Cooking Up $K_2I_3(T)C_3HE_2N_3$ Elements

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Contents of Curriculum Unit

Introduction

Hungry? Why don't you go to the kitchen and make popcorn…Without even knowing, when you sat for long hours in the kitchen with mom you were being taught basic skills of chemistry. Your kitchen has infinite possibilities for adventure. Your home's built in laboratory is the perfect place with materials, equipment, water, heat source, and a refrigeration found in any professional laboratory. There is excitement in looking at familiar things in a way that tells you something about the nature of the material, how it came to be, how it changes, and how we sense these changes.

Living organisms can become nonexistent without food. Food serves as two functions: it offers the basic materials for growth and replacement of living substances, and the energy necessary for all life functions. Living organisms are organizational, altering, delicately balanced chemical systems. These organisms are made up of elements as nonliving material. Elements are made up of even smaller particles call atoms which when arranged in combinations make larger particles called molecules. Molecules of living organism (carbohydrates, fats, proteins) are more complicated than that of molecules of the nonliving world.

All living things can be divided into two groups: autotrophs and heterotrophs. Autotrophs are organisms that generate their own nutrients as part of their life processes. These organisms include green plants and green microorganisms (one-celled plants). Autotrophs are the foundation of the food chain. Heterotrophs consume autotrophs or other heterotrophs. This group consists of all animals, including humans, most microorganisms and all non-green plants.[1]

Heterotrophs produce enzymes for the digestion of food. Digestion is the process of breaking down the complex molecule in food into simpler molecules. These molecules can be used as a source of energy or as the basic material for building a variety of proteins, fats and carbohydrates.

Long before digestion occurs changes occur in food though preparation. In general food are rapidly changing chemical systems that interact with air, water, chemicals, microorganisms and other foods. The interactions of these molecules are affected by heat and atmospheric moisture Because of the chemical processes of food; it becomes a great tool to educate youngsters to the process of chemistry.

Rationale

The focus on ***Cooking Up $K_2I_3(T)C_3HE_2N_3$ Elements*** is to use basic items in the kitchen to create an understanding of elements and chemical reactions. Science is unique as a subject in the curriculum of schools all over the world. This uniqueness results from the variety of materials and experiences necessary for its effective teaching. Other subjects can be learned using ordinary tools such as textbooks, paper and pencil. These are also essential for the teaching of science but if these are the only tools, science becomes boring and uninteresting. Experience is needed to effectively teach science. Learning must also be connected with something the children already know. The kitchen is one of those places. Children obtain special interest in objectives when food is involved. This design creates exciting, meaningful, hands-on learning. The activities in this unit will inspire children to continue further investigations in the field of chemistry.

The overall purpose of this unit is to provide:

- A unique basis for better instruction in methods of teaching chemistry
- Useful sources of learning experiments
- A manual which may be use to supplements the science curriculum
- A curriculum that uses reusable and cost effective materials
- A curriculum with simple assembly and easy clean up
- Instruction the requires the student to critically think and problem solve

•□A curriculum where the student learns through total hands on experiments and research

Target Group

This unit will be designed to encourage children age12-14 to develop a love of science using common substances from the kitchen. This unit will take up to 5 – 9 weeks to complete.

Objective

This unit called ***Cooking Up $K_2I_3(T)C_3HE_2N_3$ Elements*** will teach children elements, compounds and chemical reactions. Our journey will begin with the study of matter. The students will research and experiment to discover the properties and phases of matter. The children will then be led into a discussion about atoms. They will look at several theories behind the atom. Through discovery the students will experience the types of experiments scientist used to come up with today's model of the atom. Students will be introduced to the periodic table. They will begin an in-depth study of the organization of the elements, their symbols and it's classification. Opportunities will be given to learn how the elements affect our daily lives. Students will learn to write and interpret chemical formulas and work with common kitchen items experiencing hands on experimentation with various mixtures and solutions. Students will learn the four basic types of chemical reactions by utilizing easy to understand mathematical equations and scientific experimentation. Various types of chemical reactions will be compared, contrasted and related to the everyday living environment. Again through labs, we will begin to critically look at scientific concepts such as solubility, suspensions, and mixtures and solutions.

Strategies

Cooking Up $K_2I_3(T)C_3HE_2N_3$ Elements will allow students to use higher order thinking strategies. The students will make **comparisons**looking for similarities and differences. **Observations** will be made making visual, auditory and tactile observations. By examining an assortment of items, sorting them and categorizing, **classifications** will be made. The students will **hypothesize** coming up with a variety of appropriate explanations for particular questions. They will **identify assumptions** by differentiating between what is observably true and what is taken for granted. **Summarizations** will be made by condensing the essential meaning from a body of data. **Interpretations** will be made by explaining meanings of an experience. Children will be asked to identify problem, hypothesize, collect and organize data, test and evaluate results when **designing problems and investigations**. Lastly the children will be asked to **make decisions** by examining one's belief s, attitude, and feelings that lie behind the choices we make and examine the consequences of personally made choices.

The unit will be friendly to both teacher and students allowing maximum flexibility. The activities in this unit will promote situations for accountable talk, clear expectation and academic rigor. All of these activities will involve group work. Throughout the unit, background information will be provided.

Discussion / Classroom Activies

Throughout this unit children should be ask to keep a journal of their work. The students will notice as they follow the unit they may be asked to use information from earlier labs to make connections with what they are presently learning. This skill also teaches the children responsibility and organization of information.

Matter

Ancient scientists once believe that all matter was a combination of four items: fire, Earth, water and air.[3] Today we have a better understanding of this concept. Encarta describes matter as anything that has the property of occupying space and the attributes of gravity and inertia. Look around you. Nearly everything around you consists of matter the food we eat, our bodies, our homes, and the universe.

Matter comes in a variety of forms. Our kitchen contains several examples of these States of

Ice, bread and noodles are all examples of solids. Each object has a definite shape and occupy space. Tightly packed molecules characterize solid matter. These molecules cannot change position and can only vibrate in place due to the strong attraction between the molecules of which it is composed.

Matter can be found in the form of a liquid. Spaghetti sauce, gravy and juice are some examples. Liquids have definite volume and unlike solids, take the shape of whatever contains it. In a liquid, matter does not resist forces that act to change its shape. Molecules are able to change position by sliding. It still has a volume but has no definite shape.

Steam, the smell of food and the natural gas we use to cook are forms of gas. Gas molecules have the freedom to move about because the molecules are widely dispersed. It offers no resistance to change of shape and little resistance to change of volume. Gas, if not confined, has the ability to indefinitely diffuse, increasing the volume and decreasing in density.

Matter has the ability to change its state. Take some water and place it in an area where the temperature is 32º F. You will find that it changes to it solid form ice. If you allow the ice to sit at room temperature it will then go back to its original form water. Allow the water to sit there over a 24-hour period and you will notice that some of the water is gone. It has gone through the process of evaporation where the water has then changed into a gas.

Observations of matter

Objective: The student will be able to identify through observations the three phases of matter.

Fill three jars with different stages of matter. Fill the first jar with beans or kernels of popcorn. The second jar fill with colored water. The third jar should be filled with air. The children should create a chart like the one shown and make observations. After the activity explain to the children the definition of matter and its three phases.

Phase of Matter	Definite Shape	Definite Volume
Solid		
Liquid		
Gas		

Phases of matter search

Objective: Identify the three phases of matter in everyday living environment.

Have the children look around their homes, school and community to find the three phase of matter (solid, liquid and gas). The students will organize a list displaying the three phases of matter. Display their work on a bulletin board and/or the children can present their work to their peers.

Atoms

There has been several theories develop around atoms. It began 2000 years ago when a Greek philosopher decided that the atom was the smallest bit of matter that could be conceived. It was thought that this particle could not be divided, in fact the word atom means not divisible.

In the late 1800's John Dalton a British teacher began to accept the theories of the ancient scientist. He learned during his study that water could be separated into two gases, oxygen and hydrogen. Nine grams of water produced the same amount of oxygen and hydrogen each time (8g of oxygen and 1 g of hydrogen. He also theorized that particles of different substances must

be different from each other. An example of this would be the hydrogen and oxygen of water. Each atom is different because they have different properties.

Another 1800 theorist by the name of Thomson added to the ancient theories. He was studying how electricity flowed through a glass vacuum (Vacuum is a region where all matter has been

removed). He began to closely observe these rays when a current was passed through. He proved that these rays were made of negative particles called electrons. In 1896 after years of studying the atom he and some other scientist discovered that some particle give off positive charges, which have over 7,000 times more mass than electron.

Rutherford another scientist found some glitches in Thomas discovery and opened the door of science a little wider. He tested Thomson theory by firing alpha particles at a very thin sheet of gold foil. Rutherford noticed the majority of the alpha particles went through the foil while few were bouncing off the nucleus. Based on these findings scientist began to think that the atom is mostly empty space.

Another scientist by the name of Bohr developed the model of the atom. In the model, electrons move in a certain orbit. He found that the farther away from the nucleus the electrons are, the more energy an electron has. Today we know that Bohr's model was for the simplest of atoms like hydrogen. As our knowledge of science grew and our technology improved so did our understanding of atoms.

Through our growth of understanding we found that atoms are the building blocks of matter. Atoms are similar in many ways though when put together make up various objects. All atoms are made up from particles called protons, electrons and neutrons. Neutrons are important in that they account for the stability of the nucleus and are neutral. Protons are the positive electrical charges within the atom. The protons and neutrons of an atom are packed in a dense nucleus while negative charge of electrons orbit around them. The neutrons have no electrical charge, while each proton carries a positive charge that is equal and opposite to the negative charge of the electron. An atomic model of an atom is very complex. It is based on mathematical theory and they way the waves interact. In the new model, it is impossible to predict exactly where an electron is placed on an orbit. 9

Mental Models

Objective: Investigate models of atoms using indirect evidence

Scientist cannot see atomic particles but can observe how they behave under certain conditions. Through these observations they can develop theories or mental models of matter. Have the children place three to five items into a box and seal it. Have the children exchange the box with another table. Have them develop several tests, such as shaking the box, smelling, etc., attempting to describe the objects without opening the box. The children should record all ideas in a journal.

Understanding the size of an atom

Objective: Describe the size of the atom

Give student students a pinch of sugar. Ask them to separate one crystal of the sugar. Explain to your students if they were to cut the sugar into one hundred more parts they would have the size of an atom.

Make an electroscope (Demonstration)

Objective: Discover and observe the positive and negative charges of an atom

Electroscopes are devices that store electrical charges. Attach two strips of aluminum foil to one end of a metal rod. Push the other end of the rod through the rubber stopper leaving a little bit of the end sticking out. Place the stopper into the flask. Place a piece of rolled up aluminum foil on the top of the rod. Take a rubber comb and comb through your hair about eight to ten times. Touch the comb to the ball of foil. You will notice that the strips of foil will move apart. This experiment demonstrates the positive and negative charges that atoms carry. Because both pieces of foil are connecting to the rod, the comb gives the foil more electrons (negative charge). Due to this extra charge in the foil, the aluminum repels. Aluminum ball

Rubber stopper

Metal rod

Aluminum foil

Elements

There are some substances that cannot be decomposed or broken into more elementary substances by ordinary chemical means. These substances are called elements. If we were to take salt for example we would find that it is composed of sodium and chloride, which can no longer be broken into smaller parts. There are roughly 90 natural elements meaning these elements may be found in nature. There are about 20 more that have been artificially produced. Every substance on earth is made up of these elements which means element can be solids, liquids or gas.[4]

Element Scavenger Hunt

Observation: Familiarize themselves with the elements

Give the children a list of elements. Have the children find one item that contains each element. Students will need to know that some of these element names may be found on the sides of food boxes under active ingredients.

Element Names

Scientist work in many different countries all over the world. They all speak different languages. So that scientist can communicate they have created symbols for every element. The symbol "O" will always mean oxygen whether the chemist lives in Kenya, China or Russia. These chemical symbols are universal language all scientists understand.

Many of the elements names come from ancient languages such as Greek and Latin. Bromine is a Greek word that means "bad smell". Elements may also be named to honor a place or an individual. The element Berkelium was created at University of California at Berkeley.[3]

When writing symbols there are several rules to follow:

1. The symbol is always one or two letters. (O- oxygen, He- Helium)

2. The first letter is always capitalized any other letter must remain lower case. (Ag- silver)

Naming Fun

Objective: Classify and write the symbols of about 40 common elements

Memorization is not always fun. Unfortunately it is the only way to learn the elements and their symbols. Easy ways for children to learn these symbols are to classify the symbols by first introducing single letter symbols, then first and second letters and first and third letters.

Single letters

Hydrogen – H Boron – B Carbon – C Nitrogen – N

Oxygen – O Fluorine – F Phosphorous - P Sulfur – S

Vanadium – V Yttrium – Y Iodine – I Uranium – U

First and Second letters

Lithium – Li Beryllium – Be Helium – He Neon – Ne

Aluminum – Al Silicon - Si Argon – Ar Calcium – Ca

Titanium – Ti Cobalt – Co Nickel – Ni Barium - Ba

Selenium – Se Bromine – Br Krypton – Kr Xenon – Xe

First and Third letters

Magnesium – Mg Chlorine - Cl Chromium – Cr Manganese – Mn

Zinc – Zn Arsenic – As Cadmium – Cd

Latin Names are the most difficult symbols to remember. To assist the children with these memorizations, a teacher named Wanda Barnes came up with the idea of using mnemonic device. This is a creative way to memorize things using familiar ideas.

Element Name	Latin Name	Symbol	Mnemonic Phrase
Sodium	Natrium	Na	**Na**, I don't want any salt.
Potassium	Kalium	K	The first three letters of potassium is pot. Pots are also named**K**ettles.
Iron	Ferrun	Fe	The giant pumping iron says **Fe** fi fo fum.
Copper	Cuprum	Cu	The cop stops you and gives you a warning. He gets ready to leave and as he leaves you say **C-u** later copper.
Silver	Argentium	Ag	As I **Ag**e my hair turns silver.
Tin	Stanninum	Sn	**Sn** rhymes with tin without the i
Gold	Aurum	Au	Someone grabs your gold chain and you say **A-u** give me back that gold.
Mercury	Hydrargyrun	Hg	The mercury in the thermometer went up very **Hg**h.
Lead	Plumbum (Roman)	Pb	The lead in my **P**encil **b**roke.

 *Classroom warm-ups*

Until the elements and their symbols are familiar, you should create short five-minute warm-ups where the student writes the name and the symbol of about 10 symbols. It can be broken down into its symbols classification (first letter, first and second letter etc.). As the children become more confident, begin to make the warm up challenging by mixing the groups.

 *Crazy Puzzle*

Objective: Name the common elements

Create a crossword puzzle using element symbols that is already solved. Have the children work back and name the element writing the name next to the matching puzzle number.

 *Element Bingo*

Objective: Name the common elements and their symbols

Create blank bingo card for the children. Ask the student to fill their cards with several of the symbols (use each symbol only once). Call out the name of the element at random; student should cross out the symbol on their card. When a row is crossed out, the student should yell "Element!"

Periodic Table

Early in the 1800's chemist discovered that some of the elements had similar properties. For example sodium and potassium are both shiny and have explosive properties when dropped into water. Due to this knowledge scientist attempted to organize these elements. The arrangement that is used today is called the periodic table. When a property is repeated within a regular interval, that property is said to be periodic.

The periodic table consists of both rows and columns. The rows across the table are the periods. They a referred to as the first period second period and so on. The columns are the groups or families (IA, IIA, IIIA, etc.). Element groups or families have similar properties. Elements are listed in the table in order of atomic number, which is the number of protons in an atom.

Elements have several properties: metals, nonmetals and metalloids. Their shininess or luster distinguishes metals. With the exception of mercury, all metals are solid at room temperature. Metals are consisted excellent conductors of electricity. They permit electrons to pass through them. Metals are also great heat conductors. Copper, iron, and aluminum are use to create pots and pans used in cooking because of this property. Metals are malleable. They can be hammered

into different shapes. Their primary color is silver-gray with the exception of copper and gold. Most metals have a react when exposed to oxygen. When this happens compounds called oxides are formed.

The periodic table arranges these metals into families. In each family, the metals have similar properties. There are four different types of metals: alkali, alkaline earth, transition elements and alloys. Alkalis are the softest of the three. This metal is usually shiny and silver in color and very reactive.(Periodic Group IA with the exception of hydrogen) Alkaline earth metals are harder and denser than alkali metals. They have a higher melting point and are also chemically active. (Periodic Group IIA) There are thirty elements between group IIA and IIIA called transitional elements. They are hard, brittle and have high melting points. The last of the metals are the alloys. It is a mixture of two or more elements having the properties of a metal. Some alloys include solder, which is made from tin and lead, and Bronze, which is made from copper and tin. Not all alloys are made up from elements that are metals. Steel for example is a combination of iron and carbon.

 *Missing*

Objective: Practice using the periodic table

Create a periodic table with missing items. Ask the children to fill in the missing items.

 *Mystery Elements*

Objective: Familiarize the children with the periodic table and its uses

This is a small group activity where the children are given cards with various clues about an element. Have the children identify the element using the periodic table to unmask their identities.

 *Element Jeopardy*

Objectives: Familiarize the children with the period table and its uses

Begin by dividing the room into three teams. Allow each team to come up with a scientific name for their group. Tell the children the rules are very similar to Jeopardy on television. Each team will ask for a category. Underneath the categories will be different amounts of money. If the team correctly states the question the money goes to that team. If the team incorrectly states the question then the money is subtract from that teams score. As the values go higher the answers get more difficult. This may be done as a whole class activity or a small group activity by creating individual boards the students can use.

Compounds

Most of the matter that makes up the earth is composed of compounds. Compounds are two or more elements that have been chemically combined. Salt and water are excellent examples of simple compounds. Each of these chemicals is made up of two or more elements. Water is made of the element hydrogen and oxygen. Salt is the chemical compound of sodium and chlorine. To express the makeup of a compound chemist use chemical formulas. These chemical formulas use both symbols and subscripted numbers. The numbers represent how many atoms of each element there are, for example water and salt would be expressed as H_2O and NaCl.

 *Formula Break Down*

Objective: Create a journal of compounds and their meanings

Explain to the children that there are several items in the kitchen that a chemical compounds. Give the example of water, H_2O. Ask the students the meaning of the formula. Make sure the students make a connection between the symbols, the periodic chart and the meaning of the subscripts. Provide examples of several other household compounds. Ask the students to write down the meaning of those chemical compounds. Invite children to create drawing of the compounds in their journals. Have student develop a color key for various atoms. Student s should make certain that the atoms are touching to indicate that the atoms are chemically bonded.

 *Atomic Models*

Objective: Make models of atoms

Before beginning the activity, review with students how to determine the number of proton and electrons and neutrons in an atom. Discuss how models differ from real models. Students can create models of common kitchen molecules in their journals. Use a hole punch and construction paper to create colored dots. Some simple molecules to create could include salt NaCl, water H_2O, acetic acid in vinegar $HC_2H_3O_2$ and glucose $C_6H_20_6$. Use different types of material such as styrofoam balls to create 3-D models of their favorite model.

Mixtures, Solutions and Colloids

Physical changes in chemistry are changes that do not produce a new substance. Physical changes can be classified in several different categories: mixtures, solutions and colloids are just a few. Mixtures consist of two or more substances that are mixed together but are not chemically combined. A lot of the foods we eat are combined to create a mixture. Salads are ingredients mixed together but the items that make up a salad retain their own identity. The parts of a mixture can be easily separated. Solutions are mixtures in which the particles of the substances are spread evenly throughout the mixture. The particles will not settle out. Solutions can be made from all phases of matter. Some examples of solutions include tea, Kool-aid and seawater. The

last, a colloid is a mixture that like a solution does not settle out. Unlike the small particles in a solution the particles in a colloid are large enough to scatter light. There are several colloids because they can be made from almost all states of matter.[8]

TYPES OF COLLOIDS	
gas in a liquid	foamy shaving cream, whipped cream
liquid in liquid	emulsions (homogenized milk, mayonnaise)
solid in liquid	dyes in water
gas in solid	floating bars of soap
liquid in solid	jellies and jams
liquid in gas	fog, clouds
solid in gas	smoke in the air

 *What am I?*

Objective: Classify solutions, colloids and mixtures

Prepare three jars of substances. Label the jars A, B and, C. In jar A place a mixture of sand and water, in jar B place a mixture of Kool-aide and in jar C place a mixture of gelatin. Each group should have their own set of jars. Have the children copy the chart below in their journal. Encourage the children to classify each of the substances by experimenting with each liquid using the tools on their table. While experimenting the children should fill in the chart using an organized approach (yes/no, check/x, etc).

Mixtures, Solutions, and Suspensions			
Description	Solutions	Colloids	Mixtures
Scatter light			
Settle upon stand			

Can be separated using filter paper			
Size of particles			

 *Changes*

Objective: Observe the properties of a mixture

On a sheet of paper mix together a teaspoon of sugar and an equal amount of sand. Observed mixed substance carefully. Stir the mixed substances into a tall glass of warm water. Pour the liquid slowly into a pie tin. Be careful to leave any solid substance in the glass. Keep the pie tin in sunlight for several days until the water evaporates. Observe any substance left in the pie.

The children should discover that though the salt disappeared/ dissolved into the water no changes occurred to create a new substance. Through observations they will see that the water evaporates leaving a salt residue on the pie tin.

 *Clean Me*

Objective: Clean water by using several methods of filtering

Before the activity you need to place 3-5 filter papers, a funnel, three to five small graduated cylinders, a screen, cotton and a colander. Get the students attention by taking clean water and adding dirt sand and rocks. Develop a story around the water. Perhaps you at one time lived in the dessert, maybe there was a flood, or maybe there was a hurricane and you needed clean water to drink. Invite the students to develop a way to clean the water using the tools on their table. Encourage the children to record all findings.

 *Discovery Colloids*

Objective: Discover and observe the properties of colloids

The children should be placed in small groups of four. Provide each group with several samples of various types of colloids. Samples may include: pudding, mayonnaise, soap, whipped cream, jelly and food coloring in water. Ask the children to make and record several observations. Invite the children to decide the type of colloids each jar contains.

 *Cool Colloids*

Objective: Make and observe edible colloids

Have the students sprinkle some coarse salt on a piece of ice. As the ice begins to melt, discus what is happening. Introduce the idea of using the chemical reaction between salt and ice to super-cool the ice-cream mixture when making home made ice cream. Mix sugar, milk, heavy cream and vanilla together in a steel pan. In another larger bowl half way fill the bowl with ice. Sprinkle about two handfuls of the coarse salt on the ice. Place the smaller bowl into the large bowl. Stir the mixture until it thickens to form ice cream.

Chemical Reactions

The union of elements can create some exciting times. In the reaction of the burning paper, the paper and oxygen are reactants and the light, ashes, smoke, gases and thermal energy are products of the reaction. The changes that occur are called chemical reactions. Chemical reactions create new substances. These chemical reactions can be classified into four categories: Synthesis, decomposition, single displacement and double displacement.

Synthesis reactions occur when two or more substances combine to form one new substance.

 *Rusty*

Objective: Observe a synthesis reaction

Children can complete this project in groups of two. Give each group a piece of steel wool. Tape the steel wool to the top of a cup. Sprinkle the wool with water and observe over several days. Have students write their observation as well as the chemical reactions in their journal.

Fe +O2 Fe2O3

In a decomposition reaction a compound breaks down into two or more simpler substances.

Sugar or not

Objective: Investigate a decomposition reaction

Look at the chemical of sugar $C_{12}H_{22}O_{11.}$ There are three different elements with 45 atoms in a single molecule. Sugar can decompose if heat is added. Take a small amount of white table sugar and place it in a test tube. Using a test tube holder carefully heat the test tube until the sugar is completely burned. Take a wooden splint and taste the burnt sugar. You will find the sugar decomposed into carbon and water. The balanced equation for the reaction is

$C_{12}H_{22}O_{11}$ + heat 12C +11H_2O. Point out to the children that the sugar decomposed into two substances. The children should write their findings and the equation in their journal.

A single replacement reaction is when one element/a free element replaces another in a compound.

Eureka

Objectives: Observe a single reaction

Tie a string around a galvanized or uncoated nail. Fill the beaker half full with a solution of blue copper sulfate. Dip the nail in the CuSO4 solution for about five minutes. Have the students make observations while continuing to dip the nail. Students will observe that copper has formed on the nail. The balance reaction is Fe + CuSO4 Cu + FeSO4

In double replacement reactions, parts of two compounds replace each other.

It's Not Easy Being Green

Objectives: Observe a double replacement reaction

Have children measure 10ml of salt and copper (II) sulfate in a container. Make sure to mix the two substances. Place a single drop of water on the mixture. Have children record all observations in their journal. The students will find that the reaction turns green. This is due to the yield of the two substances. $CuSo_4 + 2NaCl\ CuCl_2 + Na_2SO_4$ The initial compound copper (II) sulfate is blue and when the reaction occurs copper (II) chloride is present which is yellow. These to color cause the mixture to turn green.

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Great Web Pages

1.http://www.eecs.umich.edu/mathscience/funexperiments/agesubject/lessons/other/una2.html

This web site Give teachers innovative ideas and concepts to enlighten the minds of children.

2. http://www.polsci.wvu.edu/Henry/Icecream/Icream.html

The first liquid nitrogen ice cream page discusses cool experiments.

3. http://chem4kids.com/reactions/equilib.html

An interactive site that allows children to discover the periodic table.

4. http://chemlab.pc.maricopa.edu/periodic/

This is a research site for both children and adults that explores the periodic table.

Pittsburgh District Content Standards

Mathematics, Communication and Science and Technology standards has been incorporated into this unit. This unit focused on the following standards:

Mathematics

1. All students use numbers, number systems, and equivalent forms (including numbers, words, objects and graphics) to represent theoretical and practical situations.

2. All students compute, measure, and estimate to solve theoretical and practical problems, using appropriate tools , including modern technology such as calculators and computers.

3. All students apply the concepts of pattern, functions and relation to solve theoretical and practical problems.

6. All students will draw appropriate conclusions from charts, tables and graphs showing the relationships between data and real world situations.

7. All students will make decisions and predictions based upon the collection, organization, analysis and interpretation of statistical data and the application of probability.

Communication.

2. All students read and use a variety of methods to make sense of various kinds of complex text.

3. All students respond orally and in writing to information and ideas gained by reading narrative and informational text and use the information and ideas to make decisions and solve problems.

4. All students write for a variety of purposes, including to narrate, inform , and persuade, in all subject areas.

5. All students analyze and make critical judgments about all forms of communication separating facts from opinion, recognizing inconsistencies and judging the validity of evidence.

8. All students compose and make oral presentations for each academic area of study that are design to persuade, inform, or describe.

Science and Technology

1. All students explain how scientific principles of chemical, physical and biological phenomena have developed and relate them to real world situations.

2. All students demonstrate knowledge of basic concepts and principles of physical, chemical, biological and earth science.

6. All students develop and apply skills of observation, data collection, analysis, pattern recognition prediction and scientific reasoning in designing and conducting experiments and solving technological problems.

7. All students evaluate advantages, disadvantages and implications associated with the impact of science and technology on current and future life.

8. All students evaluate the impact on current and future life of the development and use of varied energy forms, natural and synthetic materials and production and processing of food and other agricultural products.

9. All students demonstrate basic computer literacy, including word-processing, software applications, and the ability to access the global infrastructure, using current technology.

Materials List	
Cool Colloids	*Observations of Matter*
2 thin metal mixing bowls, one small and one large coarse salt crushed ice large mixing spoon measuring cups 125 ml sugar	3 clear jars with lids bags of popcorn

250ml milk 15ml vanilla heavy cream class set of plastic spoons and cups	food coloring 100ml of water
Metal Models boxes enough for 8 groups various items like pencils, blocks, cork, money tape	*Atomic Models* <u>2-dimensional</u> <u>hole punch</u> <u>colored construction paper</u> <u>glue</u> <u>3 dimensional</u> <u>styrofoam balls of different sizes</u> <u>hangers</u> <u>markers</u>
Understanding the Size of an Atom sugar popsicle stick	*Make an Electroscope* aluminum foil metal rod rubber stopper flask comb
Element Bingo bingo chips blank bingo cards elements written on small squares of cardboard	*What am I?* 3 jars labels sand water kool-aid gelatin
Clean Me filter paper funnel graduated cylinders screen cotton colander 100ml of water dirt sand	*Eureka* uncoated nail copper (II) sulfate beaker string
Sugar or Not sugar small test tubes metal tongs bunsen burner wooden splint	*Changes* sugar sand 100ml of warm water pie tin jar/ cup
Discovery Colloids 4 jars for each groups pudding soap whipped cream jelly food coloring in water	*Rusty* steel wool tape plastic cup

	small container water
It's Not Easy Being Green 10ml of salt 10ml of copper (II) sulfate popsicle sticks dropper water	

Appendix

Periodic Table Search

Use the periodic table of elements to complete the activity.

1. Looking at the first 103 elements, how many have just one letter in their symbol?

2. How many have two letters?

3. Name the elements that have one-letter symbols.

4. Name the elements that have the first and second letters as its symbol.

5. Name the elements that have a symbol that is totally different from its name.

6. Name symbols that are named after planets.

Chemical Compounds

Use the periodic table to help identify the elements in the compound. Identify how many atoms of each substance make up the compound.

H_2O

$NaHCO_3$

Fe_2O_3

NH_3

CCl_4

H_2S

Element Jeopardy

MATTER	ELEMENTS	COMPOUNDS	PHYSICAL CHANGE
$100 Solid liquids and gas.	$100 The smallest particle of an element.	$100 The chemical formula for water	$100 A material that is made up of two or more substances
$200 Matter that has no definite shape or volume.	$200 The simplest element.	$200 The number of atoms in the compound $C_{12}H_{22}O_{11.}$	$200 The physical changes of water.
$300 Matter that has a definite shape and a definite volume.	$300 It has an atomic number of 47	$300 A substance whose smallest unit is made up of more than one element.	$300 A mixture that doesn't settle out.
$400 Takes up space.	$400 The make up of an element.	$400 The chemical formula for salt.	$400 Salt water
$500 Water, tea and oil are just to name a few.	$500 It has an atomic mass of 4.0	$500 When a free element replaces an element that is part of a compound.	$500 Gas in liquid, solid in liquid and gas in liquid
$600 Amount of space that an object takes up.	$600 The organization of the elements.	$600 When a compound breaks down into two or more simpler substances.	$600 Two examples of colloids.

Symbols Cross Word Puzzle

1. **N**	**i**		**2.** **F**		**5.** **C**	**u**		**10.** **K**
a		**3.** **B**	**e**		**l**		**11.** **P**	
	4. **Z**	**r**		**8.** **A**		**12.** **N**	**b**	
6. **I**			**9** **C**	**s**		**e**		**21.** **A**
	7. **S**	**i**			**20.** **O**		**22.** **K**	**r**
13. **Z**	**n**		**16.** **L**			**19.** **R**		
		15. **T**	**i**		**18.** **M**	**n**		**23.** **A**
14. **B**				**17.** **A**	**g**		**24.** **R**	**u**

Element Bingo

B	I	N	G	O
				

Atom Models

An atom has the same number of electrons as protons. The electrons travel around the nucleus in many paths called orbits. All of the electron paths put together make an electron shell. Letters are used to name the shells. The first shell is called K shell. The others follow in alphabetical order, from L to Q.

Shell	Number of electrons shell can hold
K	**2**
L	**8**
M	**18**
N	**32**

Lithium Atom

K = 2 electrons

L = 8 electrons

Neon Atom

Periodic Table of the Elements

	I-A	II-A	III-B	IV-B	V-B	VI-B	VII-B	VIII-B			I-B	II-B	III-A	IV-A	V-A	VI-A	VII-A	VIII-A
1	1 H Hydrogen 1.0																	2 He Helium 4.0
2	3 Li Lithium 6.9	4 Be Beryllium 9.0											5 B Boron 10.8	6 C Carbon 12.0	7 N Nitrogen 14.0	8 O Oxygen 16.0	9 F Fluorine 19.0	10 Ne Neon 20.2
3	11 Na Sodium 23.0	12 Mg Magnesium 24.3											13 Al Aluminum 27.0	14 Si Silicon 28.1	15 P Phosphorus 31.0	16 S Sulfur 32.1	17 Cl Chlorine 35.5	18 Ar Argon 40.0
4	19 K Potassium 39.1	20 Ca Calcium 40.1	21 Sc Scandium 45.0	22 Ti Titanium 47.9	23 V Vanadium 50.9	24 Cr Chromium 52.0	25 Mn Manganese 54.9	26 Fe Iron 55.9	27 Co Cobalt 58.9	28 Ni Nickel 58.7	29 Cu Copper 63.5	30 Zn Zinc 65.4	31 Ga Gallium 69.7	32 Ge Germanium 72.6	33 As Arsenic 74.9	34 Se Selenium 79.0	35 Br Bromine 79.9	36 Kr Krypton 83.8
5	37 Rb Rubidium 85.5	38 Sr Strontium 87.6	39 Y Yttrium 88.9	40 Zr Zirconium 91.2	41 Nb Niobium 92.9	42 Mo Molybdenum 95.9	43 Tc Technetium 98.0	44 Ru Ruthenium 101.0	45 Rh Rhodium 102.9	46 Pd Palladium 106.4	47 Ag Silver 107.9	48 Cd Cadmium 112.4	49 In Indium 114.8	50 Sn Tin 118.7	51 Sb Antimony 121.8	52 Te Tellurium 127.6	53 I Iodine 126.9	54 Xe Xenon 131.3
6	55 Cs Cesium 132.9	56 Ba Barium 137.4	57-71	72 Hf Hafnium 178.5	73 Ta Tantalum 181.0	74 W Tungsten 183.9	75 Re Rhenium 186.2	76 Os Osmium 190.2	77 Ir Iridium 192.2	78 Pt Platinum 195.1	79 Au Gold 197.0	80 Hg Mercury 200.6	81 Tl Thallium 204.4	82 Pb Lead 207.2	83 Bi Bismuth 209.0	84 Po Polonium 210.0	85 At Astatine 210.0	86 Rn Radon 222.0
7	87 Fr Francium 223.0	88 Ra Radium 226.0	89-103	104 Db Dubnium (261.0)	105 Jl Joliotium (262.0)	106 Rf Rutherfordium (263.0)	107 Bh Bohrium (262.0)	108 Hn Hahnium (265.0)	109 Mt Meitnerium (268.0)									

1 H Hydrogen 1.0 — 1 Atomic Number; H Atomic Symbol; Hydrogen Element Name; 1.0 Atomic Weight (rounded to the nearest tenth)

Elements 110-111 are not included in this periodic table, because their existence is still being disputed among scientists.

6	57 La Lanthanum 138.9	58 Ce Cerium 140.1	59 Pr Praseodymium 140.9	60 Nd Neodymium 144.2	61 Pm Promethium 147.0	62 Sm Samarium 150.4	63 Eu Europium 152.0	64 Gd Gadolinium 157.3	65 Tb Terbium 158.9	66 Dy Dysprosium 162.5	67 Ho Holmium 164.9	68 Er Erbium 167.3	69 Tm Thulium 168.9	70 Yb Ytterbium 173.0	71 Lu Lutetium 175
7	89 Ac Actinium 227.0	90 Th Thorium 232.0	91 Pa Protactinium 231.0	92 U Uranium 238.0	93 Np Neptunium 237.0	94 Pu Plutonium (244.0)	95 Am Americium (243.0)	96 Cm Curium (247.0)	97 Bk Berkelium (247.0)	98 Cf Californium (251.0)	99 Es Einsteinium (252.0)	100 Fm Fermium (257.0)	101 Md Mendelevium (258.0)	102 No Nobelium (259.0)	103 Lr Lawrencium (260.0)

Approximate values for radioactive elements are listed in parentheses.