

The Ideal Gas Law is used to find the volume as given in the following formula,

$$V = \frac{mRT}{p},$$

where  $m = 2$  kg,  $R = 0.189$  kJ/(kg.K),  $T = 300$  K, and  $p = 1$  bar (abs). Calculate the volume in  $\text{m}^3$ . Show all of your calculations and unit conversions.

SOLUTION:

$$V = \frac{(2 \text{ kg})(0.189 \text{ kJ}/(\text{kg}\cdot\text{K}))(300 \text{ K})}{(1 \text{ bar})} = \left(\frac{2 \text{ kg}}{1}\right) \left(\frac{0.189 \text{ kJ}}{\text{kg}\cdot\text{K}}\right) \left(\frac{300 \text{ K}}{1}\right) \left(\frac{1}{1 \text{ bar}}\right) \left(\frac{1000 \text{ J}}{1 \text{ kJ}}\right) \left(\frac{1 \text{ bar}}{10^5 \text{ Pa}}\right) \left(\frac{1 \text{ Pa}}{1 \text{ N/m}^2}\right) \left(\frac{1 \text{ N}\cdot\text{m}}{1 \text{ J}}\right) \quad (1)$$
$$\boxed{V = 1.13 \text{ m}^3}$$