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1.32

**1.32** The information on a can of pop indicates that the can contains 355 mL. The mass of a full can of pop is 0.369 kg while an empty can weighs 0.153 N. Determine the specific weight, density, and specific gravity of the pop and compare your results with the corresponding values for water at 20 °C. Express your results in SI units.

$$\gamma = \frac{\text{weight of fluid}}{\text{volume of fluid}} \quad (1)$$

$$\text{total weight} = \text{mass} \times g = (0.369 \text{ kg})(9.81 \frac{\text{m}}{\text{s}^2}) = 3.62 \text{ N}$$

$$\text{weight of can} = 0.153 \text{ N}$$

$$\text{Volume of fluid} = (355 \times 10^{-3} \text{ L})(10^{-3} \frac{\text{m}^3}{\text{L}}) = 355 \times 10^{-6} \text{ m}^3$$

Thus, from Eq. (1)

$$\gamma = \frac{3.62 \text{ N} - 0.153 \text{ N}}{355 \times 10^{-6} \text{ m}^3} = \underline{\underline{9770 \frac{\text{N}}{\text{m}^3}}}$$

$$\rho = \frac{\gamma}{g} = \frac{9770 \frac{\text{N}}{\text{m}^3}}{9.81 \frac{\text{m}}{\text{s}^2}} = 996 \frac{\text{N} \cdot \text{s}^2}{\text{m}^4} = \underline{\underline{996 \frac{\text{kg}}{\text{m}^3}}}$$

$$SG = \frac{\rho}{\rho_{\text{H}_2\text{O}@4^\circ\text{C}}} = \frac{996 \frac{\text{kg}}{\text{m}^3}}{1000 \frac{\text{kg}}{\text{m}^3}} = \underline{\underline{0.996}}$$

For water at 20 °C (see Table B.2 in Appendix B)

$$\gamma_{\text{H}_2\text{O}} = 9789 \frac{\text{N}}{\text{m}^3}; \quad \rho_{\text{H}_2\text{O}} = 998.2 \frac{\text{kg}}{\text{m}^3}; \quad SG = 0.9982$$

A comparison of these values for water with those for the pop shows that the specific weight, density, and specific gravity of the pop are all slightly lower than the corresponding values for water.