ASSIGNMENT #3: Practice Problems #1-3 & Exercises #11-12

Practice Problems — Converting Moles to Volume and Volume to Moles

1. What volume of oxygen gas at STP contains 1.33 mol of O₂?

   \[ \text{Volume} = 1.33 \text{ mol} \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 29.58 \text{ L} \]

2. In British Columbia, the burnt-match odor of sulphur dioxide is often associated with pulp and paper mills. How many moles of SO₂ are in 9.5 L of SO₂ at STP?

   \[ 9.5 \text{ L} \times \frac{1 \text{ mol}}{22.4 \text{ L}} = 0.424 \text{ mol SO₂} \]

3. Silicon dioxide, better known as quartz, has a molar volume of 22.8 cm³/mol. What is the volume of 0.39 mol of SiO₂?

   \[ \text{Volume} = 22.8 \text{ cm}^3/\text{mol} \times 0.39 \text{ mol} = 8.91 \times 10^{-3} \text{ L} \]

EXERCISES:

11. Calculate the volume at STP occupied by the following.
(a) 12.5 mol of NH₃(g)  
(b) 0.350 mol of O₂(g)  
(c) 4.25 mol of HCl(g)

12. Calculate the number of moles in the following gases at STP.
(a) 85.9 L of H₂(g)  
(b) 375 mL of SO₂(g)  
(c) 5.00 mL of OCl₂(g)

ANSWERS:

11. (a) Volume = 12.5 mol \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 280 \times 10^3 \text{ L}
   
(b) Volume = 0.350 mol \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 7.84 \text{ L}

12. (a) \# of moles = \frac{85.9 \text{ L}}{22.4 \text{ L}} = 3.83 \text{ mol}
   
(b) \# of moles = \frac{375 \text{ mL}}{22.4 \text{ L}} \times \frac{1 \text{ mol}}{1 \text{ L}} = 0.0167 \text{ mol}
   
(c) \# of moles = \frac{5.00 \text{ mL}}{22.4 \text{ L}} \times \frac{1 \text{ mol}}{1 \text{ mL}} = 2.23 \times 10^{-4} \text{ mol}