Step Away From The Textbook!

Chemistry

- The Periodic Table
- Atoms, Elements, & Compounds
- Chemical Equations
- Mixtures & Solutions

Activities, Parodies, Games, Jokes, Review Sheets, "3-D Templates", Cold Reading Passages, and much more!

Homecourt Publishers ■ **Greenville, SC**

Step Away From The Textbook!

Can I really make copies of these pages to use as handouts?

Yes. *That's why we made them. Please feel free to make copies of the handouts so that your students can learn and enjoy the material.*

Keep in mind—it is unlawful to use these handouts for sale or profit. Please do not present the material in these handouts as your own original work, as they are protected by all relevant copyright laws.

Every effort has been made to make these handouts as complete and accurate as possible. However, *there may be mistakes*, both typographical and in content. Therefore, this material should be used only as a guide and not as an ultimate source of research. Homecourt Publishers shall have neither the liability nor responsibility to any person or entity with respect to any loss or damage caused by the information contained in these handouts.

*Okay, now that you've got all of the disclaimers out of the way—**go have fun!!!***

For information or comments, contact:

Homecourt Publishers
2435 East North St., #245
Greenville, SC 29615-1442
benbache@homecourtpublishers.com
www.homecourtpublishers.com
(864) 877-5123

Managing Editor - Ben Bache **benbache@homecourtpublishers.com**
Lead Editor – Alissa Torzewski

Thank you to **Joann Wood** for contributing ideas, inspiration, and original work to this project.

Additional contributions made by **Nancy Rechtman** and **Audrey Cook**

Cover illustration by **Zach Franzen**.

Table of Contents

"A teacher who is attempting to teach without inspiring the pupil with a desire to learn is hammering on cold iron."

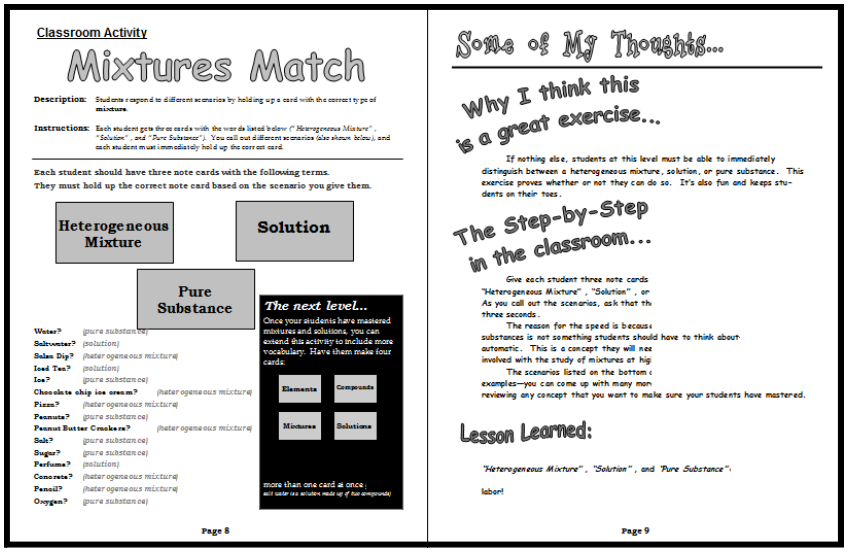
—Horace Mann (1796-1859)
"The Father of American Public Education"

Section 1

Over the next few pages I will share some of my personal classroom secrets that are sure to engage and excite your students!

Here's how it works:

The left-hand page includes the song parody, activity, poem, game, etc. for you to share with your students.



Classroom Activity

Mixtures Match

Description: Students respond to different scenarios by holding up a card with the correct type of mixture.

Instructions: Each student gets three cards with the words listed below (" Heterogeneous Mixture" , "Solution" , and "Pure Substance"). You call out different scenarios (also shown below), and each student must immediately hold up the correct card.

Each student should have three note cards with the following terms.
They must hold up the correct note card based on the scenario you give them.

Heterogeneous Mixture | Solution | Pure Substance

Water? (pure substance)
Saltwater? (solution)
Salsa Dip? (heterogeneous mixture)
Iced Tea? (solution)
Ice? (pure substance)
Chocolate chip ice cream? (heterogeneous mixture)
Pizza? (heterogeneous mixture)
Peanuts? (pure substance)
Peanut Butter Cookies? (heterogeneous mixture)
Salt? (pure substance)
Sugar? (pure substance)
Perfume? (solution)
Concrete? (heterogeneous mixture)
Pencil? (heterogeneous mixture)
Oxygen? (pure substance)

The next level...
Once your students have mastered mixtures and solutions, you can extend this activity to include more vocabulary. Have them make four cards:

Elements | Compounds | Mixtures | Solutions

more than one card at once :
salt water ice cream made up of five components

Page 8

Some of My Thoughts...

Why I think this is a great exercise...

If nothing else, students at this level must be able to immediately distinguish between a heterogeneous mixture, solution, or pure substance. This exercise proves whether or not they can do so. It's also fun and keeps students on their toes.

The Step-by-Step in the classroom...

Give each student three note cards "Heterogeneous Mixture" , "Solution" , or As you call out the scenarios, ask that th three seconds.

The reason for the speed is becaus substances is not something students should have to think about automatic. This is a concept they will nee involved with the study of mixtures at hig

The scenarios listed on the bottom examples—you can come up with many mor reviewing any concept that you want to make sure your students have mastered.

Lesson Learned:

"Heterogeneous Mixture" , "Solution" , and "Pure Substance".

labor!

Page 9

The right-hand page includes my personal commentary, including the reasons I've had success with this exercise, any key directions, and other tid-bits that might be helpful.

******The exercises on the next few pages are great to use for this topic area, but you can easily modify them to use for other topics and even subject areas. The simple format and extra notes that are provided will really help with this!***

Classroom Game

Mixtures / Solutions

Description: A version of *Connect 4!* to review **Mixtures & Solutions**

Instructions: Students fill out a 16-space board (at random) with terms you give them. You call out clues and they mark the appropriate term until they connect four spaces in a row or column. It is best described as "*Connect 4!* meets *Bingo*".

Students draw 16 boxes on their paper, and then write these terms <u>randomly</u> into the boxes.

Filtration	**Sifting**	**Magnetic Attraction**	**Evaporation**
Chromatography	**Floatation**	**Solute**	**Solvent**
Solution	**Heterogeneous Mixture**	**Physical Properties**	**Chemical Mixture**
Concentration	**Acid / Base**	**Definite Shape & Volume**	**Definite Volume, Changing Shape**

ANSWER KEY *(Call these out in <u>random</u> order)*:

1) **When a strain or thin paper is used to separate solid particles from a liquid…** ***(Filtration)***
2) **When a number of screens are used to separate smaller particles from larger ones…** ***(Sifting)***
3) **Used to separate certain metals *(i.e. iron, nickel, cobalt)* from other materials** ***(Magnetic Attraction)***
4) **Used to separate a solid from the liquid in which it has been dissolved…** ***(Evaporation)***
5) **Technique to separate and analyze the solutes in a solution…** ***(Chromatography)***
6) **Used to separate mixtures when certain solids move up when placed in water…** ***(Floatation)***
7) **The solid that dissolves in a solution…** ***(Solute)***
8) **The liquid in a solution that does the dissolving…** ***(Solvent)***
9) **A type of mixture where a solid has been dissolved in a liquid…** ***(Solution)***
10) **A mixture where the different particles can easily be seen & separated…** ***(Heterogeneous Mixture)***
11) **These don't change when particles mix and there is NO chemical reaction…** ***(Physical Properties)***
12) **A type of mixture where new substances are formed…** ***(Chemical Mixture)***
13) **The ratio of the amount of solute to solvent in a mixture…** ***(Concentration)***
14) **Label of a solution determined by where it falls on the pH scale…** ***(Acid / Base)***
15) **Characteristics of a solid, but not of a liquid or gas…** ***(Definite Shape & Volume)***
16) **Characteristics of a liquid, but not of a solid or gas…** ***(Definite Volume, Changing Shape)***

Some of My Thoughts...

Why I think this is a great exercise...

Students love to play games—it's as simple as that. It's always great when you can find a game that ties in with the standards! This particular game is modeled after "Connect 4" and my students really enjoyed it. It also allows you to cover a lot of ground in a short time.

The Step-by-Step in the classroom...

As you list specific terms, students randomly fill in their blocks on their game boards. When you call out the questions (also in random order), the students mark the correct place on their board. The object of the game is to connect four spaces in a row or column. Make sure you check the board of the student who raises his or her hand!

You can also write all of the questions on strips of paper and put them into a hat. Have students take turns drawing and reading a question (like drawing a number in "Bingo").

This game can be played first in class and then students can bring home their game boards (with answers written in) to use as a study guide.

Helpful Hint:

It may seem like a small thing, but have plastic bags on hand for game pieces! I have tried using envelopes to save some money – but they just don't work as well.

Classroom Activity

Mixtures Match

Description: Students respond to different scenarios by holding up a card with the correct type of **mixture**.

Instructions: Each student gets three cards with the words listed below *("Heterogeneous Mixture" , "Solution" , and "Pure Substance")*. You call out different scenarios *(also shown below)*, and each student must immediately hold up the correct card.

Each student should have three note cards with the following terms.
They must hold up the correct note card based on the scenario you give them.

Heterogeneous Mixture

Solution

Pure Substance

Water? *(pure substance)*
Saltwater? *(solution)*
Salsa Dip? *(heterogeneous mixture)*
Iced Tea? *(solution)*
Ice? *(pure substance)*
Chocolate chip ice cream? *(heterogeneous mixture)*
Pizza? *(heterogeneous mixture)*
Peanuts? *(pure substance)*
Peanut Butter Crackers? *(heterogeneous mixture)*
Salt? *(pure substance)*
Sugar? *(pure substance)*
Perfume? *(solution)*
Concrete? *(heterogeneous mixture)*
Pencil? *(heterogeneous mixture)*
Oxygen? *(pure substance)*

The next level...

Once your students have mastered mixtures and solutions, you can extend this activity to include more vocabulary. Have them make four cards:

Elements | **Compounds**

Mixtures | **Solutions**

You can repeat the items on the side, and add your own. In some cases, your students will need to hold up more than one card at once *(for example: salt water is a solution made up of two compounds)*

Some of My Thoughts...

Why I think this is a great exercise...

If nothing else, students at this level must be able to immediately distinguish between a heterogeneous mixture, solution, or pure substance. This exercise proves whether or not they can do so. It's also fun and keeps students on their toes.

The Step-by-Step in the classroom...

Give each student three note cards apiece, and have them write "Heterogeneous Mixture" , "Solution" , or "Pure Substance" on each note card. As you call out the scenarios, ask that they hold up the correct note card within three seconds.

The reason for the speed is because distinguishing between the different substances is not something students should have to think about—it should be automatic. This is a concept they will need to master before they get more involved with the study of mixtures at higher levels.

The scenarios listed on the bottom of the left-hand page are just examples—you can come up with many more. In fact, this exercise is great when reviewing any concept that you want to make sure your students have mastered.

Lesson Learned:

I know it sounds obvious, but it is much easier to have your students write *"Heterogeneous Mixture"* , *"Solution"* , and *"Pure Substance"* on each note card than to do it yourself. I've wasted many hours not taking advantage of my free labor!

Song Parody

The Periodic Table

Description: A song used to help students understand the **basics of the periodic table**

Instructions: Sung to the tune of *"The Itsy Bitsy Spider"*

The Periodic Table

(Sung to the tune of "*The Itsy Bitsy Spider*")

The periodic table shows us the elements.
Some are very heavy, others not as dense.
Period's the name of a horizontal row,
And the columns are the families, with properties I know.

The families are groups of elements that relate.
Each category is so vertical and straight.
The first group's number one and last is group 18,
And the other groups have all the numbers in between.

The atomic number goes from left to right and down.
Hydrogen has one electron going 'round.
Helium is next; its atomic number's two.
And please don't forgot the rest 'cause they're important, too.

The symbol and the name of a single element
Atomic mass and number are its measurements
All of these are found on each element's own square
And the large atomic numbers are usually more rare.

A zigzag on the right divides the chart in two
Metals to the left are more, it's true
Nickel, silver, cobalt, copper, gold, and zinc
And the many other metals are just as cool, I think.

On the right side of the zigzag, the nonmetals are found.
There's less of them in number, but more of them around
They're in the air and dirt and even in the sea
Oh the nonmetals are best, especially for me.

Some of My Thoughts...

Why I think this is a great exercise...

This detailed song covers many facets of the periodic table, which can often be a difficult topic for students to fully grasp. Whether you choose to utilize it as a song or a poem, it presents in-depth information to students in a nonthreatening way.

The Step-by-Step in the classroom...

I always recommend reading the songs first. This allows everyone to make sure they know the pronunciation of the words and gives students a chance to ask questions about any vocabulary they need to know beforehand. After all, the purpose of this song is to help students understand specific terms and concepts within the science standards.

Reading it as a class also allows you to address poetic language in the songs and integrate those ELA standards.

Taking it a step further:

After a lesson on the periodic table (including this song), I sometimes have my students write their own short songs or poems, which can also be done for any topic. It's a fun way to drive home lessons—not only is their creativity flowing, but they have to incorporate the information you've given them. By going over this song a few more times (at random throughout the year), I think they were all very comfortable with the topic.

Section 2

"Information Overload"

Review Sheets

The next few pages feature detailed review sheets for your students to study key topics. ***Messy Mel*** *will serve as the narrator and walk students through a wide variety of terms and concepts (with his special brand of humor).*

Feel free to make copies of these "Information Overload" sheets to distribute to your students.

Narrated by

Messy Mel

Ok, here's the deal. My name is Mel, but my close friends call me "Messy Mel." I think it's their way of showing respect.

I'm a construction worker by day and a scientist by night (well, an "honorary" scientist, anyway).

I know that science is full of fancy terms, concepts, and theories. And that's just the basics.

Well, I'm about as basic as you can get. Let me break down some of that scientific jargon in way that's easy to understand and remember.

Like I said, I'm no rocket scientist *(for what it's worth, my dear Mother used to tell me I had rocks in my head)*, but I might be just what you need!

Mixtures & Solutions

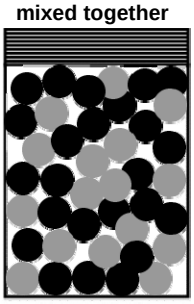
I'm obviously a very skilled scientist. How can you tell? Well, because I've got a lab coat and I'm mixing something.

What, that doesn't sound scientific to you? Well then you have a thing or two to learn about **mixtures**. Luckily, I can help.

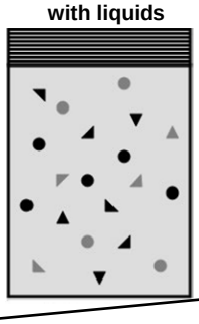
Mixtures

Heterogeneous Mixtures
(this is just a fancy way of saying several things are mixed together)

Two or more solids mixed together

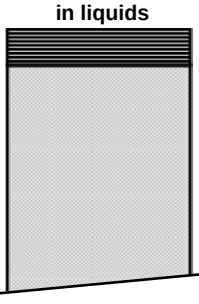


Solids mixed with liquids



Solution
(this is when things are mixed so completely, that it appears to be one substance)

Solids dissolved in liquids



Here's the one golden rule to remember with mixtures:

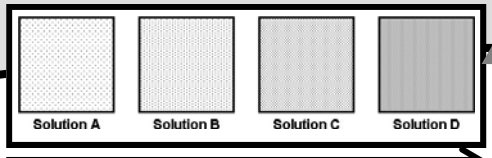
Substances in a mixture keep their individual properties, and they can always be separated again.

Now, separating mixtures is not always an easy thing to do. Here are a few methods:

Techniques for Separating Mixtures

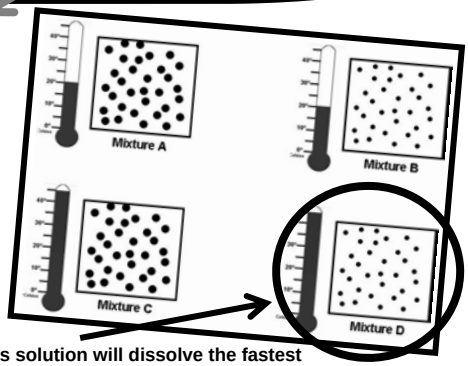
	WHEN TO USE:	
Filtration	To separate solid particles from a mixture	*A mixture is poured through filter paper, and the filter paper traps the solid particles and allows the liquid to pass through.*
Sifting	To separate smaller particles from larger particles	*A mixture of different sized solid particles is put onto a screen material that has holes of a certain size. When the mixture is shaken, the small particles go through and larger particles are left behind.*
Magnetic Attraction	To separate magnetic material from the rest of the mixture	*A magnet is stirred through the mixture, and it pulls out any magnetic material from the mixture.*
Evaporation	To separate solid particles that have dissolved in a mixture	*The solution is heated until all of the liquid turns to a gas, and only the solid particles remain.*
Floatation	To separate a mixture of solid particles.	*The mixture is placed into water and stirred. Solid particles float to the top, where they can be skimmed of the surface.*

Now, let's talk a little about **solutions**. When a solid *(or the "**solute**")* is dissolved into a liquid *(the "**solvent**")*, you have to consider a few things. The first is the **concentration**, or the ratio of solute to solvent. Please refer to my high-tech diagram.



The concentration increases when there is more solute *(the solid stuff)* compared to solvent (*the liquid*).

Also, if you're in a hurry, you might want to take into account the **rate of dissolving**. Solutions will dissolve faster when you increase temperature, decrease particle size, or stir faster. Behold:



This solution will dissolve the fastest because it is at the highest temperature with the smallest particles size. Stirring will speed things up even more.

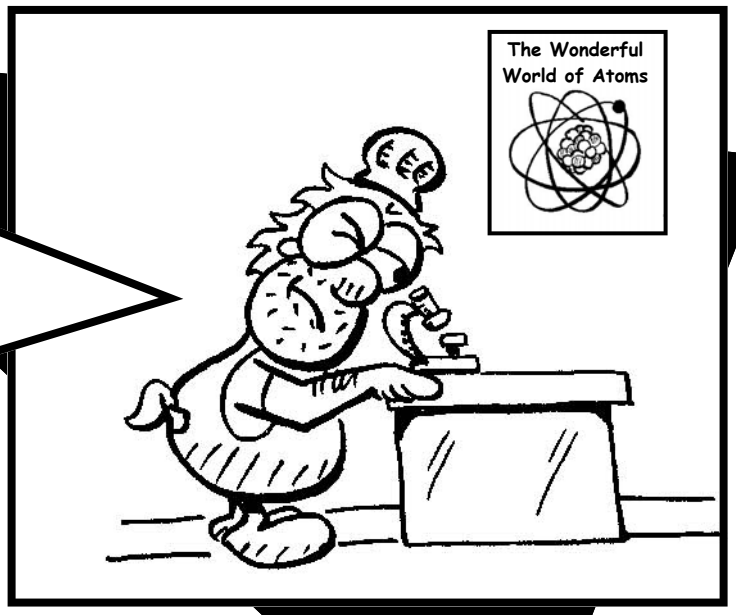
ATOMS, ELEMENTS, COMPOUNDS, & MIXTURES

Here's a simple scientific concept for you to wrap your head around:

Everything can be broken down into smaller pieces.

To put it another way: *all matter is composed of extremely small particles.*

These particles are called **atoms**, and they are too small to see with a regular microscope. Do you see that speck of dirt on the ground? Well, an atom is at least a *hundred-trillion* times smaller than that *(just so you know, that number is equal to 100,000,000,000,000).*



Okay, now we know that all matter is made up of atoms, so now lets talk about other ways it is identified. I'm talking about **elements**, **mixtures**, and **compounds**—and there is no better way to demonstrate those concepts than with a jar of marbles.

Elements

Elements are pure substances that cannot be changed into simpler forms. They are one single type of atom, just like my jar is filled with one single type of marbles.

Mixtures

Mixtures are two or more substances that retain their physical properties and can be separated out again. Notice my jar of mixed marbles.

Compounds

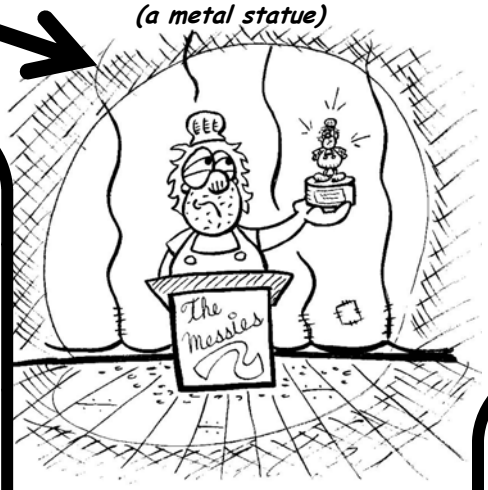
Compounds are pure substances that contain two or more elements, and they can't be separated easily. For example, try separating my ball of melted marbles.

METALS VS. NONMETALS

I'm the proud winner of the "Messy" awards for the second straight year. It's such an honor to be appreciated for the dirt and grime I leave behind.

This year's trophy was a little metal statue. A big improvement from the wooden carving they gave me last year. And, as an added bonus, it gives me the chance to compare the physical properties of metals and nonmetals. Whoopee!

This year's trophy
(a metal statue)



Metal

Luster—Has a shiny surface

Conductivity—Allows heat and electricity to move easily through

Malleable—Can be hammered into different shapes

High density—Heavy for its size

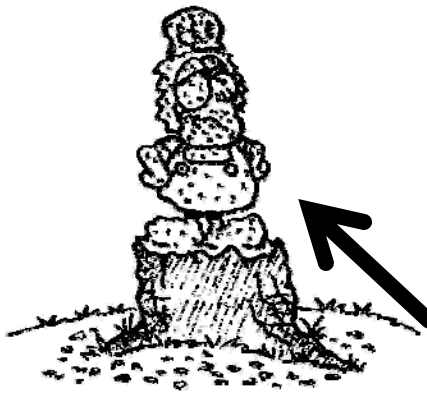
Nonmetal

Dull—Not shiny or reflective

No conductivity—Heat and electricity do NOT move easily through

Brittle—Easily breaks or shatters

Last year's trophy
(a wooden carving)



My classy reaction upon hearing that I had won my second "Messy"

THE PERIODIC TABLE

I've been racking my brain for weeks trying to create an organized way to display all of the **elements**. And then…

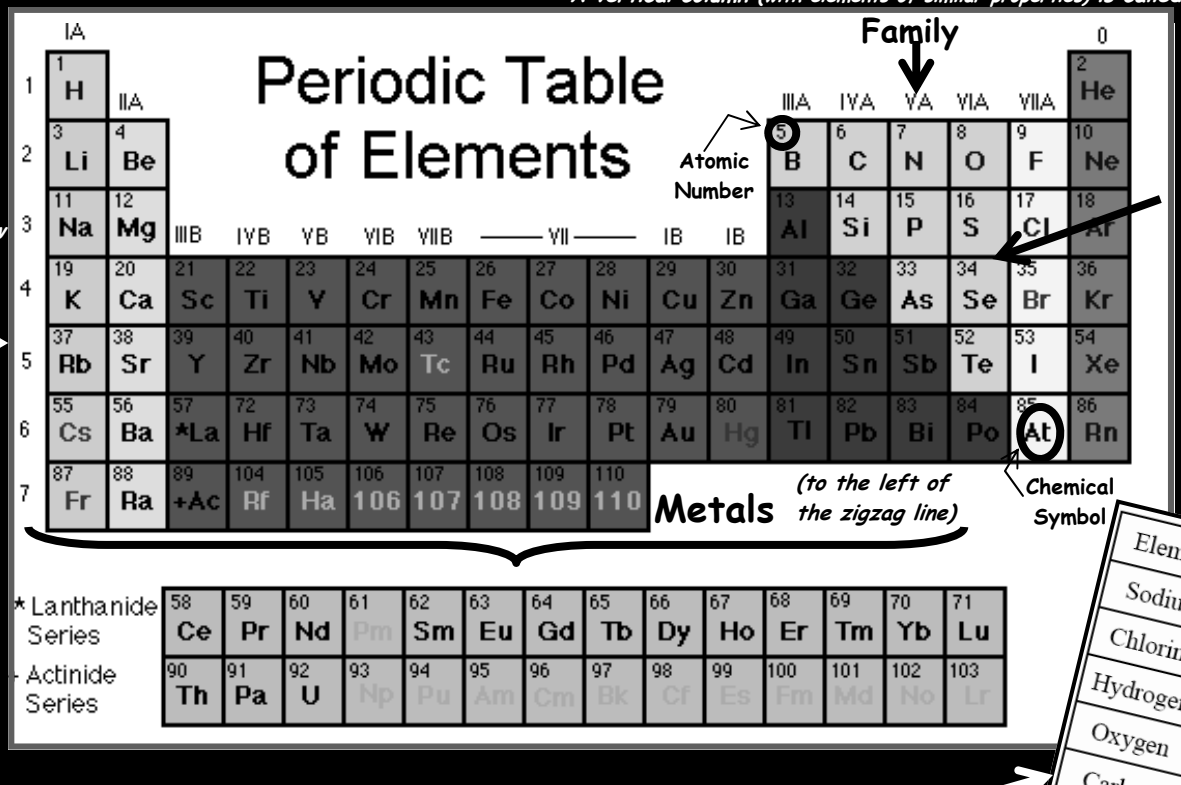
Behold! I created the Periodic Table!

…and then I found out that it's been around for over 100 years. Oh well, here it is…

A vertical column (with elements of similar properties) is called a: **Family**

A horizontal row is called a: **Period**

Non-metals *(right of the zigzag line)*



Element	Symbol
Sodium	Na
Chlorine	Cl
Hydrogen	H
Oxygen	O
Carbon	C
Nitrogen	N

A few chemical symbols that you should probably know:

Once you're like me and have mastered the Periodic Table, you can start writing the **chemical formulas** for different compounds.

Compounds are when more than one element combines to form a new substance. The formulas are written using the chemical symbols for the elements. For example:

CO_2 = Carbon Dioxide

(this compound is formed when one atom of carbon combines with 2 atoms of oxygen)

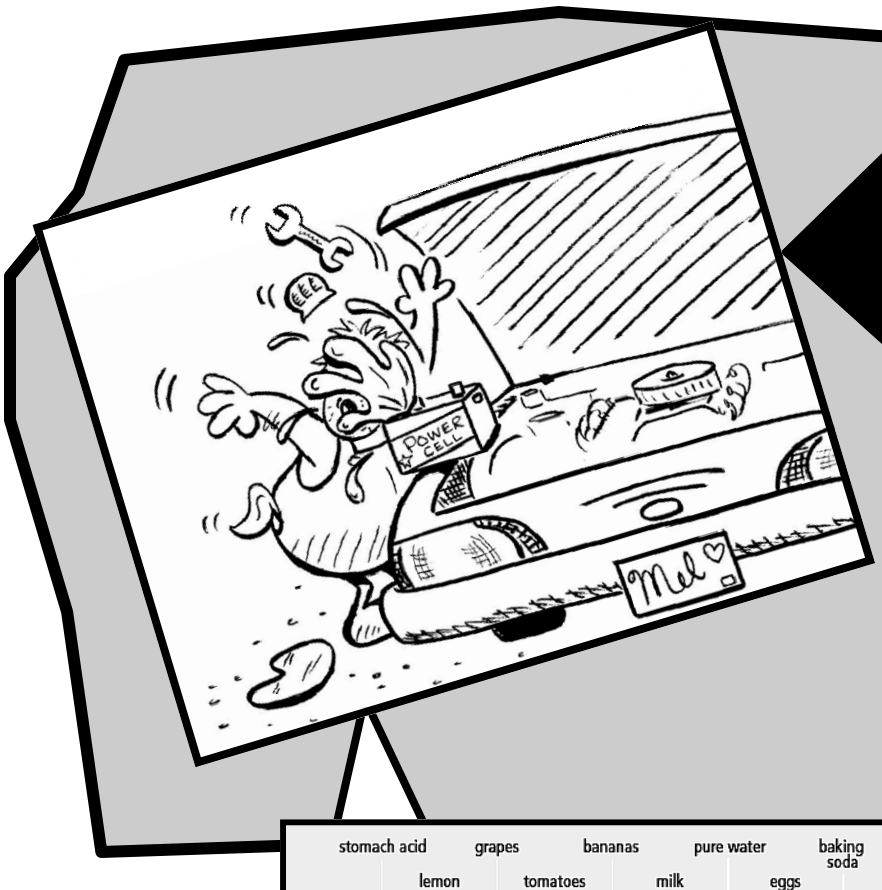
A few other compounds that might be at your kitchen table:

H_2O = Water

NaCl = Salt

$C_6H_{12}O_6$ = Sugar

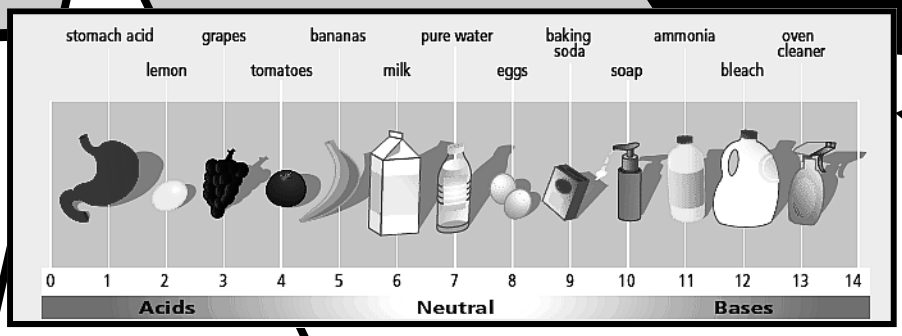
ACIDS & BASES



I'm a "glass is half full" type of guy. I'm always looking for the positive in any situation.

Sometimes that can be hard. For example, my car broke down this morning. When I opened the hood to take a closer look, I ended up squirting my face with battery acid.

So, how can I find a silver lining in all of this? Well, while my eyes were burning from the battery fluid, I realized that this might be a good time to remember everything I know about **acids and bases**. And I should probably call a mechanic.



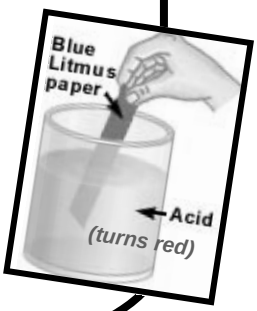
Everyday solutions on a pH Scale

For starters, **acids and bases are solutions**. To refresh your memory, *solutions are mixtures where a solute is dissolved into a solvent*, sort of like salt can be dissolved into water.

A **pH scale** *(which I've kindly placed above)* is used to measure how acidic or basic a solution is. The pH scale ranges from 0 to 14. Something with a pH value less than 7 is acidic; it is basic if it is greater than 7. If it is neutral—like water—the value is *exactly* 7.

Aside from the scale, there are few other ways to tell if something is basic or acidic. Acids usually have a sour taste *(like lemon juice)*, while bases have a bitter taste *(have you ever gotten soap in your mouth?)*.

But I wouldn't suggest tasting strange objects to see if they're acids or not. Instead, you can use other, much safer, tests. For example, a strip of blue **litmus paper** will turn red if it is dipped an acid. Red litmus paper turns blue if dipped in a basic.



One more thing worth mentioning. Acids and bases tend to react when they come in contact with one another (think about vinegar and baking soda). The end result of that reaction? A neutral solution, with a pH balance right in the middle of the scale.

CHEMICAL EQUATIONS

Don't mind me. Sometimes I like to find strange solutions and mix them together to form a **chemical reaction** (which I don't recommend… and I'm speaking from experience). I don't think I'll blow anything up… again. But I should probably go get a fire extinguisher just in case.

I'm noticing that my new substance is starting to fizz and release a strange odor. I guess I had better hurry up and explain what's going on...

A **chemical reaction** takes place when at least two elements or compounds are combined to form a new substance *(or when that new substance is broken apart into its original components).* That chemical reaction can be represented by a **chemical equation**, which I've neatly written out below.

This particular equation shows how aluminum & oxygen elements combine to form Aluminum Oxide.

Reactants *(substances being combined or broken apart)*

The arrow means "yields" or "makes"

Product *(new substance formed in the chemical reaction)*

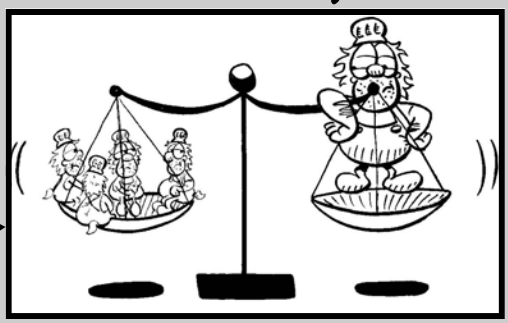
$$4Al + 3O_2 \longrightarrow 2Al_2O_3$$

Conservation of Matter

"Matter can neither be created nor destroyed..."

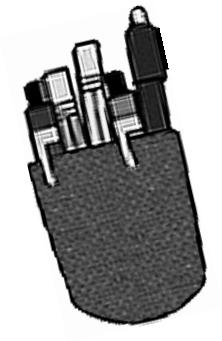
Let's talk a second about **Conservation of Matter**. Simply put, you don't make new matter (or get rid of old matter) in a chemical reaction. All you do is *change* the form of the matter. Please refer to my beautiful diagram.

Notice that the chemical equation above is a **balanced equation**. Multiplying the ***coefficients*** *(in front of the chemical formulas)* and the ***subscripts*** *(the small numbers)* gives you 4 aluminums and 6 oxygens on each side of the equation.



Notice that the scale is balanced. A bunch of little Messy Mel's have combined to form one big Messy Mel. This is sort of what happens in a chemical reaction.

Section 3



Pocket Activities

These are quick activities that can be used for class-openers, ice-breakers, attention-grabbers, and so on.

We've also added a few jokes to have in your pocket when you're really trying to keep students from staring out the window!

Activity - "A Race to Dissolve" (Mixtures & Solutions)

Divide your students into two groups. The goal of each group is to quickly dissolve a certain amount of sugar into a cup of water. However, the groups will be creating their solution under different circumstances. For example, one of the following variables should be different for each group:

- **fine sugar grains vs. coarse sugar grains**
- **high concentration of sugar vs. low concentration of sugar**
- **stirring vs. not stirring**
- **heated water vs. cold water**

Repeat the experiment several times, each time working with a new variable. The time it took the solute to dissolve in the mixture should be recorded with each experiment.

In the end, decide which of the above variables proved to have the most impact in determining the rate of dissolving. Under which circumstances would the sugar water dissolve the fastest?

Answer: The variables that would result in the fastest dissolving time should be fine sugar grains, low concentration of sugar, stirring, and heated water

Activity - Separating a Mixture

Bring several containers into the classroom, each holding a different mixture. A few examples are below:

- **sugar mixed with water**
- **sand mixed with water**
- **jelly beans mixed with M&Ms**
- **coarse gravel mixed with fine sand**
- **paper clips mixed with pencil erasers**

Divide your students into groups and have them separate the mixtures. They should first discuss the appropriate method, which may include:

- **filtration**
- **sifting**
- **magnetism**
- **evaporation**
- **floatation**

As a class, decide which of the above mixtures is different from the others. The most likely answer is the **sugar mixed with water**. Unlike the other heterogeneous mixtures, this is a *solution*. The only way to separate it would be to evaporate the water (the solvent), thus leaving behind the sugar (the solute).

Activity - Setting the Periodic Table

Ask each student to choose one square (element) from the periodic table. By simply reviewing the information, they should be able to answer all of the following questions:

- **Is it an element, compound, or mixture?** *(the periodic table gives a list of elements)*
- **Can the substance be broken down into further parts by a chemical reaction?** *(by definition, an element cannot be broken down into smaller parts)*
- **Is it a metal, gas, or other?**
- **What abbreviation is used when it is used in a chemical compound or chemical equation?**
- **What is its atomic number?**
- **Is it light or heavy compared to other elements?** *(atomic weight usually increases with the atomic number)*
- **What other elements share similar properties?** *(for most elements, those that are in the same group, or vertical column, share similar properties -- for some transition metals, the period—or horizontal row—has been separated because elements share similar properties)*

The above information can be determined from the periodic table regardless of which element is being analyzed. Depending on the level of your students, you can easily add or take away questions from the list shown above.

Activity - The Language of Chemistry

Most kindergartners can tell you what the letters C-A-T spell. However, it isn't so easy to determine what these letters spell:

- **H_2O — Water**
- **CO_2 — Carbon Dioxide**
- **NaCl — Salt**
- **$NaHCO_3$ — Baking Soda**

The items listed above are chemical compounds for everyday items. Chemists have created their own "language" that can communicate the way elements interact with one another. See if your students can find the letters used to form other common chemical compounds.

As a class, discuss why it is easier for chemists to communicate in scientific symbols and chemical equations rather than trying to explain everything in everyday language. Here are a few thoughts:

- **Symbols are faster and easier to write**
- **All chemists share technical knowledge**
- **Advanced concepts are difficult to explain in everyday language**
- **Chemists follow scientific tradition**

A Little Humor

Mixtures & Solutions

Q: What did the solvent say to the solute?
A: Enough standing around… It's time to jump in and become part of the solution!

(this classic joke format is a great way to introduce the parts of a solution)

Q: What's the most important thing for a student to learn when working with mixtures and solutions in the chemistry lab?
A: Never lick the spoon!

(safety first… hopefully, you can use this as a joke and not actual advice...)

Chemical Compounds

Teacher: Does anyone know what chemical compound I have in this beaker?
Student: Hold on, I know this one. It's right on the tip of my tongue.
Teacher: Well spit it out, it's sulfuric acid!

(this one's funny, and you can use it when introducing acids & bases)

Teacher: What is the chemical formula for water?
Student: I know! It is HIJKLMNO.
Teacher: That's not what I taught you!
Student: But you said it was H to O...

(it's cheesy, but it's an easy way to open the subject of chemical formulas)

Woman: Do you have any acetylsalicylic acid?
Pharmacist: You mean aspirin?
Woman: That's right. I can never remember that word.

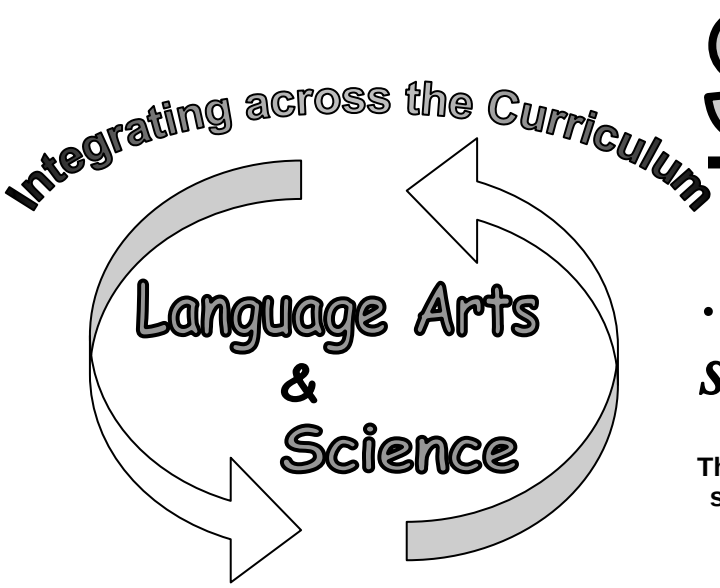
(your students will appreciate this as you go over the method used to name chemical compounds)

Periodic Table

Boy #1: Which element can you use to get the wrinkles out of your clothes?
Boy #2: Iron, of course.

Girl #1: Which element on the periodic table makes sure that everyone follows the rules.
Girl #2: That's easy — copper!

(these are terrible puns, but students like them… and there are lots out there if you want more)



Section 4

...because there are only so many hours in the day.

The next few pages include passages that focus on this scientific topic, but can also be used for practice with Reading Comprehension and other Language Arts skills. Please feel free to make copies.

Have a Drink — the story of Coca-Cola

A curious chemist stumbles into new territory

Imagine you've been working out in the sun all day. You're covered with sweat, dirt, and grime. And now it's time to take a break. Chances are, you'd pay a hefty price for a refreshing beverage. And sometimes water or lemonade just won't do. You need something that can "cut through the dust."

In 1807, Yale chemistry professor Benjamin Silliman saw this as a business opportunity. He began selling bottled seltzer water. The carbonation in the water gave it a little more kick, helping to mimic the sharp sensation of a strong alcoholic beverage (without the negative consequences). The business took off, but it did have one major drawback—carbonated water isn't real tasty.

By the 1830s, people started adding flavor to the seltzer water, creating the option of buying lemon, orange, or grape flavored drinks. The popular way to get these new beverages was at the local drugstore, where the pharmacist would mix it up at his "soda counter." By the time the 1880s rolled around, there were just as many working soda fountains as actual bars and breweries.

Of course, every curious pharmacist was having a little fun with this new industry. In the search for the perfect soda fountain drink, it became common for strange mixtures, syrups, and other concoctions to be put to the test. Obviously, just as when you carelessly throw a bunch of ingredients into a pot at home, the results were varying.

Dr. John Pemberton was definitely one of those who fell under the heading of a "curious pharmacist." The Civil War veteran had a three-legged brass pot in his backyard that he used to create his concoctions *(almost in the same fashion of a witch slaving over her Witch's Brew)*. On May 8, 1886 he decided to try out a new mixture, probably without any high expectations.

The concoction included a mixture of coca leaves and kola nuts, and it resulted in a surprisingly tasty beverage. It has changed quite a bit through the years, but Dr. Pemberton had just created the foundation for the drink we all know as Coca-Cola.

Needless to say, Dr. Pemberton was impressed by his own creation. Since he lived in Atlanta, he took his drink over to the local Jacobs' Pharmacy where they agreed to sell it. Pemberton's bookkeeper, Frank Robinson, came up with the catchy name "Coca-Cola." In fact, it was Robinson's original penmanship that is still used today in the Coca-Cola logo.

Selling about nine Coca-Cola drinks per day that year, the tally on the new product was about $50.00. But that wasn't all profit. In an effort to advertise the drink *(it was originally marketed as a "brain and nerve tonic")*, Pemberton had spent over $70.00. Pemberton was a fantastic pharmacist and a clever inventor, but he obviously wasn't a terrific businessman. Realizing this, he sold his business to Atlanta entrepreneur Asa Griggs Candler for the healthy sum of $2,300.

Pendleton had already created the perfect product, so all Candler had to do was let people know about it. He offered free tastes of the new drink, and changed the marketing plan. Candler began selling Coca-Cola as a "refreshment" rather than a "nerve tonic." It worked. By 1900, Coca-Cola was being served from coast to coast. In a few more years, it hopped the coasts and became an international sensation. Today, even with heavy competition from other soft drinks, people drink over one billion Coca-Cola products each day *(a vast improvement from the nine cups each day in 1887)*.

The chemistry behind one of the most famous outbursts in history.

"Eureka!"

Archimedes (250 BC)

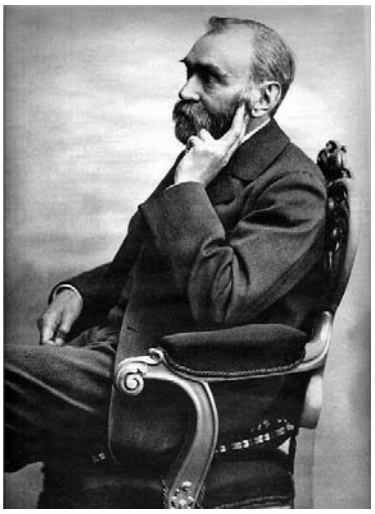
Stepping into his bath and noticing the water overflow from the tub, Greek physicist Archimedes couldn't hold back his excitement. His outcry, *"Eureka!"* translates to "*I found it!"* The water that was displaced by his body helped Archimedes figure out the answer to a problem that had previously had him perplexed.

As the legend goes, Hiero II, the leader of ancient Syracuse, had approached Archimedes around 250 BC with a strange dilemma. Hierro II wanted to determine whether a crown that he had been given was made of pure gold or with cheaper alloys. At first befuddled, Archimedes finally found the answer after the bathtub episode. He came up with the theory of hydrostatics, which says that an object placed in water has a weight equal to the amount of water it displaces. Since pure gold has a different density—or weight per volume—than other alloys, Archimedes reasoned that he could determine if the crown was indeed pure gold. This sudden revelation is what brought about his exclamation, *"Eureka!"*

In addition to his work in hydrostatics, Archimedes also had a great influence in the field of geometry and physics. Among his theoretical research, he is credited with developing the principle of the lever, which in turn led him to the creation of the catapult.

The Highest Prize in the Land

Alfred Nobel lays out the Nobel Prize (and tries to shake his reputation as an evil chemist)



Alfred Nobel

Alfred Nobel was in the business of explosives. In the mid-1800s, the Swedish engineer worked with his father developing torpedoes and mines, as well as trying to create new things that could "blow up." With that as his occupation, it seems strange that Alfred Nobel was primarily a pacifist, as well as an aficionado of science and literature. In other words, he wasn't a warmonger.

Nobel was able to work his civilized qualities into the dangerous business, searching for ways to tame his explosives. At that time, they were so sensitive that explosions would often occur in transport and in loading. In 1866, Nobel finally made a breakthrough in his experiments with nitroglycerin. He managed to create a powerful explosion that could also be controlled, and was much less likely to detonate prematurely.

Immediately, Nobel's new invention—which he named "dynamite"—became a must in the construction of canals, tunnels, and in the blasting of rock. Of course, there was another obvious use for dynamite—as a weapon. Alfred Nobel had his share of anxiety about the potential use *(or misuse)* of his new invention, and he did the best he could to direct his company towards people who would use dynamite constructively.

For the remainder of his life, Nobel continued to make improvements with explosives, and he also used his chemical expertise in other areas. Acquiring more than 300 patents, he helped in the invention of synthetic rubber, man-made leather, and even artificial silk.

With his health declining in 1895, Alfred Nobel sat down to make up his final will. He wasn't too keen on the idea of history remembering him solely as the inventor of dynamite. Nobel wanted to leave behind a different legacy, as someone who brought good into the world.

On November 27, 1895, Alfred Nobel signed his final will & testament. In it, he dictated that he wanted the bulk of his fortune to be used to create an award focused on world betterment—the Nobel Prize.

He didn't leave much time to spare. Only two weeks after signing his will, Alfred Nobel died in San Remo, Italy. His will went public in January 1896, and shocked the world. However, the ones who were perhaps the most surprised were the members of his own family. Instead of leaving them a large inheritance, Nobel had given his fortune of over thirty million kronor *(equal to $9 million)* to the creation of this Nobel Prize.

Not surprisingly, several family members contested the will, and a number of lawyers were brought in to sort out the confusion. While Alfred Nobel had been very clear in dictating his intentions, he wasn't so obvious with the legal specifics. Throughout his life, his involvement with lawyers had been with tedious patent claims or stressful business proceedings, and he wasn't eager to have a lawyer assist him in penning his final will. Several months of confusion followed.

But Nobel's wishes remained intact. It was decided that the capital from his estate would be divided up annually and given as a prize to the person or organization that had made the most positive impact on the world the previous years. The categories he dictated for the Nobel Prize included physics, chemistry, medicine, literature, and peace *(economics was added later)*.

The first Nobel Prizes were awarded in 1901, and they have since been given to such notables as Winston Churchill, Albert Einstein, Mother Theresa, and Martin Luther King, Jr.

Fun Facts: Chemistry

- Chalk is made out of trillions of microscopic skeleton fossils of single-celled plankton.

- A pure diamond is made of 100% carbon. All other gemstones are made up of multiple elements.

- Metallic sodium reacts very violently and explosively to water and even the tiny water vapor molecules in the air. However, sodium does not burn at all when submersed in highly flammable kerosene oil. In order to prevent explosions, metallic sodium is stored in kerosene.

- Based on how it is formed and how it reacts when being burned, it is fair to say that a rubber tire is actually one single giant molecule.

- Titin, the largest known protein in the world, has a full chemical name that is 189,819 letters long, although professional dictionary writers argue that it is a verbal chemical formula rather than an English word. Titin's chemical formula is $C_{132,983}H_{211,861}N_{36,149}O_{40,883}S_{693}$.

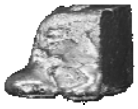
- Water is the only substance on Earth naturally found in all three states of matter: ice, liquid, and gas.

- 20% of Earth's oxygen is produced by the Amazon Rainforest, giving it the nickname "Lungs of the World."

- Lightweight objects float on sulfur hexafluoride – a colorless, odorless, non-toxic, and non-flammable gas – just like they would on water. Therefore, if you pour sulfur hexafluoride gas into a container, followed by the placement of a lightweight object, the object would appear to levitate midair. The sulfur hexafluoride can be "poured" because it is five times denser than air.

- One of the ingredients in dynamite is peanuts.

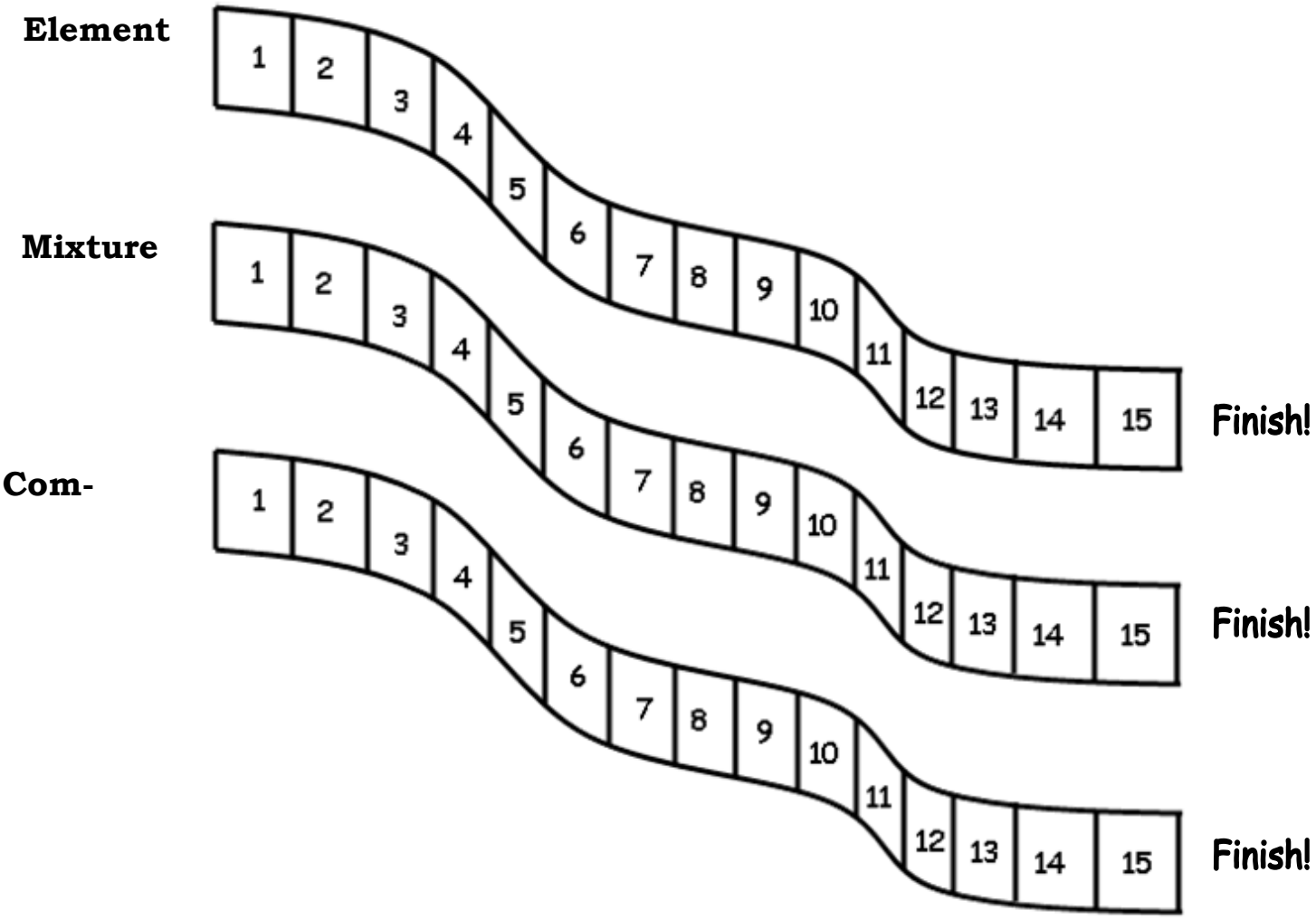
- When you breathe in helium, your voice sounds higher because the weight of helium is less than the weight of air, and the sound waves travel out of your voice box three times faster than they normally would.



- The metal gallium can melt at the touch of a hand because its melting point is only about 85.6° F.

Elements, Mixtures, Compounds

Directions: Each clue tells you how many spaces to move forward. What's the trick? You have to figure out *which trail* the clue is referring. The **type of matter** to reach space 15 first wins!



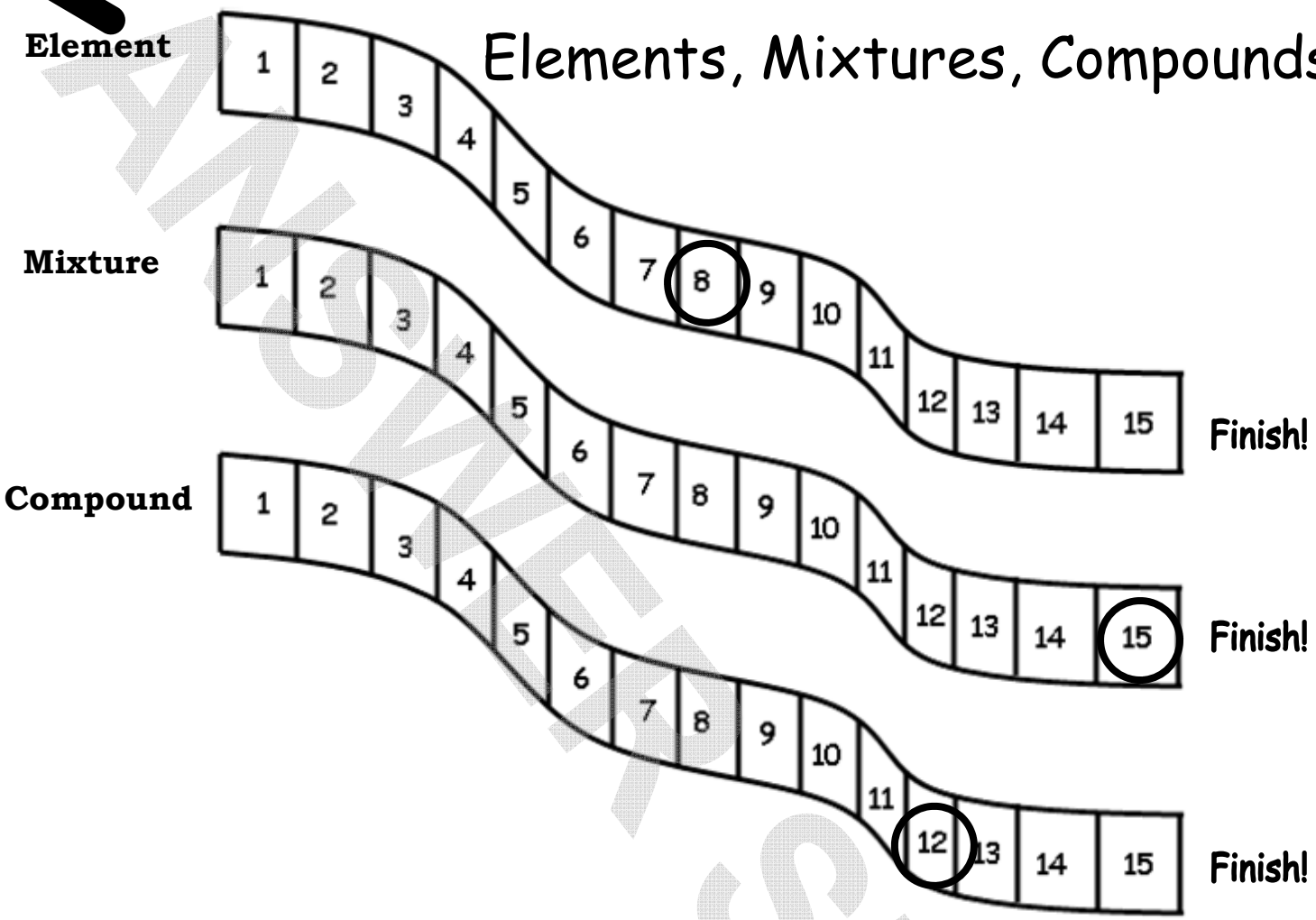
- The one that can be separated using various physical techniques moves forward **4** spaces.
- The one that includes oxygen, lead, and gold moves forward **2** spaces.
- The one that retains all of its properties when separated moves forward **5** spaces.
- The one that is a pure substance made up of two or more different atoms moves forward **5** spaces.
- The one that is made up of a single atom moves forward **3** spaces.
- The one that can only be broken down further by chemical changes moves forward **3** space.
- The one that is already as simple as it can get moves forward **3** spaces.
- The one can be made from heating two types of metals to make a new kind of metal moves forward **4** spaces.
- The one that can be classified as either homogenous or heterogeneous moves forward **6** spaces.

WINNER:_____

Section 5

Feel free to make copies of the puzzles to distribute to your students for review

Elements, Mixtures, Compounds



- The one that can be separated using various physical techniques moves forward **4** spaces. **(mixture)**
- The one that includes oxygen, lead, and gold moves forward **2** spaces. **(element)**
- The one that retains all of its properties when separated moves forward **5** spaces. **(mixture)**
- The one that is a pure substance made up of two or more different atoms moves forward **5** spaces. **(compound)**
- The one that is made up of a single atom moves forward **3** spaces. **(element)**
- The one that can only be broken down by chemical changes moves forward **3** space. **(compound)**
- The one that is already as simple as it can get moves forward **3** spaces. **(element)**
- The one can be made from heating two types of metals to make a new kind of metal moves forward **4** spaces. **(compound)**
- The one that can be classified as either homogenous or heterogeneous moves forward **6** spaces. **(mixture)**

WINNER: Mixture

The Periodic Table Alphabet Game

Directions: Write the missing letter on the blank line of each clue. All letters A-Z will be used only once. (Cross them out as you go!)

1. Compounds of the highly reactive element _luorine are used in toothpaste to prevent dental cavities.
2. The element known as tungsten has an atomic number 74 and the chemical symbol _.
3. The periodic table was invented by Russian chemist Dmitri _endeleev in 1869.
4. The nonmetal with the symbol _ is used for respiration by people and animals.
5. NaCl, a mixture of sodium and chlorine, is the chemical formula for _alt.
6. The first element on the periodic table that is neither a metal nor a nonmetal is _oron.
7. An atom or molecule that contains a charge, either positive or negative, is called an _on.
8. The fifth of the noble gases, _enon, is used in the type of car headlights that give off a bright bluish light.
9. The alkali metal with the symbol _, known as potassium, is abundant in foods such as bananas, rice, and apricots.
10. The element with the symbol _l is commonly used in household kitchens in the form of thin metal sheets.
11. Thorium and _ranium, atomic numbers 90 and 92, are the only radioactive elements that occur naturally in nature.
12. The solid metal _adium glows with a crimson red color and is actually a decayed form of uranium.
13. The element with the symbol H_ is the first noble gas and the second most abundant element in the universe.
14. The metallic element found in group 3, period 5 is _ttrium, a rare element never been found in nature by itself.
15. The compound with the chemical formula _O_2 is used by plants during photosynthesis to create sugars.
16. Ununquadium, a radioactive element discovered in 1999, is the only element today that contains the letter _.
17. Mercury, with the symbol _g, is sometimes called "quicksilver" because it is one of the only metals that are found in liquid form at room temperature.
18. The only letter not found anywhere on the periodic table is _.
19. The real name for fool's gold is _yrite, which is actually a combination of iron and sulfur, not gold.
20. Brass is a metallic mixture of copper and _inc and has been used since at least the 10^{th} century B.C.
21. Elements in the first six periods of group 18 are called _oble gases because they rarely bond with other elements.
22. The element _ead is highly poisonous to humans and animals.
23. The element _anadium is a metal with the atomic number 23.
24. Hydrogen, nitrogen, oxygen, fluorine, and most of the elements of group 18 are all _ases at room temperature.
25. The symbol Sn represents the element called _in, which was once used in thin sheets before aluminum foil.
26. The portion of the periodic table that contains the transition metals of groups 3-12 is known as the _-block.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

The Periodic Table Alphabet Game

Feel free to make copies of the puzzles to distribute to your students for review.

1. Compounds of the highly reactive element **F**luorine are used in toothpaste to prevent dental cavities.
2. The element known as tungsten has an atomic number 74 and the chemical symbol **W**.
3. The periodic table was invented by Russian chemist Dmitri **M**endeleev in 1869.
4. The nonmetal with the symbol **O** is used for respiration by people and animals.
5. NaCl, a mixture of sodium and chlorine, is the chemical formula for **S**alt.
6. The first element on the periodic table that is neither a metal nor a nonmetal is **B**oron.
7. An atom or molecule that contains a charge, either positive or negative, is called an **I**on.
8. The fifth of the noble gases, **X**enon, is used in the type of car headlights that give off a bright bluish light.
9. The alkali metal with the symbol **K**, known as potassium, is abundant in foods such as bananas, rice, and apricots.
10. The element with the symbol **A**l is commonly used in household kitchens in the form of thin metal sheets.
11. Thorium and **U**ranium, atomic numbers 90 and 92, are the only radioactive elements that occur naturally in nature.
12. The solid metal **R**adium glows with a crimson red color and is actually a decayed form of uranium.
13. The element with the symbol H**e** is the first noble gas and the second most abundant element in the universe.
14. The metallic element found in group 3, period 5 is **Y**ttrium, a rare element never been found in nature by itself.
15. The compound with the chemical formula **C**O_2 is used by plants during photosynthesis to create sugars.
16. Ununquadium, a radioactive element discovered in 1999, is the only element today that contains the letter **Q**.
17. Mercury, with the symbol **H**g, is sometimes called "quicksilver" because it is one of the only metals that are found in liquid form at room temperature.
18. The only letter not found anywhere on the periodic table is **J**.
19. The real name for fool's gold is **P**yrite, which is actually a combination of iron and sulfur, not gold.
20. Brass is a metallic mixture of copper and **Z**inc and has been used since at least the 10th century B.C.
21. Elements in the first six periods of group 18 are called **N**oble gases because they rarely bond with other elements.
22. The element **L**ead is highly poisonous to humans and animals.
23. The element **V**anadium is a metal with the atomic number 23.
24. Hydrogen, nitrogen, oxygen, fluorine, and most of the elements of group 18 are all **g**ases at room temperature.
25. The symbol Sn represents the element called **T**in, which was once used in thin sheets before aluminum foil.
26. The portion of the periodic table that contains the transition metals of groups 3-12 is known as the **D**-block.

Section 6 3-D TEMPLATES

Why 3-D Templates?

Our **3-D Templates** give students a hands-on way to interact with information. This kinesthetic technique engages the learner while the information is being presented and also helps in the processing and cognitive organization of it. To put it another way:

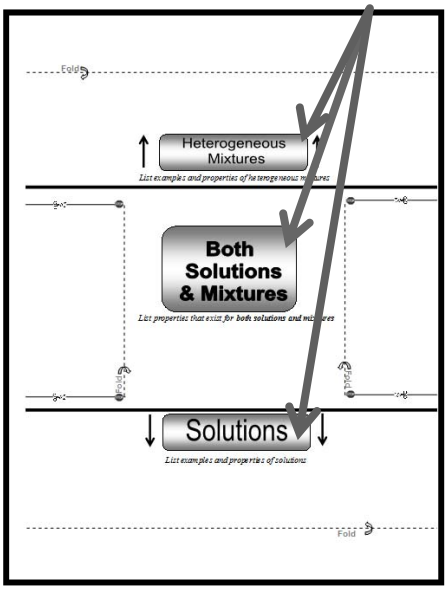
"Tell me and I'll forget; show me and I may remember; involve me and I'll understand."

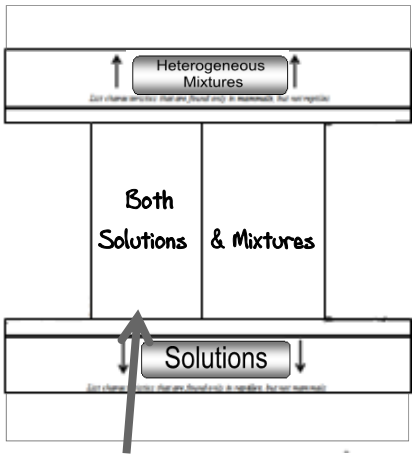
Mixtures & Solutions

This template is the equivalent of a Venn Diagram, where the students are finding similarities and differences between two items. We have chosen "Heterogeneous Mixtures" & "Solutions" as the categories, but you can modify it by choosing others (such as "Solids" & "Liquids"). Students fill in each section with the appropriate properties and examples. Once completed, the 3-D Template will make a great review sheet!

Watch as it "Unfolds"

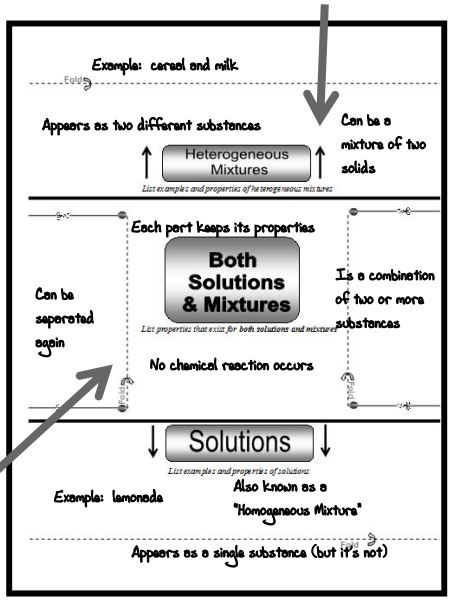
Step 1: Students fill in each area with the appropriate characteristics, similar to a Venn Diagram.





Step 2: Once filled-out, students follow the fold-lines to create a study sheet where the answers are hidden until the template is unfolded *(have them hand-label the center section)*

Step 3: Students unfold the template to reveal the Venn Diagram (other categories can also be used besides "mixtures" & "solutions", such as "solids" vs. "liquids"). The template makes a great study sheet.



The template is provided on the next page.
Make copies to hand out to your students.

Fold

Heterogeneous Mixtures

*List examples and properties of **heterogeneous mixtures***

STOP

STOP

Both Solutions & Mixtures

*List properties that exist for **both solutions and mixtures***

Fold

STOP

Fold

STOP

Solutions

*List examples and properties of **solutions***

Fold

"STEP AWAY FROM THE TEXTBOOK!"

Science

- **Ecosystems, Habitats, & the Environment**
  Number of copies = _____
- **Plants**
  Number of copies = _____
- **Animals**
  Number of copies = _____
- **The Human Body & Heredity**
  Number of copies = _____
- **Cells & Living Things**
  Number of copies = _____
- **Heat & States of Matter**
  Number of copies = _____
- **Energy & Electricity**
  Number of copies = _____
- **Light & Sound**
  Number of copies = _____
- **Astronomy**
  Number of copies = _____
- **Weather**
  Number of copies = _____
- **Earth's Materials & Processes**
  Number of copies = _____
- **Earth's Biological History**
  Number of copies = _____
- **Landforms & Oceans**
  Number of copies = _____
- **Chemistry & the Periodic Table**
  Number of copies = _____
- **Forces & Motion**
  Number of copies = _____

Social Studies

- **Exploration**
  Number of copies = _____
- **Settlement**
  Number of copies = _____
- **The American Revolution**
  Number of copies = _____
- **A New Nation**
  Number of copies = _____
- **Westward Expansion**
  Number of copies = _____
- **Slavery in America**
  Number of copies = _____
- **The Civil War**
  Number of copies = _____
- **Reconstruction Era**
  Number of copies = _____
- **Late 1800s & Early 1900s**
  Number of copies = _____
- **"Roaring Twenties" & Great Depression**
  Number of copies = _____
- **The World Wars**
  Number of copies = _____
- **Cold War Era**
  Number of copies = _____
- **Modern Times**
  Number of copies = _____

---

1 copy = $14.95 x _____ total copies = $_____

+ 8% Shipping = $_____

TOTAL = $_____

If sending this order form with a check, please provide the address where you would like materials to be shipped:

_____

_____

_____

_____

Please fax purchase orders to (864)-877-5123

Or send P.O. or this form w/ a check to:

Homecourt Publishers
2435 East North St., #245
Greenville, SC 29615-1442

For more information, contact: **Ben Bache, managing editor**
(864) 877-5123
benbache@homecourtpublishers.com