

## 12.2 Ideal Gas *Supplemental Practice Problems Equations*

$$PV = nRT \quad PV = \frac{m}{M} RT \quad M = \frac{mRT}{PV} \quad n = \frac{PV}{RT} \quad V = \frac{nRT}{P}$$

$$R = 8.31 \frac{\text{L} \cdot \text{kPa}}{\text{mol} \cdot \text{K}}$$

Remember: STP:  $T = 273\text{K}$   $P = 101 \text{ kPa}$   $V = 22.4\text{L}$   $n = 1 \text{ mole}$

$^{\circ}\text{C} \rightarrow \text{add } 273 = \text{K}$   $\text{mL} \rightarrow \text{divide by } 1000 = \text{L}$

1. What is the molecular mass of sulfur dioxide,  $\text{SO}_2$ , if 300.0 mL of the gas has a mass of 0.855 g at STP?

$$M = \frac{mRT}{PV}$$

2. A sample of hydrogen iodide, HI, has a mass of 2.28 g and occupies 400.0 mL at STP. What is the molecular mass of this compound?

$$M = \frac{mRT}{PV}$$

3. If 0.179 g of methane,  $\text{CH}_4$ , occupy 0.250 L, what is the molecular mass of methane if the volume is given at standard conditions?

$$M = \frac{mRT}{PV}$$

4. From the volume, temperature, and pressure, calculate the number of moles for each gas listed using the ideal gas equation.

750.0 mL  $\text{O}_2$  at  $27^{\circ}\text{C}$  and 99.0 kPa

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

5. From the volume, temperature, and pressure, calculate the number of moles for each gas listed using the ideal gas equation.

3.00 L CO<sub>2</sub> at -15°C and 103.0 kPa

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

RT

6. Calculate the volume each gas will occupy under the conditions listed using the ideal gas equation.

3.00 mol H<sub>2</sub> at 24°C and 100.5 kPa

$$V = \frac{nRT}{P}$$

7. Calculate the volume each gas will occupy under the conditions listed using the ideal gas equation.

150.0 g Cl<sub>2</sub> at -12.5°C and 98.5 kPa

$$n = \frac{m}{M}$$

$$V = \frac{nRT}{P}$$

8. The density of a sample of phosphorus trifluoride, PF<sub>3</sub>, is 3.90 g/L. What is the molecular mass of this gas at STP?

$$\left( \text{Hint: } D = \frac{m}{V} = \frac{MP}{RT} \right)$$

$$m = D \times V(\text{at STP } V = 22.4 \text{ L}) \quad m = 3.6 \text{ g/L} \times 22.4 \text{ L} = ? \text{ g}$$

$$M = \frac{mRT}{PV}$$

PV