

## CHEM 1

### Problem Set Ch. 4

1. Calculate each of the following quantities:

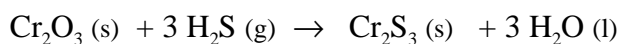
a) Mass in grams of 0.65 mol  $\text{KMnO}_4$

b) Moles of oxygen atoms in 9.22 g  $\text{Mg}(\text{NO}_3)_2$

c) Mass in kilograms of  $2.6 \times 10^{20}$  molecules of  $\text{SO}_2$

2. How many grams of silver carbonate are in 5.36 mol silver carbonate?

3. Chromium(III) oxide reacts with hydrogen sulfide gas to form chromium(III) sulfide and water:



In order to produce 63.5 g  $\text{Cr}_2\text{S}_3$ ,

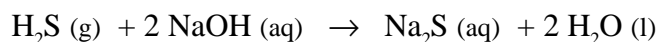
a) How many moles of  $\text{Cr}_2\text{O}_3$  are required?

b) How many grams of  $\text{Cr}_2\text{O}_3$  are required?

4. Calculate the mass of each product formed when 56.3 g silver sulfide reacts with excess hydrochloric acid:

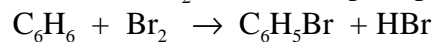


5. Consider the following reaction:



How many grams of  $\text{Na}_2\text{S}$  are formed if 3.05 g of  $\text{H}_2\text{S}$  is bubbled into a solution containing 1.84 g of  $\text{NaOH}$ , assuming that the limiting reagent is completely consumed?

6. A student reacts benzene,  $C_6H_6$ , with bromine,  $Br_2$ , in an attempt to prepare bromobenzene,  $C_6H_5Br$ :



a) What is the theoretical yield of bromobenzene in this reaction when 30.0 g of benzene reacts with 65.0 g  $Br_2$ ?

b) If the actual yield of bromobenzene was 56.7 g, what was the percentage yield?

7. Why is the theoretical yield of a reaction determined only by the amount of the limiting reagent?

8. Calculate the molarity of a 500.0 mL solution containing 2.83 g potassium iodide.

9. Calculate the volume in liters of 0.355 M manganese(II) sulfate that contains 57.0 g solute.

10. How many milliliters of 0.55 M HCl are needed to react with 3.7 g  $CaCO_3$ ?



11. How would you prepare 60.0 mL of 0.200 M  $HNO_3$  from a stock solution of 4.00 M  $HNO_3$ ?

12. Determine the empirical and molecular formula of nicotine, a component of tobacco. Nicotine consists of 74.1% carbon, 8.6% hydrogen, and 17.3% nitrogen by mass and has a molar mass of  $160 \pm 5$  g/mol.