

Gravimetric Analysis of Calcium and Hard Water

Guided Reading

Introduction

1. T or F Various anions are responsible for water hardness
2. The investigation uses _____ analysis to test for _____ hardness and _____ ions.

Background

3. The nature and amount of dissolved substances in water depends on....
4. As minerals dissolve they separate into _____ and _____.
5. The main ions contributing to water hardness are _____, _____ and _____.
6. Write the equation for the precipitation reaction between calcium and alkyl sulfates.
7. Explain why the formation of soap scum can be a problem (at least 2 reasons)
8. _____ exchange is commonly used to remove ions from hard water.
9. What chemical do municipal water treatment plants commonly use to remove calcium from hard water? _____ What about magnesium? _____

10. Write the formula of the precipitates formed when calcium and magnesium are combined with the chemicals stated in #9 (This is not directly given. You must think!)

Experimental Overview

11. What is the purpose of the lab?

12. What two solutions will be combined in this lab?

13. Careful _____, _____, and weighing of the precipitate will confirm the calculations and _____ yield.

Introductory Activity

Place the numbers 1-7 in the blanks to indicate the correct order for steps in this lab.

- _____ Dry the precipitate
- _____ Calculate % yield
- _____ Place reactants in beaker with 20 mL of water
- _____ Separate precipitate through vacuum filtration
- _____ Weigh 20 grams of each reactant
- _____ Weigh precipitate
- _____ Combine two solutions

Complete pre-lab questions 1-3

Gravimetric Analysis Video Guide

Gravimetric Analysis is a method of _____ chemical analysis in which the _____ sought is converted into a substance that can be _____ from the sample and _____.

Steps in gravimetric analysis

1. Prepare solution(s)
2. _____ of desired constituent
3. _____ isolated constituent
4. Computation of the _____ of constituent

Example problem

Unknown sample _____ g

Mass of ppt _____ g

Work:

Grams of Ca^{+2}/Ca _____ g

Mass % of calcium in original sample

_____ g x 100 = %
g

Example Data Sets

Amount of Na_2CO_3	1.98 grams
Amount of CaCl_2	2.02 grams
Mass of filter paper	0.13 grams
Mass of watch glass	10.32 grams
Precipitate, filter paper and watch glass	11.43 grams

Theoretical yield of precipitate

Actual yield of precipitate

Percent Yield

Potential error:

Amount of calcium chloride	20.2 mL
Amount of 5 M sodium carbonate	10.3 mL
Mass of filter paper	0.22 grams
Mass of watch glass	11.2 grams
Precipitate, filter paper and watch glass	12.5 grams

Moles of calcium chloride

Molarity of calcium chloride