

Important Concepts . . .

Preview Review



Science

Grade 9 TEACHER KEY

***W2 - Lesson 1: Physical and
Chemical Properties of Materials***

Important Concepts of Grade 9 Science

W1 - Lesson 1	Electrical Principles
W1 - Lesson 2	Electrical Circuits
W1 - Lesson 3A	Energy Consumption
W1 - Lesson 3B	The Distribution of Matter in Space
W1 - Lesson 4	Objects in Space
W1 - Lesson 5	Optical and Radio Telescopes
W1- Quiz	
W2 - Lesson 1	Physical and Chemical Properties of Materials
W2 - Lesson 2	Chemical Reactions
W2 - Lesson 3	Using the Periodic Table
W2 - Lesson 4	Naming Chemical Compounds
W2 - Lesson 5	Writing Chemical Equations
W2 - Quiz	
W3 - Lesson 1	Variation
W3 - Lesson 2	Reproduction and Patterns of Inheritance
W3 - Lesson 3A	Genes and Cell Division
W3 - Lesson 3B	Organisms and Matter in their Environment
W3 - Lesson 4	Biological and Chemical Monitoring/Acids and Bases
W3 - Lesson 5	Transfer of Materials through the Air, Ground, and Water/Biological Impacts of Hazardous Chemicals
W3 - Quiz	

Materials Required

Textbook:
Science in Action 9

Science Grade 9

Version 5

Preview/Review W2 - Lesson 1 TEACHER KEY

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Preview/Review Concepts for Grade Nine Science

TEACHER KEY



***W2 - Lesson 1:
Physical and Chemical
Properties of Materials***

OUTLINE

By the end of this lesson, you should

- define and classify types of matter
- identify the physical properties of matter
- identify a chemical property of a substance
- give evidence of a chemical change
- explain the difference between reactive and non-reactive substances
- outline the dangers of caustic materials and potentially explosive reactions and identify the appropriate WHMIS symbols

GLOSSARY

chemical change - change that results when two or more substances react to create a different substance or substances; the new substances have completely different properties from the originals

deposition - change of state from a gas to a solid

malleable - description of a substance that can be pounded or rolled into sheets

physical change - change in the appearance or state of a substance that does not change the composition (The substance you start with and end with are the same.)

WHMIS - Workplace Hazardous Materials Information System; a system of easy-to-see warning symbols on hazardous material.

Introductory Information for Teachers

Preview/Review courses are aimed mainly at students who have complete the regular course but who need to review before beginning the next grade. Other students may find Preview/Review courses useful in preparing for the new materials they will study in their next grade. No Preview/Review course is intended to replace the regular course because all cover only some important concepts from the Program of Studies for each grade.

Preview/Review materials are intended for use by teachers in one-subject and one-grade classrooms.

This Preview/Review course contains fifteen lessons in three sections. Each section has five lessons with homework. A short quiz is provided at the end of each section to test students' knowledge of the material studied. In a classroom, the course will likely be completed in three weeks.

Students may attend one, two, or all three sections. Because Science has five units per grade and does not divide into three sections, Sections 1 and 2 cover two units each and Section 3 covers the final unit.

In Science, textbooks are central to Preview/Review. That is, the textbook must be read and used to complete the activities proficiently.

Textbooks required:

- Grade 7: *Science in Action 7*
- Grade 8: *Science in Action 8*
- Grade 9: *Science in Action 9*

W2 - Lesson 1: Physical and Chemical Properties of Materials

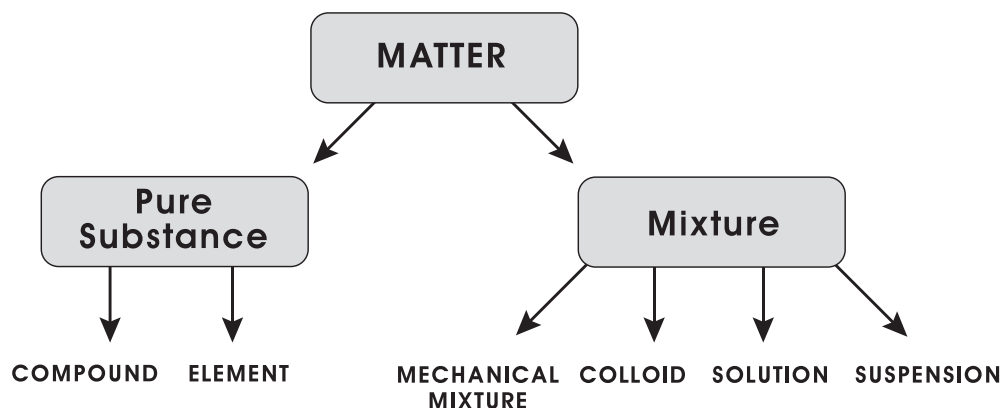
Did you know that the water we drink and the air we breath are chemicals? Water is classified as a compound and oxygen is an element. They each have unique properties and are referred to as *matter*.



The Classification of Matter

Can you describe the properties of your favorite couch or chair in your living room?

My favorite chair is a soft, pillowy leather recliner. As we describe our chairs, we are describing matter. **Matter** is anything that has mass and occupies space. Because the term *matter* can describe anything, we have to classify it based on its characteristics. Here is a diagram to outline how matter can be classified.



Matter can be a pure substance that has only one type of matter with special properties that define it. Pure substances can be further divided into elements and compounds. An **element** is a substance that is made of one type of atom. It cannot be broken down chemically into a simpler form. An example of an element is gold (symbol – Au). A **compound** is a substance made of two or more elements. Water is a **compound** with the chemical formula H_2O . It has two units of hydrogen and one unit of oxygen.

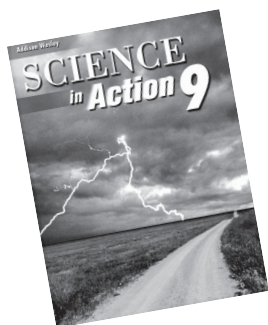
Matter can also be classified as a mixture. A mixture is a combination of pure substances that do not chemically combine. Mixtures can be classified as mechanical mixtures, solutions, suspensions, and colloids.

A mechanical mixture is a “heterogeneous” mixture made of different substances that mix and are visible. An example of this type of mixture is fruitcake. You can see that fruitcake has pieces of fruit and nuts mixed together in the batter.

A solution can be referred to as a “homogeneous” mixture. It is made of different substances that are not all visible. An example of a solution is sugar dissolved in water. The sugar and water do not chemically combine, but the sugar dissolves in the water so you cannot see it.

A suspension is a cloudy mixture that contains tiny particles of one substance held within another substance. A suspension can be filtered to separate the substances. An example of a suspension is raspberry jam. The tiny seeds are interspersed throughout the jam.

A colloid is a cloudy mixture in which the different substances cannot be easily separated. An example of a colloid is the milk you drink, a mixture of water, calcium, etc.



Read page 102 - 103 of *Science in Action 9*.

1. Identify whether the following substances are elements, compounds, solutions, suspensions, or colloids.

- a. salt mixed in water **solution**
- b. soil **suspension**
- c. silver **element**
- d. ketchup **colloid**
- e. carbon dioxide (a gas you breathe out) **compound**
- f. strawberry jam **suspension**

2. Explain the difference between a mechanical mixture and a solution.

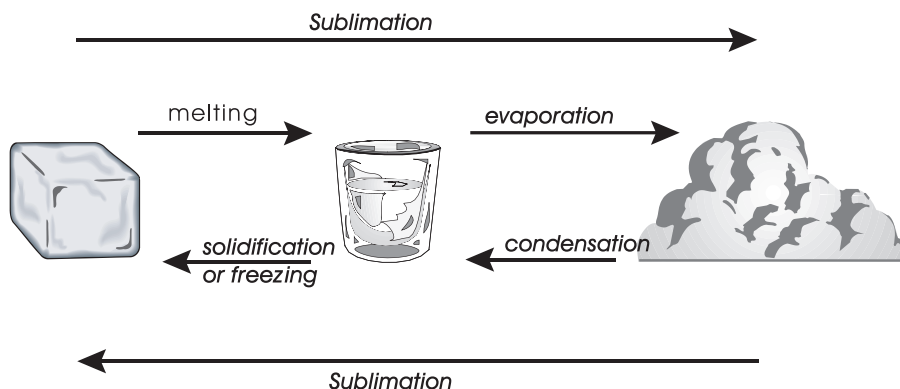
In a mechanical mixture, the components of the mixture are visible. In a solution, the components are not visible.

3. Explain the difference between an element and a compound.

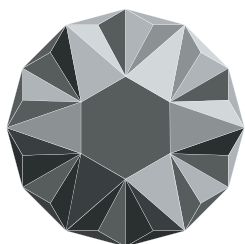
An element is made of material that cannot be chemically broken down. A compound is made of multiple elements chemically combined.

Read page 97 of *Science in Action 9*.

4. Matter can also exist in three different states: gas, liquid, or solid. Look at the diagram below and fill in the blanks identifying the different types of conversions that take place between these states. For example, the conversion of a solid into a liquid is called **melting**.

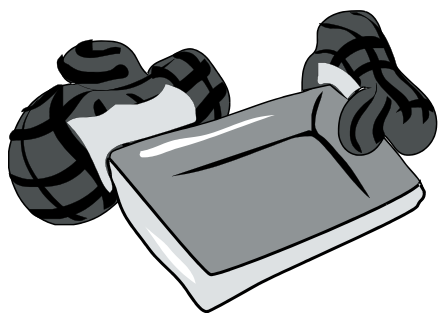


Properties of Matter



Now that you have learned about the classification of matter, you can look at the properties of matter. The properties of matter are either physical or chemical.

Physical properties describe the **appearance** and **composition** of a substance. Colour is a physical property. The melting point and boiling point of a substance are also physical properties. When a substance melts (changes state), the change is a **physical change**. The appearance of the substance is different, but its composition is the **same**.



Chemical properties describe how a substance **interacts** with another substance. An example of a chemical property is how a substance reacts with heat. Chemical properties can be seen only when a **chemical change** occurs. When your mother makes cake batter (flour, eggs, oil, baking powder, etc.) and puts it into a hot oven, a **chemical change** occurs and a cake is formed. A **chemical change** causes the formation of a new substance or substances. The cake is chemically **different** in composition from the batter. A chemical change is identified by a change in colour, a change in odour, a formation of a solid or gas, or the release or absorption of heat energy.

Read pages 98-102 of *Science in Action 9*.

5. Look at the table of physical properties on page 98, and list the eight remaining physical properties.

<i>lustre</i>	<i>hardness</i>
<i>malleability</i>	<i>ductility</i>
<i>crystal shape</i>	<i>solubility</i>
<i>density</i>	<i>conductivity</i>

6. Explain the difference between malleability and ductility.

A substance that is malleable can be pounded or rolled into sheets. A substance is ductile if it can be stretched into a long wire.

7. Look at the table of chemical properties on page 102, and list the four remaining chemical properties.

*ability to burn, behavior in air, reaction with water,
and reaction with acids*

8. Identify whether the following statements describe physical or chemical properties and list the specific property.

a. A diamond is used to cut glass.

physical / hardness

b. Copper can be stretched into thin wire.

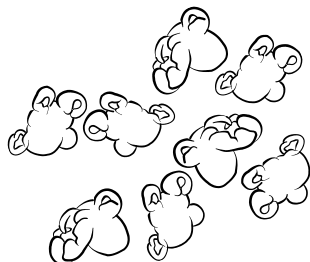
physical / ductility

c. Popcorn is popped.

chemical / reaction with heat

d. Baking soda is added to vinegar (acetic acid).

chemical / reaction with acid



9. Explain the difference between a physical and a chemical change.

A physical change involves a change of state or in other physical characteristics. A substance might look different but is chemically the same.

A chemical change involves the formation of a

new substance. It can be identified by a color change,

an odor change, the formation of a solid, or the release and absorption of heat energy.



10. Look at the pictures c, d, and e in Skill Practice on page 105. Identify whether a physical or a chemical change is taking place.

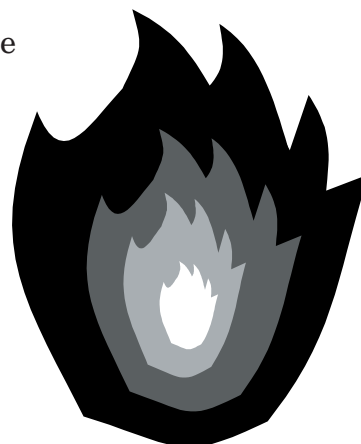
c. physical change

d. chemical change

e. chemical change

Reactive Versus Non-reactive Substances

Chemically speaking, matter can be reactive or non-reactive. If a substance is **reactive**, it chemically combines easily with other substances to form new substances. An example of this occurs when potassium combines with water to produce potassium hydroxide and hydrogen gas in a violent reaction. The hydrogen gas also starts burning in this reaction. Reactive substances are usually found on the left side of the periodic table (in groups 1 and 2).



A substance that is **non-reactive** will not naturally chemically combine with other substances. An example of a non-reactive substance is helium that is used to fill balloons. Helium is classified as a noble gas. These substances are very stable. Non-reactive substances are found in group 18 of the periodic table.

Reactive substances are usually labelled using WHMIS symbols. WHMIS stands for Workplace Hazardous Materials Information System. The symbols are red circles with pictures on the inside. The eight different WHMIS symbols are identified on page 95 of your textbook.

The WHMIS symbols identify compressed gases, a dangerously reactive material, an oxidizing material, poisonous and infectious material causing immediate and serious toxic effects, flammable and combustible material, biohazardous infectious material, corrosive material, and poisonous and infectious material causing other toxic effects.

Read pages 94-95 of *Science in Action 9*.



11. Explain the difference between reactive and non-reactive substances.

Reactive substances easily combine with other

substances to form new substances. Non-reactive

substances do not combine easily with other

substances. They are very stable.

12. Draw the WHMIS symbols for a dangerously reactive material and an oxidizing material.



13. Identify workplaces where you might find a flammable and combustible material sign and a biohazardous infectious material WHMIS sign.

flammable and combustible material gas station

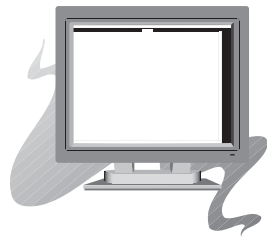
biohazardous infectious material hospital and medical lab

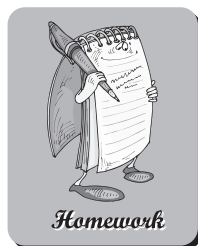
Websites

The addresses for the websites below were valid at the time of printing.

<http://www.chem4kids.com>

<http://scifun.chem.wisc.edu>





Homework

14. Find the following items at your house, and identify two physical properties of each:

a nickel *hard, shiny, conducts electricity*

vinegar *clear in color, conducts electricity*

salt *white, crystalline substance, conducts electricity in solution*

a piece of aluminum foil *silver in color, shiny, malleable, conducts electricity*

15. Look at your household cleaning and laundry supplies. Try to identify two substances that have WHMIS or hazardous symbols and explain the meaning of the caution associated with each product.

Bleach – corrosive, Tide laundry soap – poisonous if swallowed, Lysol spray – flammable and explosive, Spic and Span – Toxic, Scrub Free – corrosive

16. Look in your refrigerator at home and identify two substances that could be mixtures. Classify each substance as a mechanical mixture, a solution, a colloid, or a suspension.

Milk – colloid

Ketchup – colloid

Cheese Whiz – colloid

Salsa – mechanical mixture

Kool-aid – solution

Jam – suspension



