UNIT 2
Exploring Matter

- *Topic 2.1: In what ways do chemicals affect your life?*
- *Topic 2.2 : How do we use properties to help us describe matter?*
- *Topic 2.3: What are pure substances and how are they classified?*
- *Topic 2.4: How are properties of atoms used to organize elements into the periodic table?*
- *Topic 2.5: In what ways do scientists communicate about elements and compounds?*
- *Topic 2.6: What are some characteristics and consequences of chemical reactions?*

Topic 2.1 In what ways do chemicals affect your life?
(Pages 94-103)

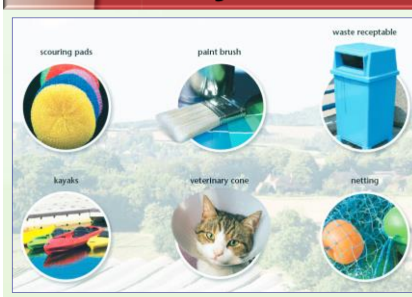

Key Concepts
- Everything—including you and everything around you—is made up of chemicals.
- Substances have characteristics that make them useful, hazardous, or both.
- Handling chemicals and lab equipment safely and responsibly is a part of your life at school.

In what ways do chemicals affect your life?

Chemicals are used to make many things that people use in their daily lives. PET plastic (polyethylene terephthalate) is used to make drinking bottles.

PET plastics are recyclable.

In what ways do chemicals affect your life?



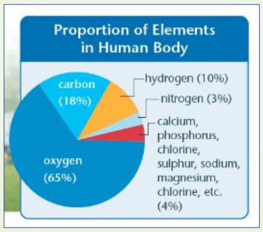
Many products can be made from the plastic used to make drinking bottles.

Do you recycle your drinking bottles?

Everything, including you and everything around you, is made of chemicals.

Everything in the world that isn't energy is a chemical or contains chemicals.

The chart on the right shows the most abundant elements in the human body.



Matter is anything that has mass and volume (takes up space).

Substances have characteristics that make them useful, hazardous, or both.

Substances can be useful and hazardous at the same time. The chart below compares characteristics of two substances.

Substance in the Home	Useful Characteristics	Hazardous Characteristics
ammonia (an ingredient in some cleaning products)	kills bacteria and other germs	• can burn skin and other body tissues • poisonous—can cause dangerous irritation if inhaled • releases poisonous gas if mixed with certain other substances such as chlorine
methane (a fuel—natural gas—that is used for heating, cooking, and transportation)	burns cleanly and efficiently in the presence of plentiful oxygen	• explosive • fumes can cause suffocation

What useful but hazardous substances do you use in your home?

Plastics: Not All Are Alike

Plastic bags were introduced to solve problems caused by using paper bags. The main problem with plastic bags is that they take a very long time to decompose.

What types of problems could slowly decomposing plastic bags cause?

Some new types of plastic bags (PVC) dissolve in hot water. This makes them useful for holding contaminated laundry.

Handling chemicals and lab equipment safely and responsibly is a part of your life at school.

Safety icons (in red and white) and WHMIS symbols (in black and white) communicate important safety information.

Safety Icons

Disposal Alert
This symbol appears when care must be taken to dispose of materials properly.

Thermal Safety
This symbol appears as a reminder to use caution when handling hot objects.

Sharp Object Safety
This symbol appears when a danger of cuts or punctures caused by the use of sharp objects exists.

Electrical Safety
This symbol appears when care should be taken when using electrical equipment.

Skin Protection Safety
This symbol appears when use of caustic chemicals might irritate the skin or when contact with micro-organisms might transmit infection.

Clothing Protection Safety
A lab apron should be worn when this symbol appears.

Fire Safety
This symbol appears when care should be taken around open flames.

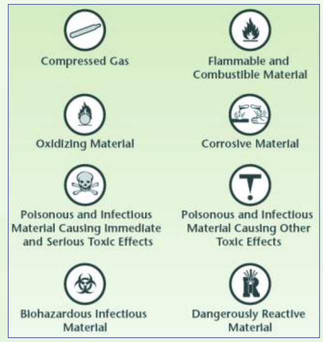
Eye Safety
This symbol appears when a danger to the eyes exists. Safety goggles should be worn when this symbol appears.

Fume Safety
This symbol appears when chemicals or chemical reactions could cause dangerous fumes.

Chemical Safety
This symbol appears when chemicals used can cause burns or are poisonous if absorbed through the skin.

Safety icons alert you to possible dangers that you may encounter when doing an activity or lab.

WHMIS Symbols

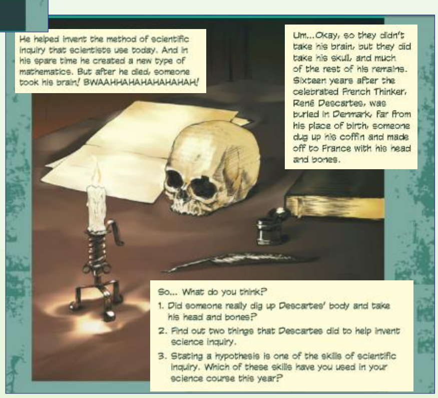


WHMIS (Workplace Hazardous Materials Information System) symbols are used to identify dangerous materials.

Take care when handling substances in containers that display these symbols.

STRANGE TALES OF SCIENCE

MINDING
SCIENTIFIC INQUIRY



Topic 2.1 Review

Key Concepts to be reviewed:

- *Everything, including you and everything around you, is made up of chemicals.*
- *Substances have characteristics that make them useful, hazardous, or both.*
- *Handling chemicals and lab equipment safely and responsibly is a part of your life at school.*

Topic 2.2 How do we use properties to help us describe matter? (Pages 104-11)

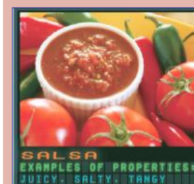
Key Concepts

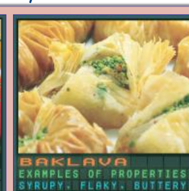
- Physical properties describe how matter looks and feels.
- Chemical properties describe how substances can change when they interact with other substances.

How do we use properties to help us describe matter?

Physical properties describe how matter looks, feels, smells, or tastes.

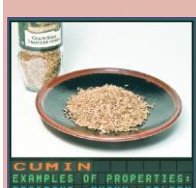
Describe as many additional **physical properties** for the foods shown below as you can.





How do we use properties to help us describe matter?

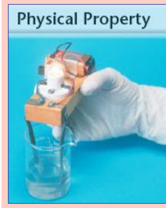
Describe as many additional **physical properties** for the foods shown below as you can.



Physical properties describe how matter looks and feels.

Physical properties of matter can be observed or measured without changing the matter itself.

Conductivity

Physical Property	What is it?	Examples
	**Conductivity** describes how well a substance lets heat or electrical current move through it. Metals tend to be good conductors, and non-metals tend to be poor conductors.	• Copper is used to make electrical wires, because it is a good conductor of electrical current. • One reason glass is good to make windows is that it does not conduct heat very well.

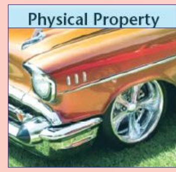
Physical properties describe how matter looks and feels.

Density

Physical Property	What is it?	Examples
	**Density** describes how compact a substance is, and is calculated by dividing its mass by its volume.	• Ice (solid water) floats on liquid water, because ice is less dense than liquid water. • Iron sinks in liquid water because iron is more dense than liquid water.

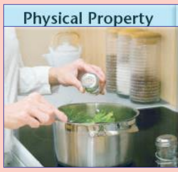
Physical properties describe how matter looks and feels.

Lustre

Physical Property	What is it?	Examples
	**Lustre** describes how well the surface of a substance reflects light.	• Many people are attracted to lustrous metals such as silver, gold, and chrome because they are shiny.

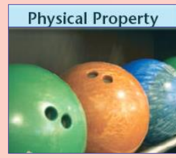
Physical properties describe how matter looks and feels.

Solubility

Physical Property	What is it?	Examples
	**Solubility** describes how much of a substance dissolves in another substance.	• Salt crystals dissolve in water to form the mixture salt water.

Physical properties describe how matter looks and feels.

Texture

Physical Property	What is it?	Examples
	**Texture** describes how the surface of a substance feels (its roughness, softness, or smoothness).	• Window glass has a smooth texture. • Brick has a rough texture.

Chemical properties describe how substances can change when they interact with other substances.

Chemical properties describe how substances can change to produce new substances with new properties when they interact with other substances. Several examples follow.

Combustibility

Chemical Property	What is it?	Examples
	**Combustibility** describes the ability of a substance to catch fire and burn in air.	• We burn wood and other fuels because of their combustibility.

Chemical properties describe how substances can change when they interact with other substances.

Reactivity with Oxygen

Chemical Property	What is it?	Examples
	Reactivity with oxygen describes the change that can occur when a substance is exposed to oxygen.	• The flesh of some kinds of fruit turns brown when it is exposed to the oxygen in air.

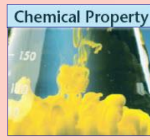
Chemical properties describe how substances can change when they interact with other substances.

Reactivity with Acids

Chemical Property	What is it?	Examples
	Reactivity with acids describes the change that can occur when a substance is exposed to acids.	• Some substances such as baking soda produce a gas when mixed with acids such as vinegar.

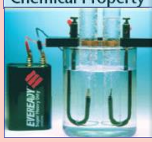
Chemical properties describe how substances can change when they interact with other substances.

Forming a Precipitate

Chemical Property	What is it?	Examples
	Reactivity with other substances describes the change that can occur when one substance reacts with other substances.	• When some substances, are mixed together, they form a solid, called a **precipitate**, which is a new substance.

Chemical properties describe how substances can change when they interact with other substances.

Decomposition Reactions

Chemical Property	What is it?	Examples
	**Decomposition** describes the change that can occur when a substance such as water is broken down into the parts that make it up.	• Chemical decomposition often happens when a substance interacts with energy such as electrical current or heat.

Topic 2.2 Review

Key Concepts to be reviewed:

- *Physical properties describe how matter looks and feels.*
- *Chemical properties describe how substances can change when they interact with other substances.*

Topic 2.3 What are pure substances and how are they classified? (Pages 112-9)

Key Concepts

- Pure substances are elements and compounds.
- Elements include metals and non-metals.

What are pure substances and how are they classified?

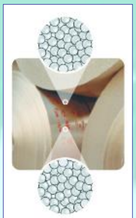
The devices shown below on the left and right use properties to separate mixtures of matter into their parts.

What other methods can be used to separate mixtures into their parts?

Pure substances are elements and compounds.

A **pure substance** is matter that contains only one type of particle, so it cannot be separated into parts physically. The two main types of pure substances are **compounds** and **elements**.

copper particles



aluminum particles

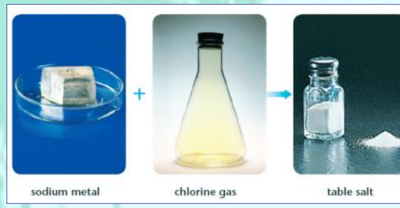
Elements are pure substances made up of one type of particle that cannot be broken down into simpler parts by chemical means.

What other **elements** can you name?

Pure substances are elements and compounds.

Compounds are pure substances made up of two or more elements that are chemically combined and can be broken down into elements again by chemical means.

distilled water particles



What **compounds** can you name?

Elements include metals and non-metals.

Metals are elements that are commonly solid at room temperature and are shiny, malleable, ductile, and good conductors.

Malleability is the ability to be bent or hammered without breaking.

Ductility is the ability to be stretched into a wire without snapping.

What other **metals** can you name?

Elements include metals and non-metals.

Non-metals are elements that can be solid, liquid, or gas at room temperature and are dull, brittle, not ductile, and poor conductors.

What other **non-metals** can you name?

Distinguishing Metals and Non-metals

Properties That Help Distinguish Metals from Non-metals

Substance	State at room temperature	Lustre	Conductivity	Malleability	Ductility
Metals	solid (except mercury, which is liquid)	shiny (lustrous)	good conductors	malleable	ductile
Non-metals	solid, liquid, or gas	dull (not lustrous)	poor conductors	not malleable (brittle)	not ductile

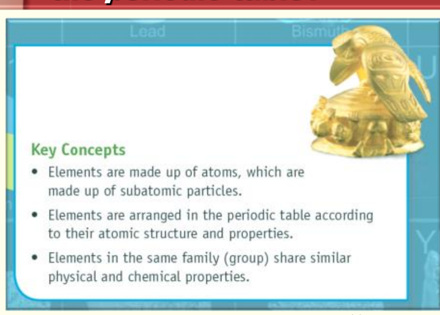
Topic 2.3 Review

Key Concepts to be reviewed:

- *Pure substances are elements and compounds.*
- *Elements include metals and non-metals.*

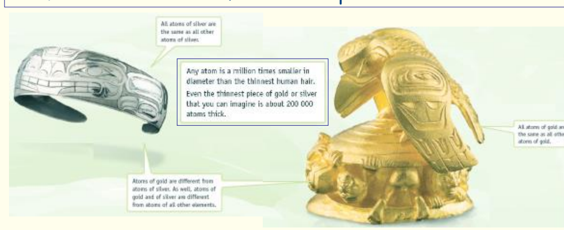
Topic 2.4 How are properties of atoms used to organize elements into the periodic table?

(Pages 120-129)



How are properties of atoms used to organize elements into the periodic table?

Elements are the building blocks of which all matter on Earth is made. The smallest unit of any element is called an **atom**. Characteristics of atoms are presented below.



How are properties of atoms used to organize elements into the periodic table?

The statements made about gold and silver atoms on the previous slide apply to atoms of **all** elements.

•Atoms of gold are different from atoms of silver. Atoms of gold and silver are different from atoms of all other elements.

•All atoms of silver are the same as all other atoms of silver. All atoms of gold are the same as all other atoms of gold.

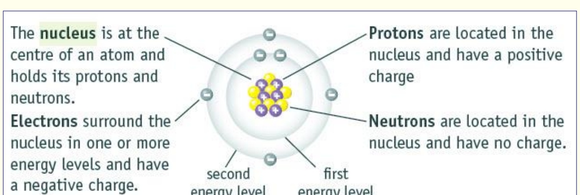
•Any atom is a million times smaller in diameter than the thinnest human hair. Even the thinnest piece of gold or silver that you can imagine is about 200 000 atoms thick.

How are properties of atoms used to organize elements into the periodic table?

Both of the works of art shown above are made of gold. How do the **atoms** in each one compare?

Elements are made up of atoms, which are made up of subatomic particles.

Atoms are the smallest unit of an element that displays the properties of that element. The diagram below shows the **atomic structure** of a carbon atom.



Elements are made up of atoms, which are made up of subatomic particles.

The particles that make up an atom are called **subatomic particles**. The positively charged centre of an atom is called the **nucleus**.

The subatomic particles found in an atom include:

- **Protons**: positively charged particles that are part of the atomic nucleus
- **Neutrons**: uncharged particles that are part of the atomic nucleus
- **Electrons**: negatively charged particles that surround the nucleus

Elements are made up of atoms, which are made up of subatomic particles.

A Comparison of Subatomic Particles

Name	Electrical Charge	Symbol	Location in an Atom	Relative Mass
proton	+	p^+	nucleus	about 1
electron	–	e^-	region around the nucleus	about $\frac{1}{2000}$
neutron	0	n^0	nucleus	about 1

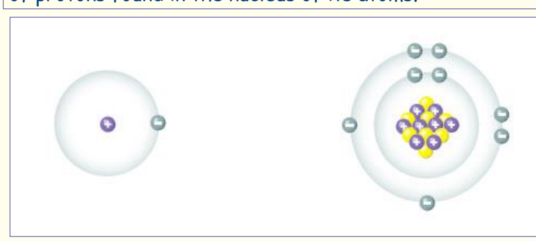
Elements are made up of atoms, which are made up of subatomic particles.

By analyzing information about an atom's subatomic particles, you can draw or construct a model of that atom.

Element	Atomic Number	Subatomic Particles	Element	Atomic Number	Subatomic Particles
Hydrogen	1	1 p^+, 1 e^-, 0 n^0	Sodium	11	11 p^+, 11 e^-, 12 n^0
Helium	2	2 p^+, 2 e^-, 2 n^0	Magnesium	12	12 p^+, 12 e^-, 12 n^0
Lithium	3	3 p^+, 3 e^-, 4 n^0	Aluminum	13	13 p^+, 13 e^-, 14 n^0
Beryllium	4	4 p^+, 4 e^-, 5 n^0	Silicon	14	14 p^+, 14 e^-, 14 n^0
Boron	5	5 p^+, 5 e^-, 6 n^0	Phosphorus	15	15 p^+, 15 e^-, 16 n^0
Carbon	6	6 p^+, 6 e^-, 6 n^0	Sulfur	16	16 p^+, 16 e^-, 16 n^0
Nitrogen	7	7 p^+, 7 e^-, 7 n^0	Chlorine	17	17 p^+, 17 e^-, 18 n^0
Oxygen	8	8 p^+, 8 e^-, 8 n^0	Argon	18	18 p^+, 18 e^-, 22 n^0
Fluorine	9	9 p^+, 9 e^-, 10 n^0	Potassium	19	19 p^+, 19 e^-, 20 n^0
Neon	10	10 p^+, 10 e^-, 10 n^0	Calcium	20	20 p^+, 20 e^-, 20 n^0

Elements are made up of atoms, which are made up of subatomic particles.

The **atomic number** for an element represents the number of protons found in the nucleus of its atoms.



1 Proton = Atomic Number of 1

8 Protons = Atomic Number of 8

Elements are arranged in the periodic table according to their atomic structure and properties.

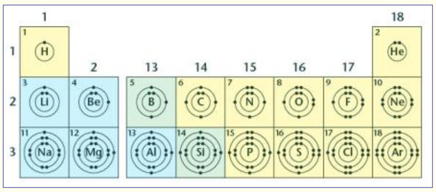
The **periodic table** is a chart in which elements are listed horizontally in order of their atomic number and in which elements with similar properties are arranged vertically.

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Group 9	Group 10	Group 11	Group 12	Group 13	Group 14	Group 15	Group 16	Group 17	Group 18
Period 1	H																	He
Period 2	Li	Be											B	C	N	O	F	Ne
Period 3	Na	Mg											Al	Si	P	S	Cl	Ar
Period 4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Period 5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Period 6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn

Elements are arranged in the periodic table according to their atomic structure and properties.

Periods (rows on the periodic table) represent the number of energy levels that contain electrons.

Families (Columns or groups on the periodic table) represent the number of electrons in the outermost energy level.



Note the arrangement of electrons in the first 18 elements.

Elements in the same family (group) share similar physical and chemical properties.

Elements in the same **family** (group) have similar chemical and physical properties because those properties are determined by the element's atomic structure.

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Group 9	Group 10	Group 11	Group 12	Group 13	Group 14	Group 15	Group 16	Group 17	Group 18
Period 1	H																	He
Period 2	Li	Be											B	C	N	O	F	Ne
Period 3	Na	Mg											Al	Si	P	S	Cl	Ar
Period 4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Period 5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Period 6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn

Elements in the same family (group) share similar physical and chemical properties.

The most reactive **metals** (shown in blue) are in group 1. Reactivity also increases as you move down in the table.

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Group 9	Group 10	Group 11	Group 12	Group 13	Group 14	Group 15	Group 16	Group 17	Group 18
Period 1	H																	He
Period 2	Li	Be											B	C	N	O	F	Ne
Period 3	Na	Mg											Al	Si	P	S	Cl	Ar
Period 4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Period 5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Period 6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn

Cesium (Cs) is most reactive.

Elements in the same family (group) share similar physical and chemical properties.

The most reactive **non-metals** (shown in yellow) are in group 17. Reactivity also increases as you move up in the table.

Fluorine (F) is most reactive.

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Group 9	Group 10	Group 11	Group 12	Group 13	Group 14	Group 15	Group 16	Group 17	Group 18
Period 1	H																	He
Period 2	Li	Be											B	C	N	O	F	Ne
Period 3	Na	Mg											Al	Si	P	S	Cl	Ar
Period 4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Period 5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Period 6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn

Elements in the same family (group) share similar physical and chemical properties.

The eight elements in green are **metalloids**. **Metalloids** share some of the properties of metals and non-metals.

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Group 9	Group 10	Group 11	Group 12	Group 13	Group 14	Group 15	Group 16	Group 17	Group 18
Period 1	H																	He
Period 2	Li	Be											B	C	N	O	F	Ne
Period 3	Na	Mg											Al	Si	P	S	Cl	Ar
Period 4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Period 5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Period 6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn

This version of the periodic table includes photos of common elements and the faces of people who either discovered the element or added to our understanding of it.

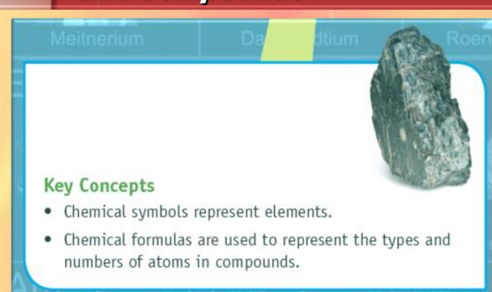
Topic 2.4 Review

Key Concepts to be reviewed:

- *Elements are made up of atoms, which are made up of subatomic particles.*
- *Elements are arranged in the periodic table according to their atomic structure and properties.*
- *Elements in the same family (group) share similar physical and chemical properties.*

Topic 2.5 In what ways do scientists communicate about elements and compounds?

(Pages 130-9)



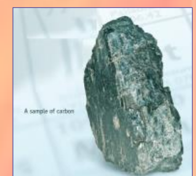
In what ways do scientists communicate about elements and compounds?

- All of the compounds on Earth are built from the elements on the periodic table.
- The periodic table lists just under 120 elements, and only 80 of these commonly form compounds.
- Scientists think that there may be as many as **10^{200}** different compounds. (That's **1000000000000000000…** and **183** more zeros)

The compounds that are just made up of **carbon** and **hydrogen** number in the millions!

Products Made Entirely of Carbon

hydrogen-powered car (pure hydrogen)



pencil "lead" (pure carbon)

diamond (pure carbon)

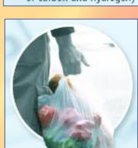
Substances made entirely of one element may take different forms.

Compounds Made of Carbon and Hydrogen

candle wax (a compound of carbon and hydrogen)

gasoline (a compound of carbon and hydrogen)

acetylene (a compound of carbon and hydrogen)



plastic (a compound of carbon and hydrogen)

Carbon and hydrogen can combine to form a variety of compounds.

natural gas (a compound of carbon and hydrogen)

Chemical symbols are used to represent elements.

Chemical symbols are letters used to represent the names of elements.

Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn

- Symbols are always either **one** or **two letters**.
- The **first letter** is always **uppercase** (capital) and the **second letter** is always **lowercase** (small).
- Symbols can be the **first** or **first** and **second** letter in the element's name.
- Sometimes the letters have come from the **Latin** name for the element.

Chemical symbols are used to represent elements.

Some Chemical Symbols That Come from the Latin Names of Elements

Element Name	Chemical Symbol	Latin Name	Meaning of Name
silver	Ag	argentum	Latin for "silver"
mercury	Hg	hydrargyrum	Latin for "liquid silver"
tin	Sn	stannum	Latin for "tin"
potassium	K	kalium	Latin for an Arabic word, *al-qalyah*, meaning "plant ashes"
iron	Fe	ferrum	Latin for "grey"
lead	Pb	plumbum	Latin for "lead"
sodium	Na	natrium	Latin for "sodium"
copper	Cu	cuprum	Latin for "Cyprian" (metal from the island, Cyprus)

Elements: Atoms and Molecules

Almost all elements exist as atoms. A few elements exist as **molecules**.

A **molecule** is a type of particle made up of two or more atoms bonded together.

Element	Chemical Symbol	Number of Atoms in the Molecule	Chemical Formula
hydrogen	H	2	H_2
nitrogen	N	2	N_2
oxygen	O	2	O_2
fluorine	F	2	F_2
chlorine	Cl	2	Cl_2
bromine	Br	2	Br_2
iodine	I	2	I_2
phosphorus	P	4	P_4
sulfur	S	8	S_8

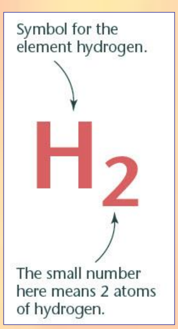
Chemical formulas are a short form for writing the name of a compound using chemical symbols and numbers.

Writing Chemical Formulas

Chemical formulas use both chemical symbols and numbers.

When writing a **chemical formula**:

- the **chemical symbol** is written **first**
- the **number of atoms** is shown as a **subscript** written smaller and slightly below the written symbol

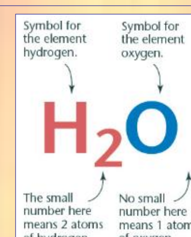


Chemical formulas are used to represent the types and numbers of atoms in compounds.

If different types of atoms are joined together, they form a **compound**.

Chemical formulas can also be used to represent compounds.

The number of each type of atom in the compound is shown with subscripts. If only one atom of an element is present, the subscript 1, does **not** have to be written.



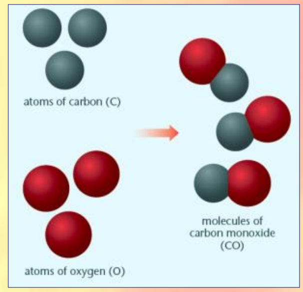
Example of Common Household Compounds and Their Formulas

Hydrogen Peroxide	Sodium Hydroxide	Sodium Chloride

H_2O_2	NaOH	NaCl

Building Models of Molecules

To help your understanding of how atoms combine to form compounds, models of the compound can be drawn or constructed from a variety of materials.



Carbon Monoxide

(CO)

Determine the number of atoms of each element in a molecule by reading its chemical formula.

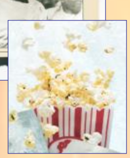
Case Study: Salt of the Earth

Why was **salt** (a very common and inexpensive compound today) considered to be so valuable in the past?

The Bombay Chronicle

Gandhi Goes on Salt March to Dandi

Because salt is affordable today, we often take it for granted.



Topic 2.5 Review

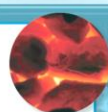
Key Concepts to be reviewed:

- *Chemical symbols are used to represent elements.*
- *Chemical formulas are used to represent the types and numbers of atoms in compounds.*

Topic 2.6

What are some characteristics and consequences of chemical reactions?

(Pages 140-51)



Key Concepts

- Compounds and elements are changed during chemical reactions.
- The properties of substances that make them useful can also make them dangerous.
- There are less-harmful alternatives to many products we use and depend on.

What are some characteristics and consequences of chemical reactions?

When a chemical reaction occurs between elements and/or compounds, a chemical change has occurred. During the reaction some substances are produced and some are consumed.

Vinegar and baking soda.

Hot coals in a fire.

What is being produced and consumed in these reactions?

Compounds and elements are changed during chemical reactions.

Chemical reactions are any changes that occur when substances interact to produce new substances with new properties.

Chemical reactions produce the sound and light of a fireworks display or the fertilizers farmers use to grow foods.

Desirable Products of Chemical Reactions

Desirable products produced by chemical reactions would be compounds we use as fertilizers or medicines, or for construction, transportation, or other purposes.

What other desirable products of chemical reactions can you think of?

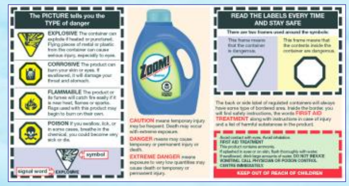
Analyze Some Chemical Reactions

Are the chemical reactions shown on the right desirable, undesirable, or both?

What are the desirable or undesirable products produced by the chemical reactions?

The properties of substances that make them useful can also make them dangerous.

Many of the substances we use at home and work have properties that make them both useful and dangerous.



In order to keep people safe, many products have warning labels on them.

Consumers must be familiar with the warning symbols on products and their meanings.

What's on a label?

Analyze a variety of household products with warning labels and identify the risks posed by using that product.

What measures should be taken to use the products safely?

There are less-harmful alternatives to many products we use and depend on.

As people become more familiar with the risks associated with using certain products, they may choose less-harmful alternatives.

Traditional Cleaning Product	Safer-to-use Alternative
window cleaner	• a mixture of vinegar and water
furniture polish	• a mixture of white vinegar and vegetable oil
stain remover	• baking soda and water paste • hydrogen peroxide (3%) for some kinds of stains
oven cleaner	• borax and vinegar (and lots of vigorous scrubbing) • baking soda (and lots of vigorous scrubbing)
dishwasher detergent	• a mixture of baking soda and borax
fabric softener	• vinegar
toothpaste	• baking soda

Do you use any less-harmful product alternatives?

Why or why not?

Identifying Unknown Gases

When chemical reactions take place, a gas is often produced. A variety of tests can be used to determine the type of gas produced.

The Test for Hydrogen

If hydrogen gas is present in a test tube, a burning splint will ignite the gas and it will burn rapidly down the test tub, making a "whoop" or "pop" sound.

Identifying Unknown Gases

The Test for Oxygen

If oxygen gas is present in a test tube, a glowing splint (one that has been blown out) will re-ignite, bursting into flames.

Identifying Unknown Gases

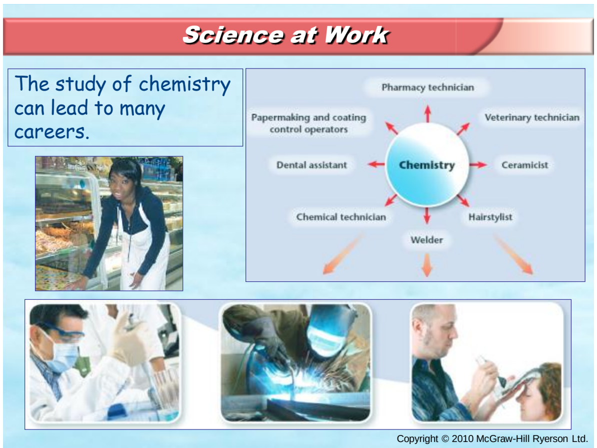
The Test for Carbon Dioxide

If carbon dioxide gas is produced, a balloon attached to the test tube will inflate. The gas in the balloon can then be mixed with a clear limewater solution from a test tube. If carbon dioxide is present, the clear limewater will turn a cloudy white colour.

Topic 2.6 Review

Key Concepts to be reviewed:

- *Compounds and elements are changed during chemical reactions.*
- *The properties of substances that make them useful can also make them dangerous.*
- *There are less-harmful alternatives to many products we use and depend on.*


Science at Work
The study of chemistry can lead to many careers.
Pharmacy technician
Papermaking and coating control operators
Veterinary technician
Chemistry
Dental assistant
Ceramicist
Chemical technician
Hairstylist
Welder
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