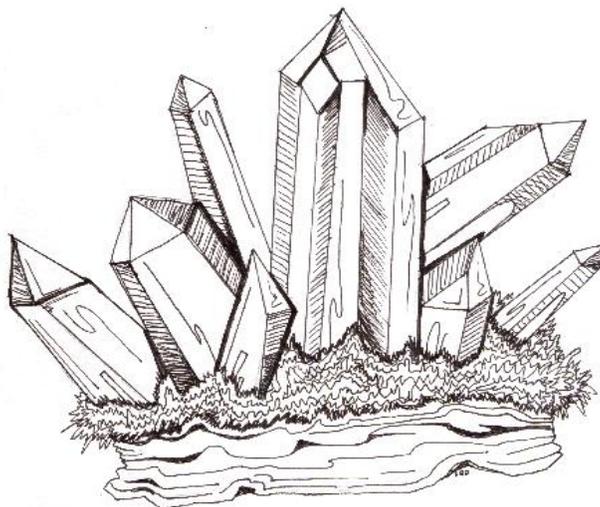


ELEMENTARY SCIENCE PROGRAM
MATH, SCIENCE & TECHNOLOGY EDUCATION

A Collection of Learning Experiences on
**POWDERS AND
CRYSTALS**

Powders And Crystals
Student Activity Book

Revised August 2006



Name _____

This learning experience activity book is yours to keep. Please put your name on it now. This activity book should contain your observations of and results from your experiments.

When performing experiments, ask your teacher for any additional materials you may need.

TABLE OF CONTENTS

Seven Tips For Safety	2
Activity Sheet for L.E. #1 - Moon Rocks.....	3
Activity Sheet for L.E. #2 - Senses.....	4
Activity Sheet for L.E. #2-8 - Class Observation Summary Chart	5
Activity Sheet for L.E. #3 - How to Use a Pocketscope.....	6-7
Activity Sheet for L.E. #4 - Heat Test	8
Activity Sheet for L.E. #5 - Water Test	9
Activity Sheet for L.E. #6 - Vinegar Test	10
Activity Sheet for L.E. #7 - Iodine Test.....	11
Activity Sheet for L.E. #8 - BTB Test.....	12
Activity Sheet for L.E. #9 - Classifying Powders & Crystals	13
Activity Sheet for L.E. #10 - Conquering the Unknown	14
Activity Sheet for L.E. #11 - Super Sleuth - What Are In These Mixtures?	15-16
Powders And Crystals Review Sheet	17-18
Powders and Crystals Student Assessment	19-20
Student Self Assessment	21
Glossary.....	22-24

Name _____

SEVEN SAFETY TIPS FOR SAFETY

Read and discuss with your class the list of seven safety tips to remember when using chemicals in science.

1. Wear your safety goggles when using any chemicals, especially when heating chemicals.
2. Only wear the safety goggles that have been assigned to you.
3. Avoid contamination of chemicals by not returning used chemicals to their original container.
4. Conserve chemicals by only taking the amount you need.
5. Dispose of any liquid chemicals down the sink and flush with cold water for 30 seconds.
6. Chemicals such as Plaster of Paris should be disposed in a trash container.
7. Keep chemical directly away from nose when smelling.
8. Clean up equipment, spills, and wash your hands **AFTER USING ANY CHEMICALS!**



Activity Sheet for Learning Experience #1 Name _____

MOON ROCKS

Define properties:

Brainstorm different kinds of properties with your class.

List 15 one word observations of your moon rock below.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.
- 14.
- 15.

SENSES

Use your sense of sight, touch, and smell to make observations about each powder and crystal. Use one word observations to describe each of the powders and crystals.

CUP	OBSERVATIONS		
	SIGHT	TOUCH	SMELL
RED			
ORANGE			
YELLOW			
BLACK			
GREEN			
BLUE			



CLASS OBSERVATION SUMMARY CHART

Discuss with the class the results of your team during each learning experience. As a class, decide what words best describe each powder or crystal for each observation or test that was done. Record these descriptions in the boxes below.

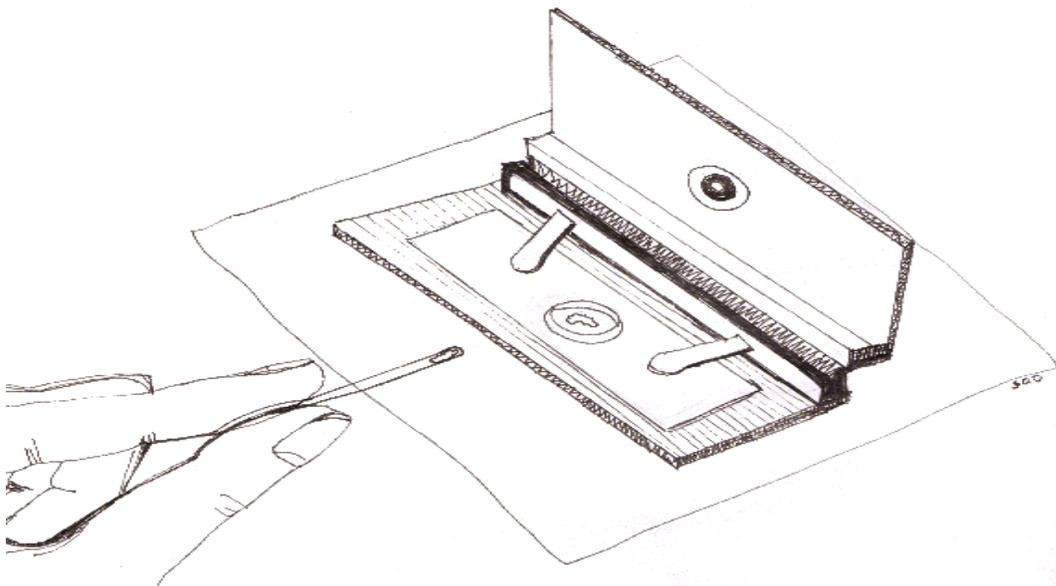
CUP	SENSES	MICRO-SCOPE	HEAT TEST	WATER TEST	VINEGAR TEST	IODINE TEST	BTB TEST
RED							
ORANGE							
YELLOW							
BLACK							
GREEN							
BLUE							

POWDERS AND CRYSTALS
HOW TO USE THE POCKETSCOPE

A microscope is a scientific instrument that must be handled with care. The pocketscope is a small microscope.

All microscopes work on the same principle. Light passes through the specimen, through the lens (where it is magnified), and into your eye. Beyond this, it is only necessary to focus these rays of light. Focusing is done by changing the distance between the lens and the specimen.

The following general steps apply for the use of the pocketscopes while studying Powders and Crystals.



1. Place only the amount of powder on a depression slide that will fit on the small flat end of a toothpick. Never place wet powders or crystals on a depression slide.
2. Place slide under the clips and be sure the specimen is over the lighthole.
3. Put a piece of white paper on the table or desk and aim the pocketscope toward the paper. Enough light will pass through the lighthole for easy viewing.
4. With one eye closed, place the other eye over the eyepiece and slowly squeeze the pocketscope together until you can see the item you are observing (the specimen) clearly.

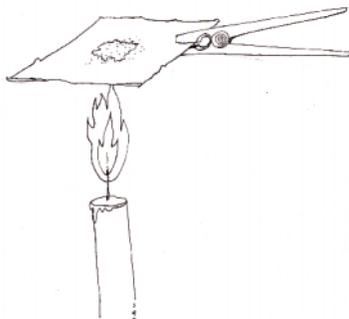
Complete the chart as you are observing the mystery powders and/or crystals through the pocketscope.

CUP	Draw a picture of what you observe under the slide.	Is it a powder or a crystal? Why do you think so?
RED		
ORANGE		
YELLOW		
BLACK		
GREEN		
BLUE		

Activity Sheet for Learning Experience #4 Name _____

HEAT TEST

Place a small amount of the first substance onto a piece of aluminum foil (10 cm x 10 cm). Attach the clothespin to the foil. Hold the clothespin as the foil is placed over the flame. Observe the results of the heat on this substance. Repeat this learning experience with the rest of the substances. Write your observations on the chart below.



CUP	OBSERVATIONS
RED	
ORANGE	
YELLOW	
BLACK	
GREEN	
BLUE	

WATER TEST

Describe how each powder or crystal has changed after the water was added to it. Use your sense of sight, touch, and smell to make your observations.

CUP	OBSERVATIONS		
	SIGHT	TOUCH	SMELL
RED			
ORANGE			
YELLOW			
BLACK			
GREEN			
BLUE			

VINEGAR TEST

Make observations about each powder and crystal when 3 -5 drops of vinegar is added to each substance.



CUP	3 - 5 DROPS of Vinegar
	OBSERVATIONS
RED	
ORANGE	
YELLOW	
BLACK	
GREEN	
BLUE	

Activity Sheet for Learning Experience #7 Name _____

IODINE TEST

Add 3-5 drops of iodine to each of the powders and crystals. Observe whether or not the iodine reacts in the substance. In one sentence, explain why the iodine reaction occurs in one substance and not another.

CUP	DID THE IODINE REACT? If so, explain how it reacted.	WRITE ONE SENTENCE EXPLAINING WHY THE IODINE REACTS IN SOME SUBSTANCES AND NOT IN OTHERS.
RED		
ORANGE		
YELLOW		
BLACK		
GREEN		
BLUE		

BTB TEST

Add a few drops of BTB to each substance. Write down the color that BTB turns to and whether or not the substance is an acid or a base based on the color change.

CUP	COLOR BTB TURNS	ACID OR BASE?
RED		
ORANGE		
YELLOW		
BLACK		
GREEN		
BLUE		



CLASSIFYING POWDERS & CRYSTALS

Review the data on your Class Observation Summary Chart. Classify the powders and crystals into different groups based on a common property (color, texture, etc). Color in the circles with the color of the powder and/or crystal that fits into each group.

A.

Group 1

Property _____

Group 2

Property _____

B.

New Group 1

Property _____

New Group 2

Property _____

C.

New Group 1

Property _____

New Group 2

Property _____

D.

New Group 1

Property _____

New Group 2

Property _____

CONQUERING THE UNKNOWN

Complete each of the tests on the substance(s) you brought from home. Write your results on the chart below.

Name of substance brought in from home	Senses	Microscope	Heat Test	Water Test	Vinegar Test	Iodine Test	BTB Test
#1 _____							
#2 _____							

After looking at the chart above and yo ur Class Observation Summary Chart, the substances we brought in from home are the most like substances in which color cup?

#1 _____ is most like (Cup Color) _____.

#2 _____ is most like (Cup Color) _____.

SUPER SLEUTH – WHAT IS IN THESE MIXTURES?

Complete each of the tests on the mystery mixture you have been assigned. Write your results on the chart below. Decide what two powders and/or crystals are making up the mixture and write their names on the lines below by the letters A, B, or C. Be prepared to discuss your results with the class.

CONTAINER	SENSES	MICRO-SCOPE	WATER	VINEGAR	IODINE	BTB	HEAT
<p style="text-align: center;">A</p> <p>Contents:</p> <p>_____</p> <p>_____</p>							
<p style="text-align: center;">B</p> <p>Contents:</p> <p>_____</p> <p>_____</p>							
<p style="text-align: center;">C</p> <p>Contents</p> <p>_____</p> <p>_____</p>							

Activity Sheet for Learning Experience #11 Name _____

Use your science notes on the previous page and your data interpretation skills to fill in the blanks.

Container A is a mixture of 1. _____ and 2. _____.

I know 1. _____ is in the mixture because _____
_____.

I know 2. _____ is in the mixture because _____
_____.

Container B is a mixture of 3. _____ and 4. _____.

I know 3. _____ is in the mixture because _____
_____.

I know 4. _____ is in the mixture because _____
_____.

Container C is a mixture of 5. _____ and 6. _____.

I know 5. _____ is in the mixture because _____
_____.

I know 6. _____ is in the mixture because _____
_____.

Powders and Crystals Review

Name _____

1. A _____ is a solid shape which is formed in a repeated pattern.
2. A _____ is a mass of fine, loose particles formed from crushing or grinding a solid substance.
3. We used our senses of _____, _____, and _____ to learn about some of the _____ of the powders and crystals.
4. _____ are characteristics or qualities of a material. Examples of properties are: _____, _____, _____, and _____.
5. The _____ has a lens that can be focused to magnify matter, so it is a kind of microscope.
6. When a substance dissolves in a liquid, a _____ is made. The liquid is the _____. The substance that dissolves is called the _____.
7. The pH scale measures how acidic or basic a substance is. A low number on the scale means the substance is an _____. For example: _____ or _____.
8. A high number on the pH scale means the substance is a _____. _____ and _____ are examples of bases.
9. When a _____ reaction occurs, atoms rearrange and a new substance is formed. Vinegar (an acid) mixed with baking soda (a base) forms a _____ and the gas _____.
10. When two or more substances are combined but do not form a new substance, (like stirring sand into water), a _____ is formed. A mixture can be separated into its original parts. A _____ is a kind of mixture.
11. A chemical reaction occurs when iodine is dropped on a _____. There is starch in _____, _____ and _____.
12. BTB chemically reacts with _____ by turning green or yellow.

13. We performed 5 tests (or experiments) on powders and crystals to find their properties. When there is a good question to be answered by testing, we often follow the steps of the scientific method. These are the steps of the scientific method:

- a. First, we make a _____, (or an educated guess), about what will happen in the experiment.
- b. Then we design and conduct fair tests, (_____).
- c. After each part of the experiment, we record our data to study our _____.
- d. Last, we retest to be sure of our results and make a _____.

14. When experimenting with powders and crystals we followed these safety precautions:

- a. Wear _____ when using chemicals, especially when _____ chemicals.
- b. Don't wear _____ safety goggles.
- c. Don't return chemicals to their original containers. They may _____.
- d. Keep your hands, clothing, and _____ away from any flame.
- e. Never use your sense of _____ to test chemicals.
- f. Chemicals that harden, like _____ of _____, should go in a trash container, **NOT DOWN THE SINK DRAIN.**
- g. Wash your _____ after touching chemicals.

Name: _____

Date: _____

Powders And Crystals Student Assessment

Directions: Read the question carefully and answer based on your knowledge about powders and crystals. Use a word from the word bank to fill in the blank. Use words only once.

starch
microscope
base
solvent

mixture
acids
crystal
carbon dioxide

properties
powders
iodine

solution
baking soda
salt

- 1.) Iodine turns purple/black in the presence of _____.
- 2.) An acid reacts with a _____ to form salt.
- 3.) When vinegar is put with baking soda, _____ and salt are formed.
- 4.) When you mix water with salt, the water becomes the _____ in the solution.
- 5.) _____ can be used to identify the starch in a potato.
- 6.) A liquid or mixture formed by dissolving two substances is a _____.
- 7.) BTB is a chemical indicator that will change colors when _____ are identified.
- 8.) A pocketscope is a small _____ that we can use in the classroom.
- 9.) A chemical reaction occurs when vinegar is added to _____.
- 10.) _____ are loose particles that are obtained by grinding or crushing a solid substance.
- 11.) Characteristics or qualities of something are called _____.
- 12.) Two substances put together that are not chemically combined form a _____.
- 13.) What is the solute in saltwater? _____

14.) Explain three safety rules we used to protect ourselves during the Powders and Crystals unit.

1.) _____

2.) _____

3.) _____

15.) We used the Scientific Method to conduct our experiments on unknown powders and crystals. Number the steps below starting with 1 (what we did first) in the Scientific Method that we used.

_____ Conclusion

_____ Hypothesis

_____ Results

_____ Experiment

16.) List at least four properties a scientist might use to classify unknown objects or substances.

1.) _____

2.) _____

3.) _____

4.) _____

POWDERS AND CRYSTALS
STUDENT SELF-ASSESSMENT



Name: _____

Date: _____

1. What do you now know about powders & crystals that you didn't know before?

2. What do you know about using a scientific method to solve a problem?

3. How do you think you and your partner(s) worked together? Give some examples.

4. What learning experiences did you enjoy? Explain why you liked them.

5. Were there any learning experiences in the unit you didn't understand or that confused you? Explain your answer.

6. Take another look at your activity sheets and science notebook. Describe how well you think you recorded your observations and ideas.

7. How did your work in this unit affect your attitude toward science?

GLOSSARY

Acid:	an acid is any compound that can react with a base to form a salt. In a water solution, an acid tastes sour.
Baking Soda:	sodium bicarbonate is a substance used as a leavening agent and as an antacid.
Base:	a base is a substance which forms a salt when it reacts with an acid.
BTB:	BTB (Bromothymol blue) is a harmless chemical (acid-base) indicator. It turns green in a weak acid and yellow in a strong acid. It remains blue in a base. It will also turn from yellow to blue in a base. The pH range of BTB is limited to 6.0-7.6. A pH reading of 7.0 is considered neutral. The complete range of pH is from 0.0 (very acid) to 14.0 (very base)
Citric Acid:	citric acid is obtained from oranges, lemons, and similar fruits used in making flavoring, extracts, dyes, etc. It is slightly corrosive and will cause stomach upset if ingested.
Classify:	to arrange or organize into categories.
Composition:	the act of combining parts to form a whole.
Conserve:	to keep from loss or work.
Contamination:	to make impure by contact or mixture.
Crystal:	a crystal is a solidified form of a substance in which the atoms or molecules are arranged in a definite pattern that is repeated regularly in three dimensions.
Dispose:	to throw away after use.
Dissolve:	to make a solution by mixing with a liquid to disappear gradually.
Hypothesis:	an educated guess based on established facts.
Indicator:	an indicator is any substance used to show the acidity or alkalinity of a solution and the presence of certain substances by changes of color.
Iodine:	iodine is a chemical element used as an antiseptic. It is used to test a substance for starch. A change to a blue-black color is a positive test. Iodine is

	poisonous, corrosive, and certain solutions may be flammable.
Magnify:	to increase the size of an object, as with a lens.
Microscope:	an instrument for magnifying objects too small to be seen by the naked eye.
Mixture:	a combination of two or more kinds of matter mixed together that can be separated by physical means.
Plaster of Paris:	Plaster of Paris is a white, powdery calcium sulfate (CaSO ₄). When mixed with water, plaster of Paris forms a thick paste that sets quickly. It is used for casts, molding, etc. Severe stomach upsets may result if ingested. Do not dispose of plaster of Paris in a sink or other plumbing fixture.
Powder:	a mass of fine, loose particles obtained by crushing or grinding a solid substance.
Properties:	qualities or characteristics of something.
Reaction:	a chemical reaction is a mutual action of substances undergoing chemical change to form a new substance.
Salt:	salt is a crystalline compound that is the chloride of sodium, abundant in nature, and used for seasoning or preserving food.
Scientific Method:	a procedure for solving a problem that involves coming up with a hypothesis, writing a procedure for testing, then coming to a conclusion based on the testing.
Senses:	the senses are the five faculties of receiving impressions through specific body organs and the nerves associated with them (sight, touch, taste, smell, and hearing).
Solidify:	to make or become hard or solid.
Solution:	a homogeneous mixture of two substances.
Specimen:	a sample used for testing.
Starch:	starch is a white, tasteless, odorless food substance found in potatoes, rice, wheat, etc. It can be identified

with the use of iodine. Uncooked starch can cause indigestion when eaten.

Suspension:

a heterogeneous mixture in which particles of a substance are mixed temporarily with a liquid.

Texture:

texture is the arrangement of particles of any material as it affects the appearance or feel of the surface.

Transmitter:

a device for sending signals or messages.

Vinegar:

vinegar is a sour liquid with a sharp odor, containing acetic acid, made by fermenting dilute alcoholic liquids such as cider. Vinegar can cause indigestion.