2008 K-8 Update

Chemistry Lessons to Engage Your Students

Presented by
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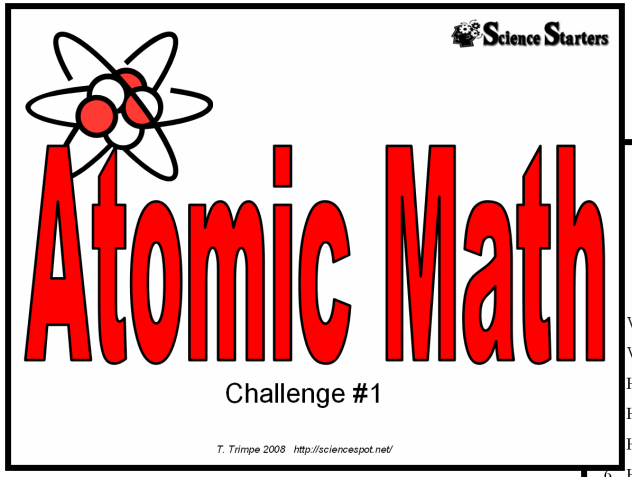
8th Grade Science Teacher
Havana Junior High School

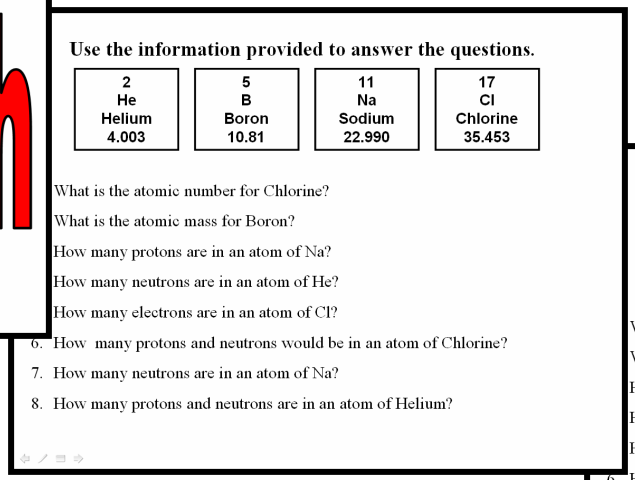
Science Starters

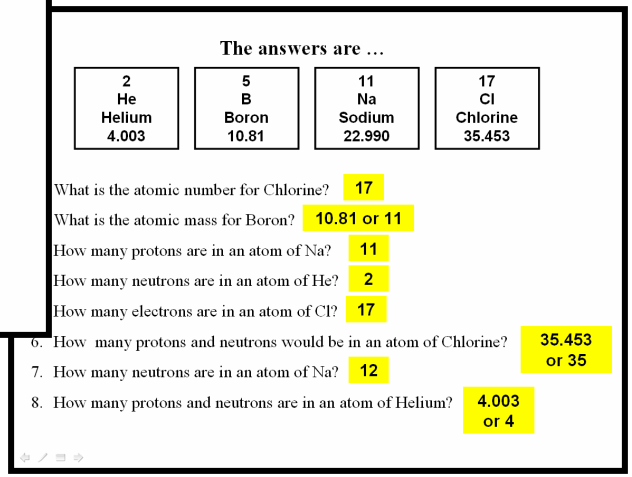
NEW

Start every class with a challenge!

Chemistry Topics:
Element Challenge
Elemental Puns
Atomic Math
Common Compounds
Compound Challenge
Periodic Table Basics





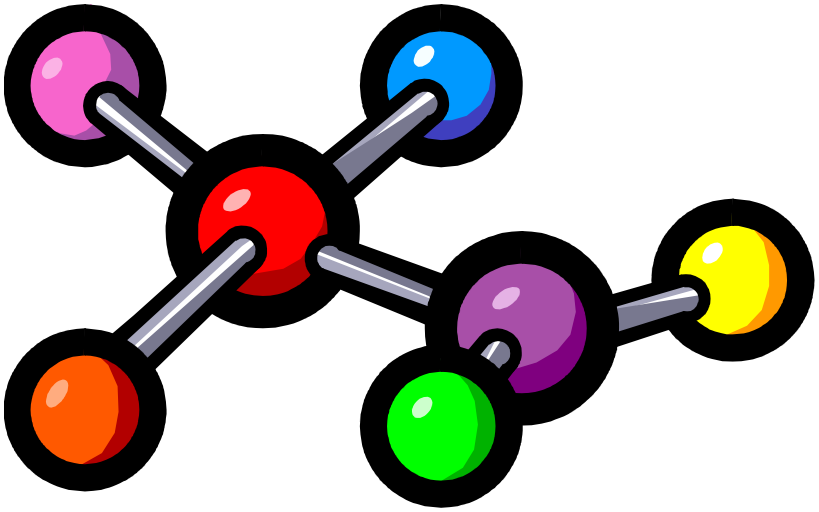


All the Science Starters are available as PowerPoint presentations and available on my website – http://sciencespot.net/

Ready for a challenge?

Science Starters

Name That Compound



Challenge #1

T. Trimpe 2008 http://sciencespot.net/

Give the correct name for each compound.

1. NaCl – A common seasoning for food
2. FeO_2 – Formula for rust
3. HCl – An acid found in your stomach
4. CH_4 – A gas produced in your body
5. H_2O – An important liquid

The answers are …

1. NaCl – A common seasoning for food

   Sodium Chloride or Salt

2. FeO_2 – Formula for rust

   Iron Oxide

3. HCl – An acid found in your stomach

   Hydrochloric Acid

4. CH_4 – A gas produced in your body

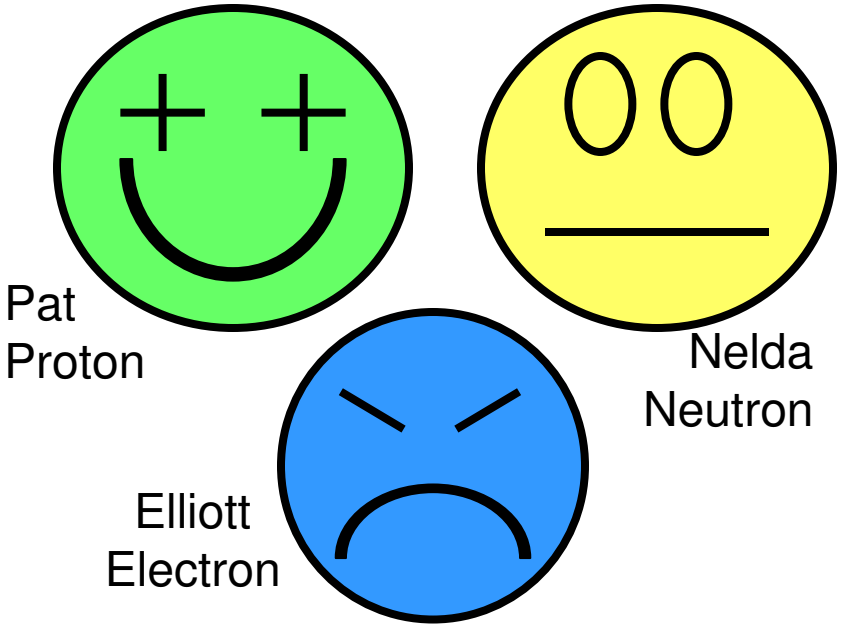
   Methane

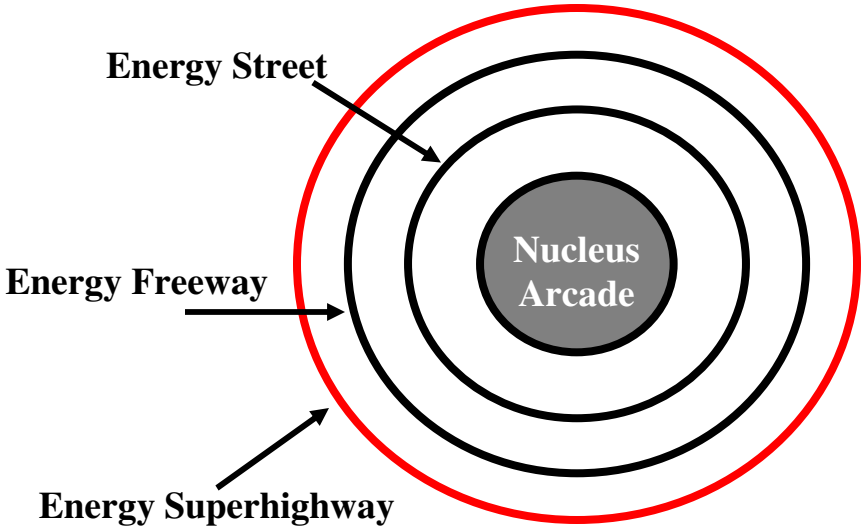
5. H_2O – An important liquid

   Water

Atoms & Elements

Introduce your students to the Atoms Family & explore Matterville





Also available … Atomic Math Challenge – Students learn how to use the periodic table to calculate the number of subatomic particles in each atom.

Atoms Family PowerPoint Available Online

The Atoms Family Song – Sing to the tune of the Adams Family Theme Song

1st Verse:

They're tiny and they're teeny,
Much smaller than a beany,
They never can be seeny,
The Atoms Family.
Chorus

2nd Verse:

Together they make gases,
And liquids like molasses,
And all the solid masses,
The Atoms Family
Chorus

3rd Verse:

Neutrons can be found,
Where protons hang around;
Electrons they surround
The Atoms Family.
Chorus

Chorus:

They are so small.
(Snap, snap)
They're round like a ball.
(Snap, snap)
They make up the air.
They're everywhere.
Can't see them at all.
(Snap, snap)

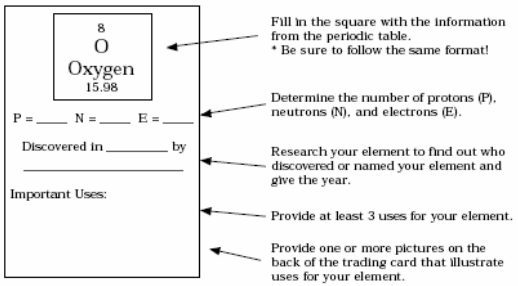
Atoms & Elements

Have your students adopt an element or two and learn more about them!

Element Trading Cards

For this project you will need to use the Internet to research the elements in the Periodic Table. Each card must include:

- Periodic Table information
- Number of protons, neutrons, and electrons
- Discovery information (Person and date)
- Important Uses
- Pictures that illustrate one or more uses for your element



My elements are:

_____

Project Due Date: _____

A list of periodic table sites has been provided on the Chemistry Links page of the Kid Zone!
Go to http://sciencespot.net/ and click Kid Zone!

Adopt-An-Element

Requirements:

1) Complete an Adopt An Element information sheet. (60% of grade)

You may use a variety of reference sources. Possible ideas are encyclopedias (book or CD Rom), science encyclopedias, science catalogs, magazines, and/or Internet sites*. Information sheets must be neat, written in black ink, and contain all the information requested. You also need to provide a list of your sources on the back of your information sheet. A minimum of three sources are required.

2) Create an advertisement for your element. (40% of grade)

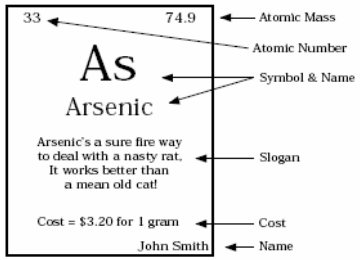
The advertisement must include the element's name, symbol, atomic number, atomic mass, cost, and an advertising slogan that describes one or more of its important uses. Advertisements must be neat, colorful, and contain all the information listed above. You may add pictures that relate to your advertisement theme.

Example:

Be sure to include:
√ Element's symbol
√ Element's name
√ Atomic number
√ Atomic mass
√ Ad slogan
√ Cost
√ Your name

You may add pictures or drawings that illustrate the various uses for your element.

Your ad must follow the same format as this example!



A list of periodic table sites is available on
The Science Spot
http://sciencespot.net/
Go to **Kid Zone**, then choose **Chemistry Links**

Element Baby Book

Cover Due: _____
Final Project Due: _____

In this project you will adopt an element from the periodic table. The element that you choose must have an atomic number from 1 – 20.

As a proud parent of your element you will create a baby book to remember each stage of your element's life.

This project will count as **TWO** test/project grades in science. You will also receive a grade in English/Language Arts. I will give you time in the library to research your element and some class time to work on your book. You will work on writing and proofreading in language arts.

Sources of Information:
Websites to help you in your search (I will provide these.)
The **periodic table** in your book will give you some information.
Encyclopedias

There will be two due dates: one for the cover so that it can be laminated, and one for the final project. I will bind each baby book. You may create your book on the computer, but it is not necessary.

Requirements:
(Check each one as you complete it.)

_____**Cover page – 3 points**
Name of element and your name
Decorative cover

_____**Page 1 – 35 points! This should be written in paragraph form.**
Name of element (Give your element a first name)
Nickname of element (Symbol)
Birth date (date element was discovered)
Birth weight (atomic mass)
Birth height (atomic number)
Race (type of element)
Attending physician (Discoverer)
Gender (state of matter at room temperature)
Place of birth (country of discovery)
Personality (emotions: boiling point and melting point)

_____**Page 2 – 5 points**
Pronunciation rebus

Created by Lisa Curry - 2003

Use the completed student projects to create a periodic table display in the hallway!

F Flourine
Atomic Number: 9
Atomic Mass: 19

The Periodic Table

N Nitrogen
Atomic Number: 7
Atomic Mass: 14.01

Explore the relationships between the elements in the periodic table.

Periodic Table Basics

Step 1: Complete the squares for each element by adding the atomic number, name, and atomic mass.

Write the atomic number at the top of the square.
Write the element's name under the symbol.
Write the atomic mass at the bottom of the square.

5
B
Boron
10.81

P = 5
N = 6
E = 5

Step 2: Determine the number of protons, neutrons, and electrons in each element.

Step 3: Create a Bohr diagram for each element.

Bohr Diagram:

Step 4: Draw the Lewis Structure for each element.

Lewis structure: •B

Step 5: Use the following colors to shade in the square for each element. You should ONLY color in the small square in the upper left-hand corner and not the entire card.

Green = Li & Na
Orange = B & Al
Pink = O & S
Red = C & Si
Blue = Be & Mg
Tan = N & P
Purple = F & Cl
Yellow = He, Ne, & Ar

Step 6: Cut the cards apart and arrange <u>according to atomic number</u> in the pattern shown below. Once you have the cards arranged in the correct order, glue them to a large sheet of construction paper.

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

Step 7: Answer the questions on the back of this worksheet using the information on your Periodic Table.

Periodic Table Basics Name _____

1. Which elements had complete outer shells? Give the name and symbol for each.
_____ _____ _____ _____

2. What do you notice about the location of the elements in #1?

3. Which elements had only one valence electron?
_____ _____ _____ _____

4. What do you notice about the location of the elements in #3?

5. What do you notice about the number of valence electrons as you move from left to right across a row or period in the periodic table? (Na → Mg → Al → Si → P → S → Cl → Ar)

6. What do you notice about the number of energy levels or shells as you move down a group or column in the periodic table? (H → Li → Na)

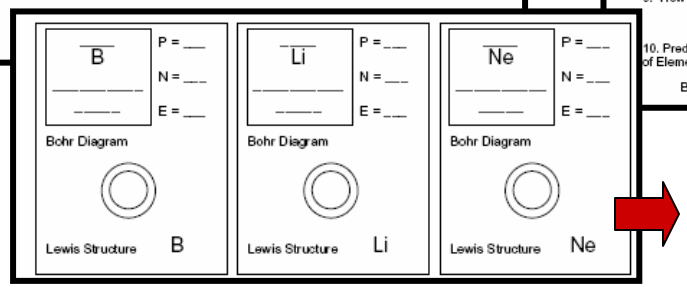
7. Elements are organized into families according to their physical and chemical properties. Identify the elements that you used in Step 5 that belong to each family based on the number of valence electrons. Give the name and symbol for each element.

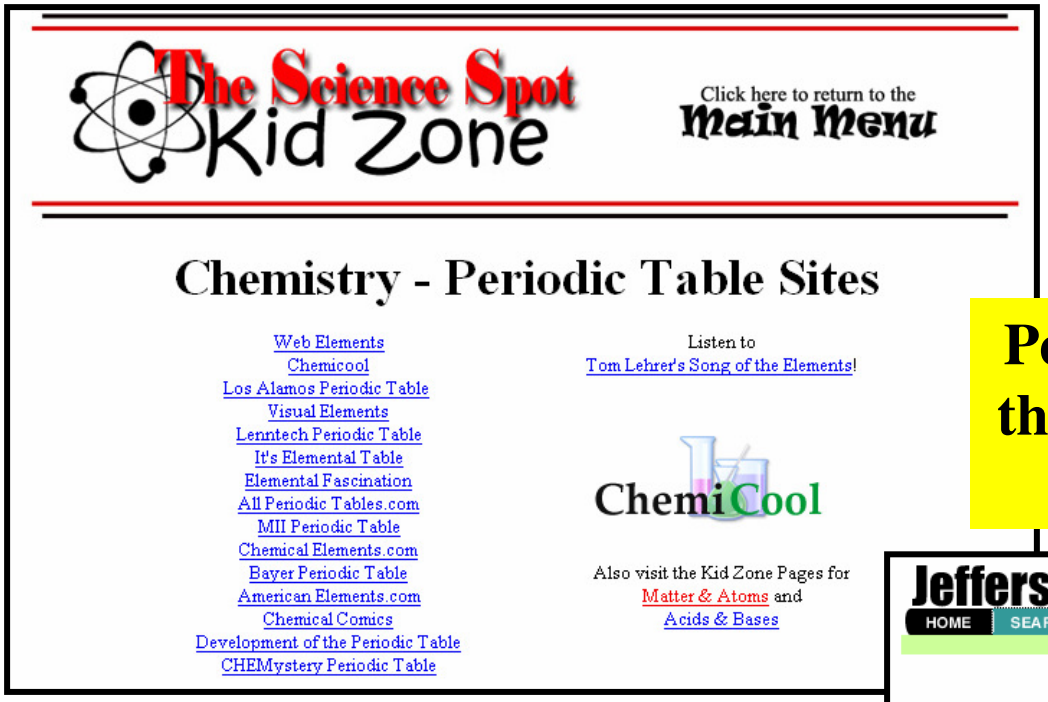
Alkali Metals - 1 valence electron _____ _____ & _____ _____
Alkaline Earth Metals - 2 valence electrons _____ _____ & _____ _____
Boron Family - 3 valence electrons _____ _____ & _____ _____
Carbon Family - 4 valence electrons _____ _____ & _____ _____
Nitrogen Family - 5 valence electrons _____ _____ & _____ _____
Oxygen Family - 6 valence electrons _____ _____ & _____ _____
Halides - 7 valence electrons _____ _____ & _____ _____
Noble Gases - Complete outermost shell
_____ _____, _____ _____, & _____ _____

8. What do you notice about the location of the elements in each family?

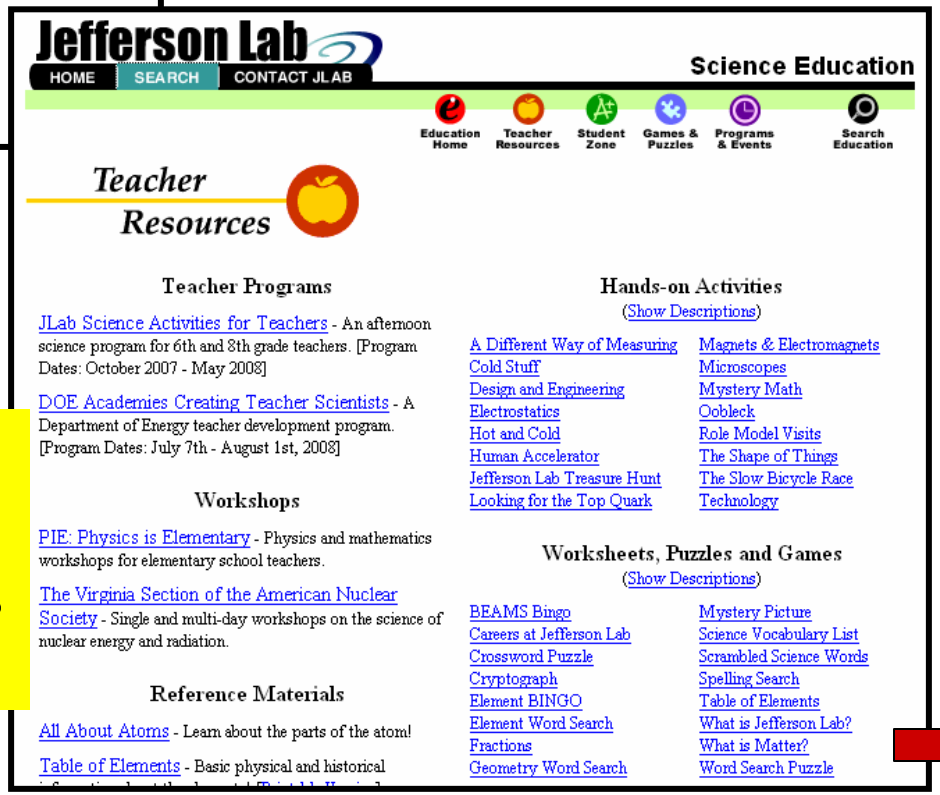
9. How would you classify hydrogen? Why?

10. Predict the number of valence electrons for each element based on its location in the Periodic Table of Elements. You will need to use the table in your textbook.
Barium = ____ Lead = ____ Xenon = ____ Potassium = ____





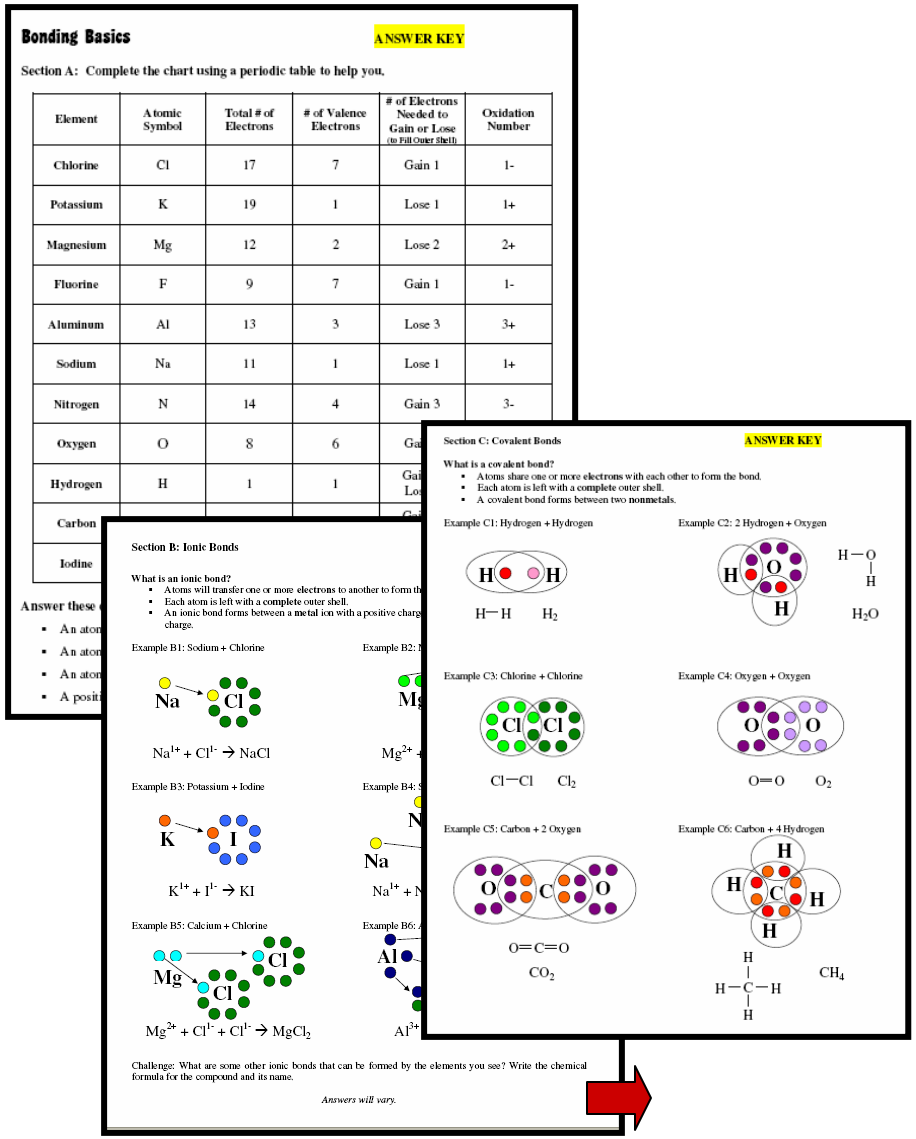
Periodic Table sites are listed in the Chemistry section of the Kid Zone at my website.



The Jefferson Lab website is an excellent resource for classroom activities as well as online games and challenges.

Chemical Bonding

Bonding Basics (2008 Version)
Students use ping pong balls to create models of valance electrons and then explore how the atoms can form ionic or covalent bonds.



Bonding Basics ANSWER KEY

Section A: Complete the chart using a periodic table to help you.

Element	Atomic Symbol	Total # of Electrons	# of Valence Electrons	# of Electrons Needed to Gain or Lose (to Fill Outer Shell)	Oxidation Number
Chlorine	Cl	17	7	Gain 1	1-
Potassium	K	19	1	Lose 1	1+
Magnesium	Mg	12	2	Lose 2	2+
Fluorine	F	9	7	Gain 1	1-
Aluminum	Al	13	3	Lose 3	3+
Sodium	Na	11	1	Lose 1	1+
Nitrogen	N	14	4	Gain 3	3-
Oxygen	O	8	6	Ga	
Hydrogen	H	1	1	Ga Lo	
Carbon					
Iodine					

Answer these
- An ato
- An ato
- An ato
- A positi

Section B: Ionic Bonds

What is an ionic bond?
- Atoms will transfer one or more electrons to another to form th
- Each atom is left with a complete outer shell.
- An ionic bond forms between a metal ion with a positive charg charge.

Example B1: Sodium + Chlorine

$Na^{1+} + Cl^{1-} \rightarrow NaCl$

Example B2: M

Mg^{2+}

Example B3: Potassium + Iodine

$K^{1+} + I^{1-} \rightarrow KI$

Example B4: S

Na

$Na^{1+} + N$

Example B5: Calcium + Chlorine

$Mg^{2+} + Cl^{1-} + Cl^{1-} \rightarrow MgCl_2$

Example B6: A

Al

Al^{3+}

Challenge: What are some other ionic bonds that can be formed by the elements you see? Write the chemical formula for the compound and its name.

Answers will vary.

Section C: Covalent Bonds ANSWER KEY

What is a covalent bond?
- Atoms share one or more electrons with each other to form the bond.
- Each atom is left with a complete outer shell.
- A covalent bond forms between two nonmetals.

Example C1: Hydrogen + Hydrogen

H—H H_2

Example C2: 2 Hydrogen + Oxygen

H_2O

Example C3: Chlorine + Chlorine

Cl—Cl Cl_2

Example C4: Oxygen + Oxygen

O=O O_2

Example C5: Carbon + 2 Oxygen

O=C=O

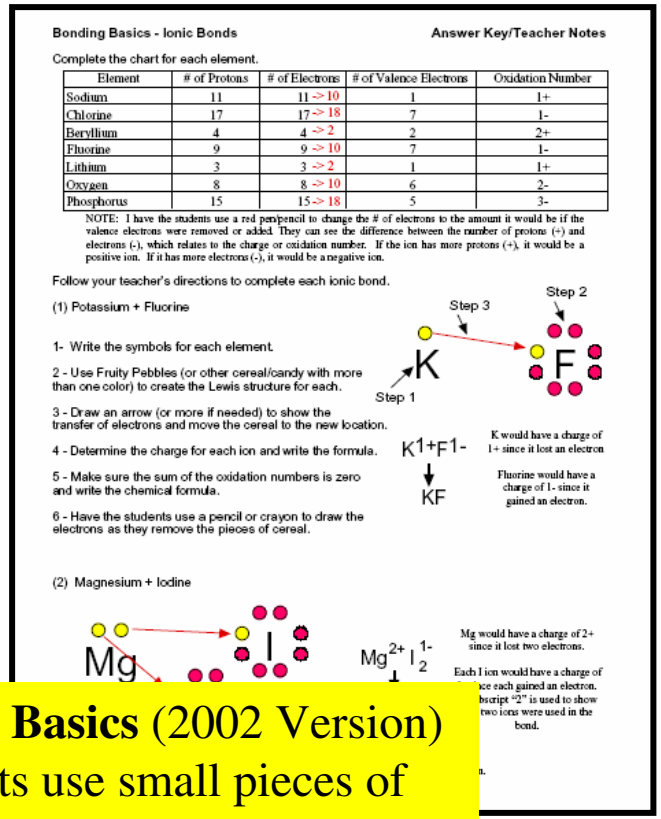
CO_2

Example C6: Carbon + 4 Hydrogen

CH_4

Chemical Bonding

Explore ionic and covalent bonding to learn how common compounds are created.



Bonding Basics - Ionic Bonds — Answer Key/Teacher Notes

Complete the chart for each element.

Element	# of Protons	# of Electrons	# of Valence Electrons	Oxidation Number
Sodium	11	11 -> 10	1	1+
Chlorine	17	17 -> 18	7	1-
Beryllium	4	4 -> 2	2	2+
Fluorine	9	9 -> 10	7	1-
Lithium	3	3 -> 2	1	1+
Oxygen	8	8 -> 10	6	2-
Phosphorus	15	15 -> 18	5	3-

NOTE: I have the students use a red pen/pencil to change the # of electrons to the amount it would be if the valence electrons were removed or added. They can see the difference between the number of protons (+) and electrons (-), which relates to the charge or oxidation number. If the ion has more protons (+), it would be a positive ion. If it has more electrons (-), it would be a negative ion.

Follow your teacher's directions to complete each ionic bond.

(1) Potassium + Fluorine

Step 3 Step 2 Step 1

K F

1- Write the symbols for each element.

2 - Use Fruity Pebbles (or other cereal/candy with more than one color) to create the Lewis structure for each.

3 - Draw an arrow (or more if needed) to show the transfer of electrons and move the cereal to the new location.

4 - Determine the charge for each ion and write the formula. $K^{1+}F^{1-}$ → KF

K would have a charge of 1+ since it lost an electron

Fluorine would have a charge of 1- since it gained an electron.

5 - Make sure the sum of the oxidation numbers is zero and write the chemical formula.

6 - Have the students use a pencil or crayon to draw the electrons as they remove the pieces of cereal.

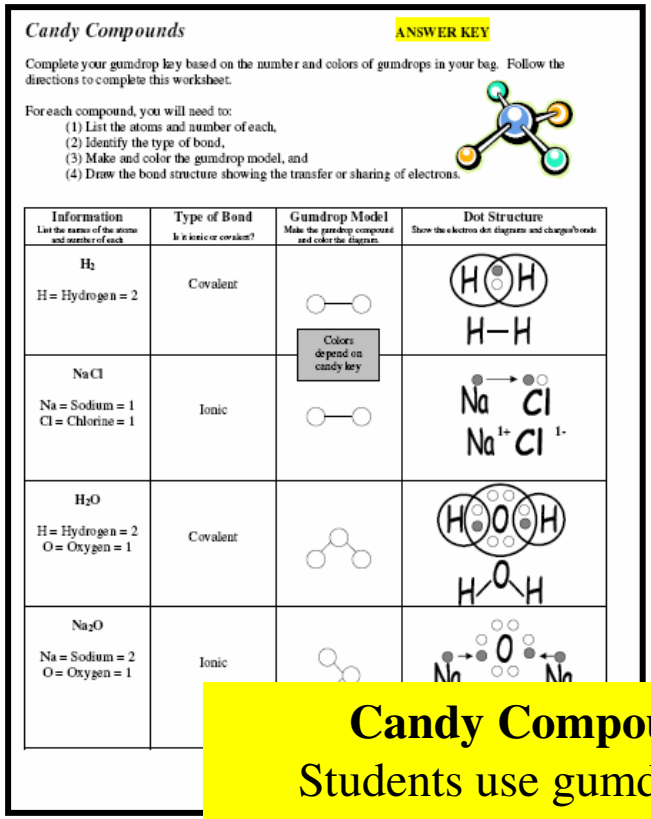
(2) Magnesium + Iodine

Mg I

Mg^{2+} I_2^{1-}

Mg would have a charge of 2+ since it lost two electrons.

Each I ion would have a charge of ...ce each gained an electron. ...bscript "2" is used to show ...two ions were used in the bond.



Candy Compounds — ANSWER KEY

Complete your gumdrop key based on the number and colors of gumdrops in your bag. Follow the directions to complete this worksheet.

For each compound, you will need to:
(1) List the atoms and number of each,
(2) Identify the type of bond,
(3) Make and color the gumdrop model, and
(4) Draw the bond structure showing the transfer or sharing of electrons.

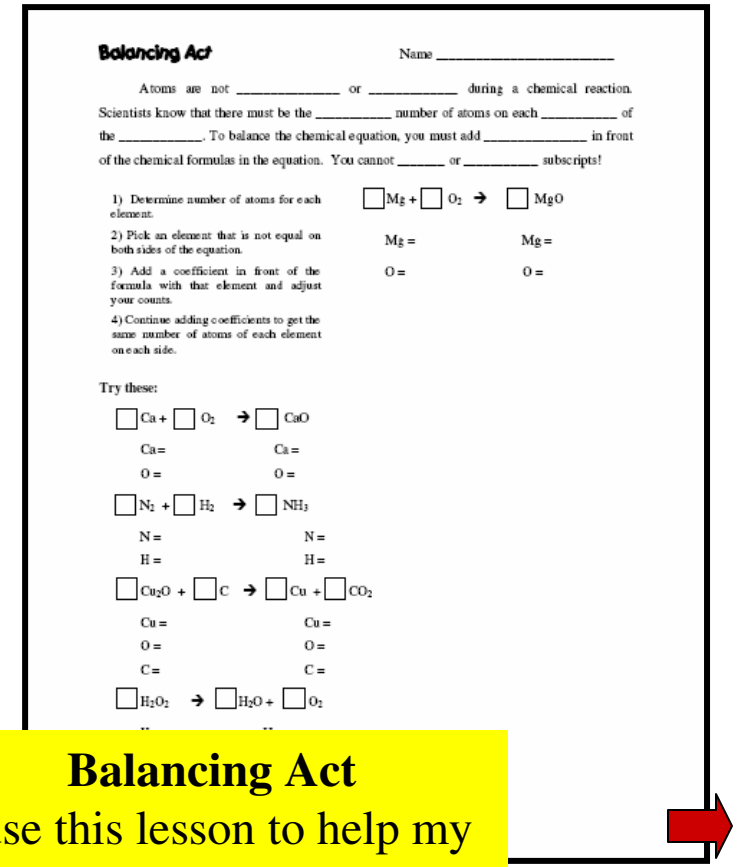
Information List the names of the atoms and number of each	Type of Bond Is it ionic or covalent?	Gumdrop Model Make the gumdrop compound and color the diagram.	Dot Structure Show the electron dot diagrams and charges/bonds
H_2 H = Hydrogen = 2	Covalent	Colors depend on candy key	H H H–H
NaCl Na = Sodium = 1 Cl = Chlorine = 1	Ionic		Na Cl Na^{1+} Cl^{1-}
H_2O H = Hydrogen = 2 O = Oxygen = 1	Covalent		H O H
Na_2O Na = Sodium = 2 O = Oxygen = 1	Ionic		O Na Na

Bonding Basics (2002 Version)
Students use small pieces of cereal or candy to model the transfer or sharing of electrons

Candy Compounds
Students use gumdrops or jellybeans to create models of ionic and covalent compounds.

Chemical Reactions

Explore the Law of Conservation of Mass and different types of chemical reactions as students learn how to balance equations.



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 =

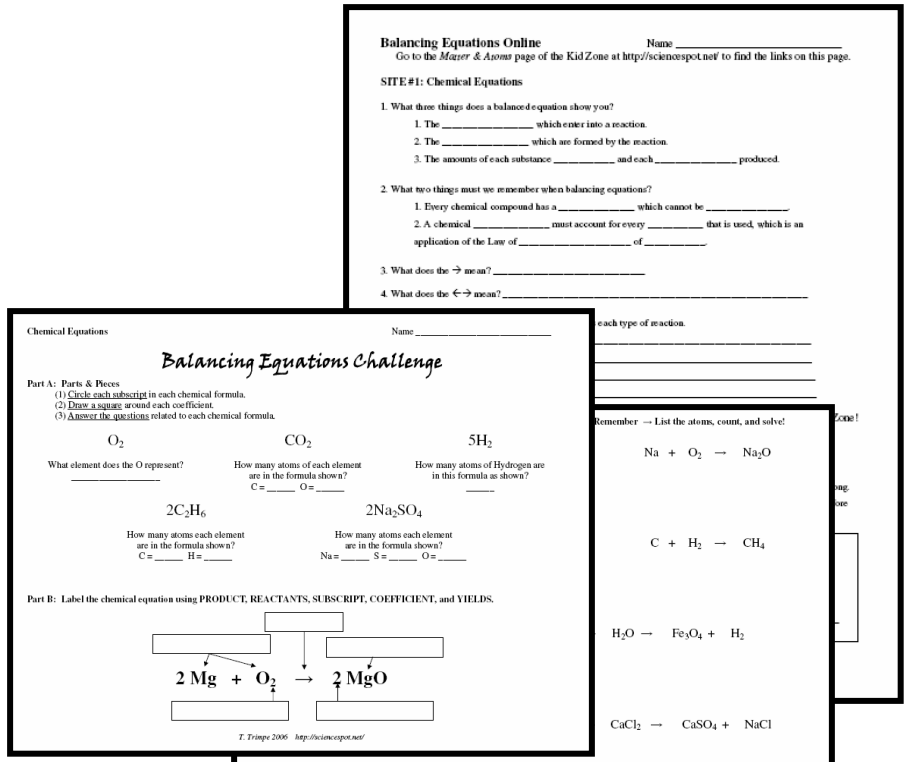
O = O =

C = C =

☐ H_2O_2 → ☐ H_2O + ☐ O_2

Balancing Act

I use this lesson to help my students learn how to balance chemical equations.



Balancing Equations Online Name _____

Go to the *Matter & Atoms* page of the Kid Zone at http://sciencespot.net/ to find the links on this page.

SITE #1: Chemical Equations

1. What three things does a balanced equation show you?
   1. The _____ which enter into a reaction.
   2. The _____ which are formed by the reaction.
   3. The amounts of each substance _____ and each _____ produced.
2. What two things must we remember when balancing equations?
   1. Every chemical compound has a _____ which cannot be _____.
   2. A chemical _____ must account for every _____ that is used, which is an application of the Law of _____ of _____.
3. What does the → mean? _____
4. What does the ←→ mean? _____

each type of reaction.

_____

_____

_____

_____

Remember → List the atoms, count, and solve!

Na + O_2 → Na_2O

C + H_2 → CH_4

H_2O → Fe_3O_4 + H_2

$CaCl_2$ → $CaSO_4$ + NaCl

Chemical Equations Name _____

Balancing Equations Challenge

Part A: Parts & Pieces
(1) Circle each subscript in each chemical formula.
(2) Draw a square around each coefficient.
(3) Answer the questions related to each chemical formula.

O_2 — What element does the O represent? _____

CO_2 — How many atoms of each element are in the formula shown? C = _____ O = _____

$5H_2$ — How many atoms of Hydrogen are in this formula as shown? _____

$2C_2H_6$ — How many atoms each element are in the formula shown? C = _____ H = _____

$2Na_2SO_4$ — How many atoms each element are in the formula shown? Na = _____ S = _____ O = _____

Part B: Label the chemical equation using PRODUCT, REACTANTS, SUBSCRIPT, COEFFICIENT, and YIELDS.

2 Mg + O_2 → 2 MgO

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Other worksheets are available for classroom lessons or online activities.

Chemical Reactions

Put your students' knowledge of balancing equations to the test with the Snowman Challenge or Equation Egg Hunt!

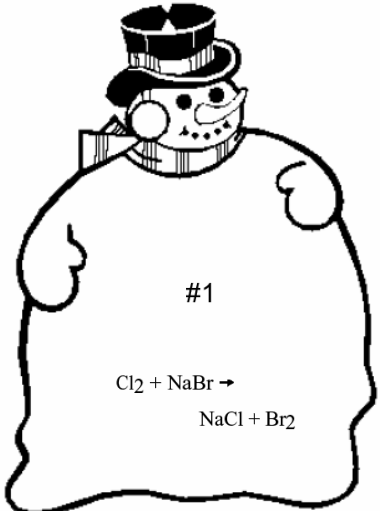
Equation Challenge Name(s) _____

Game Rules:
(1) If you touch it, you have to complete it! Teams are not allowed to put an egg back if they don't like the problem in that egg. Teams are not allowed to peek inside before choosing to take an egg!
(2) Your team can only work on one egg or problem at a time! Teams must finish the problem and get the answer approved by the teacher before looking for another one.
(3) Teams must stay together! All team members must be together when working on the problems and checking answers.

Directions:
Pick an egg and solve it the problem inside! Some problems only require an answer, while others require you to balance an equation. Write the number and your answer in a box below and have your teacher check it. If the answer is correct, put the problem back in the egg and put it in your bag. You can then pick another egg. If you do not get the correct answer, keep trying until you get it right!

# ____	# ____
# ____	# ____
# ____	# ____
# ____	# ____

Student Worksheet



Two Versions

Snowman Challenge
or
Equation Egg Hunt

Equation Challenge Problems

#1	#2	
$Cl_2 + NaBr \rightarrow$ $NaCl + Br_2$	Give the name and # of atoms for each element. $2H_2SO_4$	$HCl + CaCO_3 \rightarrow$ $CaCl_2 + H_2O + CO_2$

Chemical Reactions

Use chemistry to solve a mystery!

Name _____

North Pole Bureau Of Investigations
Case #1225: Case of the Christmas Cookie Mystery

Mrs. Claus needs your help! Each Christmas, Mrs. Claus makes a batch of her special sugar cookies to give Santa all the energy he needs to deliver presents to all the good little boys and girls around the world. A bad little elf has snuck into the kitchen and messed up all the special baking powders.

He has left a note with three mystery bags of white powder. The North Pole Bureau of Investigations has provided samples of six white powders found at Santa's house and the three mixtures left by the elf.

Without your help, Mrs. Claus will not be able to make her cookies and there will be no Christmas! Help Mrs. Claus save Christmas!

Part 1: Follow the directions to test each sample (# 1-6) with water, vinegar, iodine, and heat. Record your observations in the top part of the chart on the back of this page.

Part 2: Follow the same procedure to test the three Mystery Mixtures (A, B, and C). Record your observations in the bottom portions of the chart. Use your results from Part 1 to determine which mixture is the special sugar cookie mix!

Mrs. Claus' Special Sugar Cookies

Mix 15 cups of flour, 6 teaspoons of baking powder,
5 cups of powdered sugar, 3 pounds of butter, and
10 eggs in a large red bowl. Add lots of tender loving care
and a bit of magic dust, then bake until golden brown.

T. Trimpe 1999

North Pole Bureau of Investigation
Case #1225: Case of the Christmas Cookie Mystery

Teacher Directions

als Needed:
or each group:
small containers with different white powders labeled 1, 2, 3, 4, 5
(Baking soda, baking powder, corn starch, flour, powdered sugar, and bal
small dropper bottles filled with testing liquids
(Water, vinegar, and iodine solution)
ox of toothpicks
rips of wax paper
quares of aluminum foil (for heating samples)
weezers or tongs
mall candle (with aluminum foil as holder)
atches

y Samples
ou will need to prepare 3 mystery samples by mixing equal amounts of each
listed below. Each group should be given a small amount of each mixture to

ystery Sample 1: Flour, corn starch, and powdered sugar
ystery Sample 2: Flour, baking soda, and powdered sugar
ystery Sample 3: Flour, baking soda, and baby powder

ed Results:
tudents should discover that Mystery Sample 2 is the correct mixture to
rs. Claus' special cookies. Her recipe calls for flour, baking soda, and
d sugar. This sample will fizz in vinegar, turn black in iodine, and
bble when heated.
he two other samples would not be used for her special cookies. Mystery
1 does not fizz in vinegar, so it would not contain baking powder (or baking
(ystery Sample 3 has a distinctive odor (from the baby powder) and would
asty cookies.

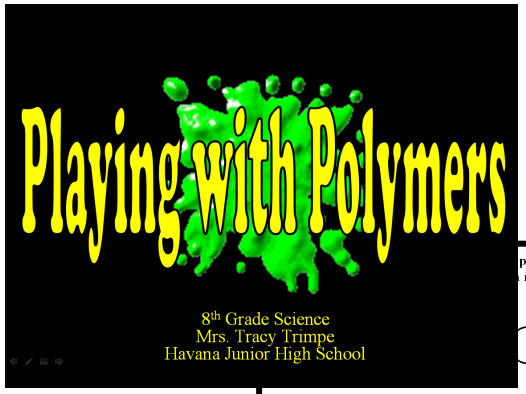
Tips:
ivide students in groups of 3 - 4 students. Each student is responsible for
t least one of the 6 powder samples. They will need to share their results
other group members. The group will need to decide their procedure for
ach Mystery Sample. I stress the need to keep samples separate to prevent
nation and poor results. My 7th graders also need to review proper safety
res.

T. Trimpe 1999

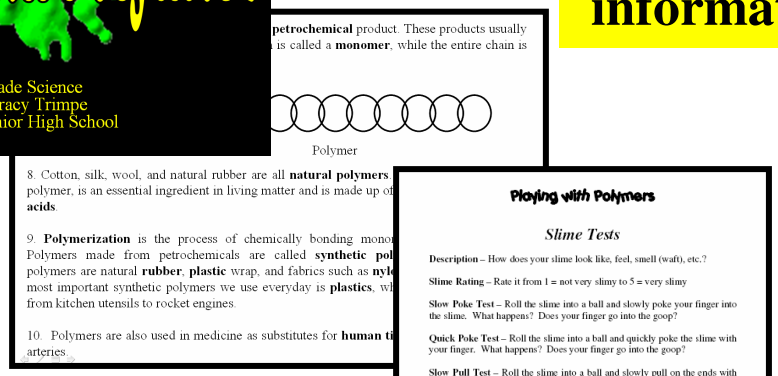
Students test 6 different white powders to determine their physical and chemical properties and then use that information to identify the "Special Sugar Cookie" mixture.

Chemical Reactions

Explore the world of polymer chemistry!



Students create five different types of slime or polymers and complete a series of tests on each one. They use that information to identify mystery slimes.


petrochemical product. These products usually
is called a **monomer**, while the entire chain is

Polymer

8. Cotton, silk, wool, and natural rubber are all **natural polymers**.
polymer, is an essential ingredient in living matter and is made up of
acids.

9. **Polymerization** is the process of chemically bonding monor
Polymers made from petrochemicals are called **synthetic pol**
polymers are natural **rubber**, **plastic** wrap, and fabrics such as **nyl**
most important synthetic polymers we use everyday is **plastics**, wh
from kitchen utensils to rocket engines.

10. Polymers are also used in medicine as substitutes for **human ti**
arteries.


Playing with Polymers

Slime Tests

Description – How does your slime look like, feel, smell (waft), etc.?

Slime Rating – Rate it from 1 = not very slimy to 5 = very slimy

Slow Poke Test – Roll the slime into a ball and slowly poke your finger into the slime. What happens? Does your finger go into the goop?

Quick Poke Test – Roll the slime into a ball and quickly poke the slime with your finger. What happens? Does your finger go into the goop?

Slow Pull Test – Roll the slime into a ball and slowly pull on the ends with your fingers. What happens? Write your observations on your worksheet.

Quick Pull Test - Roll the slime into a ball and slowly pull on the ends with your fingers. What happens? Write your observations on your worksheet.

Blob Test – Grab a timer. Roll your slime into a ball and sit it on your plate or the table. How long does it take for it to flatten out?

Hang Test - Grab a timer and a ruler. Roll your slime into a ball and hold it at a height of 30 cm above the table. Time how long it takes for the slime to reach the table.

Bounce Test - Roll your slime into a ball and drop from a height of 30 cm above the table. What happens? Write your observations (how high it bounces) on your worksheet.

NOTE: If you cannot do a test, indicate this in the box on your data chart!

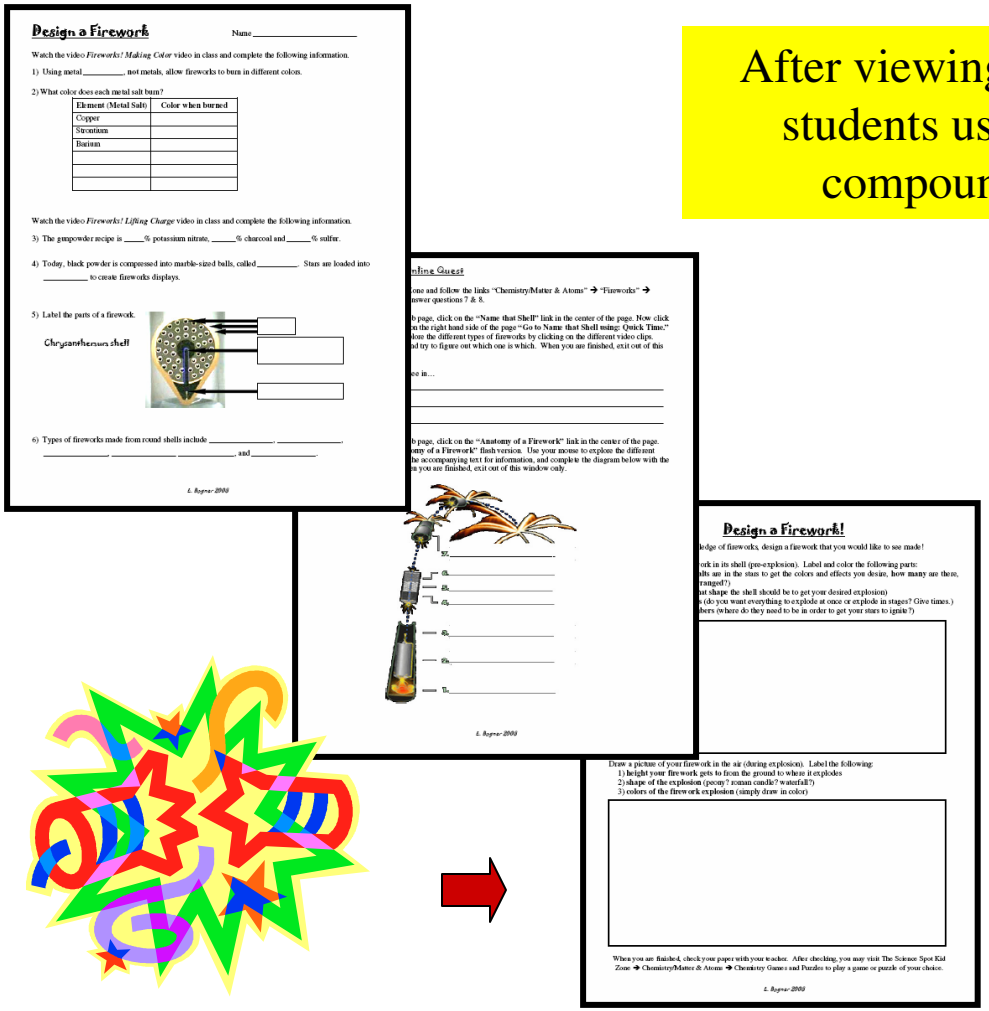
T. Trimpe 2002 http://sciencegeek.net/

Playing with Polymers PowerPoint Available Online

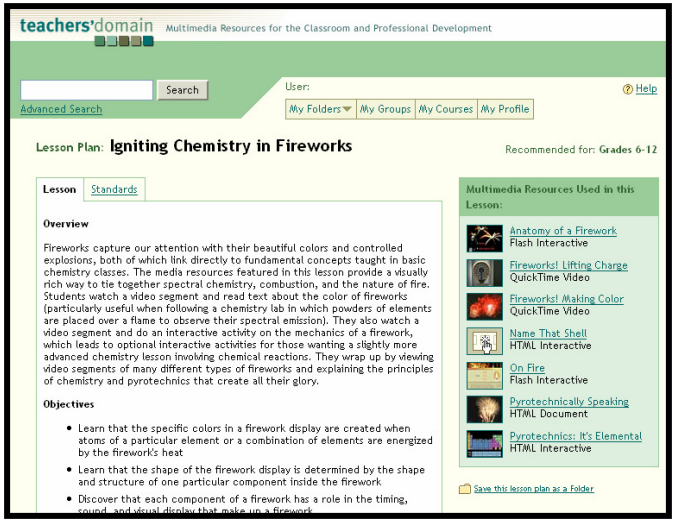
Visit the Hands-On Plastics website at teachingplastics.org and click the Getting Started link to learn how to get a free kit!

Chemical Reactions

Ignite your students interest in chemistry with fireworks!



After viewing video clips and exploring websites, students use their knowledge of elements and compounds to design their own firework.

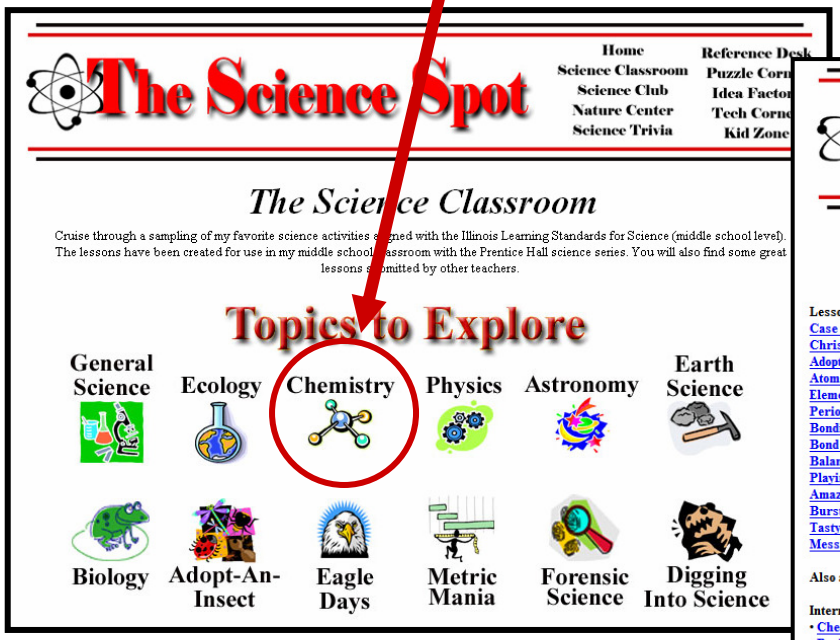


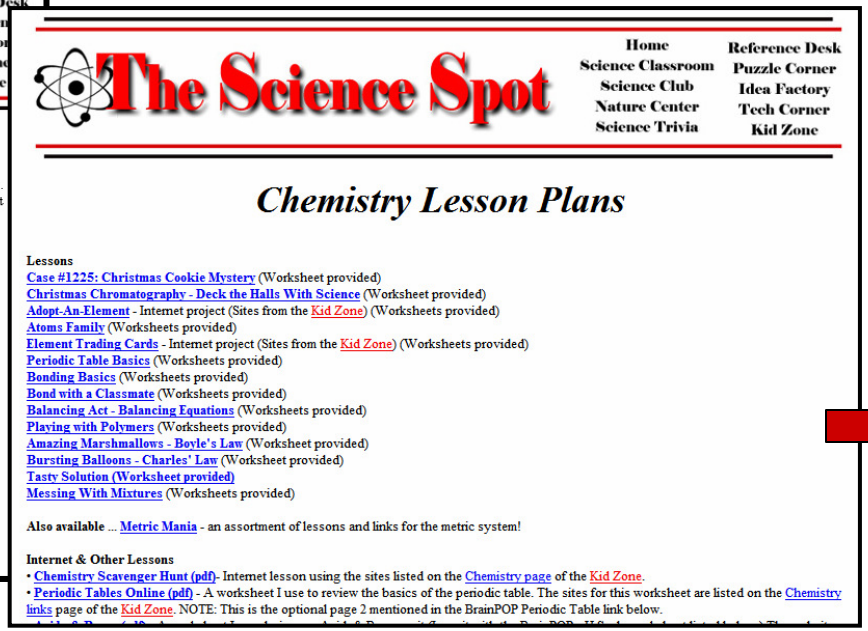
Visit the Teachers' Domain website at http://www.teachersdomain.org/ for a wealth of resources!

Chemistry Resources

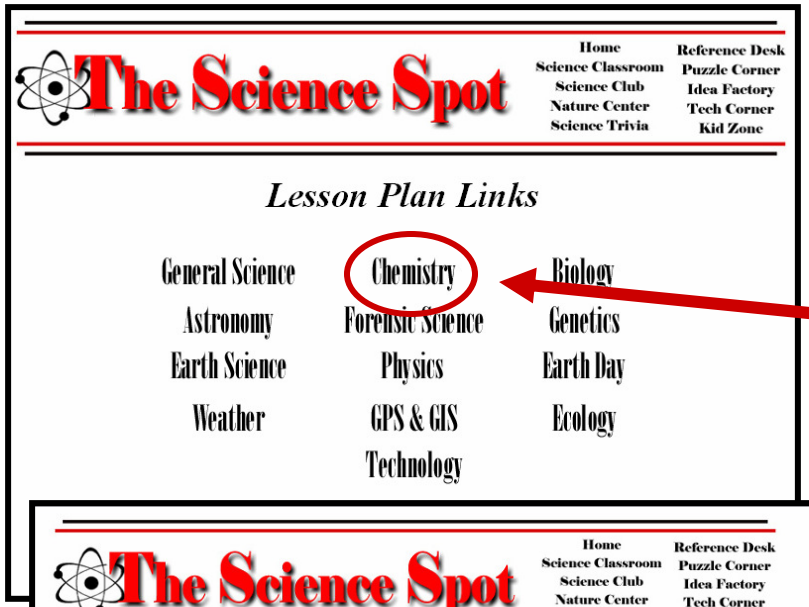
Click the link for the Science Classroom on my homepage to explore all my lessons for General Science, Physics, Biology, Forensic Science, and much more!

You'll find a link for Chemistry on the Science Classroom page where you'll find the lessons, resources, and worksheets I've discussed during this presentation.



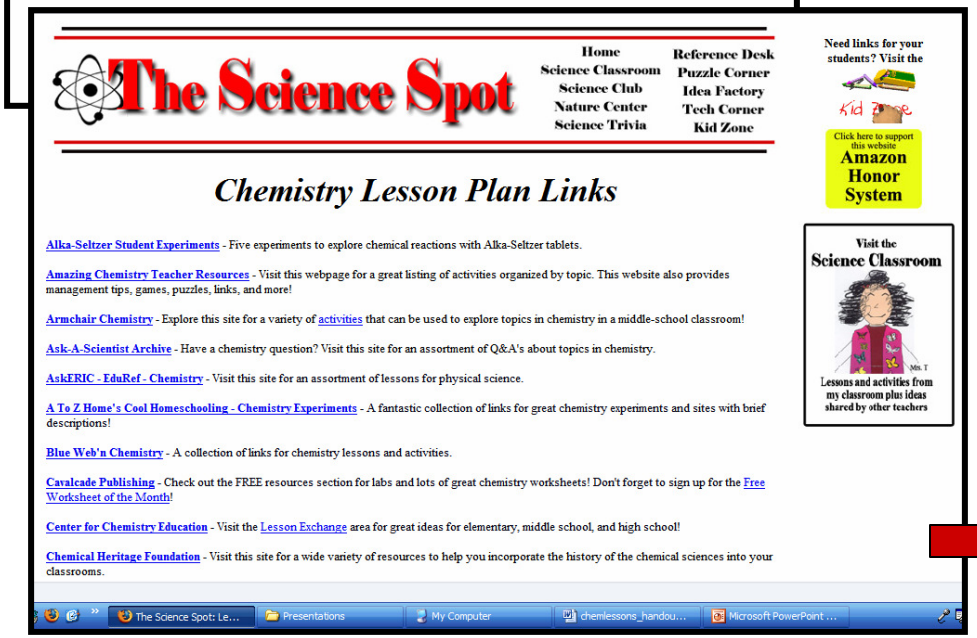


Chemistry Resources



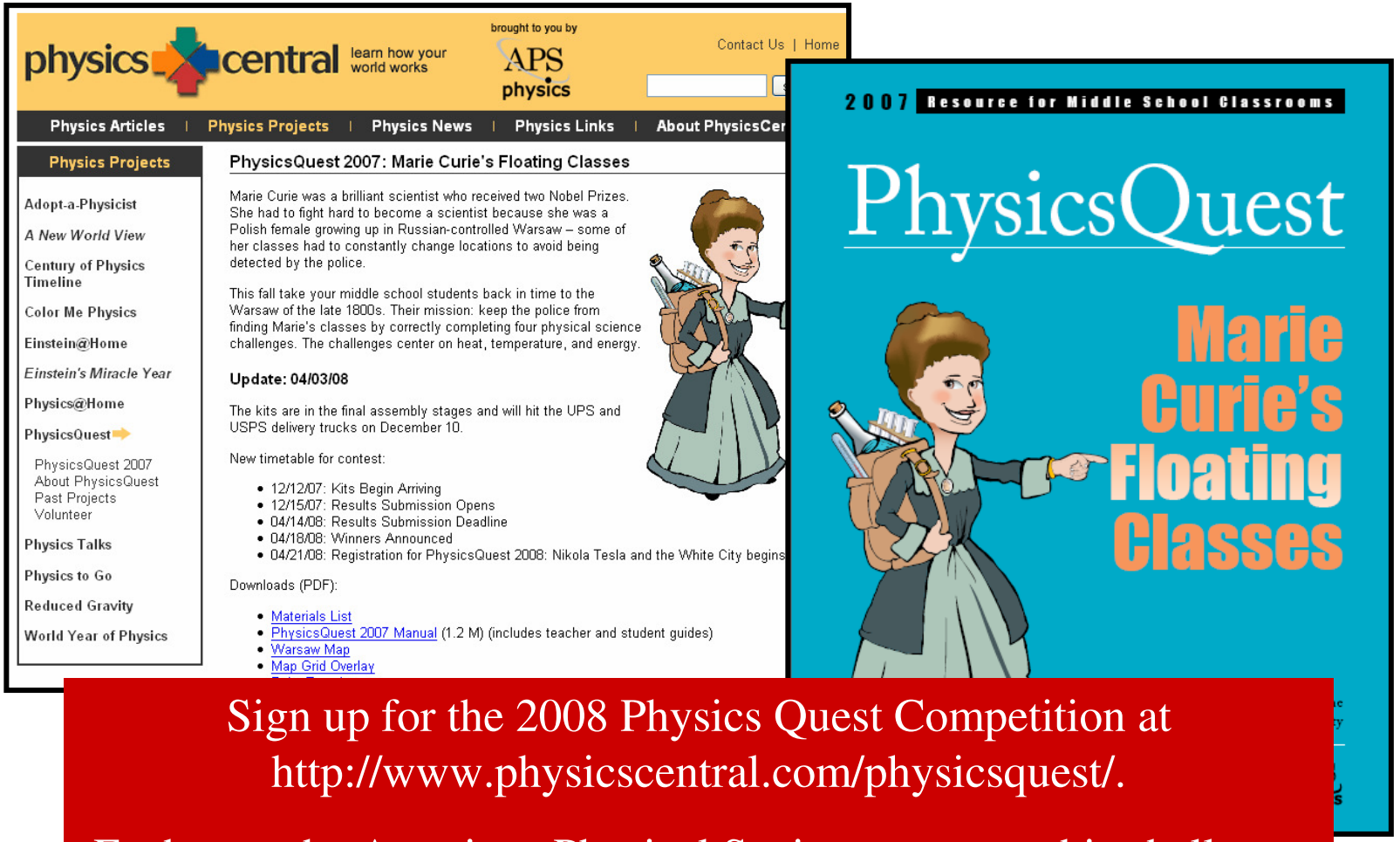
Want more resources? Click the link for the **Reference Desk** on my homepage to find a link for the **Lesson Plan Links** area.

Click **Chemistry** to find a collection of links for websites with lesson ideas, activities, and other resources.



Alka-Seltzer Experiments

Chemistry Resources

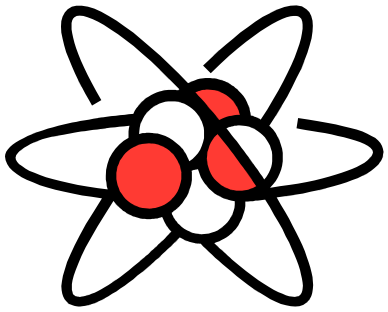


Sign up for the 2008 Physics Quest Competition at http://www.physicscentral.com/physicsquest/.

Each year the American Physical Society sponsors this challenge and provides experiment ideas and materials for classrooms.

Contact Information

Visit my website at http://sciencespot.net/



Contact me by e-mail at ttrimpe@sciencespot.net