Precipitation Reactions and Theoretical Yield

December 20 2016
SCH 3U

Formal Lab Write-Up

Purpose - To determine the percentage yield of a double displacement precipitation reaction.

Pre-Lab -

a) v= 0.5L
c= 0.70 mol/L
n= ?

n= c x v
n= 0.5L x 0.70mol
n= 0.35mol

M= (2 x 22.99) + (1 x 12.01) + (3 x 16.00)
M= 105.99g/mol

Find m
m= n x M
m= 0.35mol x 105.99g/mol
m= 37.1g

The mass of solute we would need to use is 37g.

b) v= 0.25L
c= 0.50 mol/L
n= ?

n= c x v
n= 0.25L x 0.50mol
n= 0.125mol

M= (1 x 40.08) + (2 x 35.45)
M= 110.98g/mol

Find m
m= n x M
m= 0.125mol x 110.98g/mol
m= 13.87g

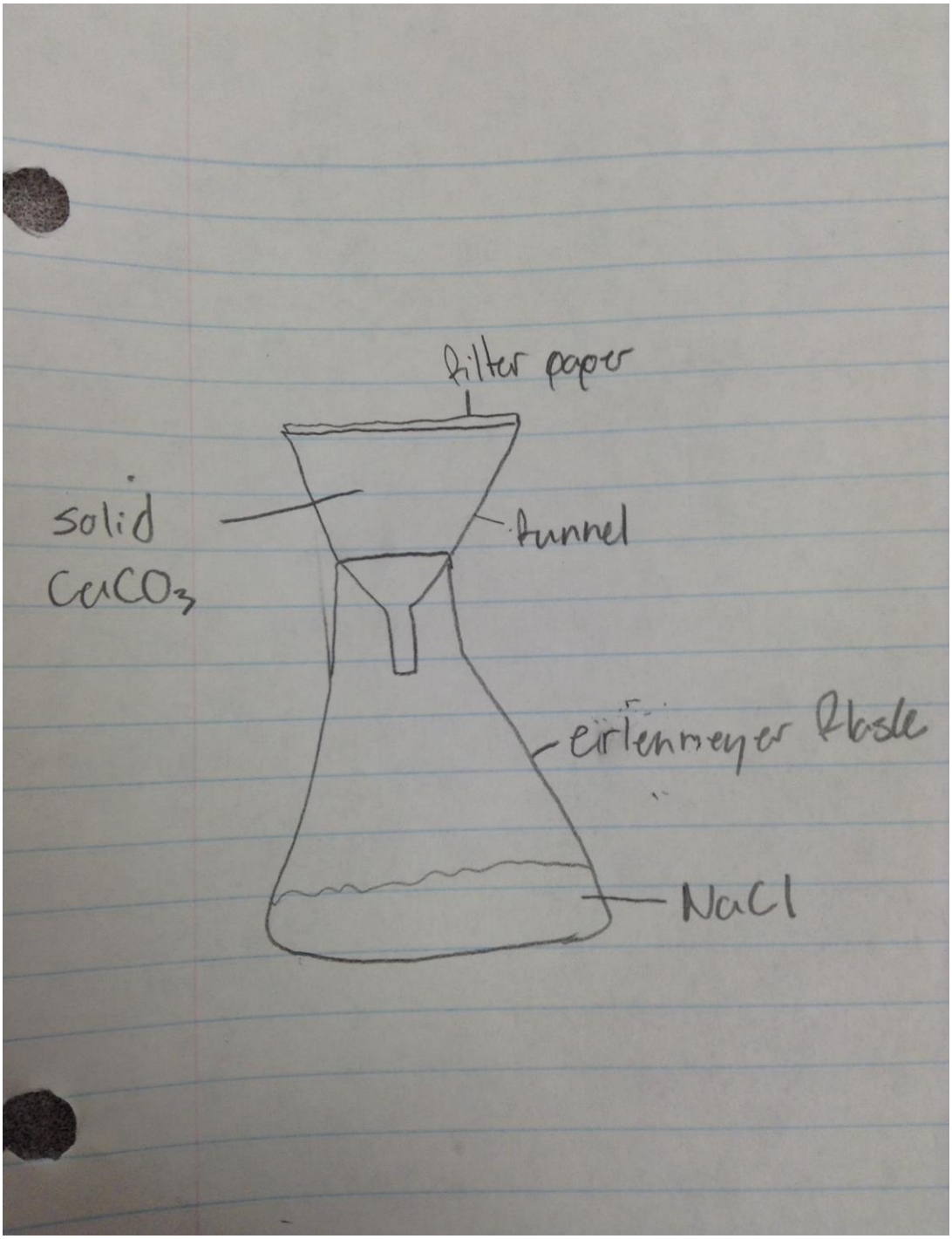
The mass of solute we would need to use is 13.9g.

Theoretical Yield

Na_2CO_3 +	$CaCl_2$ →	$CaCO_3$ +	2NaCl
v= 0.01L c= 0.70mol/L n= ? n= c x v n= 0.01L x 0.70mol/L n= 0.007mol x1/1 ---------->	v= 0.01L c= 0.50mol/L n= ? n= c x v n= 0.01L x 0.50mol/L n= 0.005mol x1/1 ---------->	**m= 0.500g** M= (1 x 40.08) + (1 x 12.01) + (3 x 16.00) M= 100.09g/mol m= n x M m= 0.005mol x 100.09g/mol m= 0.500g n= 0.005mol ← limiting reactant ~~n= 0.007mol~~	

Materials - pipettes, 2 beakers, filter paper, graduated cylinder, funnel, scale, erlenmeyer flask, distilled water, safety goggles, a 0.70 mol/L solution of Na_2CO_3, a 0.50 mol/L solution of $CaCl_2$

Diagram of Apparatus



Procedure -

1. Gather your materials, and mass your beakers and filter paper.
2. Measure out 10mL of each solution using pipettes or a graduated cylinder. Pour each solution into separate beakers.
3. Pour one beaker into the other, allowing a moment for the reaction to occur.
4. Fold your filter paper and put it into the funnel, and the funnel into the erlenmeyer flask. Use distilled water to stick the filter paper to the funnel.
5. Pour the mixture into the funnel, using distilled water to wash out the beaker. Wait until all the liquid has been filtered out.
6. Put the filter paper with the precipitate into a drying oven, and leave for as long as needed.
7. Mass the filter paper/precipitate.

Observations -

Object	Mass (g)
Beaker 1	27.50g
Beaker 1 + Calcium Chloride	37.83g
Beaker 2	31.75g
Beaker 2 + Sodium Carbonate	42.24g
Filter Paper	0.509g
Filter Paper + Dried Precipitate	0.825g

Percentage Yield

Actual yield= Filter and precipitate - filter
AY= 0.825g - 0.509g
AY= 0.316g

%y= (ay ÷ ty) x 100
%y= (0.316g ÷ 0.500g) x 100
%y= 63.2%

Discussion -

The results of our lab were pretty close, though we were under the theoretical mass. One thing that I think was largely the reason for this, was that some of our precipitate dried to the inside of our beaker. We tried getting it out with distilled water, but no matter what it didn't seem to want to come off. Another thing that I noticed was that the precipitate was so fine, that little bits of it passed through the filter paper and into our funnel and flask. I believe that these are the main two reasons that our actual mass was off, but outside factors like competing reactions may have also somehow played a part.

Conclusion -

Theoretical Mass - The theoretical mass of a double displacement reaction between Na_2CO_3 and $CaCl_2$ is 0.500 grams.

Actual Mass - The actual mass we got in our experiment of a double displacement reaction between Na_2CO_3 and $CaCl_2$ was 0.316 grams.

Percent Yield - The percent yield of our experiment was 63.2%.