

Problem 1.20

[Difficulty: 1]

1.20 Derive the following conversion factors:

- (a) Convert a pressure of 1 psi to kPa.
- (b) Convert a volume of 1 liter to gallons.
- (c) Convert a viscosity of 1 $\text{lb} \cdot \text{s} / \text{ft}^2$ to $\text{N} \cdot \text{s} / \text{m}^2$.

Given: Pressure, volume and density data in certain units

Find: Convert to different units

Solution:

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

$$(a) \quad 1 \cdot \text{psi} = 1 \cdot \text{psi} \times \frac{6895 \text{ Pa}}{1 \cdot \text{psi}} \times \frac{1 \cdot \text{kPa}}{1000 \text{ Pa}} = 6.89 \text{ kPa}$$

$$(b) \quad 1 \cdot \text{liter} = 1 \cdot \text{liter} \times \frac{1 \cdot \text{quart}}{0.946 \text{ liter}} \times \frac{1 \cdot \text{gal}}{4 \cdot \text{quart}} = 0.264 \text{ gal}$$

$$(c) \quad 1 \cdot \frac{\text{lb} \cdot \text{s}}{\text{ft}^2} = 1 \cdot \frac{\text{lb} \cdot \text{s}}{\text{ft}^2} \times \frac{4.448 \text{ N}}{1 \cdot \text{lb}} \times \left(\frac{1 \cdot \text{ft}}{0.0254 \text{ m}} \right)^2 = 47.9 \frac{\text{N} \cdot \text{s}}{\text{m}^2}$$