

Mixture Separation

The ability to separate and recover pure substances from mixtures is extremely important in scientific research and industry. Chemists need to work with pure substances, but naturally occurring materials are seldom pure. Often, differences in the physical properties of the components in a mixture provide the means for separating them. In this experiment, you will have an opportunity to design, develop, and implement your own procedure for separating a mixture. The mixture you will work with contains salt, sand, iron filings, and poppy seeds. All four substances are in dry, granular form.

OBJECTIVES

- **Observe** the chemical and physical properties of a mixture.
- **Relate** knowledge of chemical and physical properties to the task of purifying the mixture.
- **Analyze** the success of methods of purifying the mixture.

MATERIALS

- aluminum foil
- cotton balls
- distilled water
- filter funnels
- filter paper
- forceps
- magnet
- paper clips
- paper towels
- Petri dish
- pipets
- plastic forks
- plastic spoons
- plastic straws
- rubber stoppers
- sample of mixture and components (sand, iron filings, salt, poppy seeds)
- test tubes and rack
- tissue paper
- transparent tape
- wooden splints



Always wear safety goggles and a lab apron to protect your eyes and clothing. If you get a chemical in your eyes, immediately flush the chemical out at the eyewash station while calling to your teacher. Know the locations of the emergency lab shower and the eyewash station and the procedures for using them.

PREPARATION

Your task will be to plan and carry out the separation of a mixture. Before you can plan your experiment, you will need to investigate the properties of each component in the mixture. The properties will be used to design your mixture separation.

Mixture Separation *continued***PROCEDURE**

1. Obtain separate samples of each of the four mixture components from your teacher. Use the equipment you have available to make observations of the components and determine their properties. You will need to run several tests with each substance, so don't use all of your sample on the first test. Look for things like whether the substance is magnetic, whether it dissolves, or whether it floats. Record your observations in the **Data Table**.
2. Make a plan for what you will do to separate a mixture that includes the four components from step 1. Review your plan with your teacher.
3. Obtain a sample of the mixture from your teacher. Using the equipment you have available, run the procedure you have developed.

DISPOSAL

4. Clean your lab station. Clean all equipment, and return it to its proper place. Dispose of chemicals and solutions in the containers designated by your teacher. Do not pour any chemicals down the drain or throw anything in the trash unless your teacher directs you to do so. Wash your hands thoroughly after all work is finished and before you leave the lab.



Data Table				
Properties	Sand	Iron filings	Salt	Poppy seeds
Dissolves				
Floats				
Magnetic				
Other				

Analysis

1. **Evaluating Methods** On a scale of 1 to 10, how successful were you in separating and recovering each of the four components: sand, salt, iron filings, and poppy seeds? Consider 1 to be the best and 10 to be the worst. Justify your ratings based on your observations.

Mixture Separation *continued*

Conclusions

1. Evaluating Methods How did you decide on the order of your procedural steps? Would any order have worked?

2. Designing Experiments If you could do the lab over again, what would you do differently? Be specific.

3. Designing Experiments Name two materials or tools that weren't available that might have made your separation easier.

4. Applying Ideas: For each of the four components, describe a specific physical property that enabled you to separate the component from the rest of the mixture.

Mixture Separation *continued*

EXTENSIONS

1. Evaluating Methods What methods could be used to determine the purity of each of your recovered components?

2. Designing Experiments How could you separate each of the following two-part mixtures?

a. aluminum filings and iron filings

b. sand and gravel

c. sand and finely ground polystyrene foam

d. salt and sugar

e. alcohol and water

f. nitrogen and oxygen
