

Mid-Year Study Guide Part 3

If you need help answering these study guide questions, check online for the notes:

<http://msrobbinspnhs.weebly.com/> or

<http://mrsgonsalves.weebly.com/>

CHEMICAL REACTIONS

IDENTIFY THE TYPE OF REACTION AND BALANCE THE EQUATION:

- $2\text{Li} + 2\text{H}_2\text{O} \rightarrow 2\text{LiOH} + \text{H}_2$ S.R.
- $2\text{AlCl}_3 \rightarrow 2\text{Al} + 3\text{Cl}_2$ D.
- $\text{C}_6\text{H}_{12} + 9\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$ Combustion
- $2\text{AlCl}_3 + 3\text{Na}_2\text{CO}_3 \rightarrow \text{Al}_2(\text{CO}_3)_3 + 6\text{NaCl}$ D.R.
- $2\text{HNO}_3 + \text{Ba}(\text{OH})_2 \rightarrow \text{Ba}(\text{NO}_3)_2 + 2\text{H}_2\text{O}$ D.R.
- $2\text{Al} + 3\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{Al}(\text{NO}_3)_3 + 3\text{Pb}$ S.R.
- $2\text{Sb} + 3\text{I}_2 \rightarrow 2\text{SbI}_3$ S.

IDENTIFY THE TYPE OF REACTION & WRITE A BALANCED EQUATION (INCLUDE STATES):

- Aqueous solutions of ammonium chloride and lead(II) nitrate produce lead(II) chloride precipitate and aqueous ammonium nitrate. D.R.



- Solid carbon disulfide burns in oxygen to yield carbon dioxide and sulfur dioxide gases.



- Iron metal reacts with aqueous silver nitrate to produce aqueous iron(III) nitrate and silver metal.



- WRITE & BALANCE THE COMBUSTION REACTION FOR BUTANE GAS: C_4H_{10}



THE MOLE CONCEPT & COMPOUNDS

- How many magnesium sulfate molecules are in 25.0 g?

$$\frac{25.0\text{g MgSO}_4}{120.37\text{g}} \times \frac{1\text{mol}}{1\text{mol}} \times \frac{6.02 \times 10^{23}\text{ molecules}}{1\text{mol}} = 1.25 \times 10^{23}\text{ molecules}$$

- Find the molarity of a 750 mL solution containing 346 g of potassium nitrate.

$$\frac{346\text{g KNO}_3}{101.10\text{g}} = 3.42\text{mol} \quad M = \frac{3.42\text{mol}}{.750\text{L}} = 4.56\text{M KNO}_3\text{ solution}$$

3. Calculate the number of grams required to make a 50.0 mL solution of 6.0M NaOH.

$$\frac{.050L}{1L} \times \frac{6.0 \text{ mol}}{1 \text{ mol}} \times \frac{40.00g}{1 \text{ mol}} = 12.0g \text{ NaOH}$$

4. Find the % composition of copper(II) chloride. CuCl_2

M.M. = 134.45g/mol

$$\% \text{Cu} = \frac{63.55g}{134.45g} \times 100 = 47.3\%$$

$$\% \text{Cl} = \frac{2(35.45)}{134.45g} \times 100 = 52.7\%$$

5. The percent composition of a compound is 40.0% C, 6.7% H, and 53.7% O. The molecular mass of the compound is 180.0 g/mol. Find its empirical and molecular formulas.

6. A page from a lab notebook is shown below. The page displays data needed to find the empirical formula of a compound.

Mass of crucible	5.23 g
Mass of crucible and iron powder	7.46 g
Mass of iron powder	x
Mass of sulfur added to crucible	1.28 g
Mass of crucible and contents after reaction	8.74 g
Mass of iron-sulfur compound	y

#5

$$\text{C} = \frac{40.0g}{12.01g} = \frac{3.33}{3.33} = 1$$

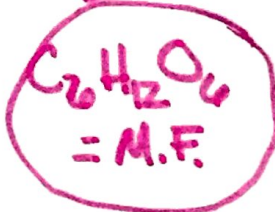
$$\text{O} = \frac{53.7g}{16.00g} = \frac{3.36}{3.33} = 1$$

$$\text{H} = \frac{6.7g}{1.01g} = \frac{6.63}{3.33} = 2$$



$$12 + 2 + 16 = 30$$

$$\frac{180}{30} = 6$$



a. Calculate the values for x and y. Show your calculations and include units in your answer.

$$x = \text{Fe} = 7.46g - 5.23g = 2.23g \quad y = 8.74g - 5.23g = 3.51g$$

b. Assume all the iron and sulfur reacted to form an iron-sulfur compound. Calculate the number of moles of sulfur and the number of moles of iron that reacted to form the compound. Show your calculations and include units in your answer.

63.5% Fe
36.5% S

$$\text{Fe} = \frac{2.23g}{55.85g} = \frac{0.0399}{0.0399} = 1$$

$$\text{S} = \frac{1.28g}{32.06g} = \frac{0.0399}{0.0399} = 1$$



c. Determine the empirical formula for the iron-sulfur compound. Show your calculations or explain your reasoning.

The ratio is 1 to 1 so FeS
iron (II) sulfide