CHEM 202 Accelerated General Chemistry I TA: Isaiah Lopez

Week 2 – Solution Stoichiometry I August 31st, 2021

MERIT Section AQG

1. Uranyl fluoride is a solid compound consisting of uranium, oxygen, and fluorine. It is produced by reacting gaseous uranium hexafluoride (UF6) with water. There is another product of the reaction as discussion below.

4.267 g of UF6 is reacted with excess water to produce solid uranyl fluoride along with 0.0485 mol of binary gas. The binary gas us 95% fluorine by mass.

1. Use the data above to **determine the empirical formula** for uranyl fluoride.
2. With the above data why are you able to find only the empirical formula? **Provide two potential chemical equations (balanced)** that show you cannot determine the molecular formula from the given data.
3. With the empirical formula of uranyl fluoride (instead of the molecular formula), is it possible to determine the mass of uranyl fluoride produced from 4.267 g of UF6 with excess water? Whether your answer is “yes” or “no,” **explain your answer** and **support it mathematically**. If you believe it is possible, determine the mass produced. If you believe it isn’t possible, show why it is not possible.
4. Consider the balanced chemical equation: 4A + 3B → 2C + D

Suppose **equal mass samples** of A and B are reacted.

1. If the molar mass of A is greater than the molar mass of B, can we tell which reactant is limiting? If so, **explain your answer**, **determine the limiting reactant**, and **support your answer with numbers**. If you cannot, **explain** why not, and **support your answer with numbers**.
2. If the molar mass of B is greater than the molar mass of A, can we tell which reactant is limiting? If so, **explain your answer**, **determine the limiting reactant**, and **support your answer with numbers**. If you cannot, **explain** why not, and **support your answer with numbers**.
3. Caffeine is a stimulant most commonly found in coffee and is 5.19% hydrogen by mass. The molecular formula of caffeine is CxH10N4O2. Determine the value of x.
4. Suppose 50.00 mL of 0.250 M CoCl2 solution is added to 25.0 mL of 0.350 M NiCL2 solution. Calculate the concentration of each of the ions present after mixing. Assume additive volumes.
5. How much silver chloride can be prepared by the reaction of 100.0 mL of 0.20 M silver nitrate with 100.0 mL of 0.15 M calcium chloride? Calculate the concentration of each ion remaining in solution after precipitation is complete.
6. You are lost in a desert. All you have is 16.0 g of hydrogen gas and 22.0 g oxygen gas. You mix the two gases in a balloon, and lighting strikes the balloon (because you creatively tied a key to the string) creating water. You obtain 20.0 g of water to drink (YAY!!). Answer the following:
   1. Write the balanced chemical reaction.
   2. Determine the limiting and excess reagents.
   3. State the amount of excess reagent remaining after the reaction occurs.
   4. Calculate theoretical yield assuming reaction goes to completion.
   5. Calculate % yield
7. A 9.780-g gaseous mixture contains ethane (C2H6) and propane (C3H8). Complete combustion to form carbon dioxide and water requires 1.120 moles of oxygen gas. Calculate the mass percent of ethane in the original mixture.
8. A 2.25-g sample of scandium metal is reacted with excess hydrochloric acid to produce 0.1502 g of hydrogen gas. What is the formula of the scandium chloride produced in the reaction?
9. A 46.2 mL portion of 0.568 M calcium nitrate solution is combined with 80.5 mL of an older calcium nitrate solution having concentration of 1.396 M. Calculate the concentration of calcium nitrate in the final solution.
10. When 1.0 mole of solid lead nitrate is added to 2.0 moles of aqueous potassium iodide, a yellow precipitate forms. After the precipitate settles to the bottom, does the solution above the precipitate conduct electricity? Explain. Write the complete ionic equation to help you answer this question.