

Problem Set 3: Unit Analysis and Problem Solving

- 1) Match the correct conversion factor to each statement.
 - a. $3.50 \text{ mols Fe(OH)}_3 \times \text{————} = 10.5 \text{ mols H}$
 - b. $67400 \text{ mL} \times \text{————} = 67.4 \text{ L}$
 - c. $2.80 \text{ mols Bi(NO}_3)_3 \times \text{————} = 25.2 \text{ mols O}$
 - d. $6.745 \text{ m} \times \text{————} = 6745 \text{ mm}$
 - e. $1 \text{ Au} + 3 \text{ HCl} + 1 \text{ HNO}_3 \rightarrow 1 \text{ AuCl}_3 + 1 \text{ NO} + 2 \text{ H}_2\text{O}$
 $1.2 \text{ mols HCl} \times \text{————} = 0.8 \text{ mols H}_2\text{O}$
 - f. $27.050 \text{ days} \times \text{————} \times \text{————} = 38952 \text{ minutes}$
 - g. $2 \text{ Bi(NO}_3)_3 + 3 \text{ H}_2\text{S} \rightarrow 1 \text{ Bi}_2\text{S}_3 + 6 \text{ HNO}_3$
 $0.50 \text{ mols H}_2\text{S} \times \text{————} = 0.17 \text{ mols Bi}_2\text{S}_3$
 - h. $0.0504 \text{ L} \times \text{————} = 50.4 \text{ mL}$
 - i. $3972 \text{ g} \times \text{————} = 3.972 \text{ kg}$

- 2) Calculate the volume of sulfuric acid in mL if the acid has a mass of 65.14 g and a density of 1.84 g/mL.

- 3) a) What volume of water is necessary to make a $1.0 \times 10^{-3} \text{ M}$ sodium hypochlorite (NaOCl) solution from 0.353 moles of NaOCl?

b) What would be the new concentration if 125 mL of the NaOCl solution was diluted to 500 mL in a volumetric flask?

- 4) Gemstones are weighed in carats (ct), with 1 carat = 200 mg (exactly). What is the mass in grams of the Hope Diamond, the world's largest blue diamond at 44.4 carats?

- 5) a) Hydrochloric acid is sold commercially as a 12.0 M aqueous solution. How many moles of HCl are in 300.0 mL of a 12.0 M solution?

b) What volume of the 12.0 M HCl solution is required to make a HCl solution with a concentration of 3.0 M?