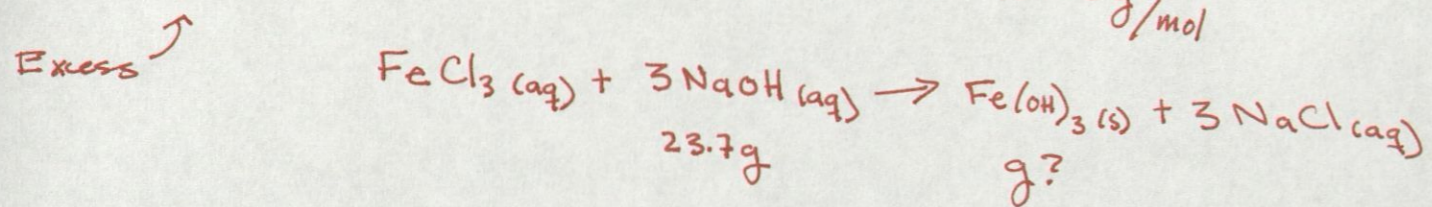


Chemistry 150 Worksheet on Stoichiometry (Gram to Gram problems)

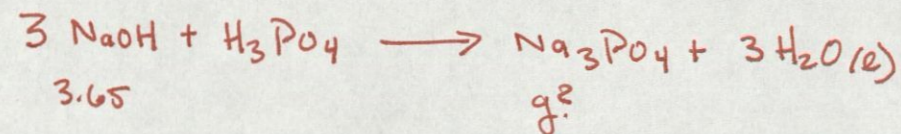
1. How many grams of iron(III) hydroxide will be obtained if 23.7 g of sodium hydroxide is reacted with iron(III) chloride?



$$\text{g Fe}(\text{OH})_3 = 23.7 \text{g NaOH} \times \frac{1 \text{ mole NaOH}}{40.00 \text{g}} \times \frac{1 \text{ mole Fe}(\text{OH})_3}{3 \text{ mole NaOH}} \times \frac{106.8 \text{g Fe}(\text{OH})_3}{1 \text{ mole}} = 21.1 \text{g}$$

2. Sodium hydroxide is neutralized by phosphoric acid.

- a. How many grams of the salt will result if 3.65 g of sodium hydroxide reacts?



$$\text{g Na}_3\text{PO}_4 = \frac{3.65 \text{g NaOH}}{40.00 \text{g NaOH}} \times \frac{1 \text{ mole NaOH}}{3 \text{ mole NaOH}} \times \frac{1 \text{ mole Na}_3\text{PO}_4}{1 \text{ mole Na}_3\text{PO}_4} \times \frac{163.94 \text{g Na}_3\text{PO}_4}{1 \text{ mole Na}_3\text{PO}_4} = 4.99 \text{g}$$

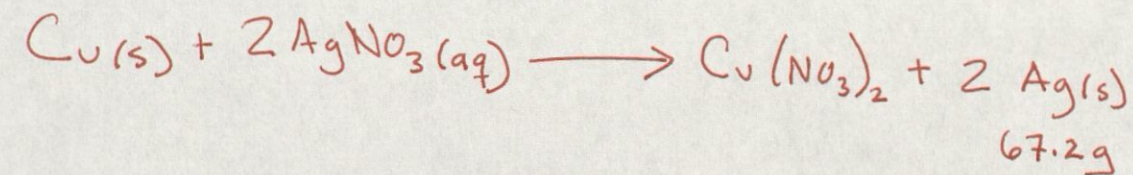
mm = 97.99 g/mole

- b. How many grams of phosphoric acid is necessary to produce 84.8 g of water?

$$\text{g H}_3\text{PO}_4 = \frac{84.8 \text{g H}_2\text{O}}{18.02 \text{g H}_2\text{O}} \times \frac{3 \text{ mole H}_2\text{O}}{3 \text{ mole H}_2\text{O}} \times \frac{1 \text{ mole H}_3\text{PO}_4}{1 \text{ mole H}_3\text{PO}_4} \times \frac{97.99 \text{g H}_3\text{PO}_4}{1 \text{ mole H}_3\text{PO}_4} = 15.4 \text{g}$$

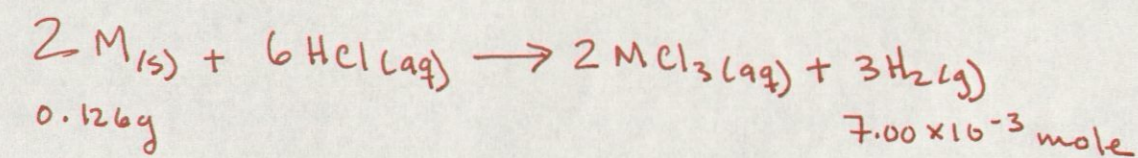
Answers: (1) 21.1 g Fe(OH)₃ (2) a. 4.99 g Na₃PO₄ b. 15.4 g H₃PO₄

3. Silver nitrate (aq) reacts with copper metal in a single replacement reaction. Copper (II) nitrate is one product formed. If 67.2 grams of silver(s) is obtained, what mass of copper(s) was used?



$$\text{g Cu} = 67.2 \text{g Ag} \times \frac{1 \text{ mole Ag}}{107.9 \text{g Ag}} \times \frac{1 \text{ mole Cu}}{2 \text{ mole Ag}} \times \frac{63.55 \text{g Cu}}{1 \text{ mole Cu}} = 19.8 \text{g Cu}$$

4. If 0.126 g of a metal, M, reacts with excess hydrochloric acid to form 7.00×10^{-3} mole of hydrogen and a solution of MCl₃ (aq), what is the atomic mass of the metal, M?



To get mm of M, need # moles of M since we know the mass of M — mm = mass/moles

$$\text{moles M} = 7.00 \times 10^{-3} \text{ moles H}_2 \times \frac{2 \text{ moles M}}{3 \text{ moles H}_2} = 4.67 \times 10^{-3} \text{ moles M}$$

$$\text{mm M} = \frac{0.126 \text{g M}}{4.67 \times 10^{-3} \text{ moles}} = 27.0$$

(3) 19.8 g Cu (4) 27.0 g/mole - Al