## 10.2 MOLE-MASS AND MOLE-VOLUME RELATIONSHIPS

# Section Review

### Objectives

- Convert the mass of a substance to the number of moles of a substance, and the number of moles of a substance to mass
- Calculate the volume of a quantity of gas at STP

### Vocabulary

- Avogadro's hypothesis
- standard temperature and pressure (STP)
- molar volume

### Key Equations

- $\text{mass (grams)} = \text{number of moles} \times \dfrac{\text{mass (grams)}}{1 \text{ mole}}$

- $\text{moles} = \text{mass (grams)} \times \dfrac{1 \text{ mole}}{\text{mass (grams)}}$

- $\dfrac{\text{grams}}{\text{mole}} = \dfrac{\text{grams}}{\text{L}} \times \dfrac{22.4 \text{ L}}{1 \text{ mole}}$

- $\text{volume of gas} = \text{moles of gas} \times \dfrac{22.4 \text{ L}}{1 \text{ mole}}$

### Part A  Completion

*Use this completion exercise to check your knowledge of the terms and your understanding of the concepts introduced in this section. Each blank can be completed with a term, short phrase, or number.*

At STP (0°C and 1 atmosphere pressure), one mole of any gas occupies a volume of ___**1**___ L. This quantity is known as the ___**2**___ of the gas. To determine the volume in liters of 2.00 mol of $SO_2$ gas at STP, you would use ___**3**___ as a conversion factor. ___**4**___, expressed in the units g/L, is used as a conversion factor when converting from volume to molar mass. When converting between numbers of representative particles, masses, and volumes, you must always convert to ___**5**___ as an intermediate step.

1. _____

2. _____

3. _____

4. _____

5. _____

## Part B  True-False

*Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.*

_____ **6.** One mole of any gas occupies a volume of 22.4 L.

_____ **7.** For a substance of known molar mass, the number of moles of a sample can be calculated from the mass of the sample.

_____ **8.** The volume occupied by one mole of a gas is dependent on the molar mass of the gas.

_____ **9.** The volume of a gas at STP can be calculated from the number of molecules of the gas.

## Part C  Matching

*Match each description in Column B to the correct term in Column A.*

| Column A | Column B |
| --- | --- |
| _____ **10.** molar mass | **a.** 22.4 L of a gas at STP |
| _____ **11.** standard temperature | **b.** 101.3 kPa or 1 atm |
| _____ **12.** molar volume | **c.** 0°C |
| _____ **13.** standard pressure | **d.** mass (in grams) of one mole of a substance |
| _____ **14.** molar road map | **e.** a means of relating mass, number of representative particles, and gaseous volume of a substance |

## Part D  Problems

*Solve the following problems in the space provided. Show your work.*

**15.** What is the density of $N_2O$, a gas, at STP?

**16.** What is the mass of two moles of NaCl?

**17.** How many moles are in 16 grams of $O_2$?

**18.** What is the volume of 16 grams of $O_2$ at STP?