

Chapter 17 Problem 62 †

**Given**

$$T_i = 10 \text{ }^\circ\text{C}$$

$$T_f = 35 \text{ }^\circ\text{C}$$

$$V_f = 75 \text{ L}$$

$$\beta = 95 \times 10^{-5} \text{ K}^{-1}$$

**Solution**

Find the volume placed in the tank which will not over flow when the gas warms up.

The volume expansion is given by

$$\beta = \frac{\Delta V/V}{\Delta T}$$

This leads to the formula

$$\Delta V = \beta V \Delta T$$

Substitute in the provided values gives

$$\Delta V = (95 \times 10^{-5} \text{ K}^{-1})(75 \text{ L})(35 \text{ }^\circ\text{C} - 10 \text{ }^\circ\text{C})$$

The expansion tank must handle the volume

$$\Delta V = 1.78 \text{ L}$$

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†Problem from Essential University Physics, Wolfson