

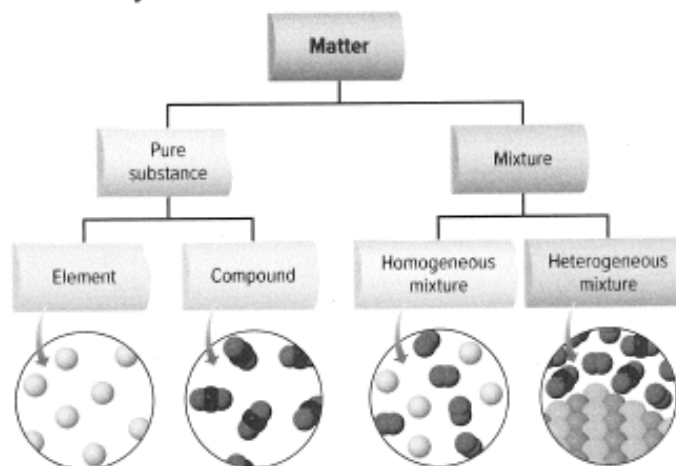
How and why do we study matter?

Use with textbook pages 86–95.

Pure Substances and Mixtures

Matter is anything that has mass and volume. It can be classified into two categories: pure substances and mixtures. A **pure substance** consists of one type of particle and cannot be separated by physical means. A pure substance can further be divided into two groups: elements and compounds. An **element** is made up of one type of atom. When atoms of two or more elements combine, they form a **compound**.

A **mixture** consists of two or more types of particles and can be separated by physical means. There are two types of mixtures: homogeneous and heterogeneous. The different substances in a **homogeneous mixture** are mixed uniformly throughout, and the different components within the mixture are not visible. A **heterogeneous mixture** has components that are distinctly visible.



Physical and Chemical Properties

Physical properties describe matter according to characteristics that are observed and measured. **Chemical properties** show the ability of matter to react with each other to form new substances. When a new substance is formed, a **chemical reaction** has occurred. Table 2.1 on page 89 in the textbook provides a list of physical and chemical properties.

Safety in the Lab

Review the safety icons and Workplace Hazardous Materials Information System (WHMIS) symbol shown in Figure 2.4 on page 91 of the textbook. The blue **safety icons** show the important procedures that should be followed before conducting a lab investigation. The **WHMIS symbols** are pictograms that identify the potential hazards that are associated with substances used in a lab. Refer to Figure 2.5 on pages 92 and 93 in the textbook to review the different safety rules in the science classroom.

Pure Substances and Mixtures

Use with textbook pages 88-90.

Use the following reading passage to answer questions 1 to 3.

Your alarm goes off at 7:00 a.m. and you roll out of bed. You make your way to the kitchen and pour yourself a glass of pulpy orange juice. The sour taste helps you wake up. You walk over to the cupboard and reach for your favourite granola cereal that has cranberries and nuts in it. You add some milk to your cereal and sit down to eat while trying to remember all the things you need for school. As you get up, you accidentally knock over a copper salt shaker and some table salt spills out. You quickly clean up the mess with a sponge and water.

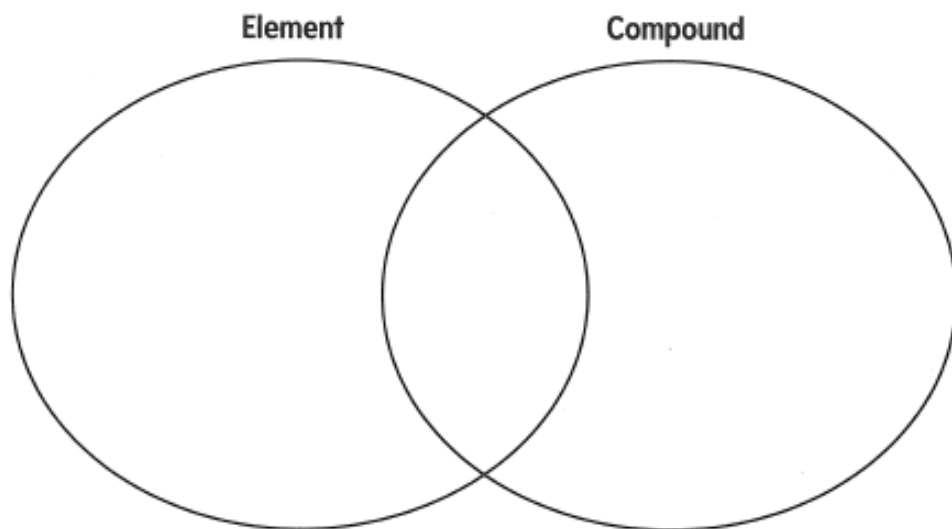
Next, it's off to the bathroom to brush your teeth. You love the feel of a clean mouth—baking soda toothpaste and minty mouthwash does the trick! Then, you jump into the shower and scrub yourself down with a bar of soap. You quickly get dressed and put on your silver necklace and gold earrings. Next, you're off to the kitchen to make your lunch for school. You pack two slices of leftover pepperoni pizza, a fruit salad, and a can of pop. You grab your backpack and head out the door. As you leave your house, you take a deep breath of fresh air and then exhale a cloud of carbon dioxide. Off to school you go.

1. Marking the Text

Pure substances and mixtures are all around us. Using two different colours, highlight all the pure substances and mixtures mentioned in the reading passage.

2. Comparing and Contrasting—Using Graphic Organizers

Comparing and contrasting helps us understand how two concepts are similar and different. Complete the Venn diagram to visually show the similarities and differences between an element and a compound.



3. Identifying Concepts

In the table below, compile a list of all the pure substances and mixtures that are mentioned in the reading passage in the order that they appear. Determine whether the sample is an **element**, a **compound**, a **homogeneous mixture** or a **heterogeneous mixture**. If the sample is a mixture, identify at least two substances that make up that mixture.

	Sample	Type of Matter	Substances in Mixture
a)			
b)			
c)			
d)			
e)			
f)			
g)			
h)			
i)			
j)			
k)			
l)			
m)			
n)			
o)			
p)			
q)			

Physical and Chemical Properties

Use with textbook pages 88-90.

Identify the physical or chemical property that is described in each statement.

1. Salt dissolves in water. _____
2. Copper produces a green flame. _____
3. An ice cube turns into water at 0 °C. _____
4. Sandpaper feels rough and gritty to the touch. _____
5. Dry Christmas trees can catch fire and burn easily. _____
6. The handle of a metal frying pan is too hot to touch. _____
7. Water heated in a kettle will turn to steam at 100 °C. _____
8. A spoonful of honey will pour slower than a spoonful of vegetable oil.

9. Gold is very soft and can be hammered into thin sheets to make jewellery.

10. Bubbles form and a gas is given off when vinegar is added to baking soda.

11. A copper penny becomes dull brown over time and eventually turns to dull light green.

12. Most elements can exist as a solid, a liquid, and a gas, depending on the temperature and pressure.

13. The strong triple bond between the atoms of a nitrogen molecule is the reason why nitrogen gas is unreactive.

Observing Chemical Reactions

Use with textbook pages 88-90.

Identify a visible sign that a chemical reaction has occurred in each description below.

1. A candle burns.

2. A leftover sandwich starts to rot and smell.

3. Potassium is added to a beaker of water and a flame appears.

4. Exploding fireworks produce an array of beautiful colours and loud sounds.

5. Wood is placed in a campfire. It starts to burn, and smoke and black ashes form.

6. An iron chain left outside in the rain starts to rust, resulting in a reddish-brown colour.

7. A piece of calcium metal is placed in a beaker of water. Bubbles of hydrogen gas form in the water.









8. Colourless hydrochloric acid is poured into a beaker with a red solution of cobalt(II) nitrate. The solution turns blue.

9. Dough is wrapped around a stick and roasted over an open fire. The bannock turns brown and is cooked all the way through.

10. A solution of clear reddish-orange sodium dichromate is added to a colourless solution of lead nitrate. A yellow insoluble solid forms.

2.1 Assessment

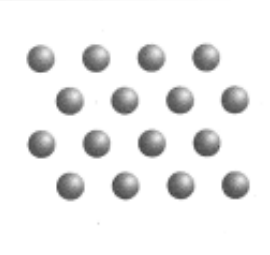
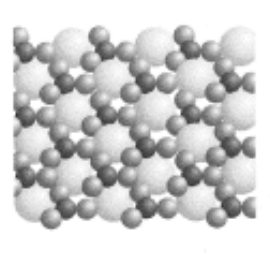

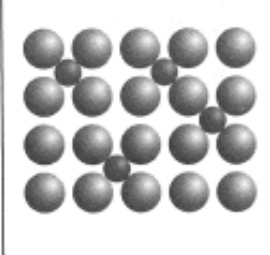
Match each description on the left with the best safety icon on the right. Each safety icon may be used only once.

Description	Safety Icon
1. ___ wear safety goggles to protect your eyes	A. 
2. ___ be careful when using electrical equipment	B. 
3. ___ be careful when working around open flames	C. 
4. ___ be careful when handling hot objects and glassware	D. 
5. ___ wear a lab apron to protect clothing and skin from spills	E. 
6. ___ wear gloves to protect the skin from corrosive chemicals	F. 
7. ___ be careful when working with sharp objects that can cause cuts	G. 
8. ___ be careful when handling chemicals that can cause burns or are poisonous when they come in contact with skin	H. 

Circle the letter of the best answer for questions 9 to 26.

9. Which of the following is made up of one type of particle?
- tea
 - lead
 - granite
 - garden salad
10. Which of the following consists of two or more pure substances?
- ice
 - oxygen
 - soda pop
 - ammonia

11. Classify matter by identifying the type of pure substances and mixtures shown below.

				
	W	X	Y	Z
A.	element	homogeneous mixture	compound	heterogeneous mixture
B.	compound	homogeneous mixture	heterogeneous mixture	element
C.	compound	heterogeneous mixture	element	homogeneous mixture
D.	element	heterogeneous mixture	compound	homogeneous mixture

12. Which of the following is correctly paired?

- A. element – air
- B. compound – baking soda
- C. heterogeneous mixture – perfume
- D. homogeneous mixture – pulpy orange juice

13. Which of the following is a mixture that has the same composition throughout?

- A. gravel
- B. wet sand
- C. granola cereal
- D. stainless steel spoon

14. Which of the following can be separated by physical means?

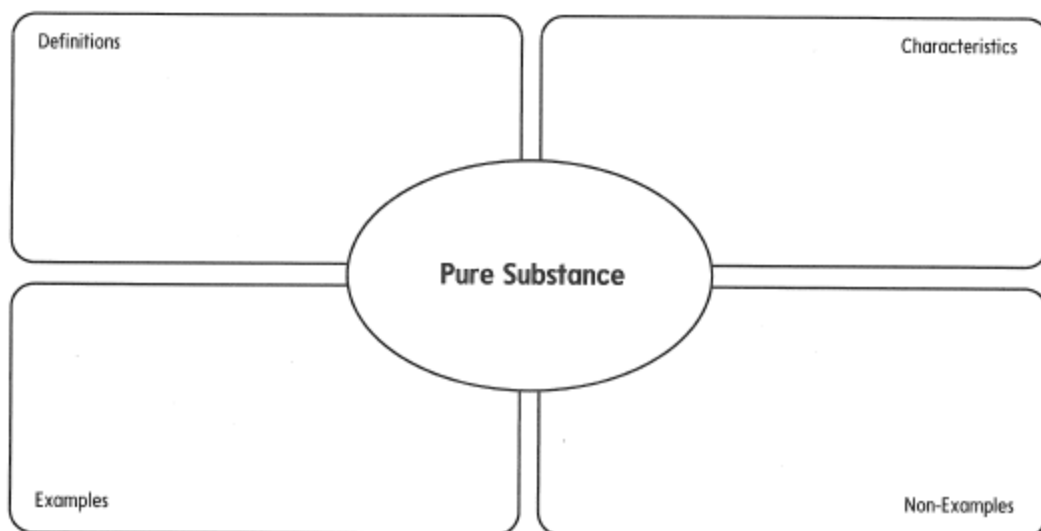
- A. platinum
- B. salt water
- C. apple juice
- D. iron filings and sand mixture

15. Boiling can be used to separate the parts of which of the following mixtures?

- A. salt water
- B. fruit smoothie
- C. liquid mercury
- D. marble and sand mixture

16. Solid tin becomes a liquid at 232 °C. Liquid tin becomes a gas at 2603 °C. What physical properties of tin are described?
- A. malleability and hardness
 - B. state of matter and solubility
 - C. melting point and boiling point
 - D. texture and ability to conduct heat and electricity
17. Which of the following statements uses viscosity and texture to describe the substance?
- A. Maple syrup flows slowly and is very smooth.
 - B. Bromine is a reddish brown liquid at room temperature.
 - C. Aluminum is shiny and can be hammered into thin sheets.
 - D. Copper is a soft metal that will allow electric currents to flow through it.
18. Sugar can dissolve in water. What physical property is described?
- A. solubility
 - B. viscosity
 - C. hardness
 - D. malleability
19. Gasoline vapour is highly flammable and can burn easily. What chemical property is described?
- A. combustibility
 - B. lack of reactivity
 - C. reactivity with acids
 - D. reactivity with oxygen
20. A colourless solution of calcium nitrate is added to a colourless solution of sodium carbonate. A white precipitate is formed. How do you know a chemical reaction has occurred?
- A. bubbles are formed
 - B. heat is given off
 - C. a gas is released
 - D. a new substance is formed
21. Concentrated sulfuric acid is added to a sugar solution. Bubbles form as a result. Which of the following explains the presence of the bubbles?
- A. a gas was formed
 - B. there was a colour change in the solution
 - C. smoke from the thermal energy was released
 - D. heat was produced in the chemical reaction

27. Complete the following Frayer model diagram for a pure substance.



28. Complete the following Frayer model diagram for a mixture.

