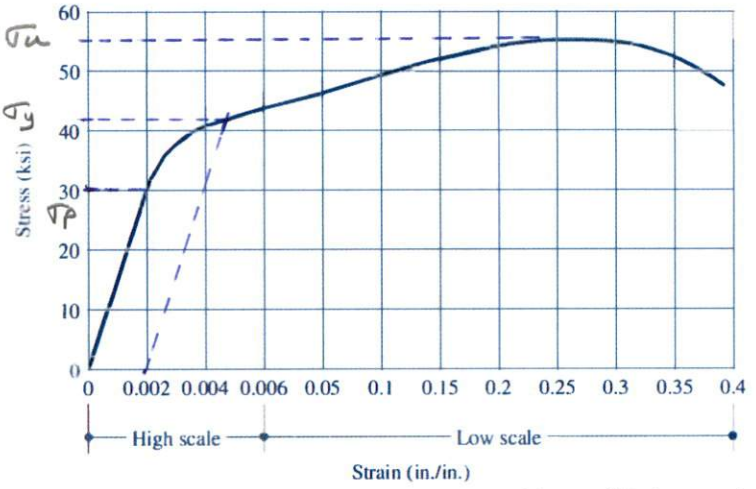
11-11

The stress-strain diagram for a tension test of an alloy specimen is plotted as shown in Fig. P11-11. The following data are recorded:

Initial diameter	= 0.502 in.
Gage length	= 2.00 in.
Diameter at the fractured section	= 0.412 in.
Final length after fracture	= 2.78 in.



Determine (a) the stress at the proportional limit, (b) the modulus of elasticity, (c) the yield stress at 0.2 percent offset, (d) the ultimate strength, (e) the percent elongation, and (f) the percent reduction in area.

Solution.

(a) $\sigma_p = 30 \text{ ksi}$

(b) $E = \dfrac{\sigma_p}{0.002} = \dfrac{30 \text{ ksi}}{0.002} = 15 \times 10^3 \text{ ksi}$

(c) $(\sigma_y)_{0.2\%} = 42 \text{ ksi}$

(d) $\sigma_u = 56 \text{ ksi}$

(e) $\%\ \text{Elongation} = \dfrac{2.78 \text{ in} - 2.00 \text{ in}}{2.00 \text{ in}} \times 100\% = 39\%$

(f) $\%\ \text{reduction in Area} = \dfrac{\frac{\pi (0.502 \text{ in.})^2}{4} - \frac{\pi (0.412 \text{ in.})^2}{4}}{\frac{\pi (0.502 \text{ in.})^2}{4}} \times 100\%$

$= 32.6\%$