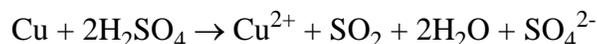


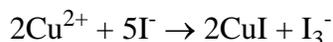
## Stoichiometry Problems Worksheet

The goal of this worksheet is to review your understanding of stoichiometry and to apply that understanding to a set of more challenging problems. You may wish to review the modules from Chem 170; links to these modules can be found in the How To... section of the Chem 260 home page.

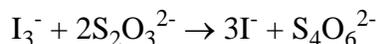
1. Halothane is an anesthetic that is 12.17% C, 0.51% H, 40.48% Br, 17.96% Cl and 28.87% F by mass. What is the compound's molar mass if each molecule contains exactly one hydrogen atom?
2. A compound that is 31.9% K and 28.9% Cl by mass decomposes when heated to give O<sub>2</sub> and a compound that is 52.4% K and 47.6% Cl by mass. Write a balanced chemical equation for this reaction.
3. A compound that combines in a fixed amount with one or more molecules of water is known as a hydrate. In lab, a 5.00-g sample of hydrated barium chloride, BaCl<sub>2</sub>•xH<sub>2</sub>O, is heated to drive off the water. After heating, 4.26 g of anhydrous barium chloride, BaCl<sub>2</sub>, remains. What is the value of *x* in the hydrate's formula?
4. The oxygen-carrying protein known as hemoglobin is 0.335% Fe by mass and contains exactly four Fe atoms per hemoglobin molecule. Calculate the protein's molar mass.
5. A 2.50-g sample of bronze, an alloy of copper and tin, was dissolved in sulfuric acid. The copper in the alloy reacts with sulfuric acid as shown by the following balanced reaction.



Adding KI produces CuI and triiodide, I<sub>3</sub><sup>-</sup>

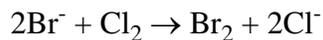


Finally, titrating the I<sub>3</sub><sup>-</sup> with S<sub>2</sub>O<sub>3</sub><sup>2-</sup>



provides an indirect method for determining the amount of Cu in the original sample. Calculate the percentage, by mass, of copper in a sample of bronze if 31.5 mL of 1.00 M S<sub>2</sub>O<sub>3</sub><sup>2-</sup> is consumed in the titration.

6. Iron reacts with  $O_2$  to produce two different oxides,  $Fe_2O_3$  or  $Fe_3O_4$ . If 167.6 g of Fe reacts completely with excess  $O_2$ , producing 231.6 g of product, which oxide was formed?
7. Assume that two experiments are performed on the chemical reaction given below.



Experiment 1: 100.0 mL of  $1.00 \times 10^{-2}$  M  $Br^-$  is added to 50.00 mL of  $2.00 \times 10^{-2}$  M  $Cl_2$

Experiment 2: 100.0 mL of  $2.00 \times 10^{-2}$  M  $Br^-$  is added to 50.00 mL of  $1.00 \times 10^{-2}$  M  $Cl_2$

Solutions of  $Br^-$ ,  $Cl_2$ , and  $Cl^-$  are colorless, but a solution of  $Br_2$  is red. If the reaction between  $Br^-$  and  $Cl_2$  always goes to completion, which of the following observations is correct? Briefly explain.

Observation A: The solution in experiment 1 will be a darker red.

Observation B: The solution in experiment 2 will be a darker red.

Observation C: The solutions will be the same shade of red.