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## 2.3 Elements and Compounds

### *Connecting to Your World*

Take two pounds of sugar, two cups of boiling water, and one quarter teaspoon of cream of tartar. Add food coloring and you have the sticky, sweet concoction known as cotton candy. You will learn how substances are classified as elements or compounds.



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## 2.3

### Elements and Compounds > Distinguishing Elements and Compounds

## Distinguishing Elements and Compounds



How are elements and compounds different?

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### Elements and Compounds > Distinguishing Elements and Compounds

An **element** is the simplest form of matter that has a unique set of properties.

A **compound** is a substance that contains two or more elements chemically combined in a fixed proportion.

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### Elements and Compounds > Distinguishing Elements and Compounds



**Compounds can be broken down into simpler substances by chemical means, but elements cannot.**

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#### Breaking Down Compounds

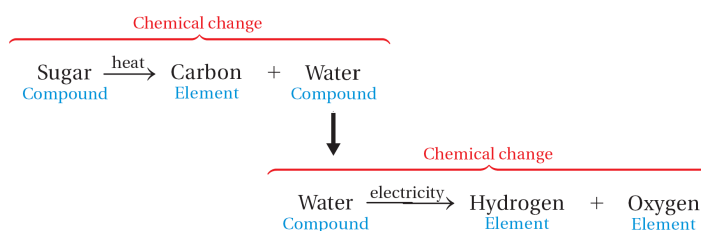
A **chemical change** is a change that produces matter with a different composition than the original matter.

When table sugar is heated, it goes through a series of chemical changes.



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The final products of these chemical changes are solid carbon and water vapor. The following diagram summarizes the process.



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### Properties of Compounds

In general, the properties of compounds are quite different from those of their component elements.

When the elements sodium and chlorine combine chemically to form sodium chloride, there is a change in composition and a change in properties.

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Chlorine is used to kill harmful organisms in swimming pools.



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Sodium is stored under oil to keep it from reacting with oxygen or water vapor in the air. Sodium vapor produces the light in some street lamps.



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Sodium Chloride (commonly known as table salt) is used to season or preserve food.



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### Elements and Compounds > Distinguishing Substances and Mixtures

## Distinguishing Substances and Mixtures



**How can substances and mixtures be distinguished?**

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Elements and Compounds > Distinguishing Substances and Mixtures



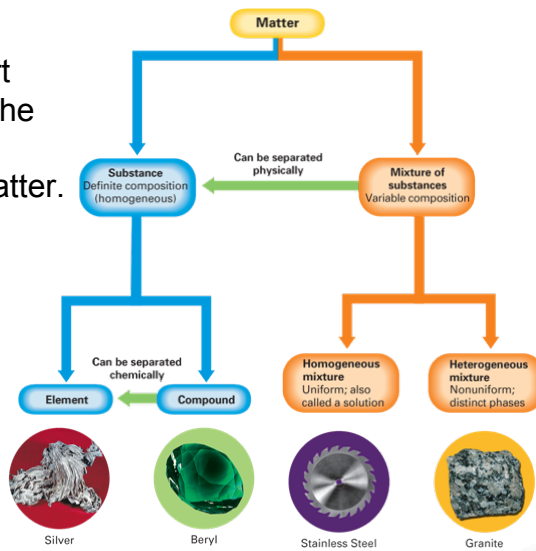
If the composition of a material is fixed, the material is a substance. If the composition of a material may vary, the material is a mixture.

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Elements and Compounds > Distinguishing Substances and Mixtures



This flowchart summarizes the process for classifying matter.





## CONCEPTUAL PROBLEM 2.2

### Classifying Materials

When the blue-green solid in the photograph is heated, a colorless gas and a black solid form. All three materials are substances. Is it possible to classify these substances as elements or compounds?



## CONCEPTUAL PROBLEM 2.2

### **Analyze** *Identify the relevant concepts.*

List the known facts and relevant concepts.

- A blue-green solid is heated.
- A colorless gas and a black solid appear.
- A compound can be broken down into simpler substances by a chemical change, but an element cannot.
- Heating can cause a chemical change.



## CONCEPTUAL PROBLEM 2.2

**Solve** *Apply concepts to this situation.*

Determine if the substances are elements or compounds. Before heating, there was one substance. After heating there were two substances. The blue-green solid must be a compound. Based on the information given, it isn't possible to know if the colorless gas or black solid are elements or compounds.



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## Practice Problems for Conceptual Problem 2.2

19. A clear liquid in an open container is allowed to evaporate. After three days, a solid is left in the container. Was the clear liquid an element, a compound, or a mixture? How do you know?



**Problem Solving 2.19** Solve Problem 19 with the help of an interactive guided tutorial



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## Symbols and Formulas



**What do chemists use to represent elements and compounds?**



**Chemists use chemical symbols to represent elements, and chemical formulas to represent compounds.**

These chemical symbols were used in earlier centuries.



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## Elements and Compounds &gt; Symbols and Formulas

Each element is represented by a one or two-letter **chemical symbol**.

Table 2.2

Symbols and Latin Names for Some Elements

Name	Symbol	Latin name
Sodium	Na	<i>natrium</i>
Potassium	K	<i>kalium</i>
Antimony	Sb	<i>stibium</i>
Copper	Cu	<i>cuprum</i>
Gold	Au	<i>aurum</i>
Silver	Ag	<i>argentum</i>
Iron	Fe	<i>ferrum</i>
Lead	Pb	<i>plumbum</i>
Tin	Sn	<i>stannum</i>