

$$l_{0st} = l_{0gl} = 11.500 \text{ cm}$$

$$\Delta T = 80.0^\circ\text{C} - 21.0^\circ\text{C} = 59^\circ\text{C}$$

$$\alpha_{st} = 11 \times 10^{-6} \text{ }^\circ\text{C}^{-1}$$

$$\alpha_{gl} = 9 \times 10^{-6} \text{ }^\circ\text{C}^{-1}$$

$$\begin{aligned}\Delta l_{st} &= \alpha \cdot l_0 \cdot \Delta T \\ &= (11 \times 10^{-6} \text{ }^\circ\text{C}^{-1})(11.500 \text{ cm})(59^\circ\text{C}) \\ &= .00746 \text{ cm}\end{aligned}$$

$$\begin{aligned}l_{st} &= l_0 + \Delta l \\ &= 11.500 \text{ cm} + .00746 \text{ cm}\end{aligned}$$

$$l_{st} = 11.507 \text{ cm}$$

$$\begin{aligned}\Delta l_{gl} &= \alpha \cdot l_0 \cdot \Delta T \\ &= (9 \times 10^{-6} \text{ }^\circ\text{C}^{-1})(11.500 \text{ cm})(59^\circ\text{C}) \\ &= .00611 \text{ cm}\end{aligned}$$

$$\begin{aligned}l_{gl} &= l_0 + \Delta l \\ &= 11.500 \text{ cm} + .00611 \text{ cm}\end{aligned}$$

$$l_{st} = 11.506 \text{ cm}$$