## LAB - SEPARATION OF A MIXTURE

Chemists often need to separate mixtures of two or more substances. Because a mixture is a ***physical combination*** of materials, the components may be separated using ***physical changes***. There are different ways of accomplishing such a process. One common laboratory technique involves ***distillation***, where substances having different boiling points are separated. Another common technique makes use of differences in the ***solubility*** of the components of the mixture.

For this experiment you will receive a mixture of iron, poppy seeds, sand, and salt. You will separate the and eventually determine the ***percentage composition*** of the mixture. You will separate sand from salt by using the difference in their solubility in water. Salt will be separated from water by a simple distillation. You will separate other material using density. You will also separate other material due to its magnetic properties.

The **Law of Conservation of Matter** states that matter cannot be created nor destroyed only rearranged.

**PROCEDURE**

1. Obtain the mass of the filter paper and document, and write your name in pencil on an outside edge. Place the filter paper in a funnel.

2. Attach an iron ring to a ring stand, and then place the funnel into the ring (A drop or two of water will help the paper stick to the sides of the funnel.)

3. **Record** the mass of the empty beaker**.** **Record** the mass of the iron, wood, sand and salt. Then pour all of the mixture into a small beaker. **Record** the mass of beaker and content.

4. Discuss within your group a method to remove the iron from the mixture. Think of some of the physical properties of iron. What can remove all the iron at once very quickly? Hint: Paper clips have iron in them and how did Mr. Robinson separate them before in a previous lab. **Record** the mass of the iron that was removed and compare with the initial mass.

5. Add 100 ml of water to the mixture. Stir the mixture to dissolve the salt. What can be removed from the mixture now and why? Record mass of Salt water solution. What is the final mass of what was removed after it has been dried? Enter into the data table.

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6. Obtain and record the mass of a **different** clean, dry beaker. The 250 ml size is best. Set this beaker under the funnel to collect the ***FILTRATE*** (clear salt-water solution).

7. Pour the mixture into the funnel. Collect the filtrate, being careful to prevent spattering. Small amounts of additional water may be used to rinse out the sand. Pour all of the water used into the funnel.

8. Rinse the ***RESIDUE*** (wet sand) with a small amount of water, and collect all of the filtrate in the beaker.

9. When all of the water has passed through the filter paper, remove the filter paper from the funnel and blot it with a layer of paper towels to absorb the excess water, and then place the filter paper on the hot plate. You will **Record** obtain its mass of the sand after it is dry

10. Meanwhile, place the beaker with salt water on a wire mesh on a ring stand. Light the Bunsen burner and evaporate the water by heating it ***gently*** until the water is gone. Bunsen burners need to have blue flames not orange. Adjust if necessary burner.

11. Remove beaker when the contents are pasty and start to spatter.
    Depending on available time, your teacher might have you dry the salt overnight in an oven. In that case, be sure label your beakers.

**12.** When the salt is dry and the beaker is cool, obtain the mass of the beaker. What is the mass of the salt?______________**g**

**DATA:** Report all visible digits

**CALCULATIONS:** show all work neatly, from the balance, including zeroes even if the computation seems "trivial".

Mass of empty beaker ______g

Mass of filter paper______g

Initial mass of sand______g

Initial Mass of wood _______g

Initial Mass of iron ______g

Initial Mass of Salt _______g

Initial Mass of total mixture _____g

Work:

Final Mass of iron _____g

Final mass of wood after drying ______g

Mass of filter paper with sand _____g

*Final mass of sand obtained ____ g

**Work:**

Mass of beaker with salt _____g

*Actual mass of salt obtained ____ g

Mass of empty, clean beaker _____g

**Analysis:**

1. Refer to the original mass of the mixture, and to the actual mass of sand you recovered. What percent of the original mass did the sand contribute? Show the calculation neatly in the space provided. **Initial mass of sand/ Total initial mass of mixture X 100= ________%**

2. Refer to the original mass of the mixture, and to the actual mass of salt you recovered. What percent of the original mass did the salt contribute? Show the calculation neatly in the space provided.

3. ***Percent yield*** is a common way to evaluate the amount of product you have obtained through laboratory work. Percent yield is determined in the following manner:
**% Yield = Actual amount of product obtained X 100.**

$$\frac{\textbf{Final mass of total mixture}}{\textbf{Initial mass of mixture}} \textbf{ X 100}$$

Theoretical amount of product possible. For the **actual amount of product obtained,** add together your masses. For the **theoretical amount of product possible**, use the initial mass of the mixture before the experiment. (Be sure that you do not include the mass of the container!)
Show the calculation neatly in the space provided.

**Discussion** - Use complete sentences - be specific with your explanations.

1. Suppose a lab group reports a percent yield of 90%. What is a possible explanation for the "missing" product? Do not consider calculation mistakes, think about the procedure used.

2. Suppose a lab group reports a percent yield of 105%. Is it really possible to collect *more* sand and salt than was originally present? What is a possible explanation for the "extra" product? Do not consider calculation mistakes, think about the procedure used.

3. Without using any additional equipment/materials, and without touching or blotting the salt, describe a procedure by which you could prove that the salt was completely dry.

4. For terms used to classify matter. Apply terms here:
a. Name one *heterogeneous mixture* present in this lab. ___________

b. Name one *homogeneous mixture* present in this lab. ___________

c. Name one *pure substance* present in this lab. __________

5. Explain in your own words how ***river water is turned into drinking water*** by the process called "distillation". Tell if this involves **physical** changes or **chemical** changes.

**Conclusion**: Summarize how **your results** support the Law of Conservation of Matter. (Your conclusion should begin with a definition of the Law of Conservation of Matter.) Must have at least 5 complete sentences. Explain why your data is not 100% accurate.