Stoichiometry Practice Problems
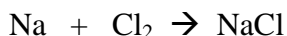
1a) How many moles of chlorine gas would react with 5 moles of sodium according to the following chemical equation? (Balance equation first)

$$Na \ + \ Cl_2 \ \rightarrow \ NaCl$$

1b) Using the equation (after it is balanced) above, determine the amount of product that can be produced from 24.7 g of sodium.

1c) How many molecules of product would be produced from 24.7 g of sodium?

2a) Using the reaction $2 \ C_8H_{18} \ + \ 25 \ CO_2 \ \rightarrow \ 16 \ CO_2 \ + \ 18 \ H_2O$, if 27.3 g of C_8H_{18} are combusted, what mass of water will be produced?

2b) How many molecules of CO_2 will be produced?

3. Chlorine is used by textile manufacturers to bleach cloth. Excess chlorine is destroyed by its reaction with sodium thiosulfate, $Na_2S_2O_3$.

$$Na_2S_2O_{3 \ (aq)} \ + \ 4 \ Cl_{2 \ (g)} \ + \ 5 \ H_2O_{\ (aq)} \ \rightarrow \ 2 \ NaHSO_{4 \ (aq)} \ + \ 8 \ HCl_{\ (aq)}$$
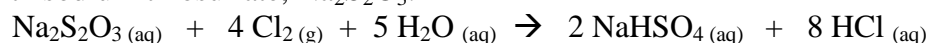
   a) How many moles of $Na_2S_2O_3$ are needed to react with 0.12 moles of Cl_2?
   b) How many moles of HCl can form from 0.12 moles of Cl_2?
   c) How many moles of H_2O are required for the reaction of 0.12 moles of Cl_2?
   d) How many moles of H_2O react if 0.24 moles of HCl is formed?

4. The incandescent white of a fireworks display is caused by the reaction of phosphorous with O_2 to give P_4O_{10}.

   a) Write the balanced chemical equation for the reaction.
   b) How many grams of O_2 are needed to combine with 6.85 g of P?
   c) How many grams of P_4O_{10} can be made from 8.00 g of O_2?
   d) How many grams of P are needed to make 7.46 g of P_4O_{10}?

5. In dilute nitric acid, HNO_3, copper metal dissolves according to the following equation:

$$3 \ Cu_{\ (s)} \ + \ 8 \ HNO_{3 \ (aq)} \ \rightarrow \ 3 \ Cu(NO_3)_{2 \ (aq)} \ + \ 2 \ NO_{\ (g)} \ + \ 4 \ H_2O_{\ (aq)}$$

   How many grams of HNO_3 are needed to dissolve 11.45 g of Cu?

Solutions to Stoichiometry Practice Problems

1. a) Balanced equation: $2\ Na + Cl_2 \rightarrow 2\ NaCl$
   2.5 mol of Cl_2 will react.

   b) 62 g of NaCl can be produced.

   c) 6.5×10^{23} molecules NaCl can be produced.

2. a) 37.8 g of H_2O will be produced.

   b) 1.15×10^{24} molecules of CO_2 will be produced.

3. a) 0.030 mol $Na_2S_2O_3$
   b) 0.24 mol HCl
   c) 0.15 mol H_2O
   d) 0.15 mol H_2O

4. a) $4\ P + 5\ O_2 \rightarrow P_4O_{10}$
   b) 8.85 g O_2
   c) 14.2 g P_4O_{10}
   d) 3.26 g P

5. 30.31 g HNO_3

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