### BACKGROUND INFORMATION:

It is often necessary to separate mixtures of two or more substances into their individual components. There are different ways of accomplishing this process. It might be a purely physical procedure, by *distillation* where substances of different boiling points are involved, or by the differences in the *solubilities* of the components of the mixture. In this experiment a mixture of sand, salt, and iron filings will be separated in order to determine the *percent composition* of a mixture.

**PURPOSE:**

To separate the components of a mixture based upon physical characteristics of each component within the mixture.

**MATERIALS:**

~3 g sand/salt/iron mixture bar magnet 250 mL beaker (in drawer)

watch glass plastic baggie ring stand, iron ring (in cabinet)

150 mL beaker 1 paper filter clay triangle (in drawer)

wash bottle drying oven wire gauze (in drawer)

2 sheets of scrap paper electronic balance scoopula (in drawer)

stirring rod (in drawer) funnel (in drawer)

**PROCEDURE:**

1. Record the label (*a*) and mass (*b*) of your given plastic vial and contents of sand/salt/iron mixture.
2. Empty contents of the vial onto a sheet of paper, then reweigh the empty vial and record result (*c*).
3. Wrap bar magnet in a plastic baggie and remove the iron filings from the mixture by using a bar magnet.
4. Place a small piece of scrap paper on the scale and “tare” the scale. Then place filings on the scrap paper and record (*e*) the mass of the iron filings. Don’t throw out the iron–save it to be recollected.
5. On a piece of filter paper write your name around the edge in **pencil**. Fold the filter paper as shown in the diagram below (be sure your name is visible), and record (*f*) the mass of the empty filter paper. Place the filter paper in the funnel.

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1. Place the remaining sand/salt mixture into a 250 mL beaker. Add 20.0 mL of water to the sand/salt mixture and stir with a stirring rod until all of the salt has dissolved.
2. Obtain and record (*g*) the mass of a clean, dry 150 mL beaker and watch glass. Filter the salt solution from the 250 mL beaker through the funnel containing the filter paper into the 150 mL beaker. *Note: Most of the sand should remain in the beaker.*
3. Transfer the remaining sand with two or more 2.00 mL portions of distilled water (use the dropper bottle) and continue to collect this ***filtrate*** in the 150 mL beaker. The less water used the better.
4. Carefully transfer the filter paper with the residue (sand) to the drying oven. When it is completely dry (tomorrow), place the filter paper and dry sand on the scale and record result (*i*).
5. Meanwhile, place the 150 mL beaker on the wire gauze and carefully place a watch glass cup-up on the beaker to prevent spatter. Heat gently on the ring stand, allowing the water to boil off. When beaker is dry and cool to the touch, obtain and record (*h*) the mass of the 150 mL beaker and watch glass and the remaining white residue in the beaker.
6. Clean up; then complete all calculations on the reverse side of this sheet.

**MEASUREMENTS: (Quantitative Data, 10 pts)**

Include all units and the correct number of decimal places in your measurements.

|  |  |
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| **Measurements** | **Value** |
| 1. Vial label (A, B, C, or D) |  |
| 1. Mass of vial and mixture |  |
| 1. Mass of empty vial |  |
| 1. Mass of mixture |  |
| 1. Mass of iron filings |  |
| 1. Mass of empty filter paper |  |
| 1. Mass of clean 150 mL beaker and watch glass |  |
| 1. Mass of 150 mL beaker, watch glass, and salt |  |
| 1. Mass of filter paper and sand, Day 2 |  |

**OBSERVATIONS: (Qualitative Data, 2 pts)** *Please use bullet format for your entries.*

**CALCULATIONS:** **ANALYSIS:**

*(Show the math and use proper units for both sections).*

* Mass of IRON Filings **(1 pt)**:
* Mass of SAND **(1 pt)**:
* Mass of SALT **(1 pt)**:
* Percentage of IRON in Mixture **(2 pts)**
* Percentage of SAND in Mixture **(2 pts)**
* Percentage of SALT in Mixture **(2 pts)**
* TOTAL MASS of the 3 Components **(1 pt)**:
* **Percent Error for EACH Component** (see teacher for theoretical values) **(9 pts)**

**CONCLUSION:**

1. Define **(3 pts)**: a. Heterogeneous mixture –

b. Homogeneous mixture –

c. Pure substance –

1. Using this experiment, give an example of each of the above **(3 pts)**:

a. Heterogeneous mixture:

b. Homogeneous mixture:

c. Pure substance:

1. Which physical property results in a successful separation of **(3 pts)**: (How did you separate the…)
   1. Iron –
   2. Sand –
   3. Salt –
2. Were the changes in the materials in this lab *physical* changes or *chemical* changes? **How do you know? (2 pts)**
3. Did the sum of the masses of the separated iron, sand, & salt equal the mass of the original mixture? (Did the “Total Mass of the 3 Components” in “Calculations” equal the initial “Mass of mixture” in part *(d)* of the Data Table?) **If not, can you suggest why the masses are not equal?** **(2 pts)**
4. What law can be illustrated in this laboratory activity? **(1 pt)**
5. While on a camping trip all the salt you have is accidentally spilled into some sand. Outline your method of recovery. (You do not have filter paper.) **(1 pt)**

8. Devise a way to separate a mixture of charcoal, sugar, and sand. **(2 pts)**