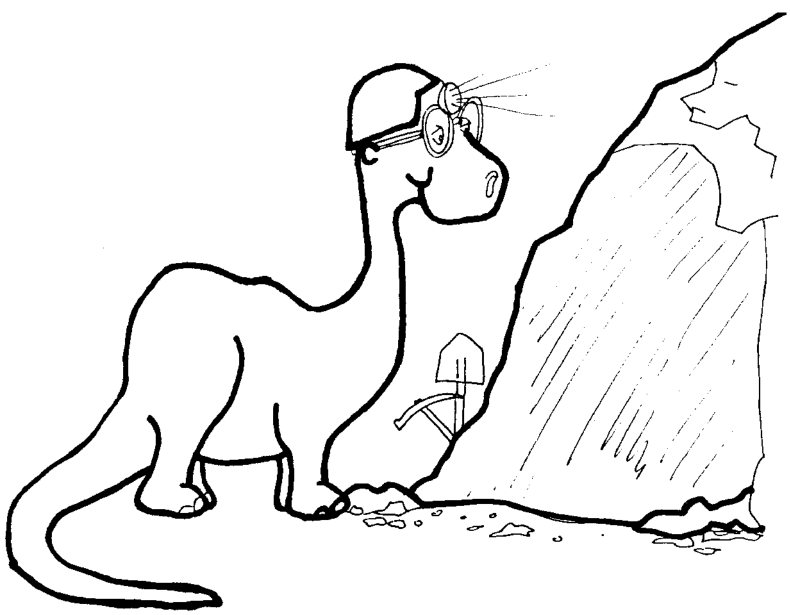
Rock Cycle

Understanding the Earth's Crust

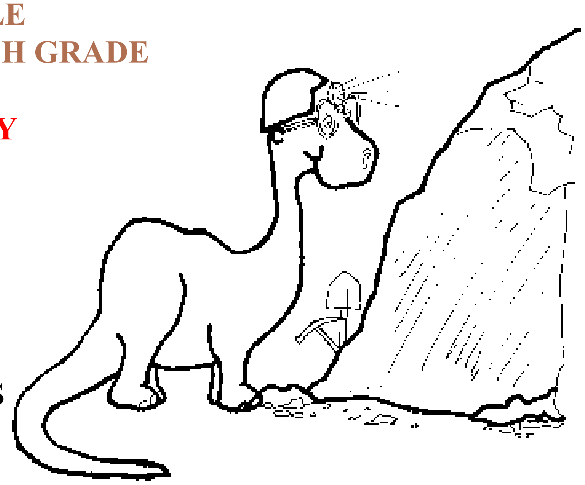
FIFTH GRADE

CHEMISTRY



1 WEEK
LESSON PLANS AND
ACTIVITIES

ROCK CYCLE
OVERVIEW OF FIFTH GRADE



CHEMISTRY

WEEK 1.
PRE: *Describing a chemical reaction.*
LAB: *Illustrating how molecules move.*
POST: *Comparing salt and sugar crystals.*

MINERALS

WEEK 2.
PRE: *Exploring minerals made of elements and compounds.*
LAB: *Discovering the different hardness of minerals.*
POST: *Analyzing why one mineral is harder than another.*

WEEK 3.
PRE: *Exploring how minerals are useful.*
LAB: *Analyzing minerals for their usefulness.*
POST: *Distinguishing colors derived from minerals.*

ROCKS

WEEK 4.
PRE: *Interpreting the different environments where rocks form.*
LAB: *Analyzing the origin of different sands.*
POST: *Comparing areas where sedimentary particles are deposited.*

WEEK 5.
PRE: *Exploring the creation of caves.*
LAB: *Examining different sedimentary rocks.*
POST: *Exploring the difficulties in identifying rocks.*

PAST LIFE

WEEK 6.
PRE: *Exploring paleontology.*
LAB: *Illustrating how fossils are preserved.*
POST: *Comparing the different eras of time.*

ROCK CYCLE - CHEMISTRY (5)

PRE LAB

Students use the periodic table to investigate elements and how they react in nature.

OBJECTIVES:

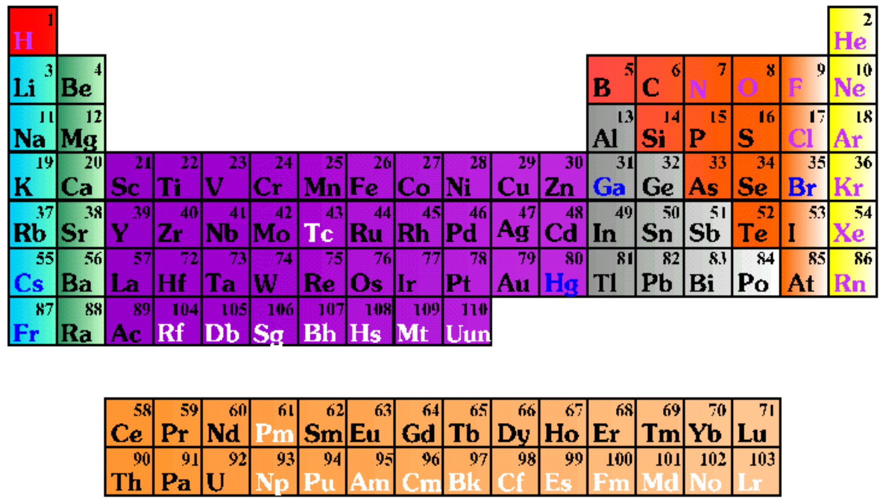
1. Distinguishing between a chemical and physical change.
2. Describing a chemical reaction.

VOCABULARY:

compound
element

MATERIALS:

periodic table placemats



BACKGROUND:

The periodic table lists the elements in order of increasing atomic number. Each element is described by its name, atomic weight, atomic symbol, and atomic number. Elements with similar characteristics are listed in vertical groups called families.

Elements are composed of small particles called atoms. Atoms are the smallest units of an element that can combine with other elements. Atoms of different elements combine to form compounds. Baking soda (sodium bicarbonate), for example, is made of sodium, hydrogen, carbon, and oxygen. Hydrogen gas, composed of two hydrogen atoms is technically a compound. The chemical formula of a compound lists all the elements that make up the compound and their proportions. The smallest unit of a compound is a molecule.


burning is a chemical change

A physical property of an element or compound is any characteristic that can be observed such as color, odor, density, hardness, or melting point. A chemical property refers to the chemical composition of that substance. For example, silicon (Si) and oxygen (O) make up quartz, silicon dioxide (SiO_2). A physical change occurs when a compound changes state, for example, ice melting to form water. No new elements or compounds are formed. Physical changes require no modification of the internal molecular arrangement of the compound.

A chemical change occurs when a new compound is produced as a result of a reaction between two substances. Chemical changes cause permanent changes in the composition of the material, for example wood changes composition when burned to ash.

PROCEDURE:

1. Review the Periodic Table with the students. Ask them to find elements that are used in daily language. For instance: ______ Valley (Silicon); _____ makes strong bones (calcium); _____ helps fight a sore throat (zinc); a coin is named after this element (nickel). See if the students can come up with more examples. This will help you determine the level of your student's knowledge of the elements.

Baking bread is a chemical change.

2. Ask your students to determine whether each of the following is a chemical or physical change. You may want to demonstrate some of these changes before the students respond.

A. bending a toothpick (physical)
B. burning a match (chemical)
C. burning sugar (chemical)
D. making a cake from scratch (chemical)
E. smashing a can (physical)
F. making instant coffee (physical)
G. melting ice to water (physical)

3. Scientists use the atomic symbols of the elements to help record chemical reactions, because it is easy to write the reaction in this chemical "short hand." Go through the chemical reactions below with your students. You may want to have them use the Periodic Table to locate the symbols. Don't worry about the numbers in the equations.

Making photos is a chemical change.

$H_2 + Cl_2$ ---------> $2\ HCl$
hydrogen (a gas) + chlorine (a gas) yields 2 molecules of hydrochloric acid

$CuO + H$ ---------> $Cu + H_2O$
copper oxide + hydrogen (a gas) yields copper + water

$H_2 + S$ ---------> H_2S
hydrogen (a gas) + sulfur yields hydrogen sulfide

ROCK CYCLE - CHEMISTRY (5)

LAB

Students experiment with supersaturation.

OBJECTIVE:

1. Illustrating how molecules move.
2. Exploring physical changes.

VOCABULARY:

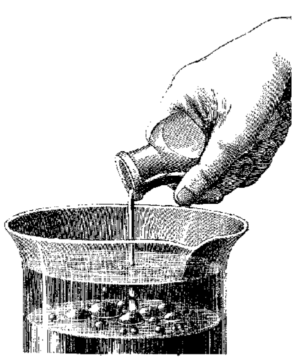
dissolve
molecule
saturated
solute
solution
solvent
supersaturated

The coffee is the solvent, the sugar is the solute, and the sweeten coffee would be the solution.

MATERIALS:

coffee filter
sugar
salt
beakers or clear cup
hot and cold water
spoon

BACKGROUND:



A solution consists of a solute (the dissolved material) and a solvent (the substance in which the solute is dissolved). The solute is present in a smaller quantity than the solvent. As the amount of solute in a solution increases, the solution becomes more concentrated. At the point of maximum concentration, the solution is saturated. Any additional solute added to a saturated solution will precipitate and drop to the bottom of the container. In general, increasing the temperature of a solution will increase how much solute can be dissolved in it (solubility). Once solute temperature has been increased, more solute has been added, but no more will dissolve, the solution is termed supersaturated.

Supersaturation is important when crystals form. For example, when making rock candy from sugar you have to boiling the water to a high temperature so you can dissolve more sugar in the solution. Only then can you precipitate crystals of sugar on a string.

PROCEDURE:

Exercise 1.

1. Instruct the students to fill a 250 ml container with 200 ml of water. Have them put 4 ml of salt in a filter and fold it as diagramed on the lab sheet.

2. Place the filter on the surface of the water. Have the students record what they see on their lab sheets. They should see very thin waves, called *schlieren*, flowing from the filter into the water.

3. Explain what is happening to the salt. The water can pass through the filter. It then dissolves the salt crystals into individual salt molecules, which can move through the holes in the filter. The salt + water forms a solution.

Exercise 2.

4. In this exercise the students will see that more solute will dissolve when the temperature of the solvent is increased. Depending on the beakers you are using, you may want to predetermine the amount of hot and cold water for each trial.

5. Have the students measure cold water into a beaker. Then have them add salt (start with 1 ml increments) and allow it to dissolve. Have the students record how much salt the solvent will hold in solution.

6. Repeat the experiment, using the same volume of hot water. Again add salt, and record how much salt can be held in solution.

7. Repeat steps 5 and 6, but using sugar instead of salt. Record the data on the sheet. For both solvents, the cold water forms a saturated solution, and the hot water forms a supersaturated solution.

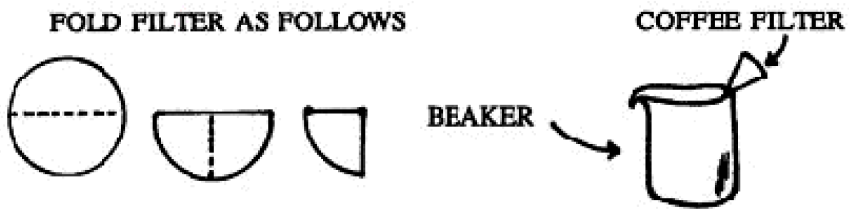
8. The students have observed a physical change in this activity. The properties of the solute are maintained in their respective solutions. They also observed how solutes (salt and sugar) are dissolved in different temperatures of water.

ROCK CYCLE - CHEMISTRY (5) LAB

PROBLEM: How do substances dissolve?

PREDICTION:____

PROCEDURE:
Exercise 1. beaker, water, salt, coffee filter (filter paper).
Put about 300-400 ml of water in a beaker. Wrap 4 ml of salt in the coffee filter. Barely wet the tip of the filter on the surface of the water, as shown in the diagram, and observe what happens. Draw what you see in the space below.



Record what happens.
____
____

Exercise 2. salt, sugar, hot water, cold water, spoon

Measure 200 ml of cold water in a beaker. Measure 1 ml of salt and mix it into the liquid. Record whether or not it dissolves. Keep adding and mixing salt into the solution until it stops dissolving. Fill in the chart below as you go. Repeat the process using hot water. Repeat the entire process using sugar.

NUMBER OF ml								
	I	2	3	4	5	6	7	8
salt(cold)								
salt(hot)								
sugar(cold)								
sugar(hot)								

CONCLUSION: What have you observed?
____
____
____

ROCK CYCLE - CHEMISTRY (5)

POST LAB

Students grow salt and sugar crystals.

OBJECTIVES:

1. Comparing salt and sugar crystals.
2. Growing crystals.

VOCABULARY:

crystal
crystalline

MATERIALS:

salt
granulated sugar
cotton string
pencil
paper clip
jar

Salt easily dissolves into water.

BACKGROUND:

Students have learned that a substance is more likely to go into solution in a solvent at a higher temperature than at a lower temperature. If a solution is allowed to cool, the solute will precipitate from the solution as a solid. Slower cooling solutions grow larger and more perfect crystals. Cooling is only one of many ways to grow crystals, whether they are organic or inorganic.

A crystal is a collection of atoms or molecules structured in a specific repeatable pattern. The patterns can be simple or complicated. A new crystal grows most easily by attaching itself to a surface of a preceding crystal. The new, growing crystal does not usually attach exactly enough to duplicate the existing crystal. The new crystal thus grows as what is termed a "dislocation." This is one reason why clusters of small crystals are common, but large perfect crystals are rare. Many other environmental factors determine how perfect a crystal will be.

PROCEDURE:

1. In this activity the students grow, observe, and compare salt and sugar crystals. The actual growth of the crystals may take several days, depending on the temperature of the solutions. You may want to make several solutions and put then in different areas

of the classroom.

2. To make Salt Crystals. Boil water and dissolve as much salt in the solution as possible. The solution will be supersaturated when salt crystals begin to collect on the bottom of the pan.

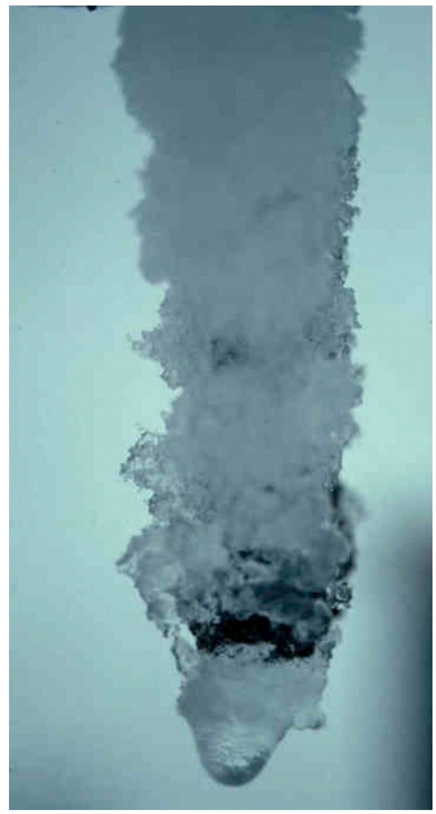
We recommend two methods for precipitating salt crystals:

A. Soak a piece of cardboard in the solution until it is saturated and sinks to the bottom of the pan. The cardboard will act as a base for crystal growth. Put the pan in a sunny location. Crystals will form as the water evaporates. This may take several days.

B. Simply place the pan of solution in a warm location, and allow crystals to grow without a template.

Both methods work. You may wish to try several pans, and study how the growth of crystals varies between them.

3. To make Sugar Crystals. Boil about 400 ml water. Add about 200 ml of sugar to the water, and stir the solution well. Pour the solution into the jar. Make sure that the jar you selected can withstand the temperature (beaker should work). Tie a paper weight to the end of the string to keep it straight. Suspend the string from a pencil. Submerge the string in the solution. The sugar crystals will grow slowly on the string over a period of several days.



Sugar crystals forming

4. Instruct the students to observe the crystals daily, and record how they change. Have them record their observations in a log, so they can then compare the results as a class. The following page shows a sample log, with space for observation and illustration. If more than two solutions are used, the log will need to be duplicated.

5. After a week you can discuss which solution made the best crystals and try to determine why one is better than the other. Generally, the slower a crystal forms, the larger it will be.

ROCK CYCLE - CHEMISTRY (5) POST

Log of your crystal growing experiment. Under day, record the type of conditions in the classroom and outside. Draw a picture or describe what the salt and/or sugar crystals look like on that day.

Day	Salt Solution	Sugar Solution
1		
2		
3		
4		