CH204 Experiment 2

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Separation and Recovery of the Components of a Mixture

Experiment 1 Post-Game Show

pipette and burette

intensive and extensive properties

interpolation

determining random experimental error

What about gross error and systematic error?

Experiment 1 Post-Game Show continued…

Another question:
Isn't there some error in the density we determined in Part 2?

We going to Jamaica, mon!

Experiment 2 Overview

Separate a mixture of salt, sand, and chalk dust based on differences in their physical and chemical properties.

Add water to dissolve NaCl.

Add acid to dissolve $CaCO_3$.

SiO_2 is left behind in the beaker.

Physical properties

Characteristics of a material that do not involve changing the chemical formula of the compound. Examples include:

Boiling point	**Physical state**
Melting point	**Particle size**
Solubility	**Color**
Density	**Shape**

When a compound changes state (solid, liquid, gas, aqueous), it is still the same compound, so that's a physical change, not a chemical change.

Chemical properties

Characteristics of a material that DO require changing the chemical formula of the compound. This means reactivity with another chemical. Examples:

- **Flammability**
- **Oxidizability (rust/tarnish/corrosion)**
- **Oxidation/reduction in general**
- **A host of other chemical reactions**

The products of a chemical process are different molecules than the reactants.

In this lab

Dissolve NaCl in water and recover NaCl by evaporating water. Is this process physical or chemical?

React $CaCO_3$ with HCl to form $CaCl_2$, then convert $CaCl_2$ to $CaCO_3$ by adding K_2CO_3. Physical or chemical?

SiO_2 – insoluble in water, and unreactive to HCl. Physical or chemical?

Part 1: Removal of NaCl

Steps 3-5, transferring the dissolved NaCl:

When you are rinsing the beaker with your squirt bottle, don't use excessive amounts of water because you will have to evaporate it all away later.

Separating the salt

Step 4: pour the dissolved NaCl through a funnel lined with filter paper.

Not all of the liquid will pour through the funnel – the final mL or so will refuse to drip through.

Part 2: "Tiny Bubbles...!"

Add HCl dropwise into the stirring mixture of sand and chalk to dissolve the chalk:

$$CaCO_3(s) + HCl(aq) \longrightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$$

Tiny bubbles from the bottom of the beaker = chemical reaction

“I can’t decant.”

Don’t worry about a few grains of sand.

“Remove the beaker from the hot plate and let it cool to room temperature.”

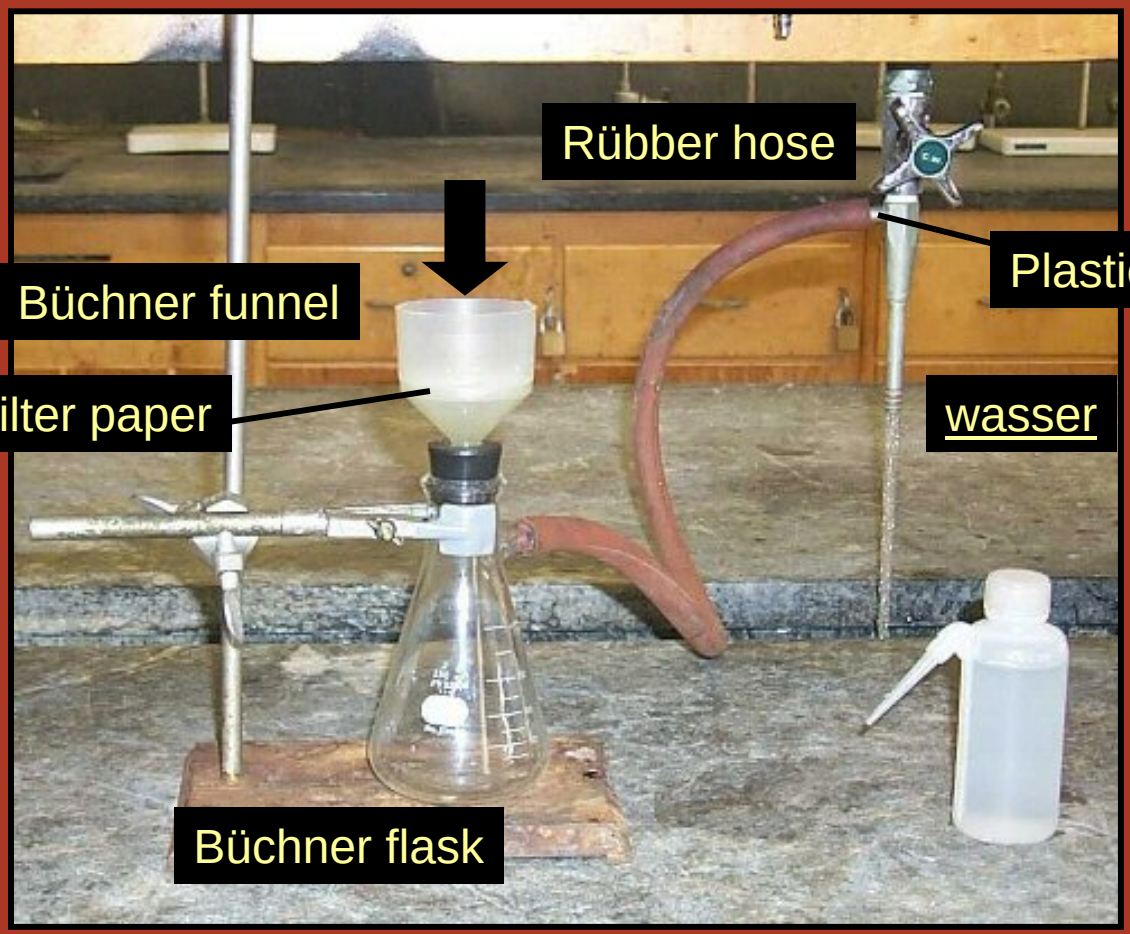
Please DO NOT put hot items on the white lab bench surface!

Part 3: Recovering the $CaCO_3$

Suction filtering is the trickiest part of the whole experiment.

Did he say “Byookner?”

Nein, Ich sprach “Büchner.”



Almost finished

Biggest source of error – wet $CaCO_3$

Dry it as best you can in the Büchner funnel, then transfer it to an evaporating dish and dry it on the hot plate.

Evaporate NaCl slowly in the large evaporating dish. Turn down the heat when the water level gets low.

Dry the SiO_2 in the beaker.

And when you're done...

Enter your name into the spreadsheet.

Enter your starting mass and the final masses of the recovered NaCl, $CaCO_3$, and SiO_2.

Do you feel lucky?

For each component, you have the option of reporting your own data or the average results of everyone who had the same unknown as you.

You can Q-Test outlying data points, but you cannot arbitrarily keep or reject data based on hunches, Tarot deck readings, or having “a really bad feeling about this one.”

How's that Q-test work again?

Let's go see.

Remember, the Q-test is only used for discarding outliers in replicate analyses. (That means repeat measurements of the same thing.)

Unknown Summary Sheets

Some of the experiments we do will require you to identify a chemical unknown in some way :

- **Determine the identity of the unknown or**
- **Determine its concentration or**
- **Determine its composition**

In addition to your normal lab report, you will turn in an Unknown Summary Sheet for these experiments.

Unknown Summary Sheets can be found on the small wooden shelves next to the stockroom or can be downloaded from the class web site at

http://courses.cm.utexas.edu/banderson/ch204/uss.html

Lab write-up

Don't forget to show a sample calculation for % recovery and for % of each component

If you Q-test an outlying data point, show the calculation regardless of whether the point stays or goes.

Post-lab problem 3

Directly analogous to our experiment with NaCl, $CaCO_3$, and SiO_2.

How would you separate and recover SiO_2 from NaCl and $CaCO_3$? Which of the separation and recovery techniques are physical and which are chemical?

Preliminary Write-up for Experiment 3

When you copy the reaction tables on pages 21 and 22

Make them big!

You will be writing your observations in those tiny boxes.

Final exam time

Quizzes make up 30% of your course grade.

Nine quizzes, drop the lowest one.

Each individual quiz you keep is worth about 3.75% of your final grade.