To: Professor Richmond-Hall, Chemistry Professor

From: Mackenzie Fournier

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Subject: Precipitation of Chalk

**Hypothesis:**

When an exchange reaction happens between two soluble ionic compounds, they form two new products. One of the new products is a precipitate.

> What technique can you use to isolate the solid product?

> Can you calculate limiting reactants and theoretical yield using volume and molarity?

**Summary of experimental findings:**

~~When doing this experiment~~ there were two substances used for this experiment CaCl2 and Na(CO3). There were three trials ~~involved in this experiment~~ for both A and B. A had an average of 1.02g of chalk in the filter and B had an average of .84g of chalk in the filter. From this data that means the more Na2(CO3) mixed with CaCl2 it what creates a larger amount of chalk.

> Check that formula.

> What can you say about limiting reactants, theoretical yield and percent yield?

**Procedure:**

The first step is to grab two clean burets and set them up in the buret stand. Then fill one buret with calcium chloride and the other with sodium carbonate. (concentrations?) The next step is to fill one flask with 20ml of calcium chloride and 10 ml of sodium carbonate then swirl the flask until you observe a white precipitate. Then grab a filter (make sure the weight is recorded) place the filter into a clean flask and pour your solution into the filter paper. Is the filter paper labeled? Then what? Repeat each trial 3 times. For the B trial is involves the same steps but instead of 20ml calcium chloride you will use 25ml and instead 10 ml of sodium carbonate you will use 5ml. Make sure you get all of the solution out of the flask by using your squeeze bottle of water and chase the chalk down into the filter. Once all the filtrate has left the filter carefully take it (what?) out and place it on the cookie sheet. Next is part B (new sentence?) place about 1 ml of filtrate A into 3 test tubes. Add about 1ml of water to the first test tube, calcium chloride to the second one and sodium carbonate to the third one. Record the presence or absence of precipitate in each test tube. Do the same steps for B.

> Do you need to weigh the filter paper with dried chalk?

The calculations needed for this experiment are Molecular weights, Volumes of Na2(CO3) and CaCl2 in each trial for A and B, Moles of Na(CO3) and CaCl2 in each trial for A and B, to identify which is limiting, Extra moles of the non-limiting reactant, theoretical yield, actual yield, mean and standard deviation. Of what?

**Results:**

**MW**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | MW |  | MW product | SD | Mean |
| CaCl2 | 110.978 | 2NaCl | 100.058 | .0161 | 1.02g |
| Na(CO3) | 105.968 | Ca(CO3) | 116.878 | .0134 | .84g |

> Units for MW? Should you use coefficients when calculating MW? Do you need mean and SD of MW?

**Volume**

|  |  |  |
| --- | --- | --- |
|  | CaCl2 | Na2(CO3) |
| A1 | 20.3 | 9.90 |
| A2 | 19.7 | 10.0 |
| A3 | 20.0 | 10.1 |
| B1 | 25.1 | 5.00 |
| B2 | 25.0 | 5.00 |
| B3 | 25.0 | 5.00 |

> This is data, not results, so doesn’t belong here. What about sig figs?

**Moles**

|  |  |  |
| --- | --- | --- |
|  | CaCl2 | Na(CO3) |
| A1 | .0104 | .0149 |
| A2 | .0099 | .0150 |
| A3 | .0100 | .0150 |
| B1 | .0126 | .0075 |
| B2 | .0125 | .0075 |
| B3 | .0125 | .0075 |

> Good. Check sig figs.

**Theoretical Yield**

|  |  |  |
| --- | --- | --- |
|  | CaCl2 | Na(CO3) |
| A1 | 1.04g | 1.50g |
| A2 | .981g | 1.50g |
| A3 | 1.00g | 1.50g |
| B1 | 1.25g | .750g |
| B2 | 1.25g | .750g |
| B3 | 1.25g | .750g |

> Theoretical yield is Ca(CO3) not the compounds shown here?

 **Actual Yield**

|  |  |
| --- | --- |
|  | Ca(CO3) |
| A1 | .0140 |
| A2 | .0098g |
| A3 | .0104g |
| B1 | .0090g |
| B2 | .0080g |
| B3 | .0083g |

> Good. Actual yield needs to be expressed in moles as well.

> What about percent yield?

**Discussion~~s~~**

During this experiment we got good results similar to the rest of the class. One of the errors in our experiment could be from some of the solution spilling over the edge of the flask and some chalk still stuck in the flask even after chasing it with water.

> What are your percent yields and do they make you concerned that you lost chalk?

**Calculations**

MW:$40.078+\left(2\right)35.45=110.978$ units?

MW Product: $\left(2\right)22.989+\left(2\right)35.45=116.878$ units?

Moles: $\frac{1.5m Na(CO3)}{1L}\*.0099l=$ .0149 mol $\frac{.500m CaCl2}{1L}\* .0203=$ .0104mol moles of what?

Theoretical: $.0104mol\* \frac{100.058}{1mol CaCO3}$ =1.04g of what?

SD: $\sqrt{\frac{\left(.0104\right)^{2}+\left(.0098\right)^{2}+\left(.0104\right)^{2}}{3-1}}$

Mean: 1.04g + .98g + 1.04g = 1.02g

**Data**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Trial | CaCl2 | Na(CO3) | Filter Paper | Dry Filter Paper with Chalk |
| Volume I F | VolumeI F |
| A1 | 0 | 23.3 | 0 | 9.9 | .94 | 1.98 |
| A2 | 20.3 | 40 | 9.9 | 19.9 | .92 | 1.90 |
| A3 | 0 | 20 | 19.9 | 30 | .92 | 1.96 |
| B1 | 20 | 45 | 30 | 35 | .94 | 1.84 |
| B2 | 0 | 25 | 35 | 40 | .92 | 1.72 |
| B3 | 25 | 50 | 40 | 45 | .91 | 1.74 |

> Sig figs?

> Masses of empty filters and filters with chalk?

**Part B**

|  |  |  |
| --- | --- | --- |
| **Water** | **Clear** | **Clear** |
| **CaCl2** | **Foggy, white** | **Clear** |
| **Na2Cl3** | **Clear** | **Foggy, white** |