

Chapter 7 Homework Key

7.56 How hot must the air in a balloon be heated if ~~the~~ initially it has a volume of 750. L at 20°C and the final volume must be 1000. L?

$$P_1 = \text{---}$$

$$V_1 = 750. \text{ L}$$

$$n_1 = \text{---}$$

$$T_1 = 20^\circ\text{C} + 273.15 = 293.15 \text{ K}$$

$$P_2 = \text{---}$$

$$V_2 = 1000. \text{ L}$$

$$n_2 = \text{---}$$

$$T_2 = ?$$

$$\frac{P_1 V_1}{P_1 T_1} = \frac{P_2 V_2}{P_2 T_2}$$

$$\left(\frac{1}{T_2}\right) \times \frac{V_1}{T_1} = \frac{V_2}{T_2} \times \left(\frac{1}{T_1}\right)$$

$$\left(\frac{1}{V_1}\right) \times T_2 \times \frac{V_1}{T_1} = V_2 \times \left(\frac{1}{V_1}\right)$$

$$T_2 = \frac{V_2 T_1}{V_1} = \frac{1000. \text{ L} \times 293.15 \text{ K}}{750. \text{ L}} = 390.8666 \text{ K}$$

$$\begin{array}{r} 390.8666 \text{ K} \\ - 273.15 \\ \hline 117.71666^\circ\text{C} \end{array}$$

$$= \boxed{120^\circ\text{C}}$$

7.78 An unknown amount of gas occupies 30.0 L at 2.1 atm and 298 K. How many moles does the sample contain? What is the mass of the gas if it is Helium? What is the mass of the gas if it is Argon?

$$\begin{aligned}
 P &= 2.1 \text{ atm} \\
 V &= 30.0 \text{ L} \\
 n &= ? \\
 R &= 0.0821 \frac{\text{L atm}}{\text{mole K}} \\
 T &= 298 \text{ K}
 \end{aligned}$$

$$PV = nRT$$

$$n = \frac{PV}{RT}$$

$$n = \frac{2.1 \text{ atm} \times 30.0 \cancel{\text{L}}}{0.0821 \frac{\cancel{\text{L atm}}}{\text{mole K}} \times 298 \cancel{\text{K}}}$$

$$n = 2.5750231 \text{ moles}$$

$$\boxed{n = 2.6 \text{ moles gas}}$$

$$\begin{aligned}
 \text{Mass of Helium} &= 2.5750231 \text{ moles} \times \frac{4.0026 \text{ g}}{1 \text{ mole}} = 10.306787 \text{ g He} \\
 &= \boxed{10. \text{ g He}}
 \end{aligned}$$

$$\begin{aligned}
 \text{Mass of Argon} &= 2.5750231 \text{ moles} \times \frac{39.948 \text{ g}}{1 \text{ mole}} = 102.867023 \text{ g Ar} \\
 &= \boxed{1.0 \times 10^2 \text{ g Ar}}
 \end{aligned}$$

