Grade 8 Science Remote Learning   Matter

8.P.1.1 **Classify matter as elements, compounds, or mixtures based on how the atoms are packed together in arrangements.**

Day 20	Use the A to Z Mixing Matter Book as your Resource text for the lessons that follow. Quiz Passage
Day 21	An Atom Apart Reading Passage and Questions that follow.
Day 22	Complete the Elements, Compounds, and Mixtures Worksheet.

8.P.1.2 Explain how the physical properties of elements and their reactivity have been used to produce the current model of the Periodic Table of elements.

Day 23	The Periodic Table and Elements. Read the Text Tuesday Passage and answer the questions that fellow.
Day 24	Use the Periodic Table to complete the Who Am I? Handout

8.P.1.3 Compare physical changes such as size, shape and state to chemical changes that are the result of a chemical reaction to include changes in temperature, color, formation of a gas or precipitate.

Day 25	Ways Matter Can Change Worksheet
Day 26	Physical Properties & Changes Worksheet

Grade 8 Science Remote Learning Matter

8.P.1.4 Explain how the idea of atoms and a balanced chemical equation support the law of conservation of mass.

Day 27	The Law of Conservation of Mass Text Tuesday Reading Passage
Day 28	Read the Conservation of Mass Flex Book as a background to complete balancing equations. Introduction to Balancing Equations

Mixing Matter

A Science A–Z Physical Series

Word Count: 1,794

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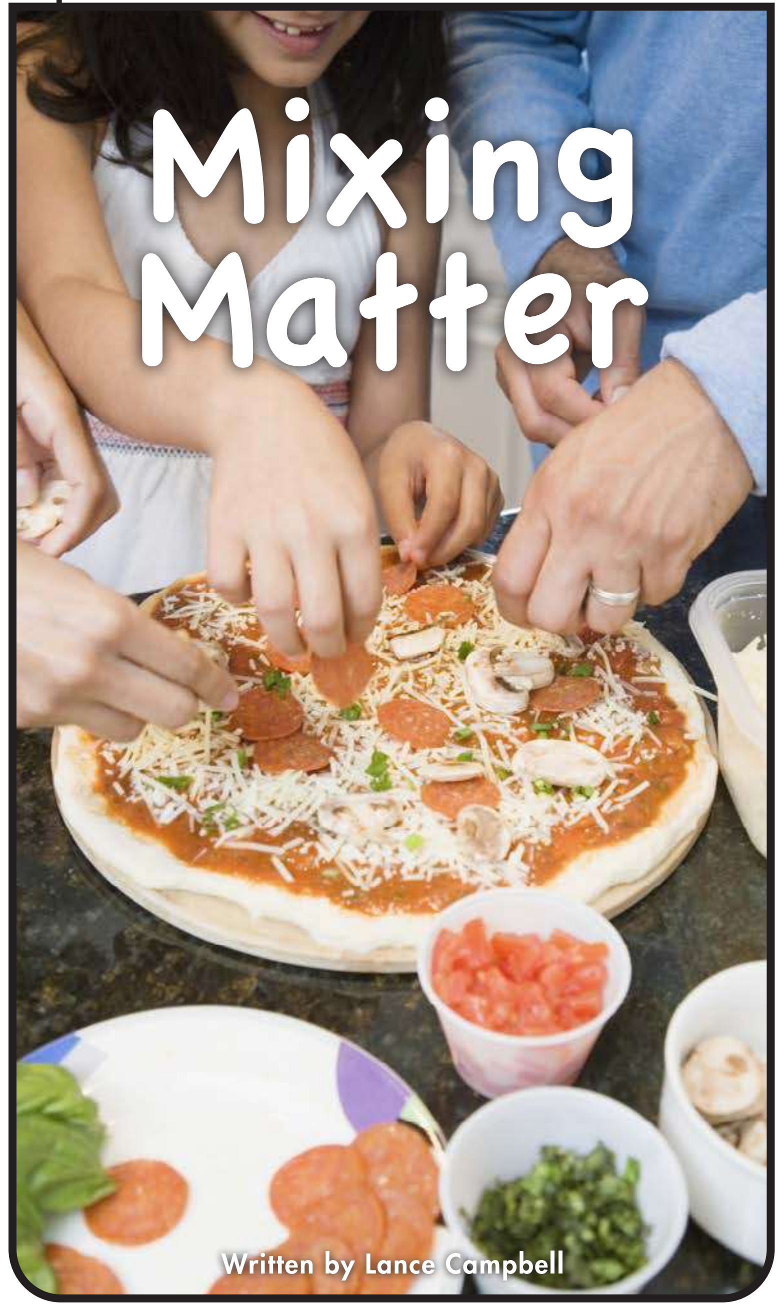

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Mixing Matter

Written by Lance Campbell

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KEY ELEMENTS USED IN THIS BOOK
The Big Idea: Everything is made of tiny particles called atoms. These atoms combine to form molecules. Atoms and molecules can combine with other atoms and molecules in many ways to form many different types of things. It is important to understand how materials change when combined. Some materials retain their own properties, while other materials form something new. Throughout our day, we see, use, and even consume combinations of materials. It is useful to understand how materials will react when combined. This knowledge can even keep us safe.
Key words: atom, chemical, chemical change, chemical reaction, concentrated, density, electron, element, gas, liquid, magnetism, mass, material, matter, mix, mixture, molecule, neutron, nucleus, physical change, property, proton, saturated, solid, solution, states of matter, substance, suspension, symbol, volume, weight **Key comprehension skill:** Compare and contrast *Other suitable comprehension skills:* Cause and effect; classify information; main idea and details; identify facts; elements of a genre; interpret graphs, charts, and diagrams **Key reading strategy:** Visualize *Other suitable reading strategies:* Ask and answer questions; summarize; connect to prior knowledge; using a table of contents and headings; using a glossary and boldfaced terms

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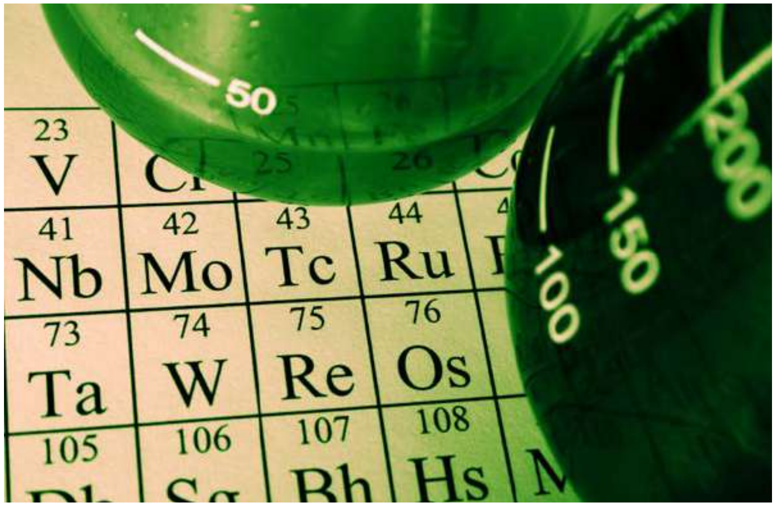
Reading Levels	
Learning A–Z	U
Lexile	890L
Correlations	
Fountas and Pinnell*	Q

*Correlated independent reading level



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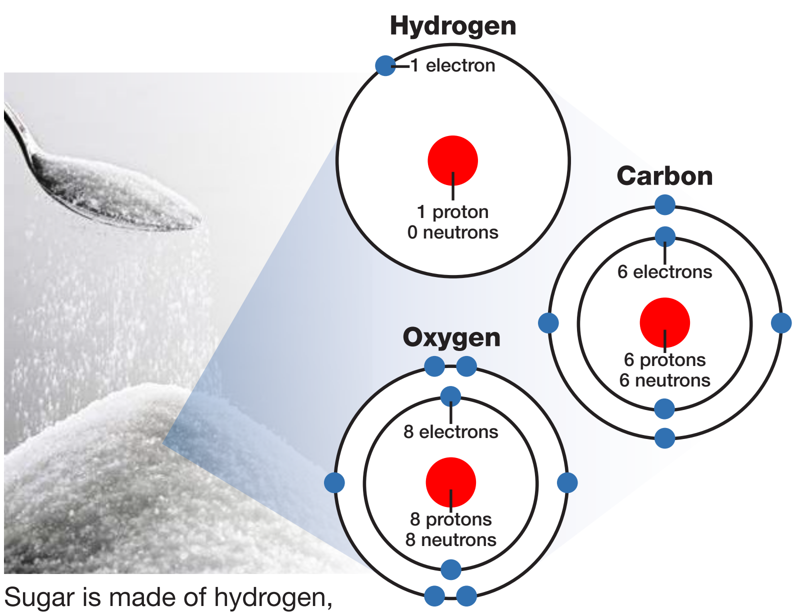
Introduction

Look at the things around you. You probably see things with many different properties. You may see books, a chair, and some water. All these things are types of **matter**. A balloon and the air you blow into it are types of matter. Everything in the universe that takes up space and has weight is made of matter. But what exactly is matter? And what makes the many kinds of matter different? How can matter be mixed to create new things? This book explores these and other questions to help you better understand what matter is and how it can change.

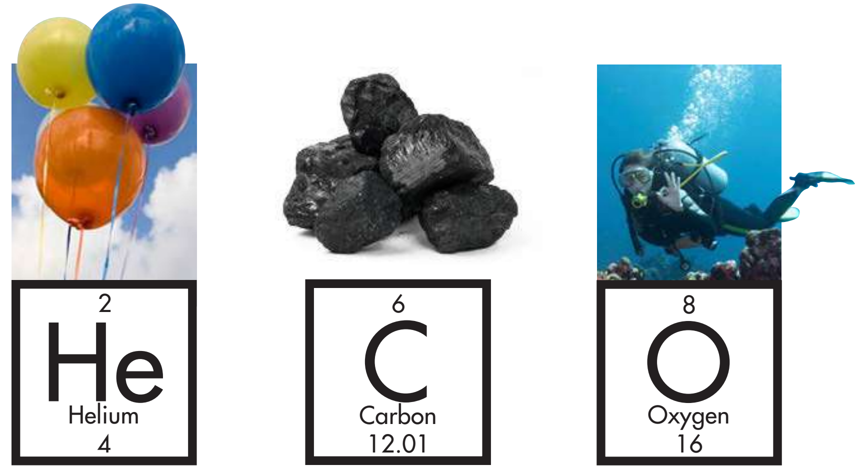
Elements

All matter is made of simple substances called **elements**. An element is a substance that cannot be broken down into a simpler substance. There are about 120 known elements on Earth.

Substances can be made of a single element. Pure iron, gold, and silver are each made of a single element. They cannot be made into simpler substances. But most substances we know of are a combination of two or more elements. Sugar is a substance made of three elements, while salt is a substance made of two elements. This means that both sugar and salt can be broken down into the simpler elements they are made of.



Sugar is made of hydrogen, carbon, and oxygen.



The number above the symbol shows how many protons are in an atom of that element. The bottom number is the average mass of a single atom of that element.

Each element can be identified using a symbol. Many symbols are the first one or two letters of the element's name. For example, helium is "He," carbon is "C," and oxygen is "O." The images above show some common elements and their symbols.

Word Wise

Some symbols for elements come from Latin. *Fe* is the symbol for the element iron. *Fe* is short for *ferrum*, the Latin word for iron. *Au* is the symbol for the element gold. *Au* is short for *aurum*, the Latin word for gold.

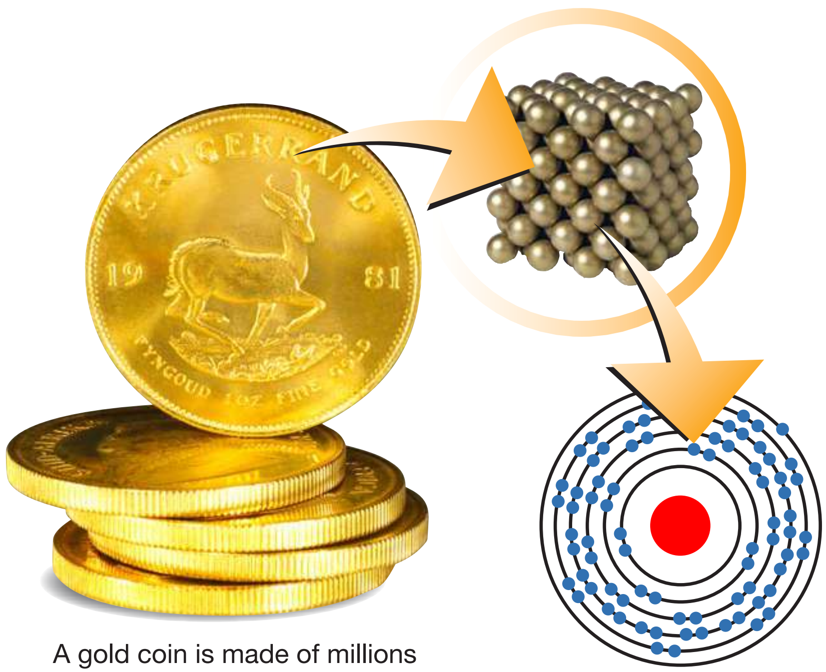
iron ore

gold

Atoms

Imagine that you had the power to look deep inside any substance or material. If you had this power, you would see that all matter, and therefore all elements, are made of tiny, invisible particles called **atoms**. Different elements are made of different atoms.

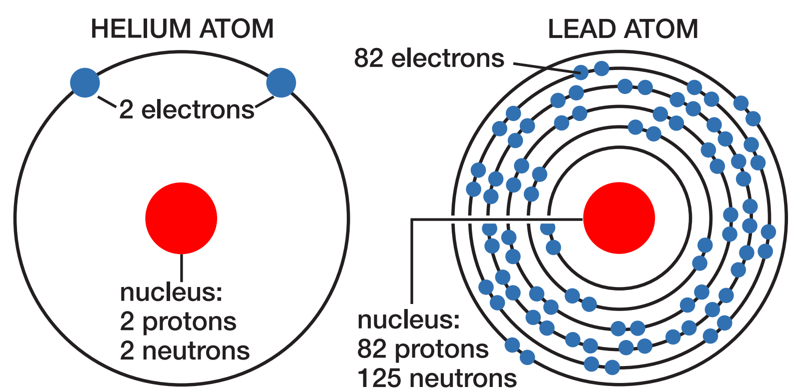
Atoms are the smallest part of an element. If you could look into a gold coin, you would see that it is made of millions of gold atoms. If you could see inside a balloon filled with helium, you would see that the helium gas is made of millions of helium atoms.



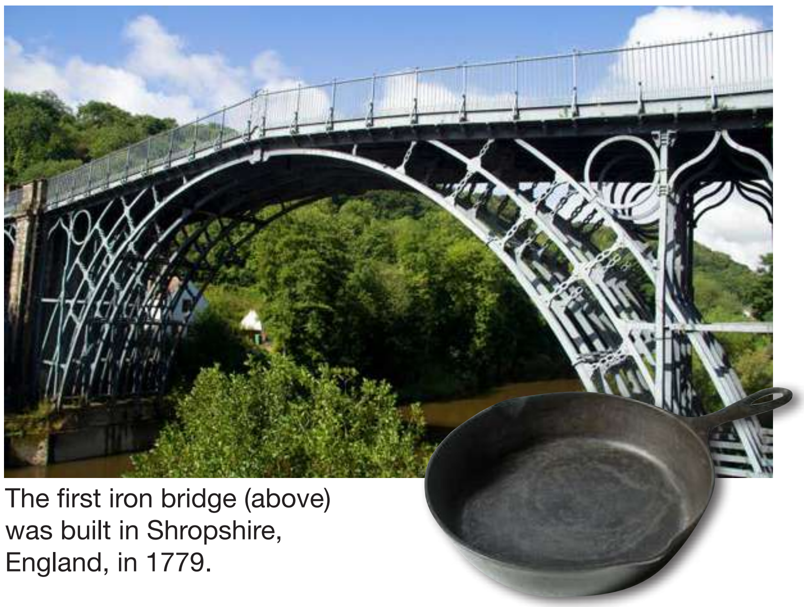
A gold coin is made of millions of gold atoms packed together.

Let's further imagine that you had super powers that let you see inside an atom. You would see that atoms are made of even smaller particles. The structure of an atom is in some ways like the structure of the solar system. In the solar system, planets orbit, or go around, the Sun. In an atom, tiny particles called **electrons** orbit the **nucleus**, or center of the atom. The nucleus of an atom is like the Sun around which planets revolve. The nucleus is made of two kinds of particles—**protons** and **neutrons**. All atoms of the same element have the same number of protons and electrons.

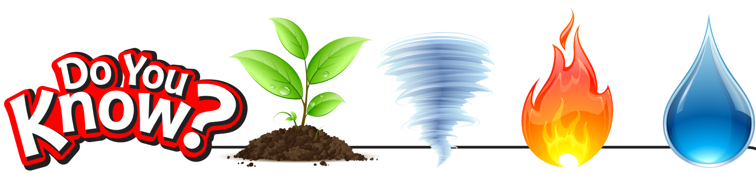
As tiny as atoms are, they have **mass**. Most of the mass of an atom is in the nucleus. So the more protons and neutrons an atom has, the more mass it has. A helium atom has 2 protons and 2 neutrons in its nucleus. This makes helium the second-lightest element. (The lightest is hydrogen.) Lead, on the other hand, has 82 protons and 125 neutrons, so it is much heavier than helium.



The more atoms you have in a sample of an element, the more it will weigh. For example, an iron skillet weighs less than an iron bridge because there are billions and billions more atoms in the bridge than in the skillet.



The first iron bridge (above) was built in Shropshire, England, in 1779.



In ancient Greece, people thought that matter was made of just four elements: earth, air, fire, and water. People believed this idea for thousands of years. It was not until the 1600s that people began to realize that there are many elements. None of those elements are earth, air, fire, or water.

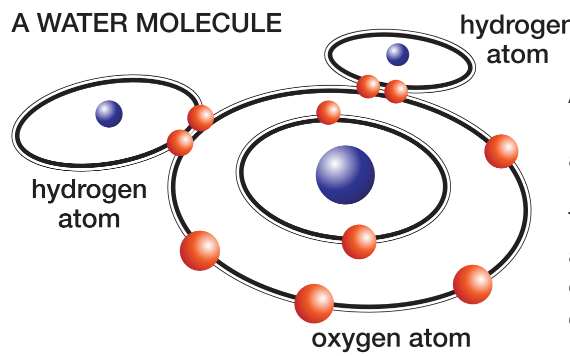
Combining Matter

You just learned that there are about 120 elements and that each is made of a unique kind of atom. But how can just 120 or so elements make up the millions of materials and substances found on Earth? They can because atoms combine.

Sometimes when atoms get close together and conditions are right, they start to share electrons. Atoms that share electrons form a **bond**. When atoms form or break a bond, they produce a **chemical reaction**. The result of atoms forming bonds is a new and bigger particle called a **molecule**.

Molecules can be a combination of just two atoms or many more, and those atoms can be of the same element or different elements. For example, a molecule of water has 3 atoms, while a molecule of table sugar has 45 atoms. Even though molecules can be made of dozens of atoms, they are still too tiny to see.

A WATER MOLECULE



A water molecule has one oxygen atom and two hydrogen atoms. The hydrogen atoms share their electrons with the oxygen atom.

When two or more different elements join, they make a **compound**. Each compound has its own properties. Salt has properties that are different from sugar because it has a different kind of molecule. A molecule is the smallest particle of a compound.

Compounds also have properties that are different from the elements that make them up. Water is a compound as well as a molecule. Oxygen and hydrogen are commonly found in the form of *gases*. But when they combine chemically, they form *liquid* water.

Molecules and compounds, like atoms and elements, are identified using letters and numbers. The letters show the elements that make up the compound, and the numbers represent the number of atoms of each element in a molecule of the compound. Common table sugar, for example, has 12 carbon atoms, 22 hydrogen atoms, and 11 oxygen atoms. Therefore, its **formula** is $C_{12}H_{22}O_{11}$.

Rock candy is simply colored table sugar with large crystals.

Changing Matter

When substances are combined, they can simply mix together without bonding to make a new compound. If the substances do not form a totally new substance, any change you observe is called a **physical change**. But when a new substance forms from the mixing of two or more different substances, the change in substances is a **chemical change**.

If matter changes from one state to another, such as liquid water changing to solid ice, it is a type of physical change. Evaporation, which changes liquid water into water vapor, is also a physical change. In each case, whether a solid, liquid, or gas, it is still water. Breaking glass into many pieces is another type of physical change. In each of these examples, no new substance is formed.

Glass breaking is a physical change.

Iron oxide, or rust, is used in paint, ink, rubber, plastic, ceramic, brick, paper, glues, and many other products.

When sugar is mixed with water, a physical change occurs, and you get sugar water. The sugar and water did not change to make a totally new substance with different properties. The substance is still water—it just tastes sugary. But when oxygen in the air combines with iron, a new substance, called *rust* or *ferric oxide,* forms. Rust is not at all like oxygen or iron. It is an entirely new substance with its own properties. The formation of rust is a chemical change.

Unpainted iron rusts more quickly than painted iron.

There are five main ways to tell whether a chemical change is happening:

1. The substance or mix of substances *changes color.* Apples turn brown due to a chemical reaction with the air.

2. *Energy gets absorbed or released.* Many fireworks make light, heat, and sound when they burn.

3. The substance *changes odor*. Food smells bad when it spoils because of chemical changes.

4. The substance or mix of substances *produces gases or solids*. If you drop an antacid tablet into water, it will create gas bubbles in the water.

5. The change is *not easy to undo.* If you bake a cake, it would be very difficult to separate out its ingredients again because they've undergone chemical changes.

When you bake a cake, you might smell the cake baking and see the batter rise and turn brown. When the cake is done and sliced, you might see a spongy texture created by the gas bubbles that formed in the batter.

Cake batter is a simple mixture. But once it is baked, chemical changes happen.

Mixing Matter

Now let's take a closer look at the physical changes that occur when matter is mixed together. Different states of matter can be mixed together without resulting in a chemical change. You can mix solids with solids, solids with liquids, liquids with liquids, gases with gases, and liquids with gases. Remember, these are the changes that happen when elements or compounds simply mix together without forming new compounds that have new and different properties. These combinations of substances are called **mixtures**.

Sometimes it is easy to see the different materials in a mixture. At other times, different substances mix so well that it is hard to see the different parts that were mixed together. For example, if you mix sand with water in a jar and shake it up, you just get cloudy-looking water. If you let the jar sit for a short time, the sand will easily separate and settle to the bottom of the jar.

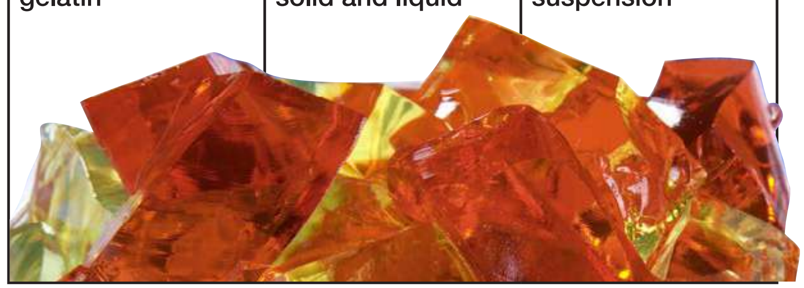
Mixing Solids and Liquids

If you mix sugar or salt with water and shake it up, the salt or sugar dissolves and will not settle to the bottom if you let it sit. This kind of mixture is called a **solution**.

Adding different amounts of a solid to a liquid can make different strengths of solutions. For example, to make a stronger cup of hot chocolate, you can just add more chocolate powder. We say that the hot chocolate is more **concentrated** when it has more chocolate powder.

However, there is a limit to the amount of solid you can add to a liquid when making a solution. For example, if you add too much salt to water and shake it up, some of the salt will not dissolve and will just settle to the bottom. If a liquid solution cannot hold any more solid, it is called **saturated**. You can add more salt to a saturated solution of salt water by heating the solution.

COMMON MIXTURES, SOLUTIONS, AND SUSPENSIONS		
Substance	**States of Matter**	**Mixture, Solution, or Suspension**
salt water	solid and liquid	solution
soda pop	liquid and gas	solution
tossed salad	solids	mixture
gelatin	solid and liquid	suspension



There are many ways to distinguish the different substances in a mixture. One way is to look at their physical properties, such as volume, weight, density, and magnetism.

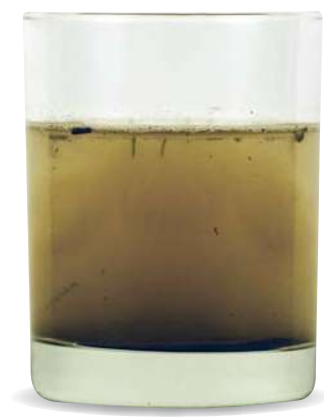
SOME PROPERTIES OF MATTER		
Property	**Definition**	**Discussion**
Volume	a measure of how much space something fills	Solids, liquids, and gases all take up space. It is impossible for one grain of sand to occupy the same space as another grain of sand.
Weight	a measure of how much mass something has	All matter has weight. Even a gas such as air has weight.
Density	a measure of how heavy something is compared to the volume it takes up	Almost all rocks are denser than water, so they sink when dropped into water. Most wood is less dense than water, so it floats in water.
Magnetism	the ability to be attracted by a magnet	Some matter, such as iron, is easily magnetized. Other types of matter, such as aluminum, wood, and paper, are not.

Do You Know?

Cream is a special kind of suspension. Pieces of proteins and fat are suspended in water. If you shake the cream long enough, the fat droplets collect into a lumpy solid called butter!

Another mixture of solids and liquids is called a **suspension**. In a suspension, the pieces of solid material are so tiny and light that they do not immediately settle out. You cannot see the solid particles. This is a physical change because the solid materials do not change chemically.

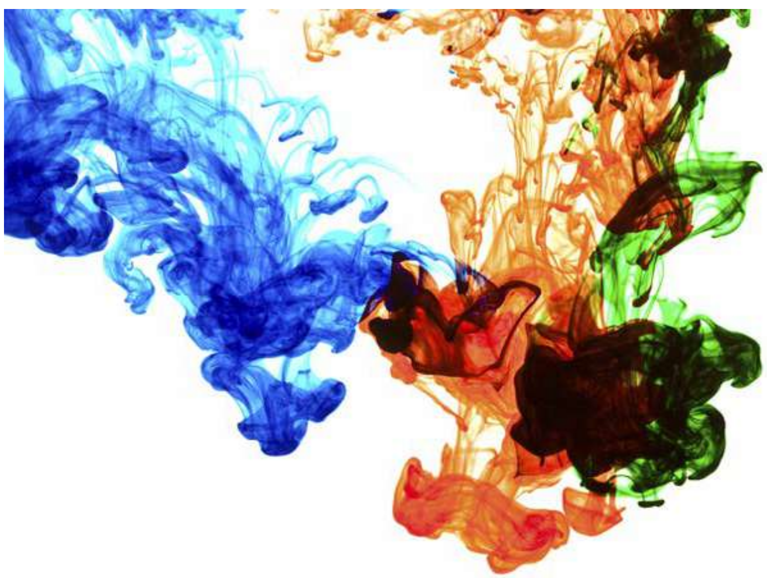
If you put a spoonful of dirt into a glass of water, the tiniest particles form a suspension. You do not see dirt. You do not see clear water. You see brown water. If it is not disturbed, the tiny particles of dirt eventually settle to the bottom of the glass due to the force of gravity.



Mixing Liquids

Liquids can mix in different ways, too. Sometimes when you mix two liquids together, they stay separate. It is easy to see the separate liquids. If you mix oil and water, the oil floats on top of the water.

But in other liquid mixtures, the liquids do not stay separate. If you mix food coloring and water, the two liquids blend completely. It is difficult to separate them.



Conclusion

Everything we see, touch, and smell is matter, and all matter is made from a small group of elements. These elements combine in many ways, both chemically and physically, to make all the wonderful things you see around you. Without elements and the many combinations they make, our world could not exist.

Glossary

atoms the smallest parts of an element (p. 7)

bond a connection between atoms that are joined together to form a molecule (p. 10)

chemical change a change in the chemical makeup of a substance (p. 12)

chemical reaction a process in which one substance is changed to another (p. 10)

compound a combination of two or more elements (p. 11)

concentrated how much of a substance is present in a solution (p. 17)

electrons particles that are part of an atom and that orbit the nucleus; they have a negative electrical charge (p. 8)

elements substances that cannot be broken down into simpler substances (p. 5)

formula numbers and letters that describe how many atoms of each element are included in one molecule or compound (p. 11)

mass the measure of the amount of matter in an object (p. 8)

matter anything that takes up space and has weight (p. 4)

mixtures combinations of substances in which chemical reactions do not occur (p. 16)

molecule the smallest part of a substance that can exist by itself, made of two or more atoms (p. 10)

neutrons particles in the nucleus of an atom that have no electrical charge (p. 8)

nucleus the positively charged central region of an atom, consisting of protons and neutrons, and containing most of the atom's mass (p. 8)

physical change a change in the size, shape, or color of a substance that does not change it into a different substance (p. 12)

protons tiny particles that are part of the nucleus of an atom; they have a positive electrical charge (p. 8)

saturated being at the point at which no more of a liquid, solid, or gas can be absorbed by a solution at a given temperature (p. 17)

solution a mixture in which the atoms of a solid separate and become invisible in a liquid (p. 17)

suspension a mixture of a liquid and a solid in which the solid does not dissolve (p. 20)

Index

Name: ________________________________

An Atom Apart

by Leslie Cargile

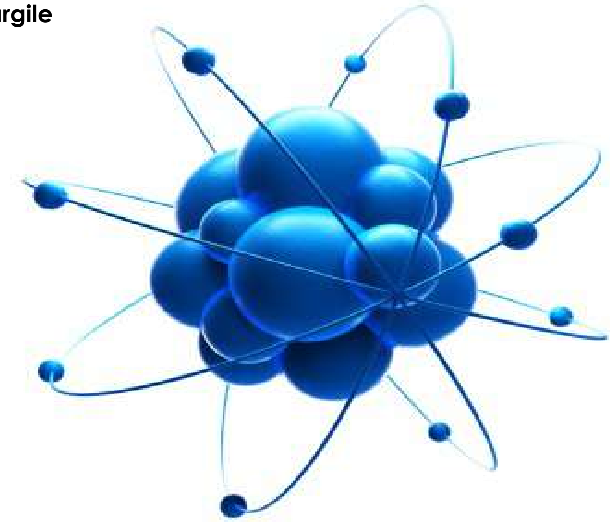
Have you ever walked through a cloud of gnats on a hot summer, only to have them follow you? No matter how you swat at them, or even if you run, they won't leave you alone. If so, then you have something in common with an atom.

Atoms are the building blocks of molecules, which when combined, make up everything. From the smallest one-celled amoeba, to every person who has ever lived, to the largest and brightest stars in the sky, atoms are everywhere.

Even way back in the time of ancient Greece, they wondered about atoms. That's where the word comes from, ancient Greece. The word *A'tomos,* when translated into English, means: *something that cannot be divided any further*. So what's an atom look like? Up until very recently no one could say one way or another.

Technically we can't see individual atoms, since there are no microscopes powerful enough. Since technology improves all the time, it may not be long before we can actually see a whole atom through a special microscope. Even though scientists cannot see atoms with microscopes, they have developed ways to detect them and learn about them.

Atoms are made up of three basic parts; protons, neutrons, and electrons. There is a core, or *nucleus,* and an electron cloud. The nucleus is made up of positively charged protons and neutral neutrons. The nucleus is held closely together by *electromagnetic force*.



Protons and neutrons make up the nucleus of the atom.
A cloud of electrons orbits the nucleus.

The negatively charged electrons are bound to the nucleus, and zap around it in a cloud. Do you remember the cloud of gnats? The gnats would be the electrons zipping around you, the nucleus.

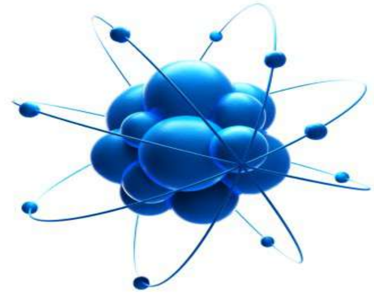
There are different ways atoms are classified. They can be classified into elements, like oxygen, carbon, or hydrogen. All of the elements known to man so far can be found on the periodic table. The number of protons an atom has decides the chemical element. The number of electrons defines the atom's chemical properties, like its melting temperature and boiling point.

The study of atoms and tiny particles that are even smaller is called quantum mechanics. Scientists still have much to learn about atoms. Maybe you will enter the study of quantum mechanics and find a brand new element. Maybe they'll even name it after you!

Name: ________________________________

An Atom Apart

by Leslie Cargile



1. What are atoms?

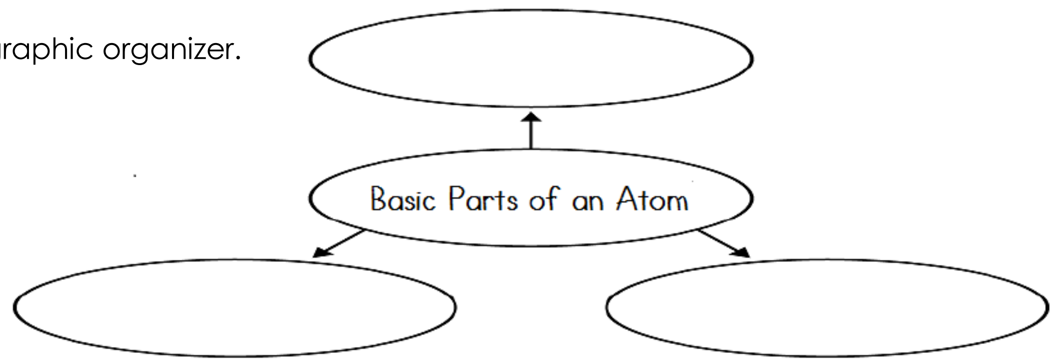
a. tiny particles that make up all matter
b. tiny particles that can only be seen with a microscope
c. tiny particles that look like gnats
d. particles that are so large they cannot be seen

2. What does the word *A'tomos* mean in ancient Greece?

____

____

3. Complete the graphic organizer.



4. What is quantum mechanics?

____

____

5. If you wanted to find the chemical element of an atom, you would need to...

a. know how many electrons it has
b. know how many protons it has
c. know its melting temperature
d. see it with a microscope

6. The author begins this article by comparing a cloud of gnats to an atom. In this scenario, what do the gnats represent? What does the person walking through the gnats represent?

____

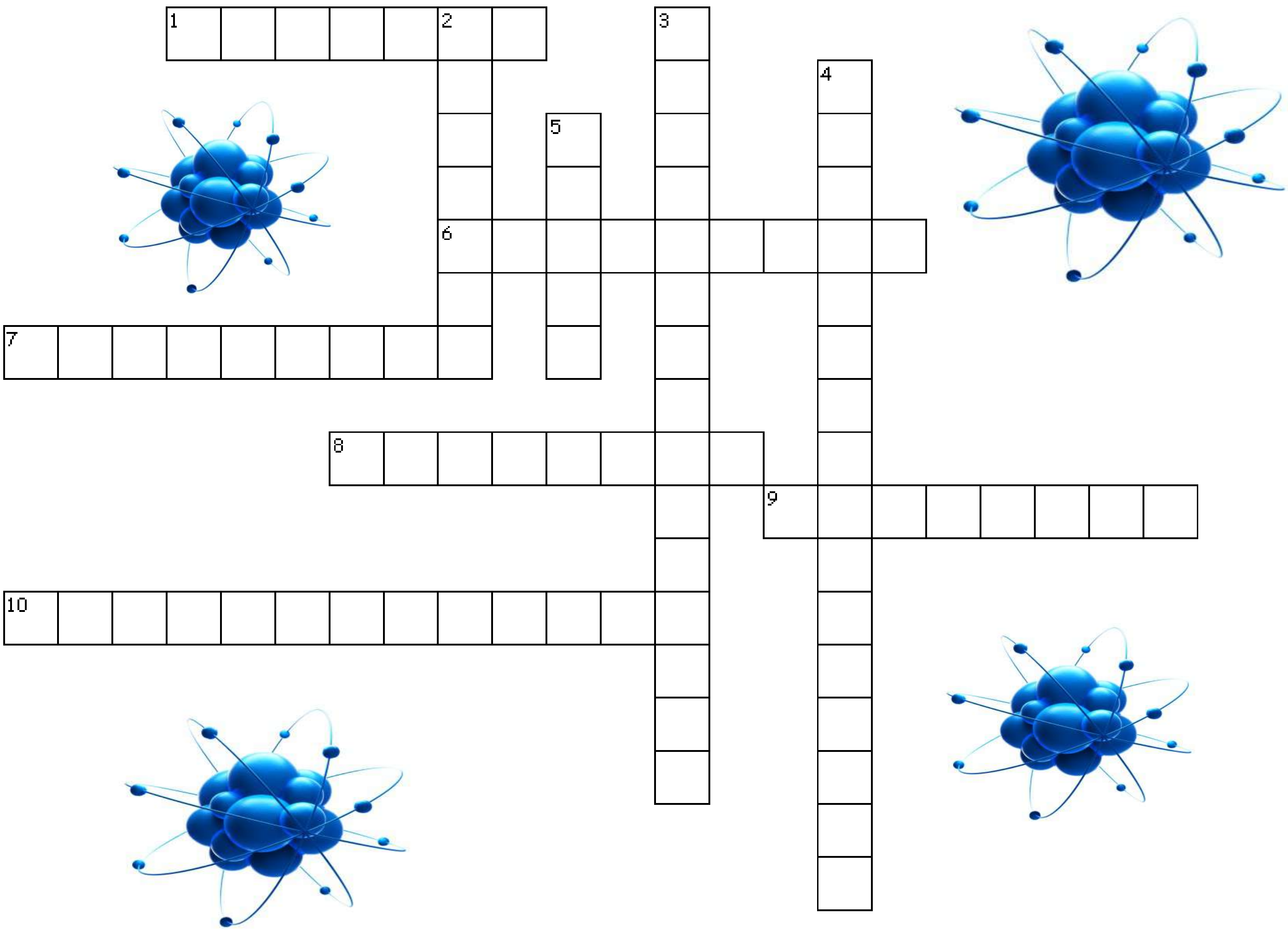
____

Something to Think About: If you discovered a new element that was added to the periodic table, what would you name it?

Name: ______________________________

An Atom Apart

Vocabulary Crossword



Across

1. positively charged parts of an atom

6. negatively charged parts of an atom

7. atoms are the building blocks for...

8. the number of electrons in atoms determine an element's ___ properties

9. neutrally charged parts of an atom

10. a chart which lists all of the known elements

Down

2. protons and neutrons are found in this part of an atom

3. type of force that holds the nucleus of an atom together

4. area of science that studies tiny particles like atoms

5. the word a'tomos comes from this language

Name ______________________________ Date_____________ Block _______ Enrichment 1

elements, compounds & mixtures worksheet

Part 1: Read the following information on elements, compounds and mixtures. CIRCLE or FILL IN the correct term for each blank where necessary.

Elements:

- A pure substance containing only one kind of _____________.
- An element is always uniform all the way through (homogeneous).
- An element can / cannot be separated into simpler materials (except during nuclear reactions).
- Over 100 existing elements are listed and classified on the _____________________.

Compounds:

- A pure substance containing two or more kinds of ________________.
- The atoms are chemically/physically combined in some way. Often times (but not always) they come together to form groups of atoms called molecules.
- A compound is always homogeneous (uniform).
- Compounds can / cannot be separated by physical means. Separating a compound requires a chemical reaction.
- The properties of a compound are usually different than the properties of the elements it contains.

Mixtures:

- Two or more ________________ or _________________ NOT chemically combined.
- No reaction between substances.
- Mixtures can be uniform (called _________________________) and are known as solutions.
- Mixtures can also be non-uniform (called _________________________).
- Mixtures can be separated into their components by chemical or physical means.
- The properties of a mixture are similar to the properties of its components.

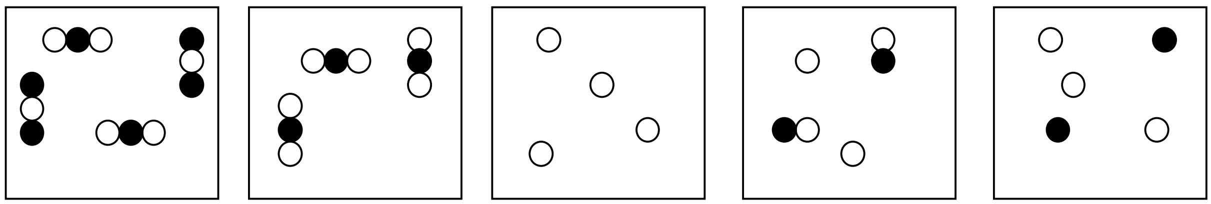
Part 2: Classify each of the following as elements (E), compounds (C) or Mixtures (M). Write the letter X if it is none of these.

___Diamond (C)	___Sugar ($C_6H_{12}O_6$)	___Milk	___Iron (Fe)
___Air	___Sulfuric Acid (H_2SO_4)	___Gasoline	___Electricity
___Krypton (K)	___Bismuth (Bi)	___Uranium (U)	___Popcorn
___Water (H_2O)	___Alcohol (CH_3OH)	___Pail of Garbage	___A dog
___Ammonia (NH_3)	___Salt (NaCl)	___Energy	___Gold (Au)
___Wood	___Bronze	___Ink	___Pizza
___Dry Ice (CO_2)	___Baking Soda ($NaHCO_3$)	___Titanium (Ti)	___Concrete

Modified from: http://pdfsdb.com/doc/elements-compounds-amp-mixtures-worksheet-43799787.html#

Name ______________________________ Date_____________ Block _______ Enrichment 1

Part 3: Match each diagram with its correct description. Diagrams will be used once.



A B C D E

___1. Pure Element – only one type of atom present.

___2. Mixture of two elements – two types of uncombined atoms present.

___3. Pure compound – only one type of compound present.

___4. Mixture of two compounds – two types of compounds present.

___5. Mixture of a compound and an element.

Part 4 GO THE EXTRA MILE - Try as many as these as you can. If you cannot figure it out, don't worry, we will cover it in class.

Column A lists a substance. In Column B, list whether the substance is an element (E), a compound (C), a Heterogeneous Mixture (HM), or a Solution (S). (Remember a solution is a homogeneous mixture.) In Column C, list TWO physical properties of the substance.

Column A	Column B	Column C
1. Summer Sausage		
2. Steam		
3. Salt Water		
4. Pencil lead (Pb)		
5. Dirt		
6. Pepsi		
7. Silver (Ag)		
8. Toothpaste (Na_2HPO_4)		
9. A burrito		
10. Italian Dressing		
11. Chicken Soup		
12. Lemonade		

Name ________________ Date ________ Block ________ Phys. & Chem. Changes HW

Directions: Use the word bank below to complete the "Ways Matter Can Change" table

Word Bank (Words may be used more than once):							
solid	liquid	gas	heat	flames	irreversible	chemically	hot

Ways Matter Can Change	
Physically	
Adding Energy	Adding heat to the matter, making it ____________
Melting	The process of a _________ changing to a ____________.
Evaporating	The process of a liquid changing into a vapor or ____________
Removing Energy	Removing __________ from the matter, making it colder.
Condensing	The process of _________ changing to liquid. (The process by which water vapor changes into water droplets and clouds)
Freezing	The conversion of a ____________ to a ______________.
Chemically	
Burning	__________ and intense heat leave behind ashes
Cooking	The ______________ change takes place from one substance to another.
Reactions	2 or more elements _______________ reacting to form a new substance.

Name ________________ Date ________ Block ________ Phys. & Chem. Changes HW

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Name ______________________________________Date _________________________ Block # ________

PHYSICAL PROPERTIES & CHANGES

Part 1 - Matching

1. Physical property a. how easily a substance dissolves in another substance
2. Solubility b. an objects attraction to another object (magnetic, electric)
3. Density c. an observable characteristic without modifying the object.
4. Physical change d. a change in state (solid, liquid, gas) of an object
5. Polarity e. how tightly of loosely atoms are packed in a substance.

Part 2 - Ways matter physically changes

(http://chemistry.about.com/od/matter/a/10-Physical-Change-Examples.htm)

Physical changes involve states of matter and energy. A state of matter can be a solid, a liquid or a gas. No new substance is created during a physical change, although the matter takes a different form. The size, shape, and color of matter may change. Also, physical changes occur when substances are mixed, but don't chemically react. One way to identify a physical change is that such a changes may be reversible, especially phase changes. For example, if you freeze an ice cube (solid), you can melt it into water again (liquid). This is a list of 10 examples of physical changes.

1. crushing a can
2. melting an ice cube
3. boiling water
4. mixing sand and water
5. breaking a glass
6. dissolving sugar and water
7. shredding paper
8. chopping wood
9. mixing red and green marbles
10. sublimating dry ice

---

1. List 5 actions to physically change matter: ____

2. True or False: Physical changes *may* be reversible. *Circle:* True False

3. True or False: A new substance is created during a physical change. *Circle:* True False

4. Think of 1 example (other than ice cube to water and back) that can be classified as a physical change.

____

____

Part 3 - Sentence completion

1. We tested the __________________ of sugar by observing if it could dissolve in water after 5 minutes.
2. Color, size, shape, smell and texture are all examples of ________________________________.
3. Depending on an objects' _________________________ that object will sink or float in water.
4. We witnessed ________________________ when the magnet attracted iron filings in our mixture lab.
5. An object undergoes a _____________________ when it is melted, burnt, mixed, crushed, boiled, etc.

Name ______________________________________Date _________________________ Block # ________

PHYSICAL PROPERTIES & CHANGES

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2. Solubility	b. an objects attraction to another object (magnetic, electric)
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Part 2 - Ways matter physically changes

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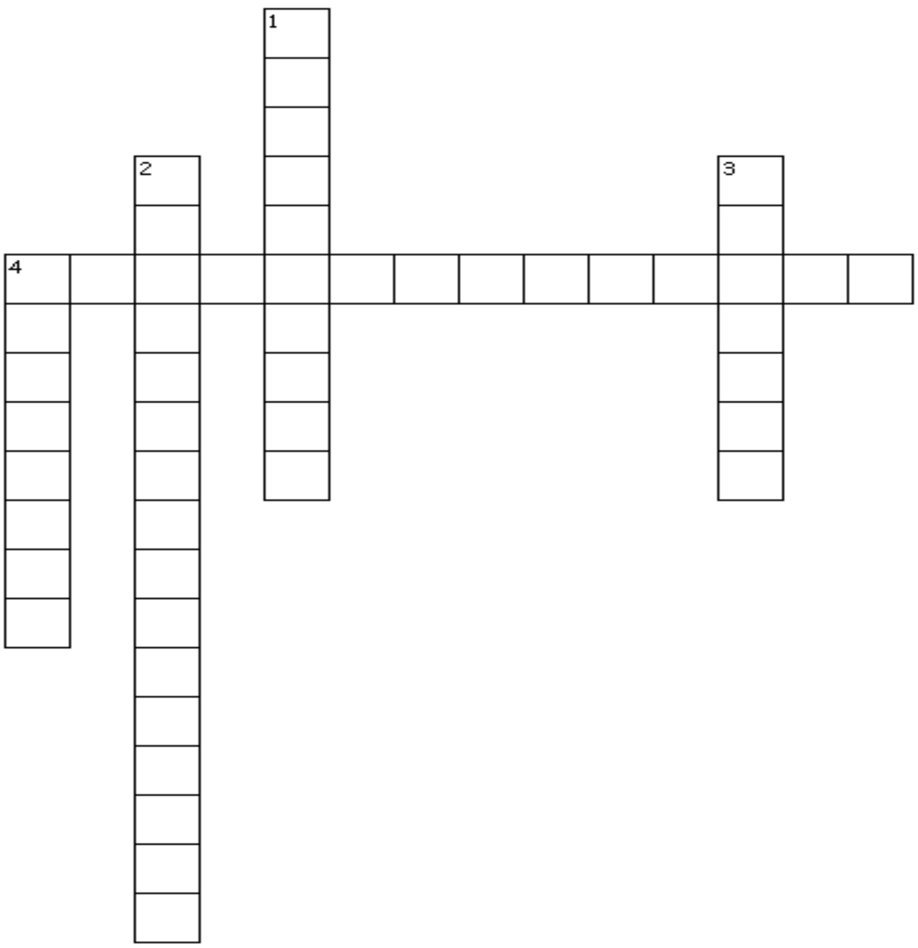
Part 4 - Real Life Application

	Object	Physical Properties	1 way you could physically change it?
1.			
2.			
3.			
4.			
5.			

Part 5 - Crossword Puzzle



Across

4. modifying the object while retaining the substance's atomic makeup

Down

1. an object dissolving in another object
2. observed without changing the object
3. how tightly or loosely atoms are packed together
4. attraction towards a particular direction

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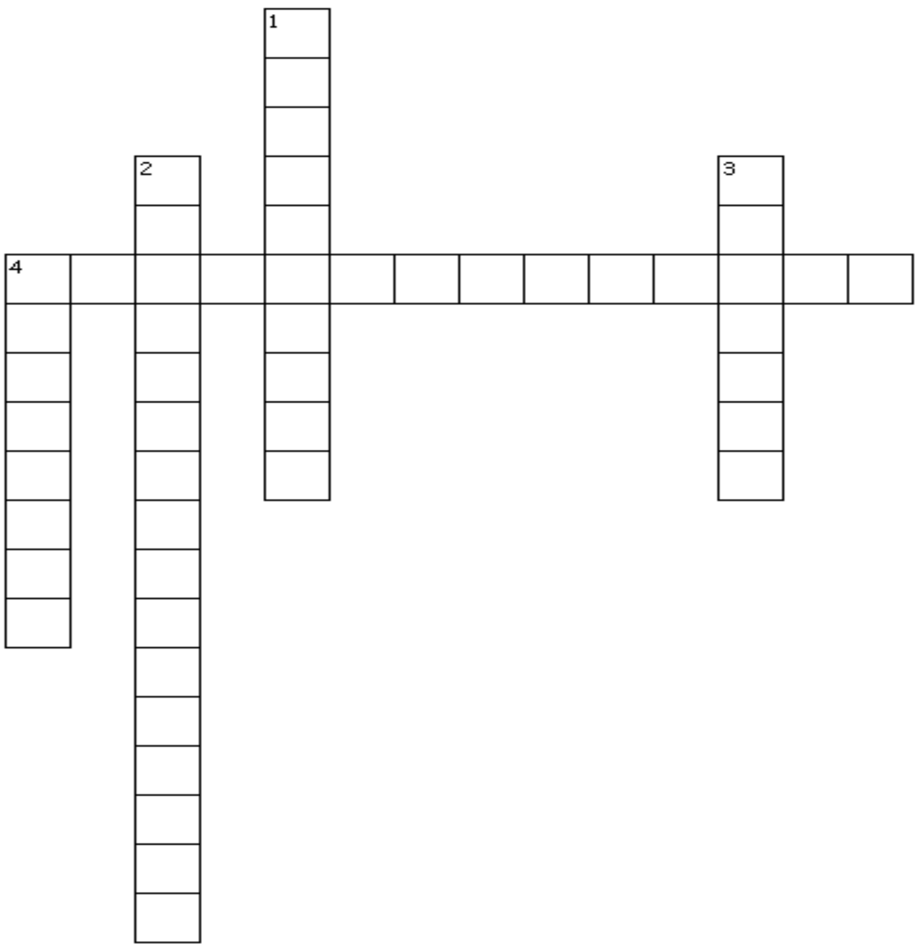

Across
4. modifying the object while retaining the substance's atomic makeup

Down
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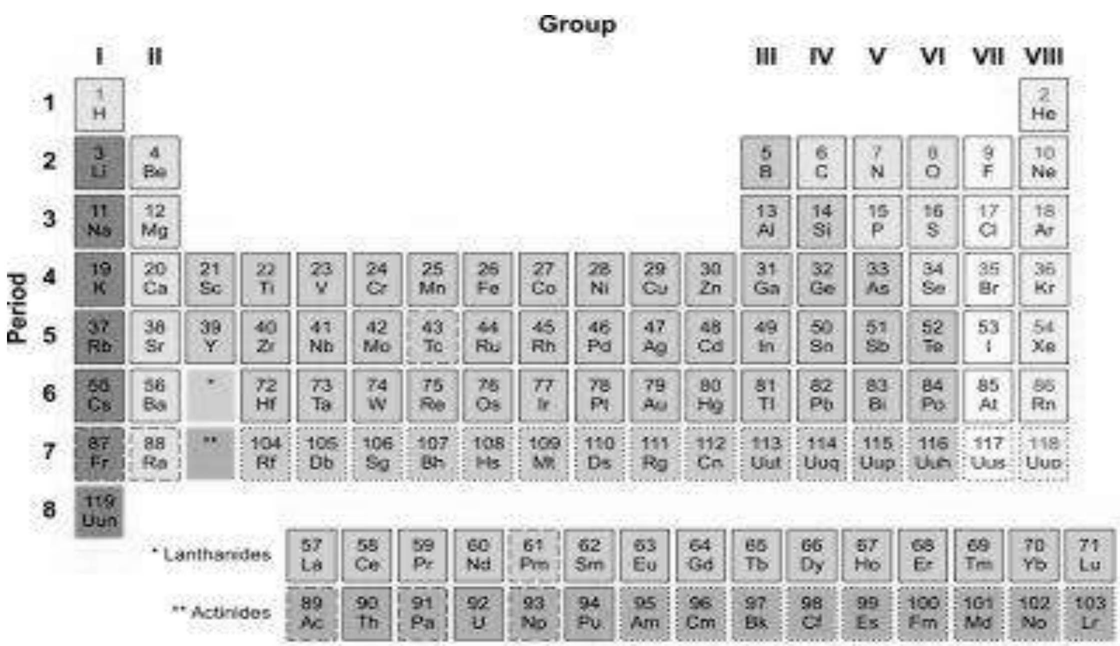
2. observed without changing the object
3. how tightly or loosely atoms are packed together
4. attraction towards a particular direction

TEXT TUESDAY
the Periodic table and Elements

The Periodic Table is a way of listing the elements. Elements are listed in the table by the structure of their atoms. This includes how many protons they have as well as how many electrons they have in their outer shell. From left to right and top to bottom, the elements are listed in the order of their atomic number, which is the number of protons in each atom. The periodic table arranges the chemical elements into a pattern so that you can predict the properties of elements based on where they are located on the table. Rows of elements are called periods. The period number of an element signifies the highest unexcited energy level for an electron in that element. The number of elements in a period increases as you move down the periodic table because there are more sublevels per level as the energy level of the atom increases.

Columns of elements help define element groups. Elements within a group share several common properties.



Period	I	II											III	IV	V	VI	VII	VIII
1	1 H																	2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba	*	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra	**	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Uut	114 Uuq	115 Uup	116 Uuh	117 Uus	118 Uuo
8	119 Uun																	

* Lanthanides	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
** Actinides	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Why is it called the Periodic Table?

It is called "periodic" because elements are lined up in cycles or periods. From left to right elements are lined up in rows based on their atomic number (the number of protons in their nucleus). Some columns are skipped in order for elements with the same number of valence electrons to line up on the same columns. When they are lined up this way, elements in the columns have similar properties. Each horizontal row in the table is a period. There are seven (or eight) total periods. The first one is short and only has two elements, hydrogen and helium. The sixth period has 32 elements. In each period the left most element has 1 electron in its outer shell and the right most element has a full shell.

Groups

Groups are the columns of the periodic table. There are 18 columns or groups and different groups have different properties. One example of a group is the noble or inert gases. These elements all line up in the eighteenth or last column of the periodic table. They all have a full outer shell of electrons, making them very stable (they tend not to react with other elements). Another example is the alkali metals which all align on the left-most column. They are all very similar in that they have only 1 electron in their outer shell and are very reactive. This lining-up and grouping of similar elements helps chemists when working with elements. They can understand and predict how an element might react or behave in a certain situation.

Element Abbreviations

Each element has its own name and abbreviation in the periodic table. Some of the abbreviations are easy to remember, like H for hydrogen. Some are a bit harder like Fe for iron or Au for gold. For gold the "Au" comes from the Latin word for gold "aurum".

YOUR ASSIGNMENT

On ONE sheet of paper, write the names of your group members and answer all questions on that sheet.

1. Describe how the periodic table of elements is organized. (Knowledge RI CCRS8.1)
2. What are the rows on the periodic table of elements also known as? (Knowledge RI CCR 8.1)
3. Where are the most reactive elements on the periodic table? What makes one element more reactive than another? (APPLICATION CCRS 8.4)
4. Why would it be important for a scientist to understand HOW an element would react with another element (APPLICATION CCRS 8.4)
5. HOW do you think ideas like the periodic table get widely known and accepted in the scientific community? Do you believe it is easier or hard to happen now? (SYNTHESIS-making conclusion CCRS 8.1)

the Periodic table of Elements

Period #

Atomic mass increases

Period	1 IA 11A	2 IIA 2A	3 IIIB 3B	4 IVB 4B	5 VB 5B	6 VIB 6B	7 VIIB 7B	8	9 VIII 8	10	11 IB 1B	12 IIB 2B	13 IIIA 3A	14 IVA 4A	15 VA 5A	16 VIA 6A	17 VIIA 7A	18 VIIIA 8A
1	1 **H** Hydrogen 1.008																	2 **He** Helium 4.003
2	3 **Li** Lithium 6.941	4 **Be** Beryllium 9.012											5 **B** Boron 10.811	6 **C** Carbon 12.011	7 **N** Nitrogen 14.007	8 **O** Oxygen 15.999	9 **F** Fluorine 18.998	10 **Ne** Neon 20.180
3	11 **Na** Sodium 22.990	12 **Mg** Magnesium 24.305											13 **Al** Aluminum 26.982	14 **Si** Silicon 28.086	15 **P** Phosphorus 30.974	16 **S** Sulfur 32.066	17 **Cl** Chlorine 35.453	18 **Ar** Argon 39.948
4	19 **K** Potassium 39.098	20 **Ca** Calcium 40.078	21 **Sc** Scandium 44.956	22 **Ti** Titanium 47.88	23 **V** Vanadium 50.942	24 **Cr** Chromium 51.996	25 **Mn** Manganese 54.938	26 **Fe** Iron 55.933	27 **Co** Cobalt 58.933	28 **Ni** Nickel 58.693	29 **Cu** Copper 63.546	30 **Zn** Zinc 65.39	31 **Ga** Gallium 69.732	32 **Ge** Germanium 72.61	33 **As** Arsenic 74.922	34 **Se** Selenium 78.09	35 **Br** Bromine 79.904	36 **Kr** Krypton 84.80
5	37 **Rb** Rubidium 84.468	38 **Sr** Strontium 87.62	39 **Y** Yttrium 88.906	40 **Zr** Zirconium 91.224	41 **Nb** Niobium 92.906	42 **Mo** Molybdenum 95.94	43 **Tc** Technetium 98.907	44 **Ru** Ruthenium 101.07	45 **Rh** Rhodium 102.906	46 **Pd** Palladium 106.42	47 **Ag** Silver 107.868	48 **Cd** Cadmium 112.411	49 **In** Indium 114.818	50 **Sn** Tin 118.71	51 **Sb** Antimony 121.760	52 **Te** Tellurium 127.6	53 **I** Iodine 126.904	54 **Xe** Xenon 131.29
6	55 **Cs** Cesium 132.905	56 **Ba** Barium 137.327	57-71	72 **Hf** Hafnium 178.49	73 **Ta** Tantalum 180.948	74 **W** Tungsten 183.85	75 **Re** Rhenium 186.207	76 **Os** Osmium 190.23	77 **Ir** Iridium 192.22	78 **Pt** Platinum 195.08	79 **Au** Gold 196.967	80 **Hg** Mercury 200.59	81 **Tl** Thallium 204.383	82 **Pb** Lead 207.2	83 **Bi** Bismuth 208.980	84 **Po** Polonium [208.982]	85 **At** Astatine 209.987	86 **Rn** Radon 222.018
7	87 **Fr** Francium 223.020	88 **Ra** Radium 226.025	89-103	104 **Rf** Rutherfordium [261]	105 **Db** Dubnium [262]	106 **Sg** Seaborgium [266]	107 **Bh** Bohrium [264]	108 **Hs** Hassium [269]	109 **Mt** Meitnerium [268]	110 **Ds** Darmstadtium [269]	111 **Rg** Roentgenium [272]	112 **Cn** Copernicium [277]	113 **Uut** Ununtrium unknown	114 **Fl** Flerovium [289]	115 **Uup** Ununpentium unknown	116 **Lv** Livermorium [298]	117 **Uus** Ununseptium unknown	118 **Uuo** Ununoctium unknown

Lanthanide Series	57 **La** Lanthanum 138.906	58 **Ce** Cerium 140.115	59 **Pr** Praseodymium 140.908	60 **Nd** Neodymium 144.24	61 **Pm** Promethium 144.913	62 **Sm** Samarium 150.36	63 **Eu** Europium 151.966	64 **Gd** Gadolinium 157.25	65 **Tb** Terbium 158.925	66 **Dy** Dysprosium 162.50	67 **Ho** Holmium 164.930	68 **Er** Erbium 167.26	69 **Tm** Thulium 168.934	70 **Yb** Ytterbium 173.04	71 **Lu** Lutetium 174.967
Actinide Series	89 **Ac** Actinium 227.028	90 **Th** Thorium 232.038	91 **Pa** Protactinium 231.036	92 **U** Uranium 238.029	93 **Np** Neptunium 237.048	94 **Pu** Plutonium 244.064	95 **Am** Americium 243.061	96 **Cm** Curium 247.070	97 **Bk** Berkelium 247.070	98 **Cf** Californium 251.080	99 **Es** Einsteinium [254]	100 **Fm** Fermium 257.095	101 **Md** Mendelevium 258.1	102 **No** Nobelium 259.101	103 **Lr** Lawrencium [262]

MOST REACTIVE
Group/Family
Group 1 = Alkali Metals

Reactivity **DECREASES** moving left to right

LEAST REACTIVE
Group/Family
Group 18 = Noble Gases

WHO AM I?

These mystery elements are waiting to be identified. The trick is—you'll need the Periodic Table to unmask their identities. Unless you have it memorized, you'll need a copy of the table from your science book or from page 119 of this book. Read the clues about each mystery element, figure out what it is, and then write the name and symbol of the element.

1. Nonmetal, halogen family, atomic mass 35
2. 25 electrons, transition element
3. gas, 48 neutrons
4. period 2, atomic mass 11
5. nonmetallic, period 3, atomic mass 32
6. 26 protons, period 4, transition element
7. 12 neutrons, metallic, 11 electrons
8. 29 electrons, period 4
9. atomic mass 20, gas
10. period 5, transition element, 51 neutrons
11. 80 electrons, transition element
12. period 4, lowest mass in period
13. metallic, period 4, 20 electrons
14. period 6, gas, 86 protons
15. 4 neutrons, metallic
16. period 4, metallic, 27 electrons
17. metallic, period 6, 56 protons
18. gas, atomic mass 16, 8 neutrons
19. mass less than 30, not neon, noble gas
20. period 5, metallic, 38 electrons

REMEMBER:

The Atomic number equals the number of protons. Atomic mass equals the number of protons plus neutrons. The number of electrons equals the number of protons.

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

Name

Text Tuesday

LAW OF CONSERVATION OF MASS

Text modified from: http://www.helium.com/items/1672816-law-of-convervation-of-mass

The most basic and fundamental law of Science is called the law of conservation of mass. It forms the foundation for studying chemical reactions and the properties of compounds. It is a very simple concept that allows for scientists to study the true nature of chemical reactions and their products. This law states "mass cannot be created or destroyed, only transferred from state to state."

A simple way to understand it is that the **reactants**, or ingredients (the substances being reacted together), in any chemical reaction must have the same mass as the **products** of the reaction. An everyday example would be the burning of wood. When wood is burned, the resulting products appear to be lesser then the original wood. This is because much of the wood escaped into the atmosphere as carbon dioxide, water vapor, and other gases. This open, outdoor setting is an example of an ***open system*** because matter can escape as gas into the atmosphere. If you were to trap these gases and measure their mass along with the left over ashes and char, the mass would be consistent with the original wood. This type of system that is sealed is known as a ***closed system***.

This concept was first discussed as early 300 B.C. by Epicurus who made the realization that "the sum total of things was always such as it is now, and such it will ever remain," The law determines that mass simply changes form, or position in space, but never ceases to exist. It may be released as a gas, or be shot off into the atmosphere, or even dissolve in a liquid, but at some level it is still there. It may sometimes be difficult to trace the products of the equation, but they were produced nonetheless.

This concept was further developed and proven by the French chemist Antoine Lavoisier. He used experimental methods to show that the products of a reaction maintain the same mass as the reactants. He did this by containing simple reactions in a sealed container where gas could not escape. This research was later furthered by the invention of the vacuum pump, which removed the atmospheric buoyancy of gases and allowed them to be more easily measured on scales.

The concept has launched us into the era of chemistry rather than the alchemy of prior generations. Scientists are now able to measure all of the products on scales. This idea lead to the idea of chemical elements, and the discovery of many previously unknown gases. The conservation of mass principal has brought science to where it is today.

YOUR TASK:

Record your answers in complete sentences on YOUR OWN paper.

1. Define the Law of Conservation of Mass (via text). Now that you've defined this law, explain what it means in your own words using an example.
2. Is it better to observe the law of conservation of mass in an open system of a closed system? Explain why in 2-3 sentences.
3. Create a visual representation of the law of conservation of mass in action.
4. How does technology help scientists know more about the states of matter?
5. What is the author's purpose for this article? Use evidence from the article to prove your point.
6. Using the article, and citing your article for evidence, explain in 6 sentences how scientists can use knowledge of the Law of Conservation of Mass to help them understand other things.

FINISHED? TURN IN TO MRS. BARTON + MRS. HILL-NORMAN

Law of Conservation of Mass

Materials	Physical Appearance	Mass (g)
Bottle	clear	92 (g)
40mL water	clear, liquid	40 (g)
Seltzer tablet	white, solid	1 (g)
Balloon	rubber, deflated	1 (g)
Total mass of system		134 (g)

After a while, bubbles started to appear and the balloon inflated as shown in figure 2.

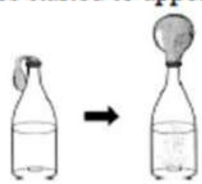


figure 2

A teacher conducted an investigation in class to determine if the contents of a closed container either loses or gains mass after a chemical reaction takes place. He placed 40 mL of water into a bottle, added one alka-seltzer tablet and quickly closed the bottle with a balloon.

The data table shows observations made before the reaction.

Once the contents of the container completely reacted, the teacher measured the mass of the entire system shown in figure 2. He shared his results with the class.

What are the reactants?

What are products?

Describe what has occurred?

How does this demonstrate the law of conservation of mass?

Conservation of Mass in Chemical Reactions

Jean Brainard, Ph.D.

AUTHOR
Jean Brainard, Ph.D.

To access a customizable version of this book, as well as other interactive content, visit www.ck12.org

Printed: April 22, 2019

CHAPTER 1 Conservation of Mass in Chemical Reactions

Learning Objectives

- Explain why chemical equations must be balanced.
- State the law of conservation of mass.
- Describe how Lavoisier demonstrated that mass is conserved in chemical reactions.

These vividly colored maple leaves were all bright green during the summer. Every fall, leaves of maple trees change to brilliant red, orange, and yellow colors. A change of color is a sign that a chemical change has taken place. Maple leaves change color because of chemical reactions.

Chemical Reactions and Balanced Equations

A chemical reaction occurs when some substances change chemically to other substances. Chemical reactions are represented by chemical equations. Consider a simple chemical reaction, the burning of methane. In this reaction, methane (CH_4) combines with oxygen (O_2) in the air and produces carbon dioxide (CO_2) and water vapor (H_2O). The reaction is represented by the following chemical equation:

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

This equation shows that one molecule of methane combines with two molecules of oxygen to produce one molecule of carbon dioxide and two molecules of water vapor. All chemical equations must be balanced. This means that the same number of each type of atom must appear on both sides of the arrow.

Q: Is the chemical equation for the burning of methane balanced? Count the atoms of each type on both sides of the arrow to find out.

A: Yes, the equation is balanced. There is one carbon atom on both sides of the arrow. There are also four hydrogen atoms and four oxygen atoms on both sides of the arrow.

Following the Law

Why must chemical equations be balanced? It's the law! Matter cannot be created or destroyed in chemical reactions. This is the **law of conservation of mass**. In every chemical reaction, the same mass of matter must end up in the products as started in the reactants. Balanced chemical equations show that mass is conserved in chemical reactions.

Lavoisier and Conservation of Mass

How do scientists know that mass is always conserved in chemical reactions? Careful experiments in the 1700s by a French chemist named Antoine Lavoisier led to this conclusion. Lavoisier carefully measured the mass of reactants and products in many different chemical reactions. He carried out the reactions inside a sealed jar, like the one in the **Figure** 1.1. In every case, the total mass of the jar and its contents was the same after the reaction as it was before the reaction took place. This showed that matter was neither created nor destroyed in the reactions. Another outcome of Lavoisier's research was the discovery of oxygen.

MEDIA

Click image to the left or use the URL below.

URL: http://www.ck12.org/flx/render/embeddedobject/82375

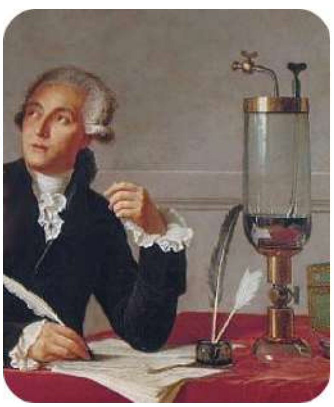


FIGURE 1.1

Antoine Lavoisier.

Q: Lavoisier carried out his experiments inside a sealed glass jar. Why was sealing the jar important for his results? What might his results have been if he hadn't sealed the jar?

A: Sealing the jar was important so that any gases produced in the reactions were captured and could be measured. If he hadn't sealed the jar, gases might have escaped detection. Then his results would have shown that there was less mass after the reactions than before. In other words, he would not have been able to conclude that mass is conserved in chemical reactions.

Summary

- A chemical reaction occurs when some substances change chemically to other substances. Chemical reactions are represented by chemical equations.
- All chemical equations must be balanced because matter cannot be created or destroyed in chemical reactions.
- Antoine Lavoisier did careful experiments to discover the law of conservation of mass in chemical reactions.

Review

1. Why must all chemical equations be balanced?
2. How did Lavoisier demonstrate that mass is conserved in chemical reactions?

Explore More

Watch the lab demonstration below, and then answer the questions that follow.

MEDIA
Click image to the left or use the URL below.
URL: http://www.ck12.org/flx/render/embeddedobject/82376

1. What reaction is demonstrated in the video?
2. How can you tell that oxygen is used up in the reaction?
3. How can you tell that the product of the reaction is different from the iron that began the reaction?
4. What evidence shows that mass is conserved in the reaction?

References

1. Jacques-Louis David. Portrait of Antoine Lavoisier . Public Domain

name ______________________________ date ________________ block ______

introduction to balancing chemical equations

review

1. Label the reactants and the product(s) in the following chemical reactions:
   a. $Na + Cl \rightarrow NaCl$

   b. $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$

2. What is a subscript? What does a subscript tell you? *Come up with an example and label the subscript.* ____
   ____
   example:

3. What is a coefficient? What does a coefficient tell you? *Come up with an example and label the coefficient.* ______________________________________
   ____
   example:

4. Look at the following equation: $Fe + Cl_2 \rightarrow FeCl_3$
   a. Which elements are in the above reaction? ______________________________
      How many of each element on the ***reactant*** side? Fe = ______ Cl = ______
      How many of each element on the ***product*** side? Fe = ______ Cl = ______

apply!

5. Plant cells use water, carbon dioxide and energy from the sun to produce glucose and oxygen. This process is called photosynthesis.

$$CO_2 + H_2O + energy \rightarrow C_6H_{12}O_6 + O_2$$

Which chemical formula(s) represents the reactants?	Which chemical formula(s) represents the products?
How many of each atom is present in the reactants? C – H – O –	How many of each atom is present in the products? C – H – O –
Is this a balanced equation (yes or no)? Explain why.	

name ______________________________ date _______________ block ______

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6. A silver spoon tarnishes. The silver reacts wit sulfur in the air to make silver sulfide, the black material we call tarnish.

$$2Ag + S \rightarrow Ag_2S$$

Which chemical formula(s) represents the reactants?	Which chemical formula(s) represents the products?
How many of each atom is present in the reactants? Ag - S -	How many of each atom is present in the products? Ag- S -
Is this a balanced equation (yes or no)? Explain why.	

7. Silicon, the second most common element in Earth's crust, is commonly used in semiconductors and electronics. Since it is naturally found in quartz, it is necessary to heat the quartz with carbon to separate the silicon.

$$SiO_2 + 2C \rightarrow Si + 2CO$$

Which chemical formula(s) represents the reactants?	Which chemical formula(s) represents the products?
How many of each atom is present in the reactants? Si - O - C -	How many of each atom is present in the products? Si - O - C -
Is this a balanced equation (yes or no)? Explain why.	

practice balancing chemical equations:

Use your page 22 (notebook) to practice balancing the following equations:

8. $Na + H_2O \rightarrow NaOH + H_2$

9. $Fe + O_2 \rightarrow Fe_2O_3$

10. $Al + O_2 \rightarrow Al_2O_3$

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Balancing Act

Name ___________________________

Atoms are not _______________ or _____________ during a chemical reaction. Scientists know that there must be the ___________ number of atoms on each ___________ of the ____________. To balance the chemical equation, you must add _______________ in front of the chemical formulas in the equation. You cannot _______ or ___________ subscripts!

1) Determine number of atoms for each element.
2) Pick an element that is not equal on both sides of the equation.
3) Add a coefficient in front of the formula with that element and adjust your counts.
4) Continue adding coefficients to get the same number of atoms of each element on each side.

☐ Mg + ☐ O_2 ➔ ☐ MgO

Mg = Mg =

O = O =

Try these:

☐ Ca + ☐ O_2 ➔ ☐ CaO

Ca = Ca =

O = O =

☐ N_2 + ☐ H_2 ➔ ☐ NH_3

N = N =

H = H =

☐ Cu_2O + ☐ C ➔ ☐ Cu + ☐ CO_2

Cu = Cu =

O = O =

C = C =

☐ H_2O_2 ➔ ☐ H_2O + ☐ O_2

H = H =

O = O =

Balancing Act Practice Name ______________________________

Balance each equation. Be sure to show your lists! Remember you cannot add subscripts or place coefficients in the middle of a chemical formula.

1. $Na + MgF_2 \rightarrow NaF + Mg$

2. $Mg + HCl \rightarrow MgCl_2 + H_2$

3. $Cl_2 + KI \rightarrow KCl + I_2$

4. $NaCl \rightarrow Na + Cl_2$

5. $Na + O_2 \rightarrow Na_2O$

6. $Na + HCl \rightarrow H_2 + NaCl$

7. $K + Cl_2 \rightarrow KCl$

Challenge: This one is tough!

$C_2H_6 + O_2 \rightarrow CO_2 + H_2O$

Balancing Act

Overhead Key

Atoms are not **CREATED** or **DESTROYED** during a chemical reaction. Scientists know that there must be the **SAME** number of atoms on each **SIDE** of the **EQUATION**. To balance the chemical equation, you must add **COEFFICIENTS** in front of the chemical formulas in the equation. You cannot **ADD** or **CHANGE** subscripts!

Step 1: Determine number of atoms for each element.

Step 2: Pick an element that is not equal on both sides of the equation.

Step 3: Add a coefficient in front of the formula with that element and adjust your counts.

Step 4: Continue adding coefficients to get the same number of atoms of each element on each side.

☐ Mg + ☐ O_2 → ☐ MgO

Mg = Mg =

O = O =

Try these:

☐ Ca + ☐ O_2 → ☐ CaO

Ca = Ca =

O = O =

☐ N_2 + ☐ H_2 → ☐ NH_3

N = N =

H = H =

☐ Cu_2O + ☐ C → ☐ Cu + ☐ CO_2

Cu = Cu =

O = O =

C = C =

☐ H_2O_2 → ☐ H_2O + ☐ O_2

H = H =

O = O =

Balancing Act
Teacher Notes

Step-by-Step Example Problem:

Step 1: Determine number of atoms for each element.

$Mg + O_2 \rightarrow MgO$

Mg = 1	Mg = 1
O = 2	O = 1

Step 2: Pick an element that is not equal on both sides of the equation.

$Mg + O_2 \rightarrow MgO$

Mg = 1	Mg = 1
O = 2	O = 1

Since the O atoms are not equal, we'll target those first!

Step 3: Add a coefficient in front of the formula with that element and adjust your counts.

$Mg + O_2 \rightarrow$ **2** MgO

Mg = 1	Mg = ~~1~~ **2**
O = 2	O = ~~1~~ **2**

Adding a 2 in front of MgO will change the number of atoms on the product side of the equation.

Step 4: Continue adding coefficients to get the same number of atoms of each element on each side.

2 $Mg + O_2 \rightarrow$ **2** MgO

Mg = ~~1~~ **2**	Mg = ~~1~~ **2**
O = 2	O = ~~1~~ **2**

Now we need to increase the number of Mg atoms we have on the reactant side. Adding a 2 in front of Mg will give us 2 atoms of Mg and balance the equation.

Balancing Act Answer Key:

Page 1 Problems

$2\ Ca + O_2 \rightarrow 2\ CaO$

$N_2 + 3\ H_2 \rightarrow 2\ NH_3$

$2\ Cu_2O + C \rightarrow 4\ Cu + CO_2$

$2\ H_2O_2 \rightarrow 2\ H_2O + O_2$ Hint: Add the O atoms on the product side together when doing the counts.

Page 2 Practice Problems

1. $2\ Na + MgF_2 \rightarrow 2\ NaF + Mg$
2. $Mg + 2\ HCl \rightarrow MgCl_2 + H_2$
3. $Cl_2 + 2\ KI \rightarrow 2\ KCl + I_2$
4. $2\ NaCl \rightarrow 2\ Na + Cl_2$
5. $4\ Na + O_2 \rightarrow 2\ Na_2O$
6. $2\ Na + 2\ HCl \rightarrow H_2 + 2\ NaCl$
7. $2\ K + Cl_2 \rightarrow 2\ KCl$

Challenge: This one is tough!

$2\ C_2H_6 + 7\ O_2 \rightarrow 4\ CO_2 + 6\ H_2O$