Name _____ Per___ Date _____ Mailbox_____

Science 8/7 Unit: Chemistry

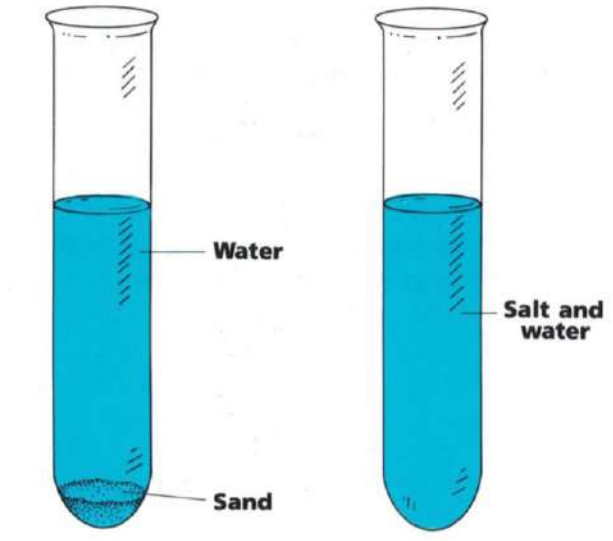
What is a solution?

Objective ▸ Describe the characteristics of a solution.

TechTerm

- **dissolve:** go into solution
- **solution:** mixture in which one substance is evenly mixed with another substance

Salt and Water What would happen if you added some sand to a test tube of water? The sand would settle to the bottom of the test tube. Suppose you then added some salt to another test tube of water. The salt disappears in the water. The salt is still in the water, but you cannot see it. The salt has dissolved (di-ZAHL-ved) in the water. When a substance **dissolves**, it goes into solution. The sand did not dissolve in the water.



Sand does not dissolve in water.

Salt dissolves in water.

Explain: Why does salt seem to disappear in water?

Solutions A mixture of salt and water is called a solution. A **solution** is a mixture in which one substance is evenly mixed with another substance. In a saltwater solution, particles of salt are evenly mixed with molecules of water.

Define: What is a solution?

Types of Solutions A liquid solution is formed when a solid dissolves in a liquid. Salt water is a liquid solution. A liquid solution may also be formed when a gas dissolves in a liquid. Club soda is a solution of the gas carbon dioxide dissolved in water. One liquid may dissolve in another liquid to form a liquid solution. Water and alcohol form this type of solution.

Liquid solutions are formed when solids, liquids, or gases dissolve in liquids. Solutions can also be formed when different substances dissolve in solids and gases. Table 1 shows some examples of different kinds of solutions.

Analyze: Why is air called a solution?

Table 1 Types of Solutions

SUBSTANCE	DISSOLVED IN	EXAMPLES
Liquid	Liquid	alcohol in water
	Gas	water vapor in air
	Solid	ether in rubber
Gas	Liquid	club soda (CO_2 in water)
	Gas	air (N_2, O_2, and other gases)
	Solid	hydrogen in palladium
Solid	Liquid	salt in water
	Gas	iodine vapor in air
	Solid	brass (copper and zinc)

19-1 WHAT IS A SOLUTION?

READING SUMMARY

- When a substance (specifically a solute) dissolves, it goes into solution.
- A solution is a mixture in which one substance is evenly mixed with another substance.
- Salt water is an example of a solution made from a liquid and a solid.
- Solutions can form when a substance dissolves in a solid, a liquid or in a gas.
- Pure solutions are examples of homogeneous mixtures

19-1 PRACTISE

CHECK *Complete the following.*

1. Solutions are formed when substances _____ in other substances.
2. Salt water is a solution formed when a _____ dissolves in a liquid.
3. A mixture in which one substance is evenly mixed with another substance is called a _____ .
4. Club soda is an example of a solution formed when a _____ dissolves in a liquid.
5. Salt water is a solution formed when a solid dissolves in a _____ .

APPLY *Complete the following.*

6. **Classify:** Which of the following substances are solutions?
   - **a.** sugar
   - **b.** mud
   - **c.** club soda
   - **d.** flour
   - **e.** sea water
   - **f.** salt and pepper
   - **g.** sand
   - **h.** air
7. For each of the substances you classified as solutions in question 6, identify the type of solution formed.

19-2 What are the parts of a solution?

Objective ▸ Identify the parts of a solution.

TechTerms

- **insoluble** (in-SAHL-yoo-bul): not able to dissolve
- **soluble** (SAHL-yoo-bul): able to dissolve
- **solute** (SAHL-yoot): substance that is dissolved in a solvent
- **solvent:** substance in which a solute dissolves

Parts of a Solution All solutions are made when one substance dissolves in another substance. A solution of salt and water forms when salt dissolves in water. The part of a solution that dissolves is called the **solute** (SAHL-yoot). Salt is the solute in a solution of salt and water. The part of the solution in which a solute dissolves is called the **solvent.** Water is the solvent in a saltwater solution.

Contrast: What is the difference between a solute and a solvent?

Soluble Substances Water is the solvent in many types of solutions. Club soda is a solution in which water is the solvent and carbon dioxide is the solute. Because carbon dioxide dissolves in water, it is said to be **soluble** (SAHL-yoo-bul) in water. A substance is soluble in water if it dissolves in water.

Predict: What will happen when carbon dioxide gas is mixed with water?

Insoluble Substances Many substance do not dissolve in water. A concrete sidewalk does not dissolve in rainwater. Sand does not dissolve in a glass of water. A plastic container does not dissolve when you add water to it. These substances are **insoluble** (in-SAHL-yoo-bul) in water. A substance is called insoluble if it does not dissolve in another substance.

A substance may dissolve in one substance but not in another substance. Sugar dissolves in water. It is soluble in water. Sugar does not dissolve in oil. It is insoluble in oil. The type of solvent determines whether a solute is soluble or insoluble.

Analyze: How can a substance be both soluble and insoluble?

19-2 WHAT ARE THE PARTS OF A SOLUTION?

READING SUMMARY

- The substance that dissolves in a solution is called a solute.
- The solvent is the substance in which a solute dissolves.
- A substance that dissolves in another substance is soluble in that substance.
- A substance is insoluble if it does not dissolve in a particular substance.
- A substance may be soluble in one solvent but insoluble in a different solvent.

19-2 PRACTISE

CHECK *Write true if the statement is true. If the statement is false, change the underlined term to make the statement true.*

1. Salt is the solute in a saltwater solution.
2. Cement is soluble in water.
3. The substance in which a solute dissolves is called a solvent.
4. Sugar is insoluble in water.
5. In a solution of sugar and water, water is the solute.

APPLY *Complete the following.*

6. **Classify:** Instant coffee is a solution formed from coffee powder and hot water. Identify the solute and the solvent in this solution.
7. Is wood soluble in water? How do you know?

Solutions

Solutions are homogeneous mixtures of two or more substances. The **solute** is the substance that is dissolved. The **solvent** is the substance in which the solute is dissolved.

Most solutions contain more solvent than solute. The rate at which a solute dissolves in a given solvent usually can be increased by

- stirring or shaking the mixture.
- breaking or crushing the solute into smaller particles.
- heating the solution.

As a general rule, a solvent will dissolve a solute that is chemically like itself.

The **solubility** of a substance is the amount of solute that can be dissolved in a certain amount of solvent at a given temperature. If a substance is **insoluble** in a solvent, it will not dissolve in the solvent.

A solution can be described as either concentrated or dilute. A **concentrated** solution contains a large amount of solute compared to the amount of solvent. It is a strong solution. A **dilute** solution has a small amount of solute compared to the amount of solvent. It is a weak solution.

When a solution has dissolved all of the solute that it can dissolve, the solution is described as **saturated**. If more solute can be dissolved in a solution, the solution is described as **unsaturated**. When a solution has dissolved more solute at a particular temperature than it normally does, the solution is said to be **supersaturated**.

Unscramble each term below. Write its correct spelling in the first blank. Next, match each term with its definition. Write the definition's letter in the second blank.

Scrambled Word	Word	Letter	Definition
1. NIOTLOSU			A. Cannot dissolve more solute
2. UILETD			B. Weak
3. ECNNTAECORTD			C. Homogeneous mixture
4. EUAUATRSRESPTD			D. To go into solution
5. VSOIELDS			E. Substance that is dissolving
6. ASURETTDNUA			F. Substance that does the dissolving
7. NLBLOISUE			G. Will not dissolve
8. STLUOE			H. Strong
9. STNVLOE			I. Contains more solute than normal
10.DTUTARASE			J. Can dissolve more solute