

Lab: Gravimetric Analysis

Name: _____

Period: ____

Introduction

In gravimetric analysis, a substance is added to a solution that reacts specifically with a dissolved analyte to form an insoluble solid or precipitate. The mass of the precipitate formed can be used to calculate the amount of the analyte in the original solution. In this lab, chlorine is the analyte and the percent chlorine in an unknown compound will be determined by reaction with silver nitrate. The unknown compound is one of the following substances: sodium chloride, potassium chloride, or lithium chloride.

A given amount of the unknown compound will be dissolved in water to make a solution. The solution will then be reacted with silver nitrate to precipitate silver chloride. The solid silver chloride will then be filtered from the solution and the mass will be determined. From the mass of silver chloride, the mass of chlorine in the sample of unknown compound can be calculated to give the percent by mass chlorine in the unknown compound. Since the percent composition of chlorine each of the possible unknowns can be found, the unknown compound can be identified.

Procedure:

- (1) Record the unknown number. Weigh between 0.150 g and 0.200 g of the unknown compound into a beaker. Record the *exact* mass. Add 10.00 mL of water to the beaker and ensure that all of the unknown is dissolved.
- (2) Measure *exactly* 10.00 mL of 0.500 M silver nitrate.
- (3) Pour the silver nitrate into the beaker. The reaction will produce a soluble nitrate compound (that will remain dissolved in the solution) and a precipitate of silver chloride (that will settle out of the solution).
- (4) Obtain a filter paper. Write your name on the filter paper (using pencil). Weigh the filter paper and record the mass.
- (5) Fold the filter paper (with your name on the outside) and place it in a funnel. Wet the filter paper using a wash bottle and press it against the sides of the funnel.
- (6) Put the funnel in a ring clamp and arrange the height so that the funnel will empty into another beaker. The bottom of the funnel should be touching the side of the beaker.
- (7) Slowly empty the contents of the reaction beaker into the funnel. Be careful not to overfill the filter paper. Rinse the beaker with a wash bottle several times to ensure that all of the contents have been transferred.
- (8) When all of the liquid has been drained from the funnel, discard the liquid waste in the sink. Carefully remove the filter paper and put it in the place designated by your teacher. Allow the filter paper to dry. When the filter paper has completely dried, record the mass of the filter paper and the silver chloride. Determine the mass of the silver chloride.

Data:

unknown number	
mass unknown compound (g)	
mass of filter paper (g)	
mass of filter paper and silver chloride (g)	
mass of silver chloride (g)	

Questions:

- (1) Calculate the percent composition of **chlorine** in each of the following compounds: sodium chloride, potassium chloride, or lithium chloride (Round your answers to one decimal place).

sodium chloride : _____ % Cl

lithium chloride : _____ % Cl

potassium chloride : _____ % Cl

- (2) From the mass of silver chloride produced in the experiment, determine the mass of chlorine in the unknown (from the mass of silver chloride, determine the moles of silver chloride, then the moles of chlorine to find the mass of chlorine).

(3) Calculate the percent chlorine by mass in the sample of your unknown. _____

(4) Identify the unknown compound. _____

(5) Write a balanced chemical equation for the reaction of YOUR unknown compound with silver nitrate.

(6) From molarity and volume, determine the moles of silver nitrate used in the reaction. _____

(7) (a) Identify the limiting reactant in the experiment as the unknown or silver nitrate. Show calculations to justify your answer.

limiting reactant: unknown or silver nitrate
circle one

(b) Why is it necessary for this substance to be the limiting reactant?

Conclusion:

The percent chlorine by mass in the compound was _____ % and therefore, the unknown compound was most likely _____

Error Analysis:

Calculate the percent error for your result (the actual percent chlorine was calculated in question 1). _____

Based on the percent error, the experimental value was _____ % (higher or lower) in than the actual value.

Consider the following laboratory situations and specifically explain how each would change the experimentally calculated percent chlorine:

(1) The filter paper was not completely dry for final mass measurement.

If the filter paper was not dry for final mass measurement, the mass of the filter paper would have been measured as a _____ value, therefore the mass of the silver chloride would have been recorded as a _____ value. Consequently, the mass of chlorine in the sample and therefore the percent chlorine would be calculated as _____ values.

(2) Some of the silver chloride precipitate remained in the reaction beaker and was not filtered from the solution.

If some of the silver chloride precipitate remained in the reaction beaker and was not filtered from the solution, the mass of silver chloride collected would have been _____. Consequently, the mass of chlorine in the sample and therefore the percent chlorine would both be calculated as _____ values.