

Separate a Mixture Using Observations

Purpose:

You will be given a mixture consisting of two parts. Your task will be to try and separate this mixture based on some individual observation you will make.

Observations

Lab 1:

1. At your lab station you will find two items. Each item will be part of the mixture you will need to separate at the end of the lab. Locate the two items in separate sandwich bags: sand and salt.
2. Make some visual observations of each item and record them in the data section.
3. Obtain two clean Dixie cups and fill them about half way with water.
4. In the first cup place a small amount of sand and stir with the spoon. Record your observations.
5. In the second cup place a small amount of salt and stir with a spoon. Record your observations.
6. Raise your hand to indicate to your teacher that you are finished with the first lab.

Data:

Observations:

Observation	Sand	salt
visual		
in water		

Lab 2:

1. Your teacher will bring you a Dixie cup full of the two substances put together in a mixture.
2. You will have to devise a plan to separate out this mixture.
3. Write your plan below.
4. Begin to separate the mixture.

Plan:

Write your plan for separating the mixture below:

Explain:

Explain how you used your observations to help you develop a plan to separate the mixture.

Zooming In and Out – Powers of 10

The following images were shown in the video. Use the “What You See” column to designate a starting point from which you zoom in or out to practice thinking about a system viewed at different scales. Thinking about how items are related or connected will help you complete this table.

- | | | | |
|-------------|---------------|------------------|---------------|
| Universe | Man or woman | Cell Nucleus | United States |
| DNA | Earth | Lake Michigan | Hand |
| Skin | Carbon Atom | Picnic Blanket | Galaxy |
| Capillaries | Skin Cell | Quarks | Chicago |
| City Park | United States | White Blood Cell | Solar System |

What You See When You Zoom In	Starting Point: What You See	What You See When You Zoom Out
	City Park	
	Chicago	
	United States	
	Solar System	
	Galaxy	
	Hand	
	Skin	
	Capillaries	
	DNA	
	Carbon Atom	

1. What items are microscopic?

2. What items would you see at the atomic/molecular level?

3. What items are macroscopic?

4. What items are large scale?

5. What are the limitations to categorizing items this way?

Solutions Bead Lab

Purpose:

In the following lab you will simulate making a solution using beads. The beads represent pure substances used to make the solution. This activity will help you better understand what is happening at the molecular level as substances dissolve.

Directions:

Follow the procedure answer the questions within the steps.

1. Obtain a Petri dish. Place some of the larger sized beads in the bottom of the dish. Add as many as you can so that they only make one layer. No beads should be over lapping, every bead must be touching the bottom of the dish.

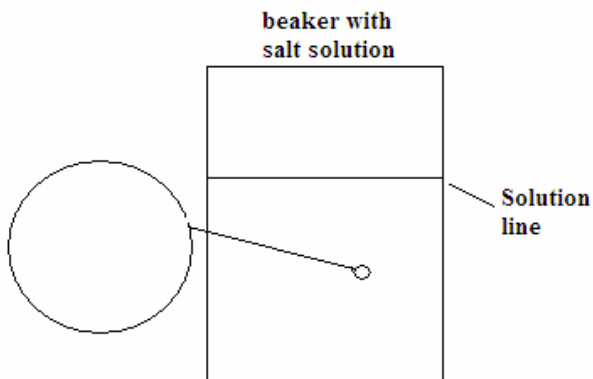
Question: Can you see any part of the bottom of the Petri dish? Why or why not? Explain.

2. Drop 4 or 5 of the smaller beads into the Petri dish with the beads.
3. The larger beads represent water molecules and the smaller beads represented salt molecules.

Questions:

- a. When you dropped in the beads, where did they go?
- b. Could you fit more small beads in the Petri dish without beads over lapping or making a new layer? Why or why not?
- c. When salt dissolves in water it breaks apart into Na^+ and Cl^- . The large circle in the picture below represents a small area of a salt solution blown up. In the large circle draw a picture of what you think happens to the Na^+ and Cl^- atoms when they dissolve in water. Use the following symbols to draw your picture. Note in the questions above the larger beads represent the water molecule and the smaller beads could represent the Na^+ and Cl^- .

- = Water molecule
 ■ = Na^+ atom
 ● = Cl^- atom



4. Obtain a Tupperware dish.
5. Place a layer of marbles on the bottom of the Tupperware dish. Again do not add too many so they overlap.
6. Add a layer of the larger size beads (water beads) on top of the marbles.
7. Add another layer of marbles.

Questions:

- a. Can you see the beads in between the marbles?

- b. Where do most of the beads go in relation to the marbles?

- c. This simulation is different than the first one in the Petri dish. This one is supposed to simulate the sand and water. Which object (marble or bead) do you think represents the sand and which represents the water? Explain.

Solutions and Suspensions

Purpose:

In this lab you will explore the properties of two kinds of mixtures and begin to identify their differences and similarities: solutions and suspensions. You will identify the properties of solutions and suspensions performing specific tests on each type of mixture.

Procedure:

Setting up for the tests:

1. Obtain three 250 ml beakers.
2. Clean all the glassware, make sure they are clear.
3. Number the beakers with a grease pencil or small piece of tape 1-3.
4. Fill the beakers with the appropriate mixtures according to the chart below. Stir each of the beakers with a spoon. Make sure to wipe off the spoon between each mixture.

Beaker	Substance(s) for mixture
1	1 spoonful of salt and 200 ml of distilled water
2	1 spoonful of sand and 200 ml of distilled water
3	1 spoonful of salt and sand and 200 ml of distilled water

Tests:

1. Perform each of the tests below and record your results in the data table provided.

Appearance:

1. Let the mixtures sit DO NOT STIR for about 2-3 minutes.
2. In the data table, write some observations about each mixture's appearance after it sits.

Separation:

In this procedure we will explore filtration.

1. Obtain three 50 ml beakers
2. Place a piece of masking tape on the 50 ml beakers and label as follows:
 - 1: salt and water
 - 2: sand and water
 - 3: salt, sand and water
3. Set up three funnel with filter paper apparatuses (1 for each 50 ml beaker). Your teacher will demonstrate how this is done for you. Place the funnels in the 50 ml beakers.
4. Stir the mixture in beaker 1 and pour a small amount of the contents into the funnel in the 50 ml beaker labeled beaker 1. Pour a small amount (no more than **20 ml**) of the contents into the funnel.
5. Write your observations.
6. Using a new piece of filter paper repeat the procedure with each of the mixtures. Some of the filtering will take a long time, so you should move on to the next test while you wait.
7. Set aside all of the left over filtered liquid for use in a later lab.

Effect of Light Beam:

1. Shine a flashlight through each of the beakers.
2. Record your observations about the beam of light.

Left behind after heating:

1. Place your data for this experiment in the separate table provided.
2. Obtain your three 50 ml beakers from the filtering part of the lab.
3. You are going to add a new beaker to test. Obtain another 50 ml beaker. Label it beaker 4.
4. Place about 20 ml of water into it and stir in about a $\frac{1}{4}$ spoonful of sand.
5. Place all the beakers on a hot plate. Set the temperature to 7.
6. Allow the water to boil until it is completely gone.
7. Record your observations in the data section.
8. Using tongs, take the beaker off the hot plate. IT WILL BE HOT.
9. Let the beaker cool then clean it.

Clean up:

1. Wash and dry all your used glassware!

Data (Tests lab):

Test	Beaker 1	Beaker 2	Beaker 3
Appearance			
Filtration			
Effect of light beam			

Data:**Left behind after heating**

	Beaker 1	Beaker 2	Beaker 3	Beaker 4
Observations				

Questions:

1. What do you think is left behind in the beaker when you heated beaker one?
2. Explain how something could still be in the water even after you filtered it?
3. Can salt stick to sand and filter out? Explain your answers using your data above
4. In the lab you tested a solution and a suspension. The solution you tested was salt water and the suspension was sand and water.
 - a. Name four characteristics of a solution based on your data.
 - b. Name four characteristics of a suspension based on your data.
5. People often like to filter their water before they drink it. Do you think filtering gets everything out of your water? Explain your answer.
6. Dirt is a mixture of several things. List some things you think could be in dirt.
7. Do you think dirt could is a suspension or solution? Explain your thoughts.
8. Answer this question with your teacher. How big are solution and suspension particles?

Take Home Lab: Solutions and Suspensions

Part 1: Look around your home and find everyday items that could be classified into each of the following categories. Explain why you think the item could be classified as such. You may not list anything used in the lab.

classification	item	explanation
solution		
suspension		

Part 2: Now, find items in your home to help you understand dissolving.

- a. Find one solid that will dissolve in water. You may not use salt. List the solid below and describe how you could tell it dissolved.

Solid: _____

Explanation:

- b. Find one liquid that will dissolve in water. List the liquid below and describe how you could tell it dissolved.

Liquid: _____

Explanation:

- c. Find one solid that will not dissolve in water. You may not use sand. Explain.

Solid: _____

Explanation:

- d. Find one liquid that will not dissolve in water. Explain.

Liquid: _____

Explanation:

Questions:

- Describe one other time in a science class when you learned or could have used one of the ideas above.
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- In part 2 above name two items that made a solution. Explain how you know it is a solution.

Making a Solar Still

Background:

Distillation is a water purification process. “Dirty” water is given heat energy and allowed to evaporate. The evaporated water cools and condenses at another point in the distillation process and fresh water is collected. Since, the substances dissolved or mixed with the water do not evaporate with the water, pure water is the only thing being condensed. In this lab you will create a solar still. A still is one name for an apparatus that can distill water. You will use heat energy from the sun to purify a salt water sample.

Procedure:

1. Fill about $\frac{1}{4}$ of a large bowl or container with salt water your teacher has already made for you.
2. Obtain a mug or glass and place it in the middle of your bowl. Make sure the salt water in the bowl does not get into the mug or glass.
3. Cover the top of the bowl with plastic wrap. Tape the ends of the plastic wrap to make sure it makes a tight seal. Air cannot be allowed to get in or out of your still.
4. Gently, write your name on the plastic wrap with a Sharpie Marker®, so you can identify which model you built.
5. Place a small weight (stopper, stone, or other object your teacher has selected) on the plastic wrap in the middle of the mug or glass.
6. Place your bowl near a window or under a lamp. Your teacher will indicate a place for you.
7. Allow the bowl to sit until the next day.
8. After you bowl has sat for a day. Make some observations.
9. Obtain paper cups for everyone in your group.
10. Carefully remove the plastic wrap from the bowl. Take out the mug or glass.
11. Dry off the bottom of the mug or glass. Make visual observations about the substance inside the mug or glass.
12. Carefully pour some of the substance into each person’s paper cup. Although normally you are not allowed to taste anything in the lab, today you can make an exception. Taste the liquid. Write your observations.
13. Answer the questions.

Data:

Observations of the bowl after it sat for one day. How has it changed from the original set up?

Observations of the substance inside the mug or glass: visual and taste.

Questions:

1. Explain or draw a picture of what happened to the water molecules in the solar still as it sat for a day.
2. Did the water in the mug or glass taste salty? _____ Explain why or why not.
3. Do you think the salt water left in the bowl would taste the same, more, or less salty than at the beginning of the experiment? Why?
4. What can this experiment tell you about how water evaporates in the ocean?
5. Do you think the still could make fresh water from orange juice or other liquids?
6. This experiment is also an analogy of the water cycle. Explain how this could be.

Adapted from: www.teachersdomain.org and Zoom