

## Problem 1.19

[Difficulty: 1]

**1.19** Derive the following conversion factors:

- (a) Convert a viscosity of  $1 \text{ m}^2/\text{s}$  to  $\text{ft}^2/\text{s}$ .
- (b) Convert a power of  $100 \text{ W}$  to horsepower.
- (c) Convert a specific energy of  $1 \text{ kJ/kg}$  to  $\text{Btu/lbm}$ .

**Given:** Viscosity, power, and specific energy data in certain units

**Find:** Convert to different units

**Solution:**

Using data from tables (e.g. Table G.2)

$$(a) \quad 1 \cdot \frac{\text{m}^2}{\text{s}} = 1 \cdot \frac{\text{m}^2}{\text{s}} \times \left( \frac{\frac{1}{12} \cdot \text{ft}}{0.0254 \cdot \text{m}} \right)^2 = 10.76 \cdot \frac{\text{ft}^2}{\text{s}}$$

$$(b) \quad 100 \cdot \text{W} = 100 \cdot \text{W} \times \frac{1 \cdot \text{hp}}{746 \cdot \text{W}} = 0.134 \cdot \text{hp}$$

$$(c) \quad 1 \cdot \frac{\text{kJ}}{\text{kg}} = 1 \cdot \frac{\text{kJ}}{\text{kg}} \times \frac{1000 \cdot \text{J}}{1 \cdot \text{kJ}} \times \frac{1 \cdot \text{Btu}}{1055 \cdot \text{J}} \times \frac{0.454 \cdot \text{kg}}{1 \cdot \text{lbm}} = 0.43 \cdot \frac{\text{Btu}}{\text{lbm}}$$