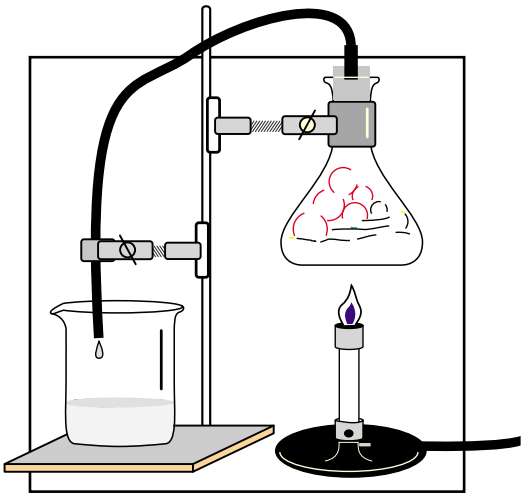
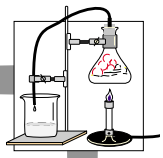
# Unit 9: Solutions and Suspensions





## Vocabulary

*Study the vocabulary words and definitions below.*

**filter** ..... a material or a device used to allow certain things to pass through while at the same time stopping others

**filtered** ..... passed through a filter

**heterogeneous** ..... not consistent and not mixed evenly

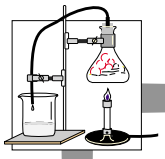
**homogeneous** ..... consistent and mixed evenly; the same throughout

**liquid solution** ..... a liquid mixture where the parts dissolve or become a part of the solution, and spread out evenly, becoming homogeneous

**solute** ..... the substance that has dissolved in a solution

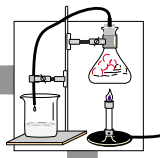
**solution** ..... a mixture of two or more substances that mix evenly with one another; a homogeneous mixture

**solvent** ..... the part of the solution that does the dissolving



**suspension** ..... two or more substances that form a cloudy mixture

**universal** ..... occurs everywhere



## Introduction

We have discussed the phases of matter and compared elements to compounds. We have not considered matter in all its forms, though. Matter occurs in many forms. In this unit, we will examine two conditions in which we find matter.

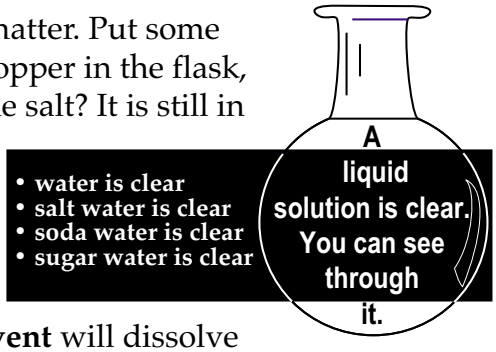
## Reviewing Matter

It is time to review some of the things that we have learned about matter.

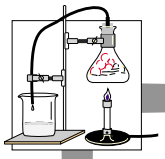
- Two or more elements combine chemically to form a compound.
- Compounds cannot be separated easily.
- A mixture of two or more substances does not combine chemically.
- Mixtures can be separated using physical means.

## Solutions

**Solutions** are one of the ways we find matter. Put some water in a flask. Add some salt, put a stopper in the flask, and shake the flask. What happens to the salt? It is still in the flask, but you cannot see it. We say that the salt dissolved in the water. This is an example of a **liquid solution**. A liquid solution is a mixture. It has one substance dissolved into another substance. A **solvent** will dissolve another substance. Water will dissolve many different kinds of substances. Water is a solvent. Sometimes, it is called a **universal** solvent because it dissolves many different substances. Water will not dissolve everything, however, and does not dissolve substances like oil and grease.




The substance that dissolves is called a **solute**. Sugar will dissolve in water, and it is a solute. It forms a liquid solution with the water. All of the molecules of the sugar spread evenly throughout the solution. In a liquid solution, all of the substances mix evenly with each other. When a solution is evenly mixed and the same throughout, it is **homogeneous**. All solutions are homogeneous.

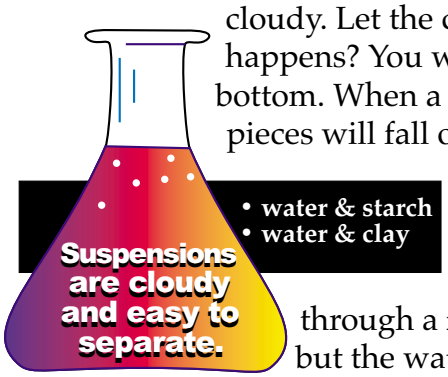


A liquid solution is clear. You can see through it. Salt water is clear. Soda water is a mixture of carbon dioxide and water. Soda water is clear also, and it is a liquid solution.

## Suspensions

Some liquid mixtures are cloudy. Add some starch to a beaker of water. Stir it. The mixture is not clear. Instead, it is cloudy. The starch mixes with the water, but it does not make a liquid solution. Remember that a liquid solution is clear. This new, cloudy kind of mixture is called a **suspension**. A suspension happens when one substance does not dissolve or mix evenly throughout when mixed with a liquid. Suspensions are cloudy. Muddy water is a kind of suspension. Not all parts of a suspension are evenly mixed. **Heterogeneous** means that the parts are different and not mixed evenly. Suspensions are heterogeneous.

A suspension is easy to separate. Mix some clay with water. It will be cloudy. Let the clay and water stand overnight. What happens? You will notice that the clay will settle to the bottom. When a suspension is left standing, the solid pieces will fall out or settle out of the suspension.



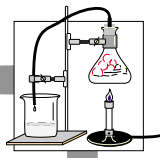

There is another way a suspension can be separated. Suspensions can be **filtered**. Pour the starch and water mixture through a **filter**. The starch will be caught in the filter, but the water will pass through.

Try to filter a beaker of salt water. What happens? You cannot trap the salt. The salt has mixed evenly with the water. It passes through the filter. The salt has dissolved in the water to the point that the pieces of salt are too small to be filtered. Salt water is a liquid solution. Liquid solutions cannot be separated with a filter.

The labels on some products say "Shake well before using." Why do you think this is necessary? The product is probably a suspension. The large parts of the suspension will settle, and you must shake it to remix the substances.

## Summary

In this unit, we learned how to identify solutions and suspensions. We have also learned how suspensions can be separated.



## Practice

*Use the list below to complete the following statements.*

| | | | |
|---|---|---|---|
| **filter** | **homogeneous** | **solution** | **universal** |
| **filtered** | **liquid** | **solvent** | |
| **heterogeneous** | **solute** | **suspension** | |

1. A solution is a _____ mixture of two or more compounds.

2. Suspensions are not homogeneous, but are, instead, _____ mixtures.

3. When sugar is dissolved into water, this is an example of a _____ solution.

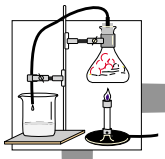
4. When making salt water, salt acts as the _____ .

5. Water is often called the _____ solvent.

6. Water acts as a _____ because so many different materials form solutions in water.

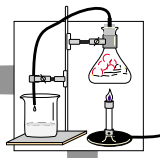
7. Milk is not a _____ because it is not clear.

8. A material that separates the compounds in a mixture is a _____ .



9. When mud and water are separated by being poured through a filter, they have been _____ .

10. Any liquid mixture that separates easily, such as starch and water, is a _____ .



## Practice

*Write* **True** *if the statement is correct. Write* **False** *if the statement is* not *correct.*

_____ 1. When making a liquid solution, the liquid will be cloudy.

_____ 2. Suspensions are homogeneous.

_____ 3. If the parts of a mixture are evenly distributed, this is homogeneous.

_____ 4. Filters put together the parts of a mixture.

_____ 5. When mixing sugar in water, water is the solute.

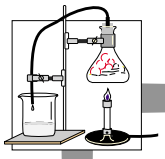
_____ 6. Water is known as the universal solvent because many different materials form solutions in water.

_____ 7. Suspensions separate easily.

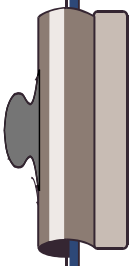
_____ 8. Heterogeneous mixtures do not separate easily.

_____ 9. If a suspension is filtered, the different substances will be separated.

_____ 10. Oil floating on top of water is a liquid solution.



## Lab Activity



### Facts:

- Solutions are evenly mixed and cannot be easily separated.
- Suspensions can be easily filtered.

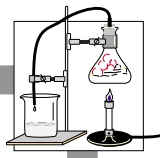
### Investigate:

- You will identify solutions and suspensions from given samples and identify ways to separate a suspension.

### Materials:

- beakers
- water
- salt
- filter
- powdered clay

1. Pour water into a beaker. Add a small amount of salt.
2. Fill the second beaker with water. Add powdered clay.
3. Stir each beaker. Observe the results.
   a. Is the salt water clear or cloudy?_____
   b. Is the clay and water clear or cloudy? _____
   c. Which beaker contains a liquid solution? _____
   d. Which beaker contains a suspension? _____
4. Allow the two beakers to sit for five minutes.



5. Observe the results.

   a. Did the salt settle out of the water? _____

   b. Did the clay settle out of the water? _____

   c. Which separates by settling, a liquid solution or a suspension?

   _____

6. Place a filter in a funnel and the funnel in an empty beaker. Pour a small amount of the salt water through the filter.

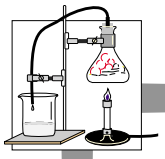
   a. Did the salt get trapped in the filter? _____

   b. Can a liquid solution be separated by filtering? _____

7. Using the same beaker and filter, pour some clay water through the filter.

   a. Did the clay get trapped by the filter? _____

   b. Can a suspension be separated by filtering? _____



## Practice

*Answer the following using short answers.*

1. Using what you have learned, explain how you might clean a muddy pool.

   _____

   _____

   _____

   _____

2. You are stranded on a boat in the ocean. You need drinking water. If you filtered the ocean water, would you have clean water? Tell why or why not.

   _____

   _____

   _____

   _____

3. What would you add to hot tea to make it sweeter?

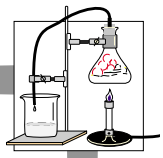
   _____

   a. When you added this ingredient, and mixed it up well with a spoon, would this mixture be a solution or suspension?

      _____

   b. Would the result be homogeneous or heterogeneous?

      _____



## Practice

*Circle the letter of the correct answer.*

1. Salt will _____ in water.

   a. dissolve
   b. not dissolve

2. A _____ will dissolve other substances.

   a. solvent
   b. solute

3. Water is a common _____ .

   a. solution
   b. solvent

4 Salt water is an example of a _____ .

   a. solute
   b. liquid solution

5. A liquid solution is _____ .

   a. cloudy
   b. clear

6. Homogeneous means _____ .

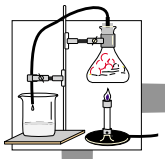
   a. alike
   b. different

7. Salt water is _____ .

   a. homogeneous
   b. heterogeneous

8. A suspension is _____ .

   a. clear
   b. cloudy



9. A suspension will _____ .

   a. not settle out
   b. settle out

10. Suspensions can be separated by _____ .

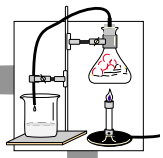
    a. filtering
    b. shaking

11. Solutions can _____ .

    a. be filtered out
    b. not be filtered out

12. Starch in water is an example of a _____ .

    a. solution
    b. suspension



## Practice

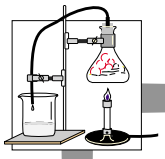
*In the lab activity, you mixed* **salt** *with* **water** *to form* **salt water**. *Complete the chart below, placing each of the substances under the correct category. If the materials do* not *form a* **solution**, *put a check mark in the* **suspension** *category.*

1. Use the terms: *salt*, *water*, *salt water*. Place your answers on row A.

2. Repeat the process, classifying *sugar*, *water*, and *sugar water*. Use row B.

3. Repeat the process, classifying *dirt*, *water*, and *muddy water* on row C.

| | **solvent** | **solute** | **solution** | **suspension** |
|---|---|---|---|---|
| **A** | | | | |
| **B** | | | | |
| **C** | | | | |



## Practice

*Write* **True** *if the statement is correct. Write* **False** *if the statement is* not *correct.*

_____ 1. Water is a solvent.

_____ 2. Liquid solutions are cloudy.

_____ 3. A suspension is homogeneous.

_____ 4. Salt water is a liquid solution.

_____ 5. Salt water is heterogeneous.

_____ 6. In a suspension, all the parts are evenly mixed.

_____ 7. A suspension can be separated by filtering.

_____ 8. A solution can be separated by settling.