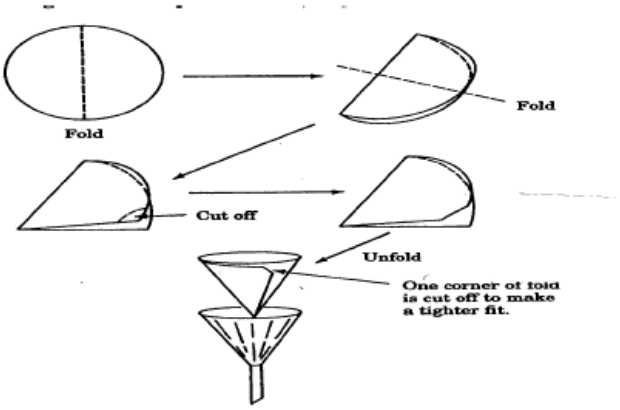
Fluid State of Mind
Student Worksheet 3

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.

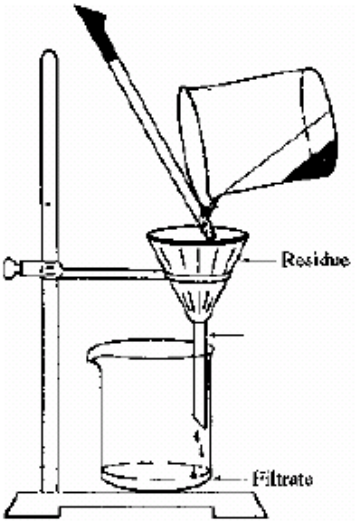
For this experiment you will receive a mixture of water, sand, and salt, separate the two materials, and eventually determine the ***percentage composition*** of the mixture. You will separate sand from salt by using the difference in their solubility in water. Salt will be separated from water by a simple distillation.

PROCEDURE



1. Prepare a piece of filter paper as shown here.
Obtain the mass of the filter paper, and write your name in pencil on an outside edge. Place the filter paper in a funnel as shown. Be sure to separate 3 edges away from 1 edge to create a cone.

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



3. Find the mass of your 400mL beaker. Obtain a sample of the fluid. Find the mass of the beaker with the fluid sample.

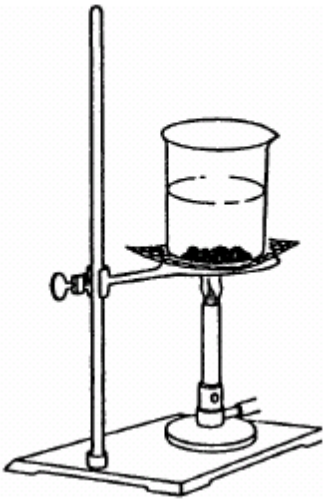
4. Obtain a **different** clean, dry beaker. The 250 ml size is best. Set this beaker under the funnel to collect the ***FILTRATE*** (clear salt-water solution).

5. Pour the sand/salt water mixture into the funnel. Collect the filtrate, being careful to prevent spattering. Small amounts of additional water may be used to rinse out all of the sand. Be sure to pour all of the water used into the funnel.

6. Rinse the ***RESIDUE*** (wet sand) with a small amount of distilled water from your wash bottle, and collect all of the filtrate in the beaker.

7. 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 in the drying oven. You will obtain its mass on the next day.

8. 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 most of the water is gone. Place the **watch glass** on the 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 your beaker is clearly labeled with your name(s).



9. When the salt is dry and the beaker is cool, obtain the mass of the beaker, watch glass, and contents.

DATA: Report all visible digits **CALCULATIONS:** show all work neatly, from the balance, including zeroes even if the computation seems “trivial”

Mass of filter paper _____g

Mass of empty beaker _____g

Mass of beaker with sand/salt/water mixture _____g

Mass of sand/salt/water mixture _____g

Mass of filter paper with sand _____g

Mass of empty beaker with watch glass

Mass of beaker with salt and watch glass _____g

*Actual mass of sand obtained ____ g

*Actual mass of salt obtained ____ g

*Mass of water in the original sample ____ 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.

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 dived by Theoretical amount of product possible * 100%.

For the **actual amount of product obtained,** add together your dry salt and dry sand masses.
For the **theoretical amount of product possible**, use the original 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. Complete the following:

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. What if your mixture had contained small pieces of **iron** in addition to salt and sand, how could you modify the procedure used in lab in order to separate the mixture? (If you are not sure, look up some properties of iron that are different from sand and salt.)

Conclusion: Summarize in a well-written paragraph (minimum 3 – 5 sentences) how **your results** support the Law of Conservation of Matter. (Your conclusion should begin with a definition of the Law of Conservation of Matter.