Name: _____ Date: _____ Period: _____

Gravimetric Analysis with Ammonium carbonate and Calcium Chloride

10 Point Lab

Background

Gravimetric analysis is a method in analytical chemistry to determine the quantity of analyte based on the mass of a solid. Example: Measuring the solids suspended in the water sample – Once a known volume of water is filtered, the collected solids are weighed.

Pre-Lab Questions

1. Write the balanced equation for double displacement reaction between ammonium carbonate and calcium chloride (refer to "Reaction Types" lesson if you forgot what double displacement means):

2. You are to produce **2.00 grams of ammonium chloride**.
    a. Use the balanced equation above. How many grams of **ammonium carbonate** do you need? *Use dimensional analysis, show your work, include units with all values, and answer with proper significant figures*.

    b. Use the balanced equation above. How many grams of **calcium chloride** do you need? *Use dimensional analysis, show your work, include units with all values, and answer with proper significant figures*.

c. Use the balanced equation above. How many grams of **calcium carbonate** will you produce? *Use dimensional analysis, show your work, include units with all values, and answer with proper significant figures*.

Do not continue until your prelab is checked by the lab instructor.

Teacher prelab check: *(4 pts)*_____

SAFETY

- Wear safety goggles until instructed to remove them.

MATERIALS

- Ammonium carbonate
- Calcium chloride
- Distiller water
- Beakers (100 mL) x2
- Erlenmeyer flask (125 mL)
- Graduated cylinder (100 mL)
- Balance
- Glass stir rod
- Scoopula
- Funnel
- Filter paper
- Pencil

PROCEDURE

Fill in the blanks on #2 and #6 using your answers from the prelab calculations. (1 pt)

1. Place a 100 mL beaker on the balance and tare the mass.
2. Add (prelab answer 2a) **_____ grams of ammonium carbonate** to the beaker. Try to get as close as possible but record the actual mass.
3. Use a graduated cylinder to obtain 50 mL of distilled water. Transfer the 50 mL of water into the **ammonium carbonate** beaker. Mix the solution using a glass stir rod until the solution all the salt is dissolved. Clean the stir rod and rinse it with distilled water.
4. Record your observations of the **ammonium carbonate** and water solution.
5. Place the second 100 mL beaker on the balance and tare the mass.
6. Add (prelab answer 2b) **_____ grams of calcium chloride** to the second beaker. Try to get as close as possible but record the actual mass.
7. Use a graduated cylinder to obtain 50 mL of distilled water. Transfer the 50 mL of water into the **calcium chloride** beaker. Mix the solution using a glass stir rod until the solution all the salt is dissolved. Clean the stir rod and rinse it with distilled water.

8. Record your observations of the **calcium chloride** and water solution.
9. Carefully and slowly pour the **calcium chloride** solution into the **ammonium carbonate** solution. Record your observations.
10. Write your initials and class period on a piece of filter paper. Record the mass the filter paper.
11. Fold the filter paper into a cone and place it into a funnel.

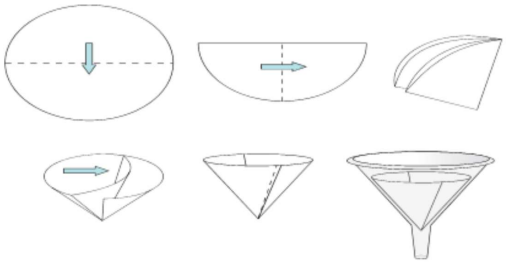

Figure 1 Step-by-step process to fold paper to be used in a funnel.

12. Place the funnel with filter paper onto the 125 mL Erlenmeyer flask. You can add a few drops of water to the filter paper to get it to stick to the funnel.
13. Pour the solution into the funnel. Do not fill above the filter paper. Allow it to drain into the Erlenmeyer flask before you add more solution. When the solution has been filtered into the Erlenmeyer flask, rinse any left-over product from the beaker into the funnel with distilled water.
14. The solution in the flask can be rinsed down the sink with running water.
15. Carefully remove the filter paper and place it in a designated area to dry out for at least 24 hours. Ensure all the product stays on the filter paper.
16. Mass the dry filter paper and product.
17. The filter paper and product can be thrown in the trash.

DATA

(2 pts)

Material	Mass (g)
Ammonium carbonate	
Calcium chloride	
Filter paper	
Dry filter paper with substance on it	

Material	Qualitative observations
Ammonium carbonate solution	
Calcium chloride solution	
Mixed ammonium carbonate and calcium carbonate solutions	

CALCULATIONS

Show your work, include units with all values, and answer with proper significant figures.

1. Mass of the product. *(1 pt)*

$$m_{filter\ paper\ and\ product} - m_{filter\ paper} = m_{product}$$

2. Percent yield. The product is **calcium carbonate**. When determining the percent yield, the **theoretical value** is your answer from prelab question #2c. Your **actual value** is your answer from calculations question #1. Use the following equation to determine your percent yield: *(1 pt)*

$$\left(\frac{m_{actual}}{m_{theoretical}}\right) \times 100\% =$$

ANALYSIS

1. The product that you massed was calcium carbonate. *(1 pt)*
    a. Was there another product? If so, what was it?

    b. Explain how the filter paper only caught the calcium carbonate. What happened to the other product?