12.2 Ideal Gas *Supplemental Practice Problems*

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

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

Remember: STP: T = 273K P = 101 kPa V = 22.4L n = 1 mole

$^oC \rightarrow$ add 273 = K mL → divide by 1000 = L

1. What is the molecular mass of sulfur dioxide, SO_2, if 300.0 mL of the gas has a mass of 0.855 g at STP?

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?

3. If 0.179 g of methane, CH_4, occupy 0.250 L, what is the molecular mass of methane if the volume is given at standard conditions?

4. From the volume, temperature, and pressure, calculate the number of moles for each gas listed using the ideal gas equation.
750.0 mL O_2 at 27°C and 99.0 kPa

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_2 at -15°C and 103.0 kPa

6. Calculate the volume each gas will occupy under the conditions listed using the ideal gas equation.
3.00 mol H_2 at 24°C and 100.5 kPa

7. Calculate the volume each gas will occupy under the conditions listed using the ideal gas equation.
150.0 g Cl_2 at -12.5°C and 98.5 kPa

8. The density of a sample of phosphorus trifluoride, PF_3, is 3.90 g/L. What is the molecular mass of this gas at STP?

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