Solution 1.24E

The mass of a substance is given. Its weight is to be determined in various units.

Analysis Applying Newton's second law, the weight is determined in various units to be

$$W = mg = (1 \text{ kg})(9.81 \text{ m/s}^2)\left(\frac{1 \text{ N}}{1 \text{ kg} \cdot \text{m/s}^2}\right) = \mathbf{9.81\,N}$$

$$W = mg = (1 \text{ kg})(9.81 \text{ m/s}^2)\left(\frac{1 \text{ kN}}{1000 \text{ kg} \cdot \text{m/s}^2}\right) = \mathbf{0.00981\,kN}$$

$$W = mg = (1 \text{ kg})(9.81 \text{ m/s}^2) = \mathbf{1\,kg \cdot m/s^2}$$

$$W = mg = (1 \text{ kg})(9.81 \text{ m/s}^2)\left(\frac{1 \text{ N}}{1 \text{ kg} \cdot \text{m/s}^2}\right)\left(\frac{1 \text{ kgf}}{9.81 \text{ N}}\right) = \mathbf{1\,kgf}$$

$$W = mg = (1 \text{ kg})\left(\frac{2.205 \text{ lbm}}{1 \text{ kg}}\right)(32.2 \text{ ft/s}^2) = \mathbf{71\,lbm \cdot ft/s^2}$$

$$W = mg = (1 \text{ kg})\left(\frac{2.205 \text{ lbm}}{1 \text{ kg}}\right)(32.2 \text{ ft/s}^2)\left(\frac{1 \text{ lbf}}{32.2 \text{ lbm} \cdot \text{ft/s}^2}\right) = \mathbf{2.21\,lbf}$$