# Homework

1. The empirical formula of *para*-dichlorobenzene, used as a moth repellent, is $C_3H_2Cl$. The molecular mass of compound is 147 u (amu.). What is the molecular formula?

2. Resorcinol, used in manufacturing resins, drugs, and other products, is 65.44% C, 5.49% H, and 29.07% O by mass. Its molecular mass is 110 u (amu.). What is its molecular formula?

3. Kerosene is a mixture of hydrocarbons used in domestic heating and as a jet fuel. Assume that kerosene can be represented as $C_{14}H_{30}$ and that it has a density of 0.763 g/mL. How many grams of $CO_2$ are produced by the combustion of 1.00 gal (3.785 L) of kerosene?

$$C_{14}H_{30}(l) + O_2(g) \longrightarrow CO_2(g) + H_2O(l)$$

4. How many milliliters of dilute HCl(aq) (d = 1.045 g/mL) that is 9.50% HCl by mass are required to react completely with 0.858 g Al?

$$Al(s) + HCl(aq) \longrightarrow AlCl_3(aq) + H_2(g)$$

5. Calculate the theoretical yield of ZnS, in grams, that can be made from 0.488 g Zn and 0.503 g $S_8$. If the actual yield is 0.606 g ZnS, what is the percent yield?

$$8Zn + S_8 \longrightarrow 8ZnS$$

6. A student prepares ammonium bicarbonate by the reaction

$$NH_3 + CO_2 + H_2O \longrightarrow NH_4HCO_3$$

She uses 14.8 g $NH_3$ and 41.3 g $CO_2$. Water is present in excess. What is her actual yield of ammonium bicarbonate if she obtains a 74.7% yield in the reaction?

7. Suppose you need about 80 mL of 0.100 M $AgNO_3$. You have available about 150 mL of 0.0400 M $AgNO_3$ and also about 1.0 g of solid $AgNO_3$. Assume that you have available standard laboratory equipment such as an analytical balance, 10.00-mL and 25.00-mL pipets, 100.0-mL and 250.0-mL volumetric flasks, and so on. Describe how you would prepare the desired $AgNO_3$ solution, including actual masses or volumes required.

8. How many grams of $BaSO_4(s)$ are formed when an excess of $BaCl_2(aq)$ is added to 635 mL of 0.314 M $Na_2SO_4(aq)$?

$$BaCl_2(aq) + Na_2SO_4(aq) \longrightarrow BaSO_4(s) + 2NaCl(aq)$$

9. What volume of 0.0250 M $MgCl_2$ should be diluted to 250.0 mL to obtain a solution with $[Cl^-] = 0.0135$ M?

10. When aqueous solutions of copper(II) nitrate and potassium carbonate are mixed, a precipitate forms. Write the net ionic equation for this reaction.