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DepED DEPARTMENT OF EDUCATION

ALS Alternative Learning System LIFELONG LEARNING

LEARNING STRAND 2
SCIENTIFIC AND CRITICAL THINKING SKILLS

MODULE 5: HOW CAN I STAY SAFE AT WORK?

ALS Accreditation and Equivalency Program: Junior High School

UNESCO United Nations Educational, Scientific and Cultural Organization

KOICA Korea International Cooperation Agency

LEARNING STRAND 2

HOW CAN I STAY SAFE AT WORK?

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MODULE 5

ALS Accreditation and Equivalency Program: Junior High School
Learning Strand 2: Scientific and Critical Thinking Skills
Module 5: How Can I Stay Safe at Work?

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User's Guide

For the ALS Learner:

Welcome to this Module entitled How Can I Stay Safe at Work? under Learning Strand 2 Scientific and Critical Thinking Skills of the ALS K to 12 Basic Education (BEC).

This module was designed to provide you with fun and meaningful opportunities for guided and independent learning at your own pace and time. You will be able to process the contents of the learning resource while being an active learner.

This module has the following parts and corresponding icons:

 *Let's Get to Know*	This will give you an idea of the skills or competencies you are expected to learn in the module.
 *Pre-assessment*	This part includes an activity that aims to check what you already know about the lesson. If you get all the answers correct (100%), you may decide to skip this module.
 *Setting the Path*	This section provides a brief discussion of the lesson. This aims to help you discover and understand new concepts and skills.
 *Trying This Out*	This comprises activities for independent practice to solidify your understanding and skills of the topic. You may check the answers to the exercises using the Answer Key at the end of the module.
 *Understanding What You Did*	This includes questions that process what you learned from the lesson.
 *Sharpening Your Skills*	This section provides an activity that will help you transfer your new knowledge or skill in real-life situations or concerns.
 *Treading the Road to Mastery*	This is a task which aims to evaluate your level of mastery in achieving the given learning competency.
 *Don't Forget*	This part serves as a summary of the lessons in the module.
 *Explore More*	In this portion, another activity will be given to you to enrich your knowledge or skill of the lesson learned. This also tends retention of learned concepts.
 *Reach the Top*	This part will assess your level of mastery in achieving the learning competencies in each lesson in the module.
Answer Key	This contains answers to all activities in the module.
Glossary	This portion gives information about the meanings of the specialized words used in the module.

At the end of this module you will also find:

References This is a list of all sources used in developing this module.

The following are some reminders in using this module:

1. Use the module with care. Do not put unnecessary mark/s on any part of the module. Use a separate sheet of paper in answering the exercises.
2. Don't forget to answer the Pre-assessment before moving on to the other activities included in the module.
3. Read the instruction carefully before doing each task.
4. Observe honesty and integrity in doing the tasks and checking your answers.
5. Finish the task at hand before proceeding to the next.
6. Return this module to your ALS Teacher/Instructional Manager/Learning Facilitator once you are through with it.

If you encounter any difficulty in answering the tasks in this module, do not hesitate to consult your ALS Teacher/Instructional Manager/Learning Facilitator. Always bear in mind that you are not alone.

We hope that through this material, you will experience meaningful learning and gain deep understanding of the relevant competencies. You can do it!

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CONTENTS

MODULE 5

LET'S GET TO KNOW

Noel is a newly-hired segregation officer in the hazardous section of a waste collection company. With no proper training for the job, Noel will be immediately assigned to his work area in two days. Unaware of the different types of hazardous waste that he is going to be exposed to, Noel is afraid that he will make a mistake in segregating wastes, will get himself in danger, or even both. Let us help Noel study what he needs to know while there is still time.

MODULE 5
PRE-ASSESSMENT

Directions: Choose the letter of the best answer. Write your answers on a separate sheet of paper.

1. Which of the following is true about matter?

   A. It is anything that occupies space and has mass.
   B. It can exist in seven states or phases.
   C. Its volume always depends on the shape of its container.
   D. Its phases differ on the size of atoms.

2. Which of the following is NOT true about a solid?

   A. It is a rigid (not flexible) matter.
   B. Its shape depends on the container.
   C. Its atoms are very close to one other.
   D. It cannot be compressed.

3. Which of the following is true about a liquid?

   A. It is less flexible than a solid.
   B. Its shape does not depend on the container.
   C. Its atoms are loosely packed.
   D. It can be compressed.

4. Which of the following is NOT true about a gas?

   A. It is the most flexible state of mater.
   B. It takes the shape of the container.
   C. Its atoms have very large spaces to move.
   D. It cannot be compressed.

5. Which of the following can be found in the periodic table?

   A. elements
   B. compounds
   C. homogeneous mixtures
   D. heterogeneous mixtures

6. Which of the following is NOT true about mixtures?

   A. They are formed when two or more substances are combined.
   B. They can only be separated through chemical means.
   C. A homogeneous mixture is called a solution.
   D. A heterogeneous mixture is composed of two or more layers.

7. Which of the following acids can be found in vinegar?

   A. citric acid
   B. hydrochloric acid
   C. acetic acid
   D. ascorbic acid

8. Which of the following is NOT a general property of metals?

   A. lustrous
   B. hard
   C. malleable
   D. dull

9. Which of the following is NOT a general property of nonmetals?

   A. high melting point
   B. low sonority
   C. brittle
   D. insulators

10. Which of the following elements is commonly used in softdrink cans?

    A. krypton
    B. aluminum
    C. chlorine
    D. copper

11. Which of the following compounds is also known as dihydrogen monoxide?

A. table salt
B. baking soda
C. water
D. bleach

12. Which of the following is used as a laxative and antacid?

A. calcium hydroxide
B. nitric acid
C. ammonia
D. magnesium hydroxide

13. Which of the following is NOT true about a material safety data sheet?

A. increases a person's risks or vulnerability to hazards
B. indicates all possible hazards when handling a product
C. provides basic information on a material or chemical product
D. gives instructions on what to do with the material during an emergency

14. Which of the following is NOT an MSDS pictogram?

A. corrosion
B. question mark
C. flame
D. biohazard

15. Which of the following is a physical property of a material?

A. extinguishing media
B. eye protection
C. boiling point
D. regulatory information

LESSON 1

SETTING THE PATH

HOW IS MATTER DIFFERENT FROM EACH OTHER?

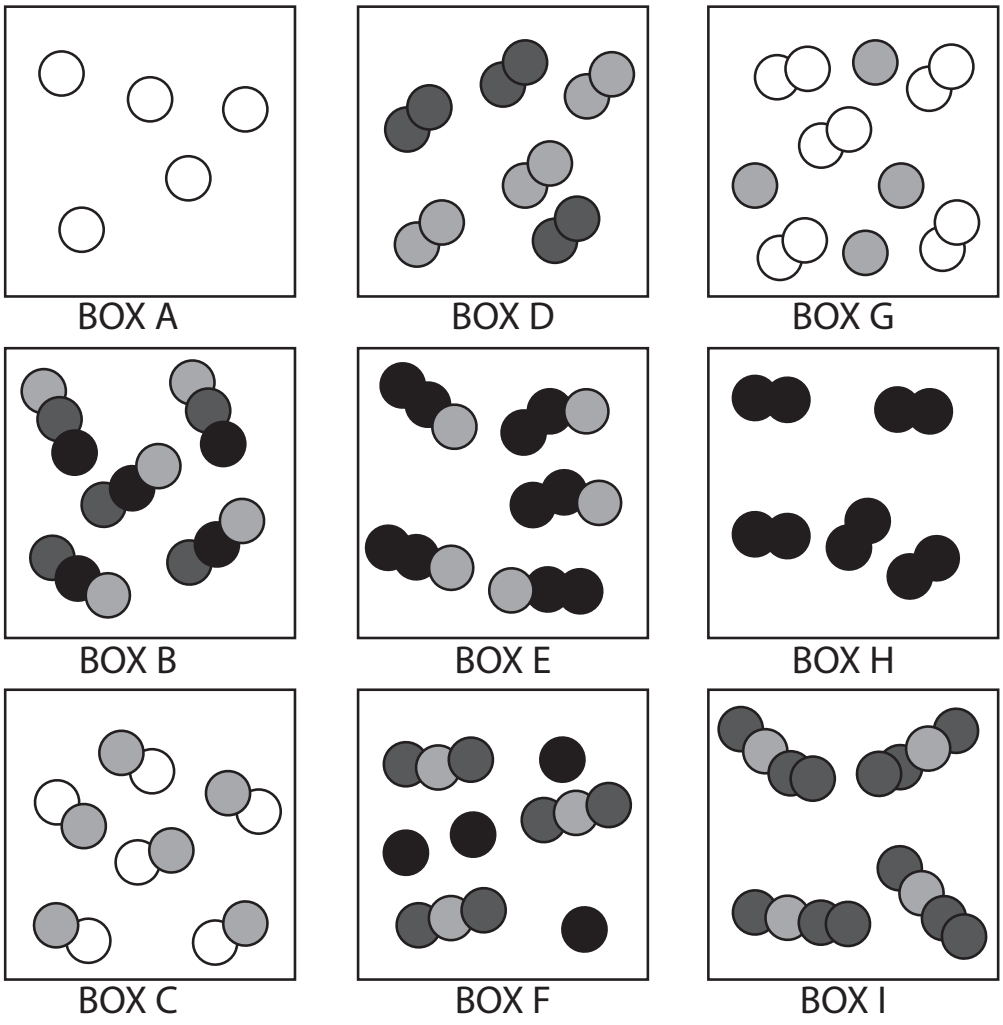
At the end of this lesson, you will be able to:

- differentiate mixtures and pure substances (LS2SC-PS-PSF-AE/JHS-9);
- differentiate elements and compounds (LS2SC-PS-PSF-AE/JHS-10);
- differentiate acidic and basic mixtures (LS2SC-PS-PSF-AE/JHS-11); and
- differentiate metals and nonmetals (LS2SC-PS-PSF-AE/JHS-12).

LESSON 1

TRYING THIS OUT

1. You have been given nine boxes containing plastic balls to sort.



2. These boxes have to be placed in larger boxes.
3. There are only three large boxes.
4. Group the boxes based on the arrangement of the plastic balls.

Continuation on page 7.

5. Write the letters of your answer on a separate sheet following the format below.

BOX 1	BOX 2	BOX 3
What are the similarities of the plastic balls in Box 1?	What are the similarities of the plastic balls in Box 2?	What are the similarities of the plastic balls in Box 3?

LESSON 1

UNDERSTANDING WHAT YOU DID

Matter is anything that occupies space and has mass. It can exist in three states or phases: solids, liquids, or gases. The main difference of the three states is based on the arrangement of their building blocks, the atoms.

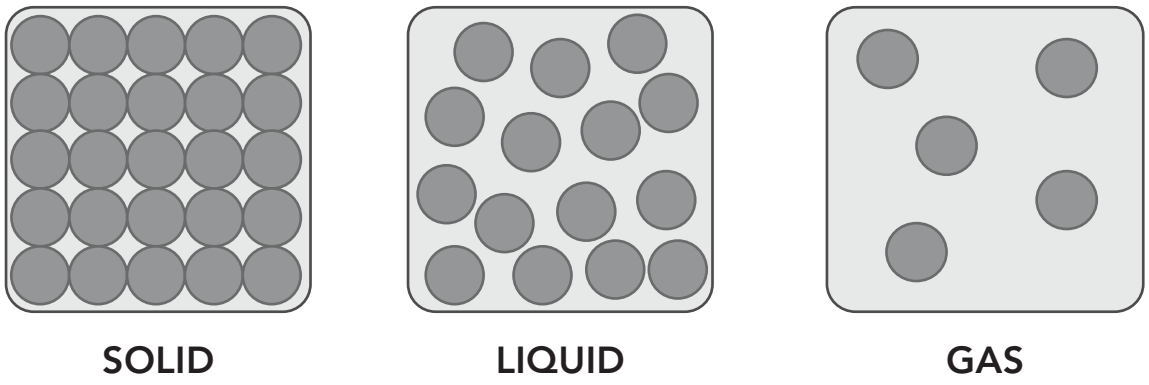


Figure 1.1. Arrangement of atoms in different states of matter.

Solid is a rigid (not flexible) matter – it has a definite shape because its atoms are very close to one another and cannot easily move. **Liquid** is a more flexible matter – it takes the shape of the container because its atoms are loosely packed and have enough (but little) space to move. **Gas** is the most flexible matter – it takes the shape of the container because of the large space between its atoms.

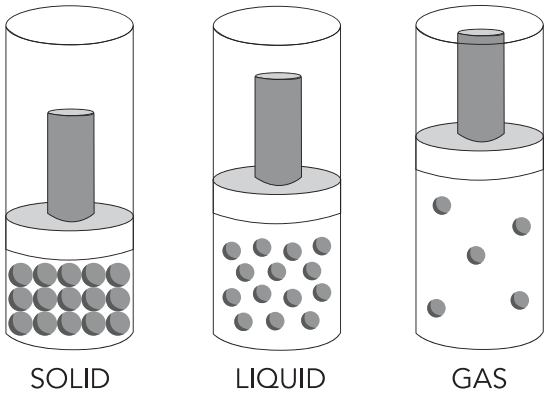


Figure 1.2. Compressibility of the different states of matter.

Aside from state, matter can also be classified according to its composition (what it is made of).

A **substance** is a matter that is homogeneous (having the same kind in all of its parts). It can either be elements or compounds.

Elements are pure substances which cannot be broken down into simpler substances. Elements may either have one atom (monoatomic or monatomic), two atoms (diatomic), or more than two atoms (polyatomic). Familiar elements include oxygen, gold, sulfur, and iron. These elements are listed and arranged in the **periodic table** according to their properties.

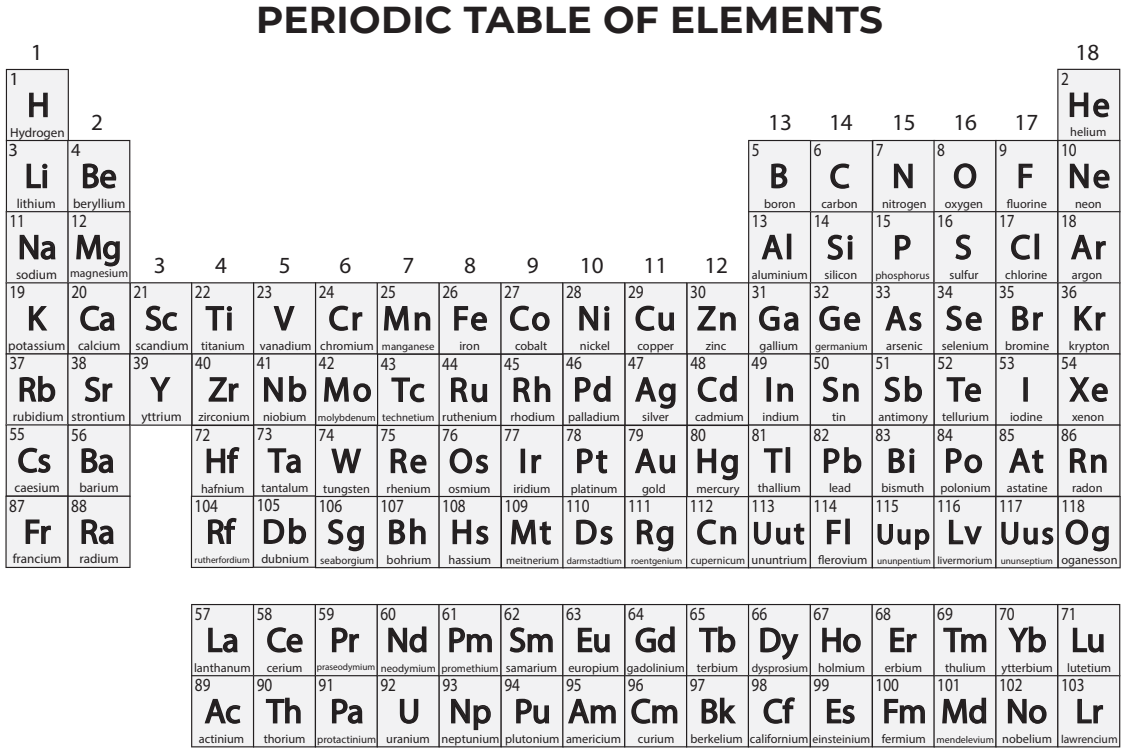


Figure 1.3. The Periodic Table of Elements.
"Based on IUPAC Periodical Table of Elements, (2018, December 1). https://iupac.org/what-we-do/periodic-table-of-elements/"

When two or more elements are combined, a **compound** is formed. Familiar compounds include water, salt, and sugar.

Figure 1.4. Examples of compounds.

A **mixture** is formed when two or more substances are combined physically. There are two types of mixtures: a **heterogeneous mixture** shows a visible separation of its components (e.g., oil and water, ice in soft drinks, chocolate chips); and a **homogeneous mixture** shows no separation of its components (e.g., salt or sugar in water, air, coins). Many homogeneous mixtures are referred to as **solutions.**

Figure 1.5. Examples of heterogeneous mixtures.

Figure 1.6. Examples of homogeneous mixture.

Since it is the product of the physical combination of substances, **mixtures can be separated physically**. For example, a heterogeneous mixture of iron and sand can be separated by the use of a magnet because iron can be attracted by magnets. A homogeneous mixture of salt and water can be separated by boiling water, leaving only salt crystals from the container after a certain period of time.

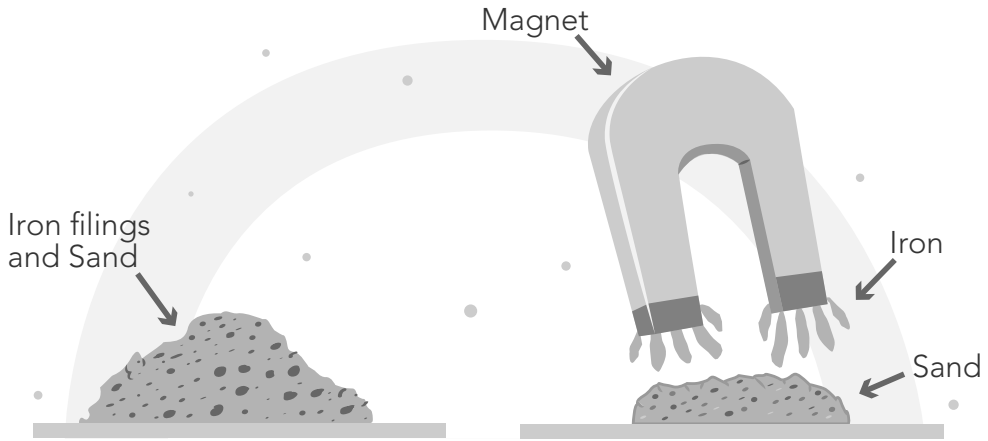


Figure 1.7. Separation of iron and sand.

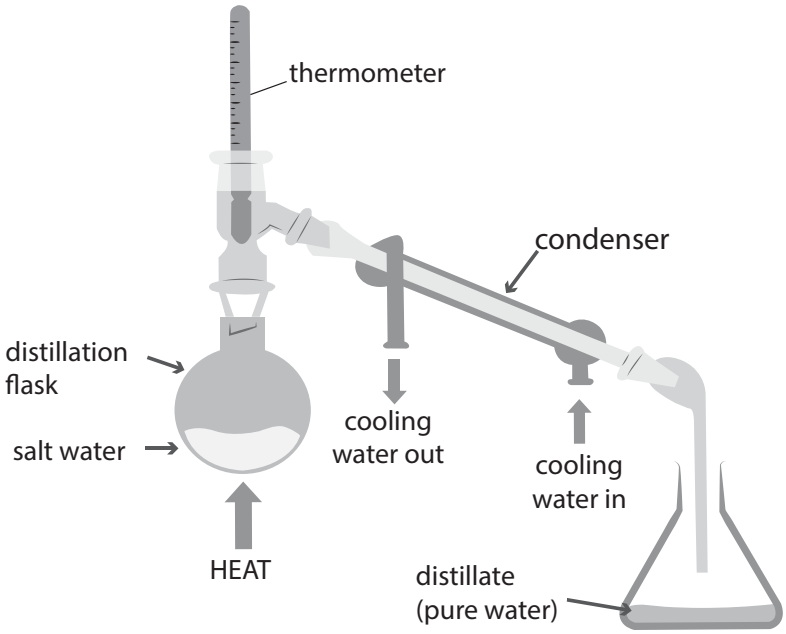
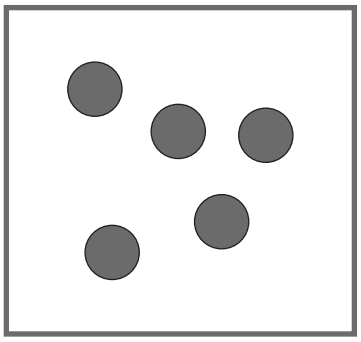


Figure 1.8. Separation of salt and water can be done in two ways: **evaporation** *produces water vapor which is released to the atmosphere, while* **distillation** *involves collection of condensed water vapor (returning to liquid state). Salt remains in the original container in both processes.*

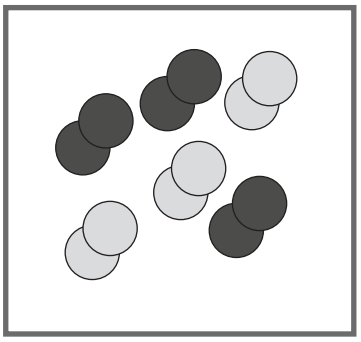
LESSON 1

SHARPENING YOUR SKILLS

I. **Directions:** On a separate sheet of paper, identify each box if it contains an element, compound, or mixture.



BOX A



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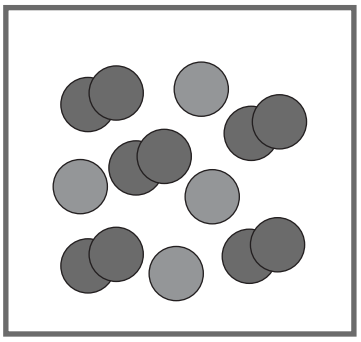
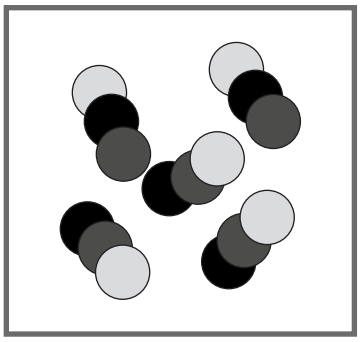
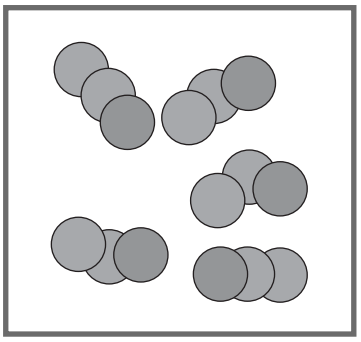


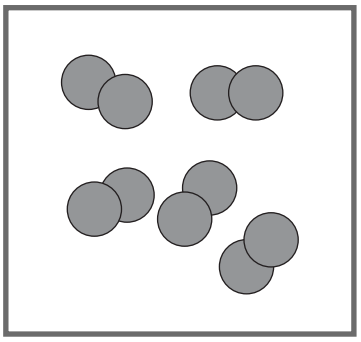
BOX G



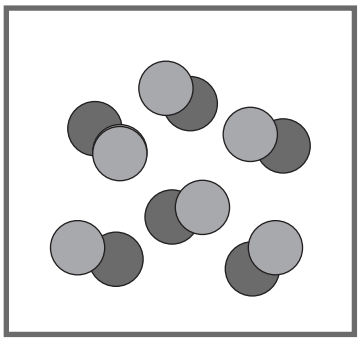
BOX B



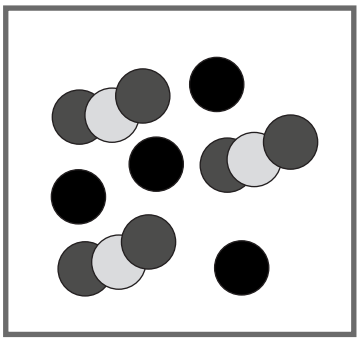
BOX E



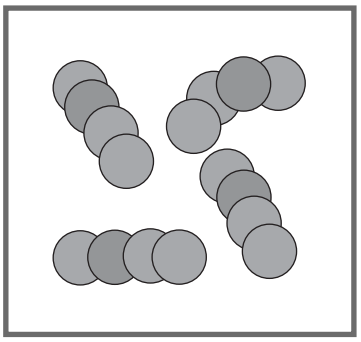
BOX H



BOX C



BOX F



BOX I

Another classification of homogeneous mixtures (solutions) is acids and bases. **Acids,** from the Latin word *acidus*, are sour mixtures. We are familiar with common sour taste of vinegar (contains acetic acid) and citrus fruits such as lemons and grapefruits (contain citric acid and ascorbic acid). When placed in water, acids produce hydrogen ions (H+) which gives its sour taste and the ability to corrode (form rust) metals.

Figure 1.9. Common household acids (carbonated beverages, vinegar, citrus fruits, juices, ketchup).

Bases, on the other hand, are bitter mixtures. The slippery feel of bases is the reason why soaps (a common base mixture at home) are also slippery. When placed in water, bases form hydroxide ions (OH-). Other examples of bases are antacids and drain openers (liquid sosa).

Figure 1.10. Common household bases (baking soda, soap, detergents, bleach).

Elements, too, can be further classified as metals or nonmetals. Separation of these substances can be seen in the periodic table.

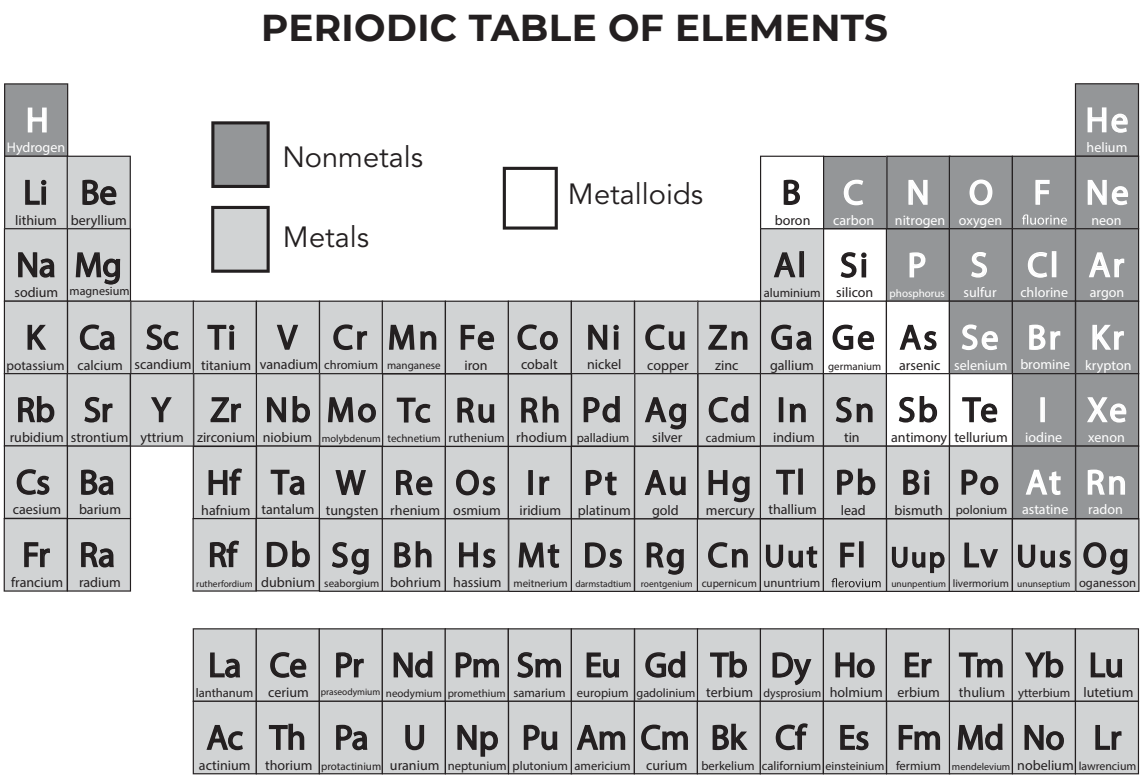


Figure 1.11. Metals, metalloids, and nonmetals in the periodic table. Metalloids are intermediates of metals and nonmetals, which means they have properties of both substances. "Based on IUPAC Periodical Table of Elements, (2018, December 1). https://iupac.org/what-we-do/periodic-table-of-elements/"

The easiest way to differentiate metals and nonmetals is by comparing their physical properties. Simply speaking, a general rule states that the properties of metals are opposite of nonmetals.

Metals have a shining surface (gold, silver, copper) while nonmetals are **dull** (carbon, silicon, nitrogen). This property is called **metallic luster.**

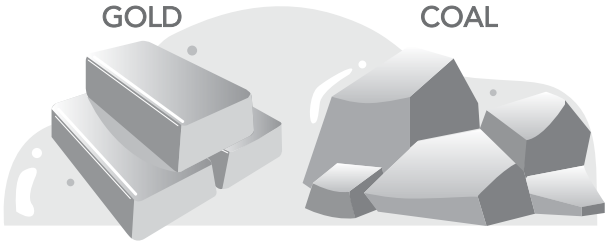


Figure 1.12. Gold, a metal, has a shining surface, while carbon, a nonmetal, from coal has a dull surface.

In general, metals have comparably high **hardness**. Nonmetals, in contrast, are **brittle**.

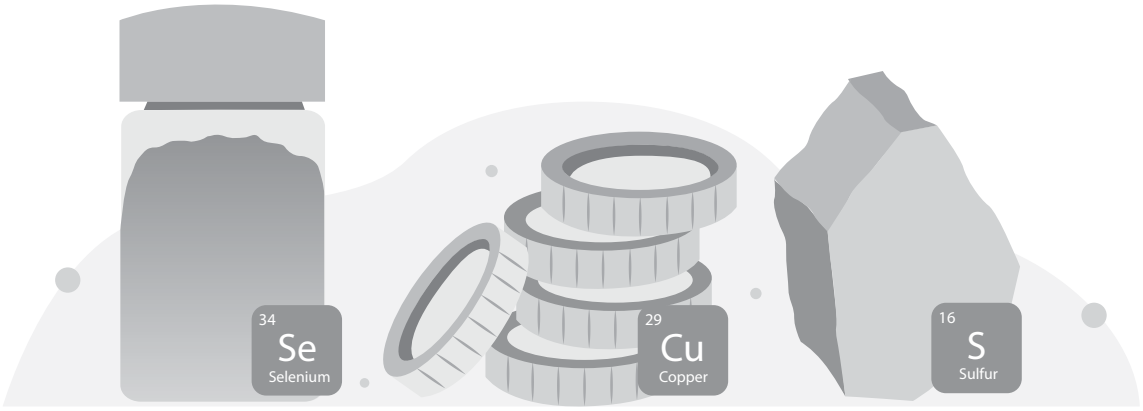


Figure 1.13. Hardness of metals and brittleness of nonmetals.

Some metals such as gold, iron, and zinc can be beaten into thin sheets. This property is called **malleability.**

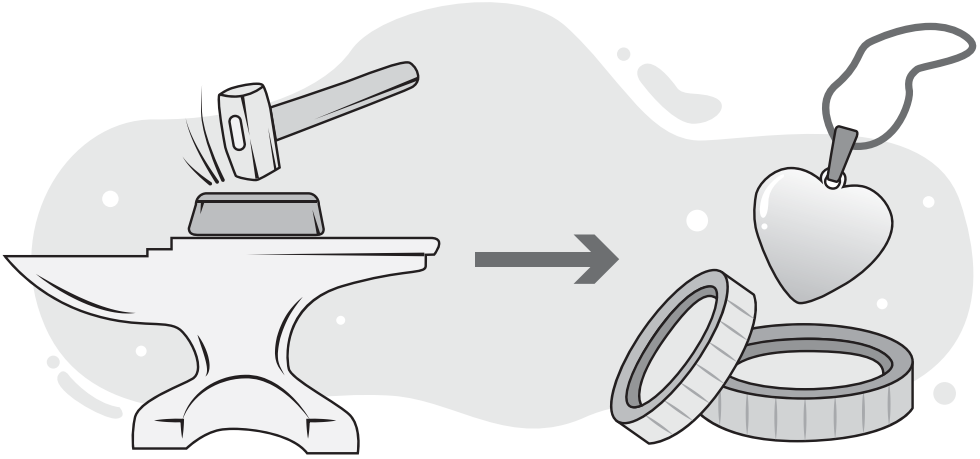
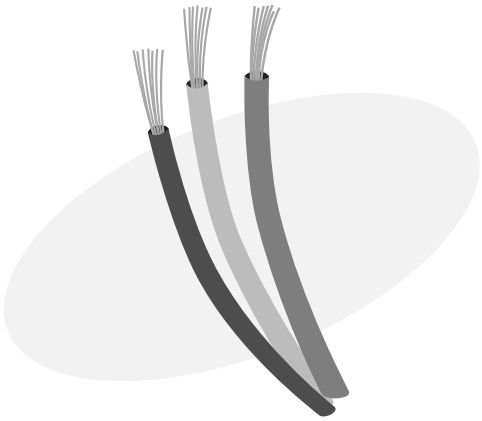


Figure 1.14. Gold can be hammered into thin sheets for the production of coins and jewelry.

Metals such as copper, iron, and aluminum can be drawn into wires, a property known as **ductility.** Metals have high **boiling and melting points** which make them good conductors of heat **(thermal conductivity)**. Silver and copper are best conductors of heat. Meanwhile, nonmetals are **insulators** of both heat and electricity.



Metals like iron, tin, and copper make sounds when struck to a hard surface, just like those school bells. This property is **sonority.**

Figure 1.15. Copper is commonly used in making wires due to its high ductility and electrical and thermal conductivity.

These are the general differences of metals and nonmetals. However, there are exceptions:

1. All metals, except mercury, exist as solids at room temperature. Gallium and cesium have low melting points and can easily melt on your hand.
2. Iodine is a nonmetal but it is lustrous.
3. Diamond, the hardest natural substance with a high melting and boiling point, is a nonmetal. It is one of the physical forms (allotrope) of carbon.
4. Graphite, another allotrope of carbon, is a known conductor of electricity.
5. Alkali metals (lithium, sodium, potassium) are so soft that they can be cut with a knife. They have low densities and low melting points.

II. **Directions:** On a separate sheet of paper, complete the table below by writing the differences between metals and nonmetals based on their properties. An example is provided in the table below.

PROPERTY	METALS	NONMETALS
1. Luster	lustrous	dull
2.		
3.		
4.		
5.		
6.		
7.		
8.		

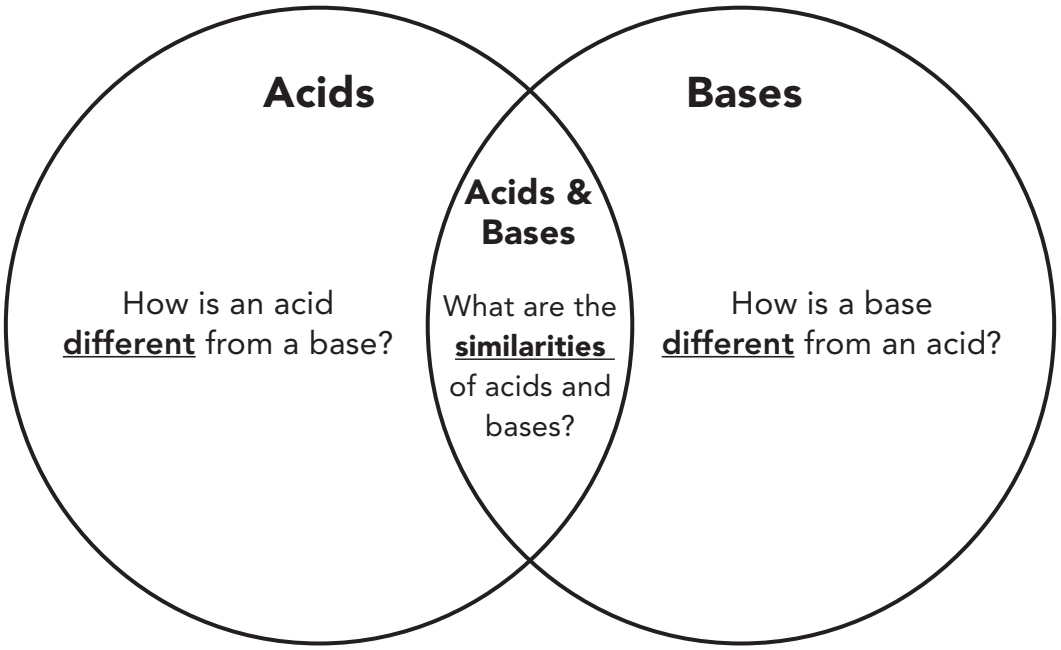
LESSON 1

TREADING THE ROAD TO MASTERY

I. **Directions:** On a separate sheet of paper, identify if the underlined word/s refer to a **CO** for compound, **HO** for homogeneous mixture, **HE** heterogeneous mixture, **ME** for metal, and **NM** for nonmetal. Answers can be repeated.

_____ 1. **Oil, water, and dishwashing liquid** are placed in a glass.
_____ 2. **Silver** is a lustrous material.
_____ 3. **Sodium chloride** in water turns into sodium and chlorine ions.
_____ 4. Sweet water **(sugar in water)** is evaporated to get sugar crystals.
_____ 5. A box of **pizza with pepperoni and mushrooms**
_____ 6. **Oxygen** is used for breathing and sustaining life.
_____ 7. **Excess juice powder** in water that settled at the bottom of a container
_____ 8. **Iron** in steel blocks easily rusts when exposed to large amounts of acid.

II. **Directions:** Compare and contrast acids and bases using the Venn diagram below. Write your answers on a separate sheet of paper.



LESSON 2

SETTING THE PATH

HOW CAN I USE MATTER IN EVERYDAY LIFE?

At the end of this lesson, you will be able to:

- describe the roles of matter in improving life (LS2SC-PS-PSF-LE/AE/JHS-1); and
- identify the application of matter in everyday life (LS2SC-PS-PSF-LE/AE/JHS-1).

LESSON 2

TRYING THIS OUT

1. *Question:* Imagine an old woman walking along a street then runs out of breath. What do you think would happen?

    - *Follow-up Question:* What if a first-aider with an oxygen tank attends to the old woman? What do you think would happen?

2. *Question:* Imagine a plant on a pot with soil that's dried after being exposed to the sun after several days. What do you think would happen?

    - *Follow-up Question:* What if a gardener notices the plant and starts pouring water to it? What do you think would happen?

3. *Question:* Imagine your favorite adobo has too much soy sauce. What would it taste like?

    - *Follow-up Question:* What if your mom/dad adds vinegar to it? What do you think would happen?

LESSON 2

UNDERSTANDING WHAT YOU DID

Undeniably so, matter has been able to help us in our everyday life. It is able to improve our daily living, from the purest substances to the most complex basic substances.

Krypton is a noble gas in the periodic table. It is present in the air we breathe at very small amounts on Earth, and even smaller in Mars. Sir William Ramsay and Morris Travers found small amounts of it while studying liquefied air. Krypton is found in some photographic flashes and some fluorescent light bulbs (with argon). It is also used in making signs with yellowish-green glows.

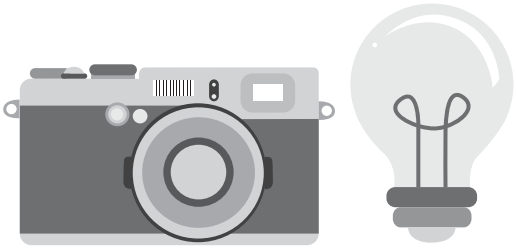


Figure 2.1. Krypton is found in photographic flashes and light bulbs.

Aluminum, has been used to create cans for soft drinks and to make kitchen utensils and siding for houses. Discovered by Hans Christian Oersted in 1787, this metal has been used for different functions: conductivity, thin foils for food wrapping, and airplane parts. It is also one of the most abundant metals in the Earth's crust.

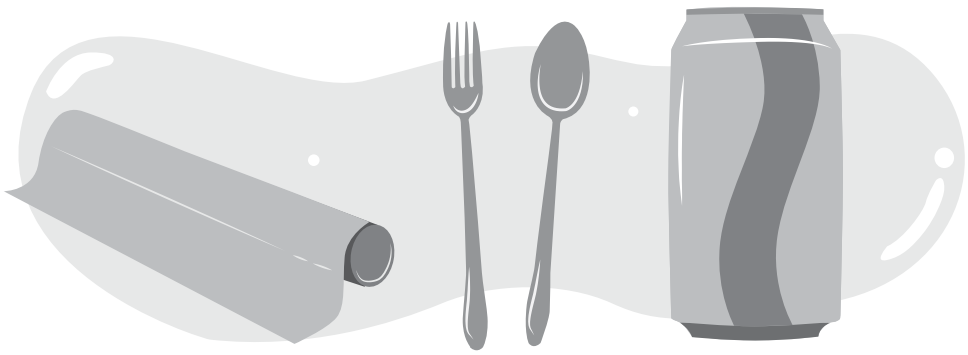


Figure 2.2. Aluminum in thin foils, kitchen utensils, and softdrink cans.

Figure 2.3. Chlorine in bleach and other cleaning products.

Chlorine, from the Greek word *chloros* which means greenish yellow, is unique because it is an element that is never found by itself in nature. Instead, it is combined with almost all other elements. First discovered by Carl Wilhelm Scheele in 1774 and credited as an element by Sir Humphry Davy in 1810, this halogen element has been used in the manufacturing of laundry bleach and cleaning products. Chlorine is also added to the water supply to provide clean drinking water for people.

Copper, from the Latin word *cuprum*, which means from the island of Cyprus, is a highly conductive metals. Copper has also been found to be corrosion-resistant in seawater, moisture, and air, which makes it effective in various uses such as coin-making, water pipes, and jewelry. Since copper is a soft metal, it has to be mixed with other metals. This mixture, called an **alloy**, makes copper more durable and stronger. Examples of copper alloys are bronze and brass.

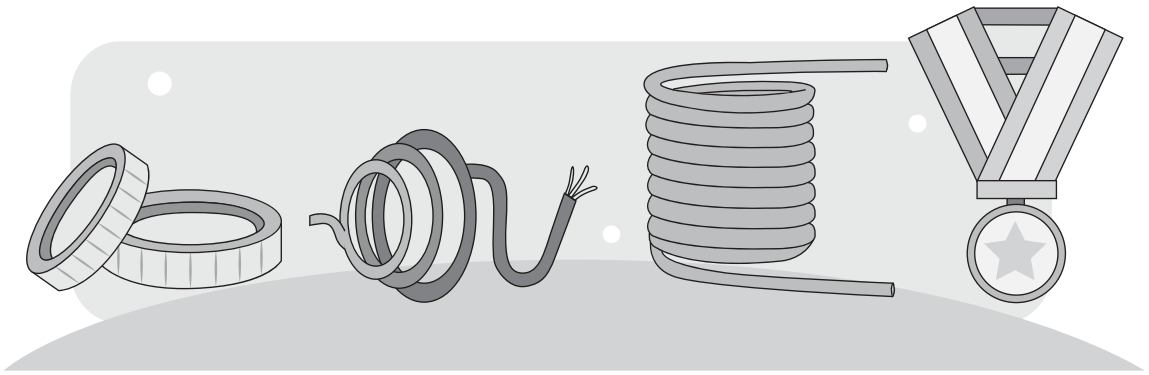


Figure 2.4. Copper in coins, pipes, and bronze.

Dihydrogen monoxide **(H_2O)**, or simply **water**, is the most important compound in our life. Basically, it helps us survive even if everything else is gone (our body is made up of more than 60% water).

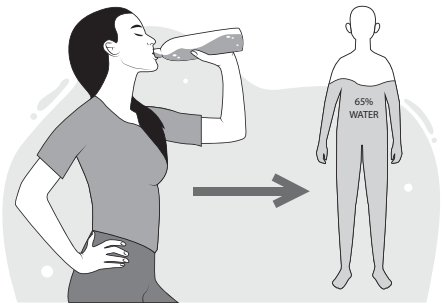


Figure 2.5. Clean drinking water as a basic necessity.

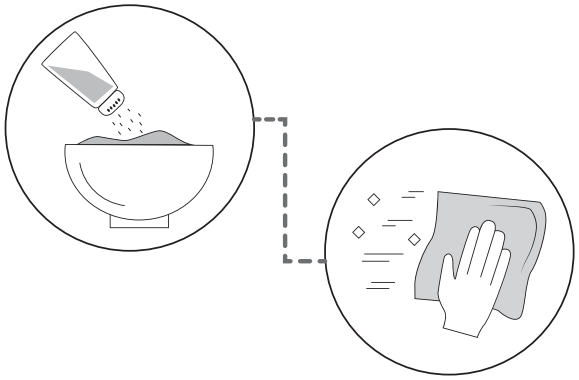


Figure 2.6. Table salt is collected from minerals (called halite) or salt ponds. It can be used for cooking and cleaning.

Table salt, sodium chloride **($NaCl$)**, is used in cooking and cleaning. This compound is also abundant in minerals underwater, sodium chloride has more than 14,000 specific uses, including food preservation.

Baking Soda, sodium hydrogen carbonate or sodium bicarbonate **($NaHCO_3$)**, is a popular baking ingredient. Aside from this, baking soda can also be used as a cleaning agent, whitening agent, and odor remover (deodorizer).

Figure 2.7. Baking soda is used for preparing breads and pastries.

Another cooking agent, commonly used as a sweetener, is sucrose or **table sugar ($C_{12}H_{22}O_{11}$).**

Figure 2.8. Baking soda is used for oral healthcare.

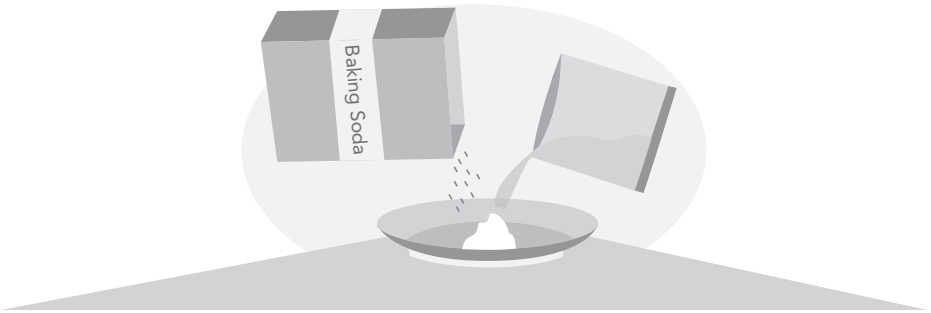


Figure 2.9. Baking soda, when mixed with water, can be used as a deodorizer by eliminating unwanted odor in a certain location.

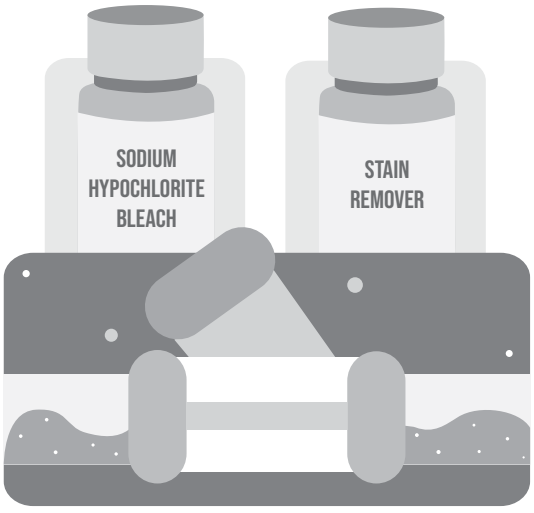


Figure 2.10. Sodium hypochlorite is used to clean metal/pipe stains.

Sodium Hypochlorite or **bleach (NaClO)** is used as a stain remover, disinfectant, and deodorant. It is also used to treat water and to reduce skin damage.

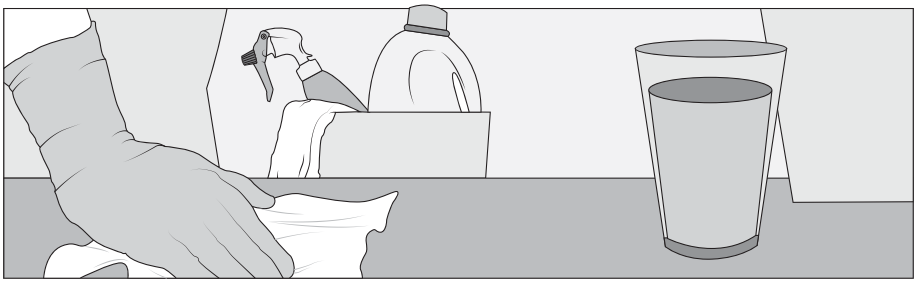


Figure 2.11. Sodium hypochlorite is used as disinfectant to eliminate bacteria and other disease-causing organisms.

Hydrogen Peroxide (H_2O_2) is used as a germicidal agent and is the only one of its kind that is composed of oxygen and water. It is an alternative to bleach and is a potent disinfectant. It is used in personal hygiene products like mouthwash and toothpaste, and is also used to lighten hair. It is likewise used to sanitize meat and other food products.

Figure 2.12. Hydrogen peroxide is used as bleach alternative due to its germicidal properties.

Figure 2.13. Hydrogen peroxide, as a germicidal, can be used to treat acne at certain concentrations.

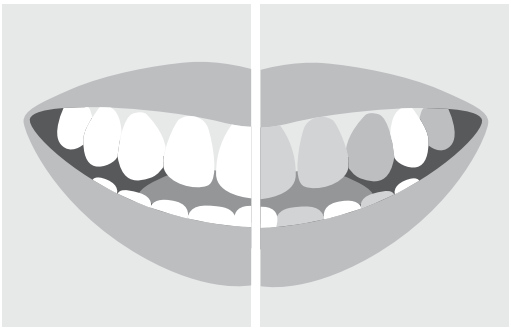


Figure 2.14. Hydrogen peroxide is used to lighten hair and treat teeth discoloration.

LESSON 2

SHARPENING YOUR SKILLS

I. On a separate sheet of paper, match the given items in Column A with the classification of substance in Column B and its use in Column C.

ELEMENT OR COMPOUND	USE	COLUMN A	COLUMN B	COLUMN C
		1. Aluminum	**A.** Element	**a.** Flourescent light bulbs
		2. Water	**B.** Compound	**b.** Thin foil
		3. Sodium Chloride		**c.** Water disinfectant
		4. Copper		**d.** Brassmaking
		5. Sucrose		**e.** Drinking
		6. Krypton		**f.** Whitening agent
		7. Sodium Hydrogen Carbonate		**g.** Minerals
		8. Chlorine		**h.** Sweetener
		9. Sodium Hypochlorite		**i.** Stain remover
		10. Hydrogen Peroxide		**j.** Mouthwash

Acids and bases have also been used in our homes and in manufacturing of other products.

TABLE 1. CHEMICAL NAME, COMMON NAME, AND USES OF COMMON ACIDS

CHEMICAL NAME	COMMON NAME	USES
hydrochloric acid, HCl	muriatic acid (used in pools) and stomach acid is HCl	Used in cleaning (refining) metals, in maintenance of swimming pools, and for household cleaning
sulfuric acid, H_2SO_4		Used in car batteries, and in the manufacture of fertilizers
nitric acid, HNO_3		Used in manufacture of fertilizers and explosives as well as extraction of gold
acetic acid, $HC_2H_3O_2$	vinegar	Used in manufacture of vinegar
carbonic acid, $H2CO_3$	responsible for the "fizz" in carbonated drinks	Used in production of carbonated drinks
citric acid, $C_6H_8O_7$		Used in food and dietary supplements; also added as an acidulant in creams, gels, liquids, and lotions
acetylsalicylic acid, $C_6H_4(OCOCH_3)CO_2H$	aspirin	Used as active ingredient in aspirin

TABLE 2. CHEMICAL NAME, COMMON NAME, AND USES OF COMMON BASES

CHEMICAL NAME	COMMON NAME	USES
sodium hydroxide, NaOH	lye or caustic soda	Used in the manufacture of soaps and detergents; the main ingredient in oven and drain cleaners
potassium hydroxide, KOH	lye or caustic potash	Used in the production of liquid soaps and soft soaps; used in alkaline batteries
magnesium hydroxide, $Mg(OH)_2$	milk of magnesia	Used as an ingredient in laxatives, antacids, and deodorants; used in the neutralization of acidic wastewater
calcium hydroxide, $Ca(OH)_2$	slaked lime	Used in the manufacture of cement and lime water; added to neutralize acidic soil
aluminum hydroxide		Used in water purification and as an ingredient in antacids
ammonia, NH_3		Used as a building block for the synthesis of many pharmaceutical products and in many commercial cleaning products; also in the manufacture of fertilizers

II. On a separate sheet of paper, match the given item in Column A with the classification of substance in Column B and its use in Column C.

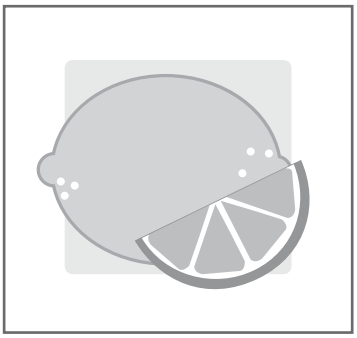
ACID OR BASE	USE	COLUMN A	COLUMN B	COLUMN C
		1. H_2SO_4	**A.** Acid	**a.** Car batteries
		2. NaOH	**B.** Base	**b.** Fertilizers
		3. $HC_2H_3O_2$		**c.** Vinegar
		4. $C_6H_8O_7$		**d.** Softdrinks
		5. $Mg(OH)_2$		**e.** Food supplement
		6. $Ca(OH)_2$		**f.** Soaps
		7. H_2CO_3		**g.** Alkaline batteries
		8. KOH		**h.** Antacid
		9. HNO_3		**i.** Cement
		10. NH_3		**j.** Medicine

LESSON 2

TREADING THE ROAD TO MASTERY

Directions: Explore your home and identify three acids, bases, metals, and nonmetals. Paste photos of your answers and explain how it improves your life. Follow the format below. Show your answers on a separate sheet of paper.

ACIDS



It improves my life by...

_____

_____

_____

_____

_____

It improves my life by...

_____

_____

_____

_____

_____

It improves my life by...

_____

_____

_____

_____

_____

LESSON 3

SETTING THE PATH

HOW DOES MATTER BECOME DANGEROUS?

At the end of this lesson, you will be able to:

- determine the risks and hazards of common substances and mixtures at work (LS4LC-PE-PSC-AE/JHS-9); and
- describe how to observe health and safety measures at work (LS4LC-PE-PSC-AE/JHS-12).

LESSON 3

TRYING THIS OUT

Directions: On a separate sheet of paper, identify the given signs and symbols by writing the corresponding letter on the blank before each number.

_____ **1.** Elevator
_____ **2.** Wheel chair access
_____ **3.** Use the bins
_____ **4.** Train stations
_____ **5.** Public toilet
_____ **6.** First aid
_____ **7.** Escalator
_____ **8.** No bicycles
_____ **9.** Information
_____ **10.** Hospital
_____ **11.** Waiting room
_____ **12.** Children crossing
_____ **13.** No smoking

A. 

B. 

C. 

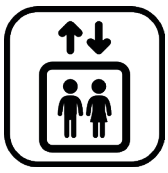
D. 

E. 

F. 

G. 

H. 

I. 

J. 

K. 

L. 

M. 

- *Question:* What is the purpose of having signs and symbols?
- *Question:* If you see the sign for number 1, what are you expected to do?
- *Question:* If you see the sign for number 7, how will it help you?

LESSON 3

UNDERSTANDING WHAT YOU DID

There are common household materials which contain harmful chemicals. These can be present in your kitchen, in your bedroom, or even inside your comfort room.

Here are some of the most dangerous household chemicals, including the ingredients to watch for and the nature of the risk.

1. **Air Fresheners**

Air fresheners may contain any of a number of dangerous chemicals. Formaldehyde irritates the lungs and mucous membranes and may cause cancer. Petroleum distillates are flammable; irritate the eyes, skin, and lungs; and may cause fatal pulmonary edema in sensitive individuals. Some air fresheners contain p-dichlorobenzene, which is a toxic irritant. The aerosol propellants used in some products may be flammable and may cause nervous system damage if inhaled.

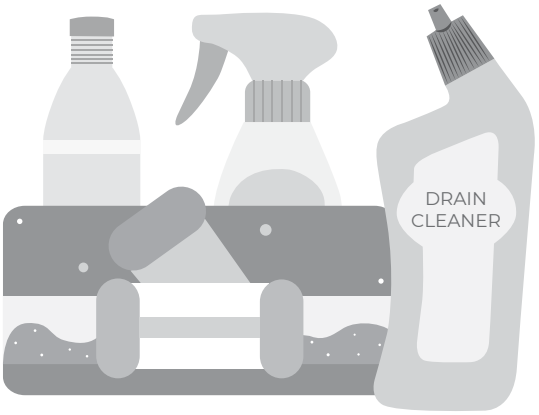
2. **Ammonia**

Ammonia is a volatile compound that can irritate the respiratory system and mucous membranes if inhaled, can cause chemical burn if spilled on skin. It will react with chlorinated products (e.g., bleach) to produce deadly chloramine gas.

3. **Antifreeze**
   Antifreeze is ethylene glycol, a chemical which is poisonous if swallowed. Inhaling it can cause dizziness while drinking it can cause serious brain, heart, kidney, and other internal organ damage. Ethylene glycol has a sweet flavor, so it is attractive to kids and pets. Antifreeze typically contains a chemical to make it taste bad, but the flavor is not always a sufficient deterrent. The sweet smell is enough to lure young children and pets.

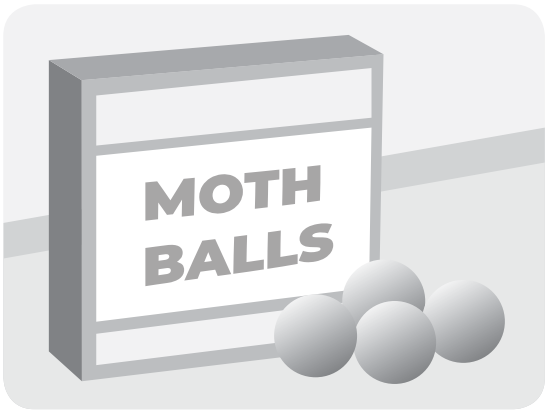
4. **Bleach**
   Household bleach contains sodium hypochlorite, a chemical that can cause irritation and damage to the skin and respiratory system if inhaled or spilled on the skin. Never mix bleach with ammonia or with toilet bowl cleaners or drain cleaners as dangerous and possibly deadly fumes may be produced.

5. **Drain Cleaners**
   Drain cleaners typically contain lye (sodium hydroxide) or sulfuric acid. Either chemical is capable of causing an extremely serious chemical burn if splashed on the skin. They are toxic to drink. Splashing drain cleaner in the eyes may cause blindness.

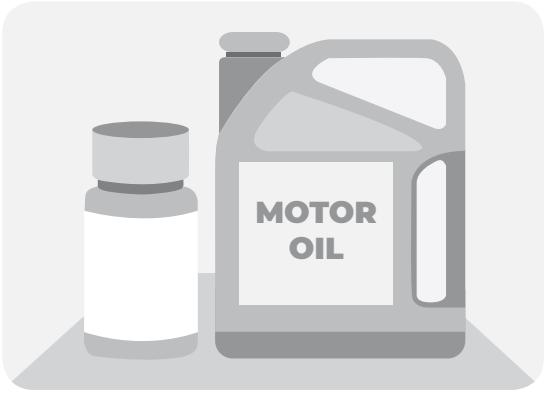


6. **Laundry Detergent**
   Laundry detergents contain a variety of chemicals. Ingestion of cationic agents may cause nausea, vomiting, convulsion, and coma. Non-ionic detergents are irritants. Many people experience chemical sensitivity to dyes and perfumes present in some detergents.

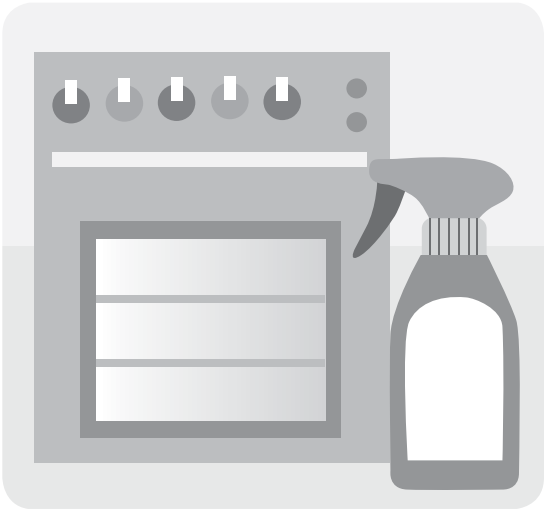
7. **Mothballs**
   Mothballs are either p-dichlorobenzene or naphthalene. Both chemicals are toxic and known to cause dizziness, headaches, and irritation to the eyes, skin, and respiratory system. Prolonged exposure can lead to liver damage and cataract formation.



8. **Motor Oil**
   Exposure to the hydrocarbons in motor oil can cause cancer. Many people are unaware that motor oil contains heavy metals, which can damage the nervous system and other organ systems.



9. **Oven Cleaner**
   The danger from oven cleaner depends on its composition. Some oven cleaners contain sodium hydroxide or potassium hydroxide, which are extremely corrosive strong bases. These chemicals can be deadly if swallowed. They can cause chemical burns on the skin or in the lungs if the fumes are inhaled.



10. **Rat Poison**
    Rat poisons (rodenticides) are less lethal than they used to be, but remain poisonous to people and pets. Most rodenticides contain warfarin, a chemical which causes internal bleeding if ingested.

11. **Windshield Wiper Fluid**
    Wiper fluid is toxic if you drink it, plus some of the poisonous chemicals are absorbed through the skin, so it is toxic to touch. Swallowing ethylene glycol can cause brain, heart, and kidney damage, and possibly death. Inhalation can cause dizziness. The methanol in wiper fluid can be absorbed through the skin, inhaled, or ingested. Methanol damages brain, liver, and kidneys and can cause blindness. The isopropyl alcohol acts as a central nervous system depressant, causing drowsiness, unconsciousness, and potentially death.

Containers of household materials may include the following graphic image based on how hazardous the product is. This graphic image is called "pictograms." **Pictograms** are graphic images that immediately show the user of a hazardous product what type of hazard is present. In the figure, an exclamation mark often indicates caution or the need for strict attention. A Material Safety Data Sheet (MSDS) may contain nine pictograms, as seen in Figure 3.6 in the next page.

	**EXPLODING BOMB** (For explosion or reactivity hazards)		**FLAME** (For fire hazards)		**FLAME OVER CIRCLE** (For oxidizing hazards)
	**GAS CYLINDER** (For gasses under pressure)		**CORROSION** (For corrosive damage to metals, as well as skin, eyes)		**SKULL AND CROSSBONES** (Can cause death and toxicity with short exposure to small amounts.)
	**HEALTH HAZARD** (May cause or suspected of causing serious health effects)		**EXCLAMATION MARK** (May cause less serious health effects or damage the ozone layer)		**ENVIRONMENT*** (May cause damage to the aquatic environment)
	**BIOHAZARDOUS INFECTIOUS MATERIALS** (For organisms or toxins that can cause diseases in people or animals)				

*** The Globally Harmonized System (GHS) also defines an environmental hazards group. This group (and its classes) was not adopted in Workplace Hazardous Materials Information System (WHMIS) 2015. However, you may see the environmental classes listed on labels and Safety Data Sheets (SDSs). Including information about environmental hazards is allowed by WHMIS 2015.**

Figure 3.6. MSDS pictograms.

Hazardous products must be handled cautiously! Read labels and follow directions carefully. Words to look for: **DANGER – WARNING – CAUTION**

POISON	can injure or kill if absorbed through the skin, ingested or inhaled.
TOXIC	can cause injury or death if swallowed, inhaled, or absorbed through the skin.
IRRITANT	causes soreness or swelling of skin, eyes, mucous membranes, or respiratory system.
FLAMMABLE	easily catches fire and tends to burn rapidly.
FLAMMABLE LIQUID	has a flash point below 140°F (100°F for US DOT purposes).
COMBUSTIBLE LIQUID	has a flash point from 140°F (100°F for US DOT purposes) to 200°F
CORROSIVE	a chemical or its vapors that can destroy materials or any living tissue.

LESSON 3

SHARPENING YOUR SKILLS

I. **Directions**: On a separate sheet of paper, write **H** if the following household materials are hazardous and **NH** if they are not hazardous.

_____ **1.** Cologne
_____ **2.** Detergent soap
_____ **3.** Vinegar
_____ **4.** Fish sauce
_____ **5.** Shrimp paste
_____ **6.** Liquid Sosa
_____ **7.** Ammonia
_____ **8.** Urea
_____ **9.** Malathion
_____ **10.** Honey

II. **Directions**: Find the hazardous effect of household materials in Column A in Column B. Write your answer on a separate sheet of paper.

_____	**1.** Motor oil	**a.**	Internal organ damage
_____	**2.** Moth balls	**b.**	Nervous system damage
_____	**3.** Bleach	**c.**	Deadly fumes
_____	**4.** Air freshener	**d.**	Respiratory damage
_____	**5.** Anti freeze	**e.**	Irritates lung

LESSON 3

TREADING THE ROAD TO MASTERY

Directions: On a seperate sheet of paper, determine whether the following household materials are **Corrosive**, **Flammable**, or **Poisonous**.

_____ **1.** Muriatic acid
_____ **2.** Rat killer
_____ **3.** Gasoline
_____ **4.** Diesel
_____ **5.** Bleach
_____ **6.** Dish washing liquid
_____ **7.** Battery fluid
_____ **8.** Drain cleaner
_____ **9.** Fabric softener
_____ **10.** Butane

MODULE 5

DON'T FORGET

- Matter is anything that has mass and occupies space. Matter can exist in three forms or phases: solids, liquids, or gases.
- A substance is defined as matter which is homogeneous and of which all parts are alike. Substances are either elements or compounds.
- Elements are pure substances which cannot be decomposed into simpler substances by chemical means.
- Compounds are pure substances that are composed of two or more elements.
- Mixtures are defined as matter which consists of two or more substances mixed together.
- A mixture can be either homogeneous or heterogeneous.
- Compounds can be classified further as metallic or nonmetallic based on their properties.
- Mixtures can be classified further as acidic or basic based on their properties.

- Matter has been used to improve daily life.
- A Material Safety Data Sheet (MSDS) provides basic information on a material or chemical product. It contains information on the properties and potential hazards of the material, how to use it safely, and what to do if there is an emergency.

MODULE 5
EXPLORE MORE

For additional activities related to the topics of this module, these resources may be helpful:

Acid-Base Reactions in Solutions
https://www.youtube.com/watch?v=ANi709MYnWg

Elements and Compounds: Science for Kids
https://www.youtube.com/watch?v=avgFqlNML5o

Homogeneous and Heterogeneous Mixtures
https://www.youtube.com/watch?v=msSclkLW4Lk

Matter: CrashCourse Kids
https://www.youtube.com/watch?v=wyRy8kowyM8

Metals and Nonmetals: Physical Properties
https://www.youtube.com/watch?v=AJbe5THaNuU

MSDS, now the SDS
https://www.youtube.com/watch?v=sn7nvCY0ocY&t=9s

What is Matter?
https://www.youtube.com/watch?v=QQsybALJoew

What's Matter? CrashCourse Kids
https://www.youtube.com/watch?v=ELchwUIlWa8

MODULE 5

REACH THE TOP

You are almost done! Answer the questions by writing the letter of the best answer on a separate sheet of paper.

1. It is anything that occupies space and has mass.

   A. matter
   B. chemistry
   C. vacuum
   D. air

2. Which state of matter has atoms that are loosely packed and have little space to move?

   A. solid
   B. liquid
   C. gas
   D. none of the above

3. Which state of matter has a large space between its atoms?

   A. solid
   B. liquid
   C. gas
   D. none of the above

4. It can either be elements or compounds.

   A. matter
   B. mixture
   C. nonmetals
   D. substance

5. Which substance can be monatomic, diatomic, or polyatomic?

   A. homogeneous
   B. matter
   C. element
   D. compound

6. What refers to the combination of two or more elements?

   A. compound
   B. substance
   C. mixture
   D. solution

7. Which of the following mixtures is heterogeneous?

A. salt and water
B. chocolate chip cookie
C. clean air
D. coins

8. Which of the following mixtures is homogeneous?

A. oil and water
B. ice and water
C. sugar and water
D. fruit salad

9. Which of the following is NOT a property of acids?

A. sour taste
B. slippery texture
C. produces hydrogen ions
D. corrodes metals

10. What is the intermediate of metals and nonmetals?

A. alloy
B. stainless steel
C. metalloid
D. brass

11. Which acid is used for cleaning pools?

A. carbonic acid
B. sulfuric acid
C. citric acid
D. hydrochloric acid

12. Which acid is used in the production of vinegar?

A. acetylsalicylic acid
B. nitric acid
C. acetic acid
D. carbonic acid

13. Which base is used in oven and drain cleaners?

A. sodium hydroxide
B. aluminum hydroxide
C. ammonia
D. potassium hydroxide

14. Which base is used in antacids?

A. ammonia
B. magnesium hydroxide
C. aluminum hydroxide
D. calcium hydroxide

15. Which of the following does an MSDS prevent?

A. hazard
B. risk
C. A and B
D. none of the above

16. Which of the following is not a hazard for chemicals?

A. health hazard
B. driving hazard
C. fire hazard
D. reactivity hazard

17. How many pictograms exist in the GHS classification for MSDS?

A. 3
B. 6
C. 9
D. 12

18. This section provides an overview of the physical and health hazard risks associated with using the product.

A. first aid measures
B. chemical name
C. handling and storage
D. hazards identification

19. This section provides general procedures on how to handle flammable materials.

A. hazards identification
B. pictogram
C. fire-fighting measures
D. exposure controls, personal protection

20. This section provides a description of the material's appearance.

A. exposure controls, personal protection
B. handling and storage
C. pictogram
D. physical and chemical properties

ANSWER KEY

PRE-ASSESSMENT

PAGE 2

1. A
2. B
3. C
4. D
5. A
6. B
7. C
8. D
9. A
10. B
11. C
12. D
13. A
14. B
15. C

LESSON I: HOW IS MATTER DIFFERENT FROM EACH OTHER?

SHARPENING YOUR SKILLS

PAGE 13

ACTIVITY I

- **BOX A**: Element
- **BOX B**: Mixture
- **BOX C**: Compound
- **BOX D**: Mixture
- **BOX E**: Compound
- **BOX F**: Mixture
- **BOX G**: Mixture
- **BOX H**: Element
- **BOX I**: Compound

ACTIVITY II

PROPERTY	METALS	NONMETALS
1. Luster	lustrous	dull
2. Hardness	hard	brittle
3. Malleability	malleable	non-malleable
4. Ductility	ductile	non-ductile
5. Melting point	high	low
6. Boiling point	high	low
7. Sonority	sonorous	non-sonorous
8. Electrical conductivity	conductive	insulator

ANSWER KEY

TREADING THE ROAD TO MASTERY

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ACTIVITY I

1. HE
2. ME
3. CO
4. HO
5. HE
6. NM
7. HE
8. ME

ACTIVITY II

- **Acids** – sour taste, produce hydrogen/hydronium ions, can rust metals
- **Bases** – bitter taste, slippery feel, produce hydroxide ions
- **Acids and Bases** – pure substances, compounds, chemical separation

ANSWER KEY

LESSON II: HOW CAN I USE MATTER IN EVERYDAY LIFE?

SHARPENING YOUR SKILLS

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ACTIVITY I

ELEMENT OR COMPOUND	USE	COLUMN A	COLUMN B	COLUMN C
A	B	1. Aluminum	A. Element	a. Flourescent light bulbs
B	E	2. Water	B. Compound	b. Thin foil
B	G	3. Sodium Chloride		c. Water sprinkler
A	D	4. Copper		d. Brassmaking
B	H	5. Sucrose		e. Drinking
A	A	6. Krypton		f. Whitening agent
B	F	7. Sodium Hydrogen Carbonate		g. Minerals
A	C	8. Chlorine		h. Sweetener
B	I	9. Sodium Hypochlorite		i. Stain remover
B	J	10. Hydrogen Peroxide		j. Mouthwash

ANSWER KEY

ACTIVITY II

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ELEMENT OR COMPOUND	USE	COLUMN A	COLUMN B	COLUMN C
A	A	1. H_2SO_4	A. Acid	a. Car batteries
B	F	2. NaOH	B. Base	b. Fertilizers
A	C	3. $HC_2H_3O_2$		c. Vinegar
A	E	4. $C_6H_8O_7$		d. Softdrinks
B	H	5. $Mg(OH)_2$		e. Food supplement
B	H	6. $Ca(OH)_2$		f. Soaps
A	D	7. H_2CO_3		g. Alkaline batteries
B	G	8. KOH		h. Antacid
A	B	9. HNO_3		i. Cement
B	Z	10. NH_3		j. Medicine

TREADING THE ROAD TO MASTERY

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- 1 point for each correct answer

ANSWER KEY

LESSON III: HOW DOES MATTER BECOME DANGEROUS?

SHARPENING YOUR SKILLS

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ACTIVITY I

1. H
2. H
3. NH
4. NH
5. NH
6. H
7. H
8. H
9. H
10. NH

ACTIVITY II

1. B
2. D
3. C
4. E
5. A

TREADING THE ROAD TO MASTERY

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1. Corrosive
2. Poisonous
3. Flammable
4. Flammable
5. Poisonous
6. Poisonous
7. Corrosive
8. Corrosive
9. Poisonous
10. Flammable

ANSWER KEY

REACH THE TOP

PAGE 45

1. A
2. B
3. C
4. D
5. C
6. A
7. B
8. C
9. B
10. C
11. D
12. C
13. A
14. C
15. C
16. B
17. C
18. D
19. C
20. D

GLOSSARY

Chemistry	the branch of science that deals with the identification of the substances of which matter is composed
Hazard	a danger or risk
Importance	the state or fact of being of great significance or value
Industry	a particular form or branch of economic or commercial activity
Matter	has mass and occupies space
Precaution	a measure taken in advance to prevent something dangerous, unpleasant, or inconvenient from happening
Safety	the condition of being protected from or unlikely to cause danger, risk, or injury
Substance	a particular kind of matter with the same properties
Uniform	remaining the same in all cases and at all times; unchanging in form or character

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