Connected Chemistry
Modeling Matter Unit
Lesson 6: Mixtures

Student's Lesson at a Glance

Lesson Summary

From the previous lessons, students may have learned that some types of matter are composed of pure substances and some are not. Through exploration, students identify how substances change and behave at the submicroscopic level when mixed together. Students then classify the types of mixtures as homogeneous or heterogeneous. Students assess their knowledge using a physical modeling activity and a final "putting it together" activity that requires them to draw on knowledge of all concepts learned in the unit.

SWBAT (Students Will Be Able To):

- Define and identify a pure substance
- Define what a mixture is
- Define and identify a heterogeneous mixture
- Define and identify a homogenous mixture

Essential Vocabulary

Keep a list of all important words from this lesson. This list, in addition to the lists from other lessons, will make studying easier and improve scientific communication skills. The essential vocabulary from the unit is in bold. Additional words that will expand your scientific vocabulary are in italics.

CCC Reminder

- Refer back to your definitions for atoms, elements, and compounds to help with this lesson.
- Keep using your periodic table in the back of the book to help decode molecules.
- Follow the sketching and observation protocol; the more you practice these skills, the more accurate you will become. Remember to include a key.
- Pause the simulations when you are creating sketches.
- Use the vocabulary section and note section to take good notes so that studying for tests and quizzes is easier.
- Support your claims with evidence.

Notes

Homework

Upcoming Quizzes/ Tests

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Activity 1: Connecting

Matter is composed of elements and compounds. Each of the simulations thus far have included **pure substances**, which are composed of only one type of element or compound. However, not all matter is composed of pure substances. For example, prepared Kool-Aid® contains a mixture of flavoring with food color, sugar, and water. Because a prepared Kool-Aid® drink is a combination of different substances, it is not a pure substance; it is a **mixture**.

A color change can be observed at the macroscopic level when Kool-Aid® powder is added to water. Likewise, when sugar is added to water, the mixture will taste sweet. But, what happens to the particles on the submicroscopic level when you add each substance to form the mixture? Are new substances formed or do the original substances remain the same? Does the motion of particles change when they are mixed?

In this investigation, you will examine what happens when elements and compounds are mixed and classify how substances change as well as the types of mixtures that exist. Sketch your prediction of the submicroscopic view of Kool-Aid® powder and water mixture. Do not forget to include a key.

Sketch a submicroscopic view of water and Kool-Aid® mixture	Explain why you think that this is an accurate representation of this mixture
	Motion
	Appearance
	Interactions
	Location
Key	

Activity 2: Teacher Demonstrating Mixtures

Demonstration

Use Simulation 5, ***Set 1***

Your teacher will run the simulation of mixing ethanol and water. Sketch a submicroscopic picture of the mixture after 30 seconds. Describe your sketches under the observations section of the table. Do not forget to include a key.

Sketch the submicroscopic view of the water and ethanol after mixing	**Observations**
	Motion
	Appearance
	Interactions
	Location
Key	

Activity 3: Students Exploring Mixtures

Part 1

Use Simulation 5, ***Sets 2-6***

In the next exploration, you will add two or three substances together as your teacher did following the trials in the table below. Write down your observations ***after 30 seconds****.*

Always include a key.

Set	Create a submicroscopic sketch of the mixture created by mixing:	Record Observations
2	Water, (H_2O) + Mercury, (Hg)	Motion
		Appearance
		Interactions
		Location
3	Water, (H_2O) + Hydrogen peroxide, (H_2O_2)	Motion
		Appearance
		Interactions
		Location

Set	Create a submicroscopic sketch of the mixture created by mixing:	Record Observations
4	Water, (H_2O) + Pentane (C_5H_{12})	Motion
		Appearance
		Interaction
		Location
5	Water, (H_2O) + Ethanol, (C_2H_5OH) + Hydrogen peroxide, (H_2O_2)	Motion
		Appearance
		Interactions
		Location
		Key

Set	Create a submicroscopic sketch of the mixture created by mixing:	Record Observations
6	Water, (H_2O) + Ethanol, (C_2H_5OH) + Pentane, (C_5H_{12})	Motion
		Appearance
		Interaction
		Location
	Key	

Part 2: Use Simulation 5, ***Sets 1-6***

Using your observations of sets 1-6 on pages 53-56, create two group descriptions of the mixtures and divide your trials into two separate groups.

Group 1: Layers

1. Which trials from page 54 belong in this group?

2. How are all the trials in this group similar?

3. How are the trials in this group different?

4. Are these trials pure substances or mixtures? *Support your claim with evidence.*

Group 2: No Layers

5. Which trials from pages 53-56 belong in this group?

6. How are all the trials in this group similar?

7. How are the trials in this group different?

8. Are these trials pure substances or mixtures? *Support your claim with evidence.*

9. How does group 2 differ from group 1?

Activity 4: Teacher Facilitated Discussion: Heterogeneous and Homogeneous Mixtures

In your small group or pairs, answer the following questions. Be ready to support your claims with evidence in the classroom group discussion.

10. What do the prefixes on the words **hetero**geneous and **homo**geneous mean?

11. Based on the prefixes and the simulations that you just completed, what is a **homogeneous mixture**?

12. Based on the prefixes and the simulations that you just completed, what is a **heterogeneous mixture?**

13. Which of your trials are heterogeneous mixtures? Which of your trials are homogeneous mixtures? Support your claims with evidence from the simulation.

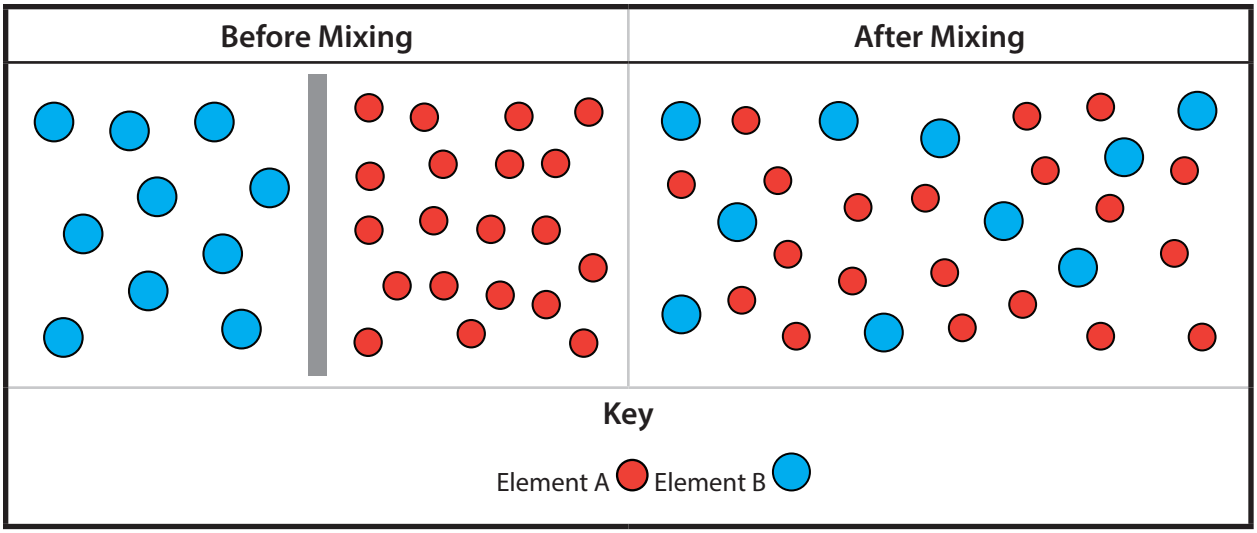
Activity 5: Physical Modeling of Elements, Compounds and Mixtures

Students sometimes have trouble distinguishing between elements, compounds, and mixtures when larger amounts are present. This activity will help students learn how to distinguish between elements, compounds, and mixtures using hands-on models.

Activity 6: Capstone Activity - Mixtures Undergoing Physical and Chemical Changes

The following questions require you to use all the knowledge you have gathered about mixtures, chemical changes and physical changes.

Part 1: *Consider the two submicroscopic diagrams.*

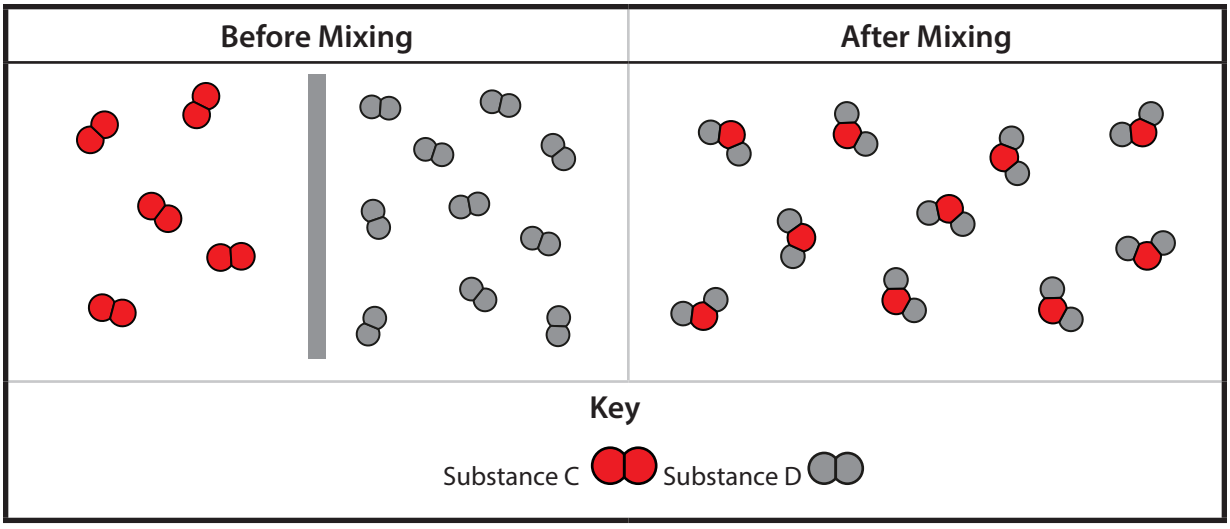


14. Before mixing, classify the two elements as pure substances or mixtures. *Support your claims with evidence.*

15. Does mixing these two substances result in a physical change or chemical change? *Support your claim with evidence.*

16. If a mixture forms, state the type of mixture (homogeneous or heterogeneous). *Support your claim with evidence.*

Part 2: *Consider the two submicroscopic diagrams.*



17. What is different about the substances before mixing in part 1 and 2?

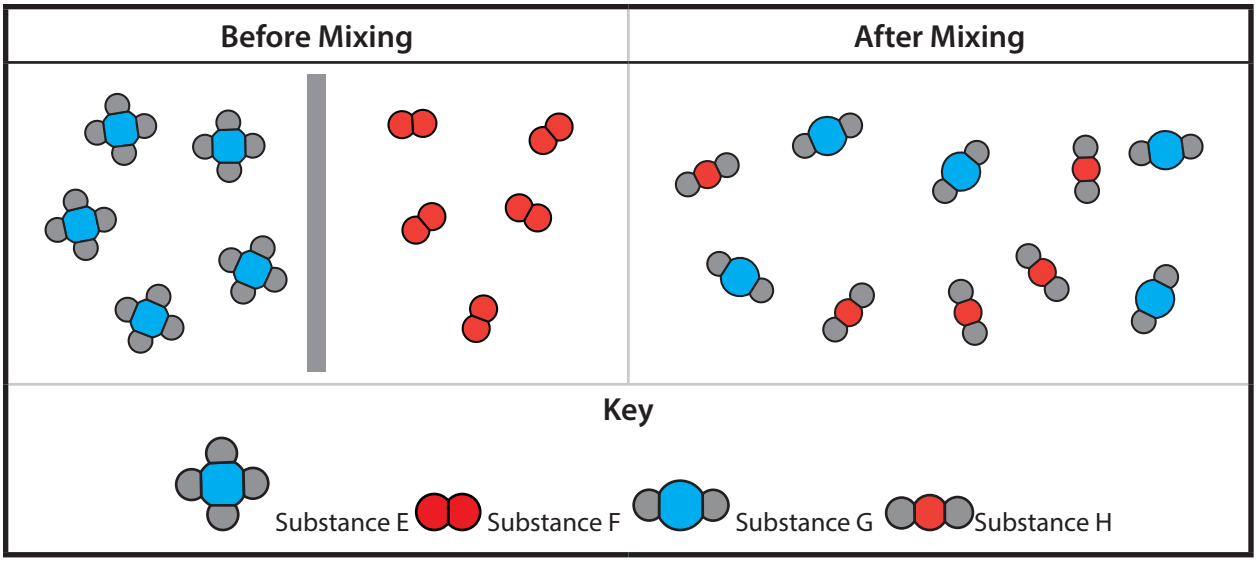
18. Are substances C and D elements or compounds? *Support your claim with evidence.*

19. Does mixing these two substances result in a physical change or a chemical change? *Support your claim with evidence.*

20. After mixing, is the resulting product an element or compound? *Support your claim with evidence.*

21. Is a mixture formed based on the After Mixing diagram of Element C and D? *Support your claim with evidence.*

Part 3: *Consider the two submicroscopic diagrams.*



22. Are substances E and F elements or compounds? *Support your claim with evidence.*

23. Does mixing these two substances result in a physical change or a chemical change? *Support your claim with evidence.*

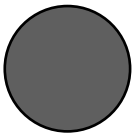
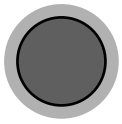
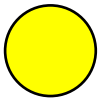
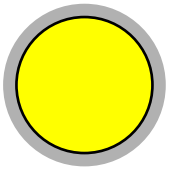
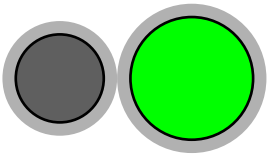
24. After mixing is the resulting product an element or compound? *Support your claim with evidence.*

25. Is a mixture formed based on the After Mixing diagram? *Support your claim with evidence.*

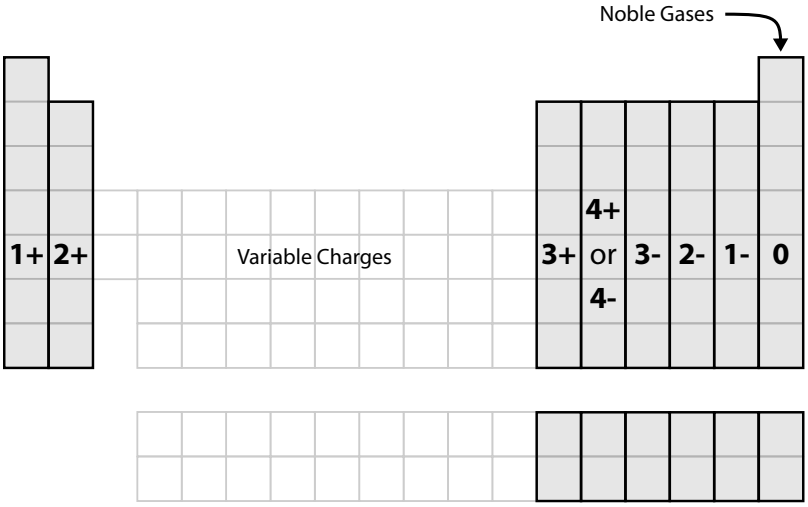
Activity 7: Looking Ahead: An Introduction to Ions

Many of the substances you have explored in this unit are known as molecular compounds, such as water, hydrogen peroxide, pentane, and carbon dioxide. These compounds are held together with covalent bonds. Covalent bonding involves the sharing of a pair of electrons between two atoms. In future units, you will explore another type of compound called an ionic compound. Ionic compounds are made up of ions with either a positive or a negative charge. Because opposite charges attract, a positive ion and a negative ion can come together to form an ionic bond. You will learn more about ionic and molecular compounds later, but it is important to learn to identify the difference between ions, regular atoms, or molecules in CCC simulations.

In all CCC simulations, a gray halo is used to identify ions and ionic compounds on the submicroscopic level. To indicate an ion with a symbol, the charge is indicated with a superscript number and a + or - sign after an element symbol:

Name	Symbol	CCC Model
Sodium	Na	
Sodium Ion	Na^+	
Sulfur	S	
Sulfur Ion	S^{-2}	
Sodium Chloride	NaCl	

Although the halo in the submicroscopic view does not indicate whether an ion or ionic compound is positively or negatively charged, you can use a simple rule to identify an ion's charge using the periodic table. For example, using the chart on the right, you can identify that sodium, in the first column of the periodic table, forms an ion with a charge of +1. Similarly, sulfur forms an ion with a charge of -1, which can be determined from its location in the sixth column of the periodic table.



Use this periodic table and the one in the back of this workbook to fill in the missing information in the table below.

Name	Symbol	CCC Model
Magnesium Ion		
	F^-	
Chlorine		
	Ca	
	K^+	
	He	
Lithium Ion		