

# GENERAL CHEMISTRY

## STANDARD 9.4

# DEFINITIONS

- STP – Standard Temperature and Pressure
  - 1.00 atmosphere of pressure
  - 0°C (273 K)
- The volume of exactly one mole of any gas at STP is exactly 22.4 L
  - It does not matter what the gas is
- One mole of a gas at STP is 22.4 L can be used as a conversion factor

# EXAMPLES

- Find the volume of 2.5 moles of CO at STP

$$\frac{2.5 \text{ moles CO}}{1} \times \frac{22.4 \text{ L CO}}{1 \text{ mol CO}} = 56 \text{ L CO}$$

- Find the volume of 35 g of CO<sub>2</sub> at STP

$$\frac{35 \text{ g CO}_2}{1} \times \frac{1 \text{ mol CO}_2}{44.0 \text{ g CO}_2} \times \frac{22.4 \text{ L CO}_2}{1 \text{ mol CO}_2} = 18 \text{ L CO}_2$$

# TRY IT YOURSELF

- Find the volume of  $3.52 \times 10^{24}$  molecules of  $\text{NO}_2$
  
- Find the volume of 72 g of  $\text{O}_2$  at STP

# TRY IT YOURSELF SOLUTIONS

- Find the volume of  $3.52 \times 10^{24}$  molecules of  $\text{NO}_2$

$$\frac{3.52 \times 10^{24} \text{ molecules NO}_2}{6.02 \times 10^{23} \text{ molecules NO}_2} \times \frac{1 \text{ mol NO}_2}{1 \text{ mol NO}_2} \times \frac{22.4 \text{ L NO}_2}{1 \text{ mol NO}_2} = 131 \text{ L NO}_2$$

- Find the volume of 72 g of  $\text{O}_2$  at STP

$$\frac{72 \text{ g O}_2}{32.0 \text{ g O}_2} \times \frac{1 \text{ mol O}_2}{1 \text{ mol O}_2} \times \frac{22.4 \text{ L O}_2}{1 \text{ mol O}_2} = 50. \text{ L O}_2$$