Regents Chemistry
Ms. Randall
Lab Activity: Separation of a Mixture

Background:
A **mixture** results when two or more **pure substances** (elements and compounds) are mixed together. The components of a mixture are not chemically combined and therefore retain their physical properties which can be used to separate the mixture. For example, a mixture of iron filings can be separated by using a magnet since iron has a **physical property** of being magnetic.

Chromatography, distillation, filtration and decantation are physical separation techniques. **Chromatography** is based on the ability of a substance to adhere to a surface and can be used to separate ink into its individual components. **Distillation** is based on substances having different boiling points and can be used use to separated alcohol from water. **Filtration** is based on particle size and can be used to separate a solid from a liquid. **Decantation** is a fast process of separating a solid from a liquid by gently pouring the liquid down a stirring rod and not disturbing the solid settled at the bottom of the beaker.

A mixture can be **heterogeneous** or **homogeneous**. A heterogeneous mixture does not have uniform composition while a homogeneous mixture does have uniform composition. Granite, bean soup, oil-vinegar salad dressing all have non-uniform composition and would be classified as heterogeneous mixtures. Salt water, syrup, and vinegar all have uniform composition and would be classified as homogeneous mixtures. An **aqueous solution** contains a **solvent** and a **solute**. The solvent, water, is the dissolving medium while the solute is the substance that dissolves. In a glass of lemonade, powered lemonade is the solute and water is the solvent.

Objective: To separate a mixture of sand and salt into its individual components and determine the percentage of each component in the mixture.

Materials:
Filter paper, Funnel, Stirring rod, Mixture (sand, salt, iron), Bunsen burner, Plastic beaker, 250 mL Erlenmeyer flask, Balance or scale

Safety: Wear goggles at all times in the lab. Use care with open flames of Bunsen burners. Wash hands before leaving lab.

Pre-Lab: Mixtures can be physically separated. That is, one component of a mixture can be separated from other components by physical means. No chemical reaction is necessary. Complete the chart below:

Mixture	Separate by…	Physical Property
Example: Coffee	*Boiling off the water, collecting it, leaving the coffee bean extract and sugar*	*Boiling point*
Iron Chips & Soil		
Sugar & Water		
Salt & Sand		
Water & Rubbing Alcohol		

Components of a mixture are not _____ (chemically/physically) combined and can be separated by_____ (physical/chemical) means. _____ is a physical separation process based on boiling points. _____is a physical separation process based on particle size. Saltwater can be classified as a homogenous mixture or a _____where the salt is the _____ (solute/solvent) and the water is the _____ (solute/solvent). Sand can be separated from water by using a process called _____. Separating sand from water is a _____ (physical/chemical) change.

Procedure:

1. Obtain a cup of the iron, sand, and salt mixture.
2. Determine the total mass of the mixture (just mixture not the cup) you obtained and write it in your data table
3. Your group must determine the mass of EACH substance in the mixture (sand, salt, and iron filings) you were given and calculate the percent composition of each.
4. Write a step by step procedure for separating each substance from the mixture.
5. Check the procedure with your teacher before starting the lab!!
6. Wet materials need to be dried before determining their masses so try to use as little water as possible to accomplish your task.
7. Base the procedure you create on the following materials found in the lab**:**

Funnel, filter paper, beakers, flasks, water, magnets (kept in baggies!), heating setup (ring stand, evaporating dish, wire gauze, Bunsen burner)

Data:

- Record your data under "Experimentally Determined Mass."
- Record your teacher's data (which will be provided for you when you have completed your lab) under "Actual Mass."

Substance	Experimentally Determined Mass (g)	Actual Mass (g)
TOTAL (Iron + Sand + Salt)		
Iron		
Sand		
Salt		

Analysis/Calculations:

1. What is the percentage *you* determined of each component in the total mixture? Show your calculations.

From Reference Table T: *% composition =* $\frac{part}{whole} \times 100$

% Iron	% Sand	% Salt

2. Based on your teacher's data, what is the actual, or true, percent composition of each component in the mixture? Show your calculations.

% Iron	% Sand	% Salt

3. Calculate your percent error in the mass data you collected.

From Reference Table T: *% error = (experimental mass - actual mass) x 100*
actual mass

% Iron	% Sand	% Salt

A positive %error means you were above the accepted/actual value. A negative % error means you were below the accepted value.

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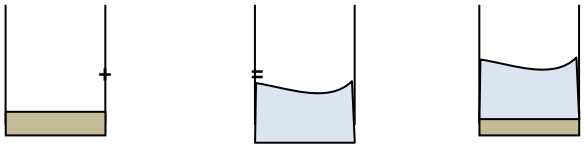
<u>Lab Conclusion:</u> Separation of a Mixture

1. Write a paragraph summarizing what you have learned about the scientific concept of the lab from doing the lab. Back up your statement with details from your lab experience.

2. What is the % composition of sand in the mixture? (*Hint: Table T!)*

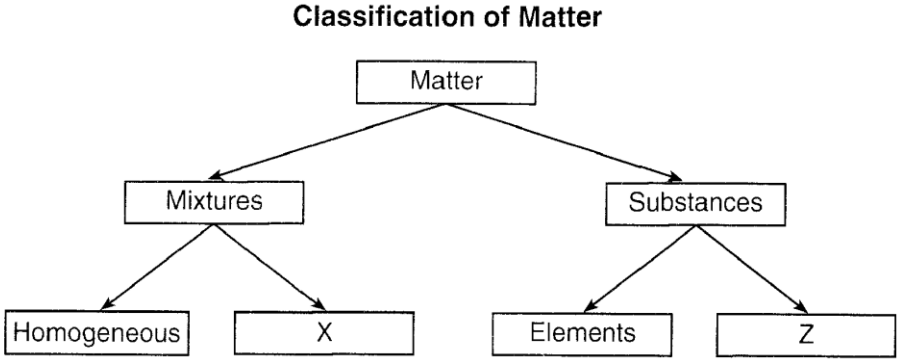


7g sand + 13g water = ____g sand + water mixture

3. A mixture of crystals of salt and sugar is added to water and stirred until all solids have dissolved. Which statement best describes the resulting mixture?(circle the correct answer)

A) The mixture is homogeneous and can be separated by filtration.
B) The mixture is homogeneous and cannot be separated by filtration.
C) The mixture is heterogeneous and can be separated by filtration.
D) The mixture is heterogeneous and cannot be separated by filtration.

4. Base your answers to questions **4** and **5** on the diagram below concerning the classification of matter.



1. What type of mixture is represented by *X*?

2. Given a mixture of sand and water, state *one* process that can be used to separate water from the sand.