

CHEMICAL QUANTITIES

Practice Problems

SECTION 10.1 THE MOLE: A MEASUREMENT OF MATTER

1. What is the molar mass of sucrose ($C_{12}H_{22}O_{11}$)?
2. What is the molar mass of each of the following compounds?
 - a. phosphorus pentachloride (PCl_5)
 - b. uranium hexafluoride (UF_6)
3. How many moles is 3.52×10^{24} molecules of water?
4. How many atoms of zinc are in 0.60 mol of zinc?
5. What is the mass of 1.00 mol of oxygen (O_2)?

SECTION 10.2 MOLE–MASS AND MOLE–VOLUME RELATIONSHIPS

1. What is the molar mass of each of the following compounds?
 - a. $C_6H_{12}O_6$
 - b. $NaHCO_3$
2. Calculate the mass in grams of each of the following:
 - a. 8.0 mol lead oxide (PbO)
 - b. 0.75 mol hydrogen sulfide (H_2S)
 - c. 1.50×10^{-2} mol molecular oxygen (O_2)
3. How many grams are in 1.73 mol of dinitrogen pentoxide (N_2O_5)?
4. How many grams are in 0.658 mol of calcium phosphate [$Ca_3(PO_4)_2$]?
5. Calculate the number of moles in each of the following:
 - a. 0.50 g sodium bromide ($NaBr$)
 - b. 0.00100 g monochloromethane (CH_3Cl)
6. A chemist plans to use 435.0 grams of ammonium nitrate (NH_4NO_3) in a reaction. How many moles of the compound is this?
7. What is the volume at STP of 2.66 mol of methane (CH_4) gas?
8. How many moles is 135 L of ammonia (NH_3) gas at STP?

10.3 PERCENT COMPOSITION AND CHEMICAL FORMULAS

1. A sample of a compound analyzed in a chemistry laboratory consists of 5.34 g of carbon, 0.42 g of hydrogen, and 47.08 g of chlorine. What is the percent composition of this compound?
2. Find the percent composition of a compound containing tin and chlorine if 18.35 g of the compound contains 5.74 g of tin.
3. Determine the empirical formula of each of the following compounds from the percent composition:
 - a. 7.8% carbon and 92.2% chlorine
 - b. 10.0% C, 0.80% H, 89.1% Cl



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Vocabulary Review

Select the term from the following list that best matches each description.

mole

Avogadro's number

molar mass

22.4 L

percent composition

empirical formula

standard temperature and pressure (0° C, 1 atm)

1. a description of the relative amounts of each element in a compound

2. the lowest whole-number ratio of the atoms of the elements in a compound

3. the volume occupied by one mole of any gas at STP

4. the mass (in grams) of one mole of a compound

5. the SI unit representing 6.02×10^{23} representative particles of a substance

6. 6.02×10^{23} particles

7. the temperature and pressure at which one mole of gas occupies a volume of 22.4 L
