Problem Set 8: Molar Mass, Mole Ratios and Stoichiometry

1. Calculate the molar mass for the following substances.

    a. water

    b. calcium chloride

    c. sodium carbonate

2. How many atoms of carbon are in 1 mol of carbon dioxide?

3. How many atoms of oxygen are in 1 mol of carbon dioxide?

4. How many molecules of carbon dioxide are in 1 mol of carbon dioxide?

5. A typical cup of coffee contains around 95 mg of caffeine. The molecular formula of caffeine is $C_8H_{10}N_4O_2$. Answer the following questions about caffeine.

    a. How many moles of caffeine are in a typical cup of coffee?

    b. How many molecules of caffeine are in a typical cup of coffee?

6. Cisplatin is a chemotherapy drug used to treat a variety of different types of cancer. It is synthesized from potassium tetrachloroplatinate and ammonia through the following reaction:

$$K_2PtCl_4 + 2NH_3 \longrightarrow 2KCl + Pt(NH_3)_2Cl_2$$

    a. What is the mole ratio between the two reactants?

    b. What is the mole ratio between potassium tetrachloroplatinate and cisplatin?

    c. How many moles of cisplatin can form from 2.50 mol of potassium tetrachloroplatinate?

    d. How many grams of cisplatin can form from 8.13 mol of potassium tetrachloroplatinate?

    e. How many moles of cisplatin can form from 1.33 mol of ammonia?

    f. How many grams of cisplatin can form from 12.19 mol of ammonia?

    g. How many grams of cisplatin can form from 25.00 g of potassium tetrachloroplatinate?