Colorful Chemistry

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Teacher's Guide

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M.A.S.H.
Math **A**nd **S**cience **H**ands-On

A Science Literacy Project

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ACTIVITIES:

Colorful Chemistry
Supplies List

Item	Quantity
10 Gallon Container	1
**Aluminum Foil	1 roll
Bag It Floss System	36
*Baking Powder	1 can
Book Rings, 1 1/4"	1
*Cooking Oil	1 pint
*Corn Starch	1 box
**Dishoap, Dawn	1 bottle
**Food Colors	1 box
Hand Lens	30
*Lbls., Ass't Dots 3/4"	2 packages
*Lbls., White 1"x3"	70
Lens Paper	1
Macaroni	1 box
Measuring Cup (1 cup)	1
Medicine Cups (1101-1200)	60
Nails, Iron (8d)	10
Northern Beans	1 pound
Pennies	40
Pipettes	30
Plastic Cups (9 oz)	2
Plastic Vials w/ Lids	30
Salad Cont. 6"x6"x3"	10
*Salt	1 box
Sandbox sand (2 cups)	1 pound
*Steel Wool	1 roll
*Straw Stirrers	30
Styrofoam Meat Trays	10 lg
*Sugar (2 cups)	1 pound
Tasterspoons	30
Teacher Guide	1
*Toothpicks	1 box
Transparency "Dissolve"	5
*Vinegar, white	2 pint
*Wax Paper	1 roll
*Ziploc Sandwich Bags	70

*Consumable **These items are consumable after a number of uses.

M.A.S.H. at a Glance

Introduction

This section is written to provide you with a quick overview of the major curriculum elements around which the M.A.S.H. Kits are designed. The acronym M.A.S.H. represents Math And Science Hands-on. M.A.S.H. Kits were developed through a cooperative effort among local school districts, Educational Service Center Region 16, and Southern Illinois University at Edwardsville and originated from a regional Title II Science Cooperative. Funding by the Illinois State Board of Education through a Science Literacy Grant provided development, piloting, and revision of these kits, designed to meet the needs of teachers wanting to teach activity-based science in southwestern Illinois. Specifically, these needs were identified as: availability and cost of materials, lack of time needed to teach science inquiry, and teachers' limited background in science. The thrust of development focused on these needs. The key elements of the M.A.S.H. Kit program are: scope and sequence of fundamental science concepts, alignment with state goals, emphasis on science process skills, cooperative learning, integration of language arts, opportunity to apply mathematics skills in real problem solving situations, teacher ownership, and alternatives in assessment. Special recognition should be given to the exemplary science kit program from Schaumburg Illinois School District 54, for their initial assistance and ideas.

Scope & Sequence

Each kit is developed around a fundamental theme in science that can be matched to concepts covered in most textbooks. Students explore these central themes as they complete approximately ten developmentally appropriate, process-based activities. The primary sequence introduces a theme from life, physical, or earth science. The intermediate kits further develop these same themes. Middle school kits continue to reinforce these same basic themes while utilizing a higher level of technology.

State Goals

The M.A.S.H. Kits were developed by Illinois educators primarily to assist classroom teachers in meeting the educational needs of their students. As a result, each investigation's instructional objectives focus upon the Illinois State Goals for Learning. The broad learning outcomes (knowledge & skills) addressed within each activity for both science and mathematics, are identified by goal and letter. Each investigation has been carefully selected to prepare students to meet or exceed those particular goals.

Science Process Skills

The activities in the kits address the science process skills necessary for students to utilize when learning science: observe, measure, classify, infer, predict, communicate, formulate hypothesis, experiment, and interpret data.

Cooperative Learning

The instructional approach utilized in this curriculum is one of having students work in cooperative groups. It is recommended that the size of your cooperative groups not exceed four students. Many educational benefits occur when students work together in groups to investigate and solve problems. Cooperative learning more closely resembles the way individuals work together to solve problems in the real world. Another important reason for the use of cooperative groups is to make the acquisition, costs, and management of materials reasonable for the classroom teacher.

Language Arts

Students read about, talk about, and write about the exciting science activities they are doing. This additional use of language along with the science investigation, reinforces the students' understanding of the scientific principles being explored. Not only do many of the kits include their own science-related books, but an additional list of resources is located in the introduction of each kit guide.

Mathematics

Many of the science investigations result in an opportunity for the students to apply mathematics skills in a variety of ways. Students are encouraged to quantify their observations with metric measurements; record and report those same observations with charts, tables, and graphs. Often times students will need to apply mathematical operations to solve problems or answer questions.

Alternatives in Assessment

The Unit Test provided in this guide can be used to determine students' understanding of the major concepts dealt with in the kit. Unit Tests use a variety of different questions such as multiple choice, fill in the blank, short answer, etc. The Unit Test may be given in a pre-post type format to determine: 1) the increase of students' understanding as a result of this unit and 2) clarify students' prior skills and knowledge to determine the direction instruction should take. Kits also include a performance based assessment that gives teachers the opportunity to observe what students actually can do with the science concepts and skills they have learned.

Teacher Ownership

The success of this program has been strongly dependent upon teacher ownership, especially at the very beginning of the projects' early stages of developing, piloting, and editing of the core activities. Continued teacher ownership has resulted in the creation of extension activities which provide additional instructional opportunities in all curricular areas. These extensions continue to be developed by classroom teachers using the M.A.S.H. kits. Materials for these activities may or may not be included in the kit. If you have a great extension idea for a kit activity, please send it to us at Southern Illinois University Edwardsville, Box 2226, Edwardsville, IL. 62026.

Colorful Chemistry

Major Purpose

Excite your students, and yourself, by learning about chemistry with a touch of magic! With the *Colorful Chemistry* kit, students learn the basic principles of chemistry by making solids disappear, baking soda bubble, and colors change. Pennies will shine like new after being placed in a "mystery" solution. Using the activities contained in *Colorful Chemistry*, the students will play the role of a magician while most importantly learning the secrets behind the experiments. By completing various activities, students explore the properties of materials like copper, aluminum, and iron; investigate the principles and conditions behind rust; discover that some chemicals dissolve in water and some do not; and create and observe several physical and chemical changes. Through *Colorful Chemistry,* students will be exposed to the characteristics of the elements and processes that create and shape our world.

Objectives

After completing *Colorful Chemistry*, a student will be able to:

Generally:

- identify the concept of change and its significance in scientific experiments
- create and complete graphs
- understand the importance of accuracy and thoroughness in scientific experimentation
- use techniques for proper measurement of both liquids and solids

Specifically:

- identify mixtures and solutions and make samples of each
- distinguish among matter based on physical and chemical attributes
- use scientific terms such as 'solution' and 'mixture'
- recognize that oil will mix with water and vinegar only with the aid of detergents
- determine what substances will rust, and what will aid or hinder this process

These safety rules may be discussed and posted during science activities or the teacher may have the class generate a list of safety procedures to follow.

SAFETY POSTER:

1. Listen to your teacher's instructions.
2. Don't touch or pick up any materials unless your teacher tells you to.
3. Follow directions.
4. Ask your teacher for help if you need it.
5. Cooperate with a partner or with your group.
6. Never put anything in or near your eyes or mouth.
7. Clean up work area and return all materials to their proper places.
8. Always walk in the science area.
9. Talk quietly in groups.
10. Tell your teacher immediately in case of accidents.
11. BE CAREFUL!!!

Cooperative Learning: Classroom Management Techniques

1. In order for your students to complete the activities successfully, it is essential that they know, and follow, the ten rules for group work:
    - Move into groups quietly, without bothering others
    - Use quiet voices
    - Stay with your group
    - Everyone does a job
    - Everyone shares the work
    - No one is bossy
    - Everyone shares materials
    - Everyone shares ideas
    - Take turns talking
    - Care about others' feelings

2. Initially avoid competition between groups. This can be accomplished by carefully selecting groups in a variety of manners — randomly (i.e. by birthdays), by students' abilities, or by allowing the students to choose groups for themselves. It is important to note that if the final technique is used to form groups, the students must be made aware that if their group does not perform adequately or productively, alternative selection methods will be employed (i.e. teacher selection).

3. Clearly define the task to be done.

4. Be sure there is a "product" connected with the group activity.

5. In setting time limits, allow too little time rather than too much time for the group to finish.

6. Each person in the team should play an active role. Regular rotation of roles should occur to give each student the opportunity to play a different role. Roles students can have are:

Principal Investigator:	This person keeps the group members on task, makes sure the activity is understood by all and is completed. Any questions will be immediately clarified with the teacher.
Materials Manager:	This person obtains all supplies the group needs. If the group is large enough, a second Materials Manager can be assigned to be responsible for returning materials to the supply area and having the group clean up its work area.
Recorder/ Evaluator:	This person writes down responses that team members have formulated. This person notes how well group members perform their responsibilities, contributing to the overall performance and outcome of the group.
Reporter:	This person writes down the group's conclusions and reports to the class. The reporter may also need to record the group's data on a class graph or chart. If the group is large enough, two Reporters can be assigned — one to record conclusions and chart data, the other to present their findings to the class.

7. Follow the Five C's of Group work to have a safe, and FUN, science activity:

Caution:	Laboratory group work requires caution in every part. Safety instructions should be followed and a safety checklist should be implemented before each activity.
Cooperate:	To ensure successful group work, each member must cooperate with the other members of the group.
Contribute:	Each member must make an effort to contribute something to the group.
Control:	Group work requires control over our body movements, voices, and actions. To avoid chaos in the classroom, control must be practiced by each member of the group.
Clean-Up:	Each group member must do his or her part to clean up after the activity. Students must make sure the work area is clean and all materials are put away.

8. The culmination of a group activity should be a time of sharing and evaluating how well group members worked together as well as examining the groups' end results or products.

Resource List

Cobb, Vicki. More Science Experiments You Can Eat. New York: Harper & Row, 1979.

Cobb, Vicki. Science Experiments You Can Eat. New York: Harper & Row, 1972.

Lewis, James. Measure, Pour, & Mix Kitchen Science Tricks. New York: Meadowbrook Press, 1990.

Strongin, Herb. Science on a Shoestring. California: Addison Wesley Publishing Co., 1985.

Tolman, Marvin N. and James O. Morton. Physical Science Activities for Grades 2-8. New York: Parker Publishing Co., 1986.

Van Cleave, Janice Pratt. Chemistry for Every Kid: 101 Easy Experiments that Really Work. New York: John Wiley & Sons, Inc., 1989.

Introductory Activity: Getting Started

TIME: 30-40 Minutes

OBJECTIVES: Students will define the word **change.** Students will learn the proper method for making a science journal entry.

TEACHER BACKGROUND INFORMATION: The purpose of this lesson is to introduce the kit by defining the word change.

Before beginning this lesson, the teacher should review the **Rules for Group Work** and determine if any more are needed or if some should be deleted. Also, the teacher should determine the consequences for not following the rules. The rules should be posted in the classroom. It is very important for the learning process that each student follow the rules.

Suggestion: To assist you in preparation and cleanup of materials select a group of three students to become lab assistants for each activity. One group of lab assistants will have the responsibility of getting out materials and measuring the powers needed. The other group of lab assistants will be in charge of cleaning up after class -- washing and drying materials and putting them away. This saves the teacher time while encouraging student responsibility. Lab assistants might enjoy having lab coats to wear on their day. The lab coats could be white shirts bought at a garage sale. Included are copies of a Show and Tell Ribbon that could be used as a language arts activity during the kit.

MATERIALS:

Clear plastic cup with an ice cube (teacher supplies ice cube)
Cup of water
Spoon
Sugar
Chart paper (teacher supplied)

PROCEDURE:

1. Bring a clear plastic cup with an ice cube in it and set it so students can observe it while they are brainstorming the word "change."
2. Ask the students to brainstorm what a change might be. Record the students' responses on the chalkboard or chart paper.
3. Demonstrate dissolving by stirring a small amount of sugar in a cup of water. Don't use too much sugar because you want all the sugar to dissolve. The students should be able to verbalize that a change has taken place but cannot be seen.
4. Discuss what is happening to the ice cube.
5. Have the students define "change." The definition should be similar to this - "Change is when something happens to make a thing different even if we can't see that it is different."
6. Each student should have a journal. This can be notebook paper in a construction paper folder or additional sheets of paper stapled together.

   Demonstrate how to make a journal entry about the changes in the ice cube on chart paper. The entry should have a title, a date, and what is observed. For example:

An Ice Cube in a Cup

03/20/19 An ice cube was in a cup and part of it has changed to water.

This experiment will continue until the water evaporates. As the experiment continues, introduce the terms solid, liquid, gas, melting, and evaporation. Make an entry on the chart each day until the water has evaporated. Point out the importance of dating each journal entry. Once the ice cube has melted, make a mark on the cup with a marker so the students can see that it is evaporating. Continue marking levels daily.

7. We suggest you assign groups today, but you can wait until the first activity requiring group work.

FORMATIVE EVALUATION: Students should complete an acceptable journal entry.

ACTIVITY #1: Hand Lens

TIME: 30 Minutes

OBJECTIVES: The students will practice the proper way to use a hand lens and use the hand lens to enhance their observations.

TEACHER BACKGROUND INFORMATION: There are two basic methods for using hand lenses. The most common and natural method is to put the lens close to the object being viewed. A more effective method, however, is the jewelers' technique. Jewelers hold the lens very close to the eye and they bring the object up the lens. This technique gives a wider and less distorted field of view than the first method. It may feel uncomfortable at first, but with practice, children will probably prefer it and should be encouraged to use this method when practical. (NOTE: Hand lens are kept in small "Bag it Floss" ziploc baggies attached to a ring. This procedure is to introduce students to proper methods of taking care of scientific equipment properly.)

MATERIALS:

30 hand lenses
30 "Bag it Floss" resealable bags to store the hand lenses
30 Pipettes
Plastic cups of water (4-6)
Sand
Wax paper (approximately 10 cm x 10 cm piece) per student
Student page #16
Lens paper (for teacher demonstration)

(The teacher should demonstrate how to clean the hand lenses before giving them to the students.)

PROCEDURE:

1. Show the students a hand lens. Ask the students if they know what it is and what it is used for. Tell them it is a scientific instrument used to magnify things so a scientist can observe them better. Point out that the lens on the hand lens being used is made of plastic and can be scratched easily. For this reason lenses need to be handled with care. The lens should not be touched. The hand lens should be held with the handle. The lens should only be cleaned with lens paper. The lens should be wiped gently in a circular motion with the lens paper. The hand lens should be put back in bag when not in use. The students should be careful not to drop the hand lens. Demonstrate the jewelers technique for using the hand lens.
2. Pass out the hand lenses and give the students about five minutes to explore. Encourage them to use the jewelers' technique. The teacher will need to determine whether or not students are to stay in their seats during exploration.
3. Students should put their hand lenses back into the bags and lay them aside so the first observation of the grains of sand is <u>without</u> the use of the hand lenses.
4. Give each student several grains of sand on wax paper. Ask such questions as the following and write student responses on chalk board:
    - What is the color of the sand?
    - What is the shape of the grains?
    - Are they all the same size?

5. Let the students use hand lenses now. Pass out student page #16 and have students answer the first four questions.
6. Place the cups of water and pipettes in a convenient location accessible to students. After answering the first four questions on their student page, have them fill a pipette with water to continue their investigation.

FORMATIVE EVALUATION: Review the students' description of their observation as recorded on their student page.

NAME _____

ACTIVITY #1: HAND LENS

1. Does the color of the sand change when you look at it with the hand lens?

_____

2. Are all the grains of sand the same color as you look at them with the hand lens?

_____

3. What is the shape of the grains of sand?

_____

4. Are they all the same size?

_____

5. When you add water to the sand do you see any bubbles?

_____

6. Does the sand dissolve when water is added?

_____

7. Did you see a color change when the water was added?

_____

8. Do you see a crystal shape in each piece, or are they different shapes and sizes?

_____

ACTIVITY #2: Which Will Rust?

TIME: 40 Minutes

OBJECTIVE: To predict, chart, and observe which will rust -- iron, copper, or aluminum.

TEACHER BACKGROUND INFORMATION: A chemical change takes place when iron unites with oxygen to form iron oxide or rust. The iron nail will rust more rapidly.

NOTE: In setting up the materials for this experiment and for other throughout the unit, it would be beneficial to assign and rotate students as lab assistants to help with set up and clean up.

(NOTE: When using medicine cups, 1 cc is equal to 1 mL.)

MATERIALS:

30 ziploc bags
10 pennies
10 pieces of aluminum foil about 4 cm x 4 cm
10 nails
10 medicine cups
10 plastic vials filled with water
90 colored dots for graph (90 will be needed only if all students predict all 3 will rust)
30 labels for putting names on the bags
1 ballot per student, page 18
1 student page #20 for each student
Clothespins or paperclips (teacher supplied)

Each group will need 3 ziploc bags, a plastic vial of water, a medicine cup, a penny, a 4 cm x 4 cm piece of aluminum foil, a nail, and 3 labels for putting names on the bag.

TEACHER/STUDENT PROVIDED MATERIALS: Poster board, chart paper or newsprint for graph

PROCEDURE:

1. Brainstorm "rusting" by asking what things rust and what they think causes rust. Record all the students ideas on the chalkboard.
2. Hold up the copper penny, aluminum foil, and nail and ask if anyone knows what they are made of. If they don't know, tell them. Pass out a ballot to each student. Ask each one of the students to predict which ones will rust in water by marking their ballot. Students may predict more than one item will rust.
3. Collect the ballots and tally by selecting three students to make tally marks at the board as ballots are read.
4. Tell the students we are going to graph their predictions. Discuss the importance of an accurate title, number of columns, title of columns, and keeping the dots in a straight line. Make a class graph and let students put the correct number of colored dots on it.

STUDENT BALLOT

WILL IT RUST?

PENNY	YES	NO
ALUMINUM FOIL	YES	NO
NAIL	YES	NO

WILL IT RUST?

PENNY	YES	NO
ALUMINUM FOIL	YES	NO
NAIL	YES	NO

WILL IT RUST?

PENNY	YES	NO
ALUMINUM FOIL	YES	NO
NAIL	YES	NO

WILL IT RUST?

PENNY	YES	NO
ALUMINUM FOIL	YES	NO
NAIL	YES	NO

WILL IT RUST?

PENNY	YES	NO
ALUMINUM FOIL	YES	NO
NAIL	YES	NO

WILL IT RUST?

PENNY	YES	NO
ALUMINUM FOIL	YES	NO
NAIL	YES	NO

WILL IT RUST?

PENNY	YES	NO
ALUMINUM FOIL	YES	NO
NAIL	YES	NO

WILL IT RUST?

PENNY	YES	NO
ALUMINUM FOIL	YES	NO
NAIL	YES	NO

WILL IT RUST?

PENNY	YES	NO
ALUMINUM FOIL	YES	NO
NAIL	YES	NO

WILL IT RUST?

PENNY	YES	NO
ALUMINUM FOIL	YES	NO
NAIL	YES	NO

5. Discuss the need to set up experiments to determine which one will rust. Also, take time to review rules for working in groups and assign groups if this has not already been done.
6. Give the students the following directions:
   A. Each group will need to get 3 ziploc bags, 3 labels, 1 vial of water, 1 penny, 1 piece of aluminum foil, 1 iron nail, and a medicine cup. (Write list on board.)
   B. Everyone in the group must write their names on each label and stick one label on each of the bags.
   C. Put the penny, the aluminum foil, and nail in separate bags.
   D. Measure 5 mL of water into the medicine cup and put it into the bag. Press out the air and seal. (This will need to be demonstrated.)
7. The teacher might want to hang a strong string in the room which is long enough to hang all the bags on with paper clips or clothespins. (Clothespins are best.)
8. After several days, discuss with the class which one rusted and how accurate their predictions were. Emphasize class predictions rather than individual predictions to encourage risk taking.

FORMATIVE EVALUATION: The students will record the results and conclusion of the experiment on their student page.

Name _____

Activity #2: Which will Rust?

Materials:

3 ziploc bags
3 labels
1 vial of water
1 penny
1 piece of aluminum foil, cut 4 cm x 4 cm
1 iron nail
1 medicine cup

Procedure:

1. Write the name of everyone in the group on each of the labels. Stick one label on each of the bags.
2. Put the penny, the aluminum foil, and the nail in separate bags.
3. Carefully measure 5 mL of water into the medicine cup and pour it into one of the bags. Press out the air and seal the bag.
4. Put 5 mL of water into the other two bags. Press out the air and seal them.
5. Have someone from the group hang the bags on the clothesline.
6. Return all materials to the assigned places and go back to your desk.

ACTIVITY #3: What Makes Iron Rust?

OBJECTIVE: Students will investigate, observe, and record the conditions necessary to cause iron to rust.

TEACHER BACKGROUND INFORMATION: Rusting of iron requires oxygen to form because rust is iron oxide. This is a chemical change. A chemical change is a change that results in a new substance that has unique properties. Iron and oxygen alone will not form rust, and the "control" should support this. If water is added, the reaction will occur. Other materials, such as salt, will also increase the rate of the reaction, but usually only if water is also present. The teacher might want to hang a strong string in the room which is long enough to hang all the bags on with the paper clips or clothespins. (Clothespins are best.) The teacher will need to decide whether to read through the directions for setting up the experiment as a class and then send the students to groups or give the groups written directions and let them read and do the experiment. The students should mark off each step of the experiment as they complete it. The teacher should monitor the groups as they work.

MATERIALS:
Each Group:
- 4 sandwich size ziploc bags
- 10 mL salt in medicine cup
- Steel wool (to make 4 quarter size pieces)
- 1 plastic vial of water (about 10 mL)
- 2 medicine cups for measuring
- Salt and water
- Student pages #22 & 23

Optional:
Teacher Demonstration:
- 2 nails
- Clear nail polish (teacher supplied)
- Clothespins and clothesline (teacher supplied)

PROCEDURE:

1. Cut steel wool into 4 pieces about the size of a quarter. Make each piece flat like a quarter.
2. Place 1 piece of steel wool into each bag.
3. Press the first bag flat to remove air and seal it closed. Place a label on the bag and write "CONTROL" and student names and stick it on this bag.
4. To the second bag, add 5 mL of water. Remove the air from the bag and seal it closed. Write "+WATER" and student names on one of the labels and stick it on this bag.
5. To the third bag, add 5 mL of salt. Remove air from the bag and seal it closed. Write "+SALT" and student names on one of the labels and stick it on this bag.
6. To the fourth bag, add 5 mL of water and 5 mL of salt. Remove air from the bag and seal it closed. Write "+SALT +WATER" and student names on one of the labels and stick it on this bag.
7. Mix the contents of each bag and everyone in the group should observe it carefully. Record the date and your observations on Day 1. Think about these questions as you observe. Does the salt dissolve when mixed with water? Does the steel wool change? Do bubbles form?
8. Place bags in assigned place. Observe your bags each day for four more days. Record the date and your observations on each day. From your experiment can you suggest what might be needed to make iron rust?

LANGUAGE ARTS EXTENSION: Take two iron nails. Paint one of the iron nails with clear nail polish. Put each in a separate bag with 5 mL of water. Observe what happens.

FORMATIVE EVALUATION: The students will record the results on their student page.

Name _____

Activity #3: What Makes Iron Rust?

Materials:

- 4 ziploc bags
- 4 labels
- Steel wool
- 2 medicine cups for measuring salt and water
- 10 mL of salt in a medicine cup
- 10 mL of water in plastic vial

Procedure:

1. Cut your steel wool into 4 pieces about the size of a quarter. Make each piece flat like a quarter.
2. Place 1 piece of steel wool into each bag.
3. Press the first bag flat to remove air and seal it closed. Place a label on the bag and write "CONTROL" and student names and stick it on this bag.
4. To the second bag, add 5 mL of water. Remove the air from the bag and seal it closed. Write "+WATER" and student names on one of the labels and stick it on this bag.
5. To the third bag, add 5 mL of salt. Remove air from the bag and seal it closed. Write "+SALT" and student names on one of the labels and stick it on this bag.
6. To the fourth bag, add 5 mL of water and 5 mL of salt. Remove air from the bag and seal it closed. Write "+SALT +WATER" and student names on one of the labels and stick it on this bag.
7. Mix the contents of each bag and everyone in the group should observe it carefully. Record the date and your observations on Day 1. Think about these questions as you observe. Does the salt dissolve when mixed with water? Does the steel wool change? Do bubbles form?
8. Place bags in assigned place. Observe your bags each day for four more days. Record the date and your observations on each day. From your experiment can you suggest what might be needed to make iron rust?

Name _____

Activity #3: What Makes Iron Rust?

Bag #1 Control

Day 1 _____

_____

Day 2 _____

_____

Day 3 _____

_____

Day 4 _____

_____

Day 5 _____

_____

Bag #2 +Water

Day 1 _____

_____

Day 2 _____

_____

Day 3 _____

_____

Day 4 _____

_____

Day 5 _____

_____

Bag #3 +Salt

Day 1 _____

_____

Day 2 _____

_____

Day 3 _____

_____

Day 4 _____

_____

Day 5 _____

_____

Bag #4 Water+Salt

Day 1 _____

_____

Day 2 _____

_____

Day 3 _____

_____

Day 4 _____

_____

Day 5 _____

_____

ACTIVITY #4: Will it Dissolve?

TIME: 35 - 45 Minutes

OBJECTIVE: In this experiment students will discover that some chemicals dissolve in water and some do not.

TEACHER BACKGROUND INFORMATION: The term "dissolve" is when a powder becomes part of a liquid and cannot be seen. The sugar and salt will dissolve, but the cornstarch will be cloudy.

MATERIALS (10 Groups of 3 students):

10 "WILL IT DISSOLVE?" transparencies, p. #26
10 foam trays
30 straw stirrers
30 hand lenses
10 medicine cups with 1 mL of sugar
10 medicine cups with 1 mL of salt
10 medicine cups with 1 mL of cornstarch
10 medicine cups with 10 mL of water
10 pipettes
10 pieces of 6" x 9" black construction paper (teacher supplied)
1 student page #25 for each student

TEACHER DEMONSTRATION

1 clear cup with water
1 medicine cup with 1 mL of sugar
1 straw stirrer

PROCEDURE:

1. Before beginning the experiment, ask the students what dissolve means and how they know that it is happening. Demonstrate this by putting 1 mL of sugar in a clear cup of water. Stir and watch as it dissolves. After discussion, define dissolve and write it on the chalkboard and let students copy the definition on their worksheet. "Dissolve: You cannot see the powder anymore and the water is clear."
2. Go to groups and pass out materials. (If this is the first time the kit has been used, cut the transparencies in half to make a total of ten lab sheets.) Black construction paper should be inserted under lab transparency to make viewing of sugar, salt, and cornstarch easier.
3. Look at the **sugar** with your hand lens. Observe the color, size, and shape of particles and discuss. Put drops of water on the sugar circle on the lab sheet. Put a few grains of sugar on the water drop. Stir sugar in the water drop. Discuss the result in groups. Record the result on student page #25. D= Dissolve and ND= Not Dissolve. Teacher leads class discussion on the results.
4. Repeat Step 4, insert **salt**. The students will need to stir longer for salt than sugar.
5. Repeat Step 4, insert **cornstarch**.
6. Complete student page and return materials to assigned place.

FORMATIVE EVALUATION: The students will record the results and conclusion of the experiment on their student page.

Name _____

Activity Sheet #4: Will it Dissolve?

Define dissolve:

_____

_____

_____

_____

	SUGAR	SALT	CORN STARCH
W A T E R			

D = Dissolve

ND = Not Dissolve

Conclusion:

Sugar and water: _____

_____

Salt and water: _____

_____

Cornstarch and water: _____

_____

ACTIVITY #4: TRANSPARENCY MASTER

Will it dissolve?

SUGAR SALT CORNSTARCH

Will it dissolve?

SUGAR SALT CORNSTARCH

ACTIVITY #5: Does it Mix?

TIME: 45 - 50 Minutes

OBJECTIVE: Students will combine two liquids, observe whether they mix, and record the results.

TEACHER BACKGROUND INFORMATION:

Results of the experiment are as follows:

1. The water and vinegar mix. The solution turns all blue.
2. The oil and vinegar do not mix. The solution will be clear on top and blue on bottom. The oil is on top because it is lighter than the vinegar.
3. The oil and water do not mix. The solution will be clear on top and blue on bottom. The oil is on top because it is lighter than the water. The food coloring is water based and will not mix with the oil.
4. Liquids that mix do not separate. They turn all one color when food coloring is added.

A solution is a substance, usually water, which has another substance dissolved in it. One part of the solution is identical to all other parts of the solution. Sugar water is a solution.

A mixture is two or more substances mixed together such as beans and macaroni. Variable amounts of each component may be mixed. Any part of the mixture may be different than another part.

NOTE: It is suggested that the teacher have a container to pour the liquids in when the experiment is completed and a pan of soapy water to put the dirty vials and medicine cups in so clean up will be easier.

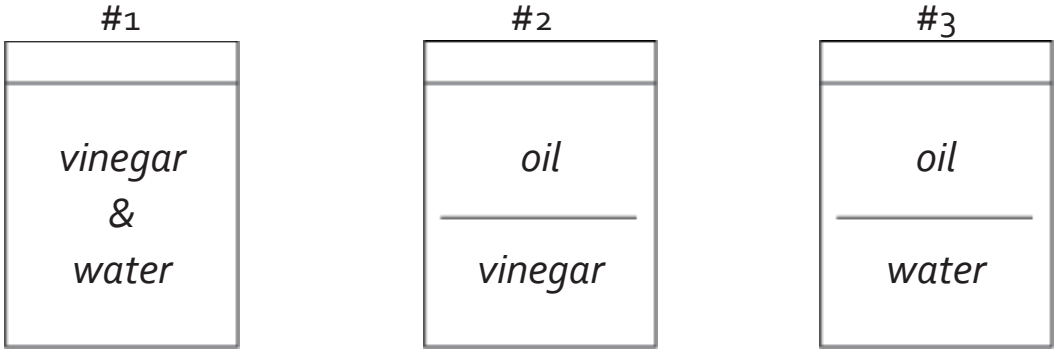
MATERIALS (10 groups of 3 students):
10 foam trays
30 plastic vials with lids
20 medicine cups with 10 mL of water
20 medicine cups with 10 mL of oil
20 medicine cups with 10 mL of vinegar
Crayons (student supplied)
1 student page #29 for each group member

MATERIALS (10 groups of 3 students):
1 bottle blue food coloring
Container to put liquids in after the experiment (teacher supplied)
Dish pan for soapy water (teacher supplied)

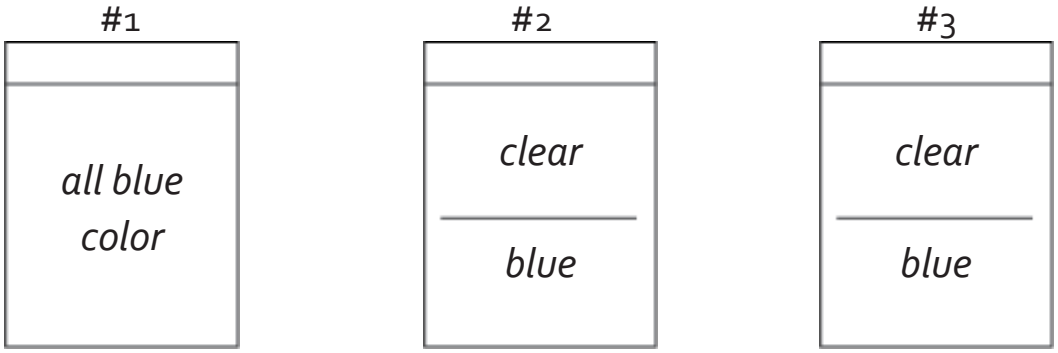
PROCEDURE:

1. Have the students go to their groups and give them each a copy of the student page #29. (The teacher may write the directions on a chart or chalkboard or use a transparency if she prefers.) This activity works best if everyone in class does each step together.
2. Make mixture #1 by combining 10 mL of water with 10 mL of vinegar in the plastic vial. Put the lid on the vial. Shake twice and observe. Put the vial on the student page by #1. Discuss findings with the whole class. Record findings together.

3. Make mixture #2 by combining 10 mL of oil with 10 mL of vinegar in the plastic vial. Put the lid on the vial. Shake twice and observe. Put the vial on the student page by #2. Discuss findings with the whole class. Record findings together.
4. Make mixture #3 by combining 10 mL of oil with 10 mL of water in the plastic vial. Put the lid on the vial. Shake twice and observe. Put the vial on the student page by #3. Discuss findings with the whole class. Record findings together.
5. Ask the following questions: Which is heavier -- oil or vinegar? Which is heavier -- oil or water? The student page results should look like this:



6. The teacher tells the students 2 drops of blue food coloring will be added to each vial. Before doing so, HAVE THE STUDENTS CIRCLE THE PICTURE OF THE VIAL THEY THINK WILL BE ONE COLOR. Teacher adds 2 drops of blue food coloring to each vial.
7. Have the students observe the food coloring as you add 2 drops of it to each vial. Discuss what it looks like. Shake and observe the vials. Color the drawings. It is best to let it set for a while. The drawings should look like this:



mix
vinegar & water

do not mix
oil & vinegar

do not mix
oil & water

FORMATIVE EVALUATION: The students will record the results and conclusion of the experiment on their student page.

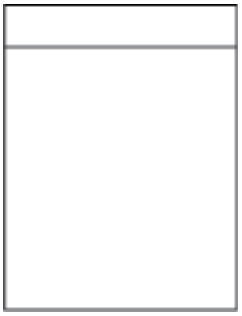
NAME _____

ACTIVITY #5: DOES IT MIX?

1. Color each vial. WRITE "MIXED" or "NOT MIXED" under each vial.

vinegar & water | oil & vinegar | oil & water

#1  _____

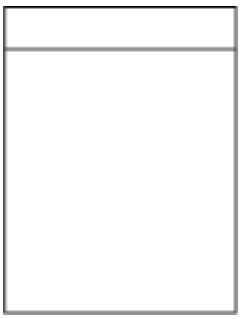
#2  _____

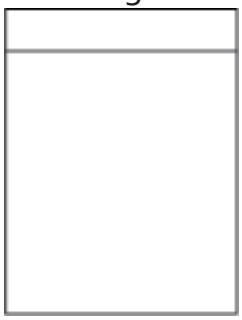
#3  _____

==========

vinegar & water | oil & vinegar | oil & water

#1  _____

#2  _____

#3  _____

ACTIVITY #6: Colorful Chemistry

TIME: 30 Minutes

OBJECTIVE: The students will observe that water-based food coloring is not soluble in oil and discover that detergent allows the water and oil to mix.

TEACHER BACKGROUND INFORMATION: THE MILK WORKS BEST AT ROOM TEMPERATURE. Do not let the students blow on the milk because the colors mix more rapidly and it becomes gray. The food color's reaction in the milk fat is similar to the oil in "Does it Mix?" The dish soap allows the water and oil to mix.

MATERIALS:

10 clear plastic containers
1 red, 1 yellow, and 1 blue food coloring
Dish soap
10 cups of milk at room temperature (whole milk works best because of the high fat content; teacher supplied)
Crayons (teacher supplied)
1 students page #31 for each student

Each group of 3 students will need 1 plastic container, 1 cup of milk, 3 student pages, and crayons.

PROCEDURE:

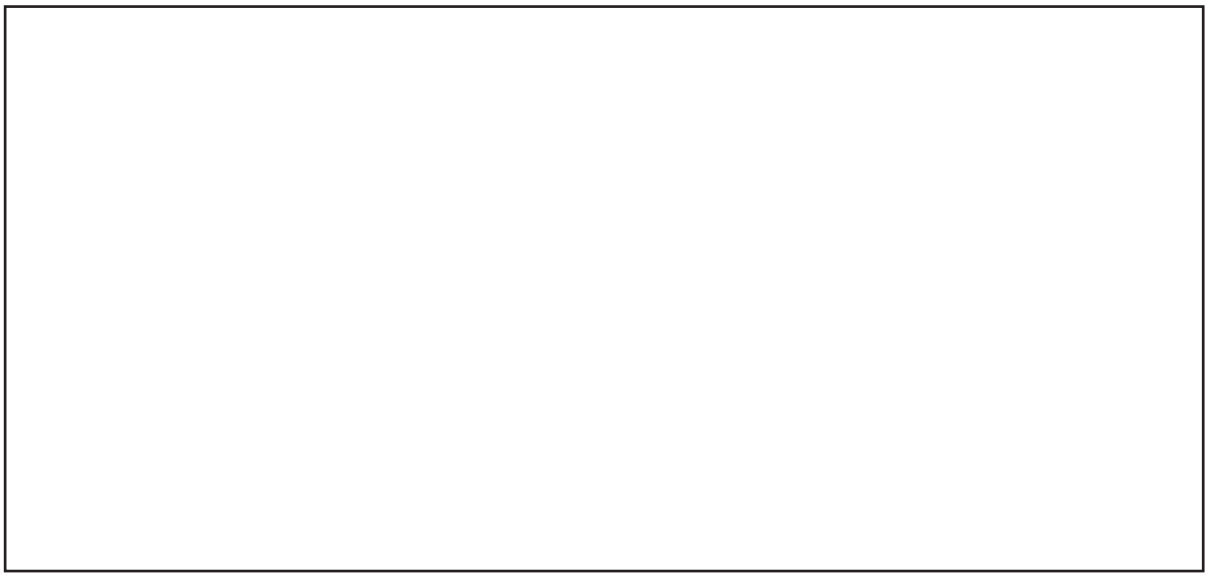
1. Have the following directions on a chart or the chalkboard. "Pour small carton of milk (1 cup) into the plastic container." The teacher carefully drops 2 drops of each color of food coloring in different corners of the container. Water, observe, discuss with the class. "Draw a picture of what you see in the BEFORE rectangle on your student page." Describe it in words.
2. Predict what will happen when 2 drops of dish soap are added to one end along the edge of the dish. Then add 2 drops of dish soap to one end along the edge of the dish. Observe results. Discuss. Add 2 drops of dish soap to the other end of the dish. Observe results. Discuss. Add 2 drops of dish soap along one side of the dish. "After dish soap has been added to all three colors, draw a picture of what you observed in the AFTER rectangle of the student page."
3. During class discussion students can be given the opportunity to explain why the colors mixed when the dish soap was added. The explanation for what occurs when the soap is added is that the soap reacts with both water and fat (emulsifying agent) allowing the water and the colors to mix together.

FORMATIVE EVALUATION: The students' drawings should reflect their understanding of what has taken place during the activity.

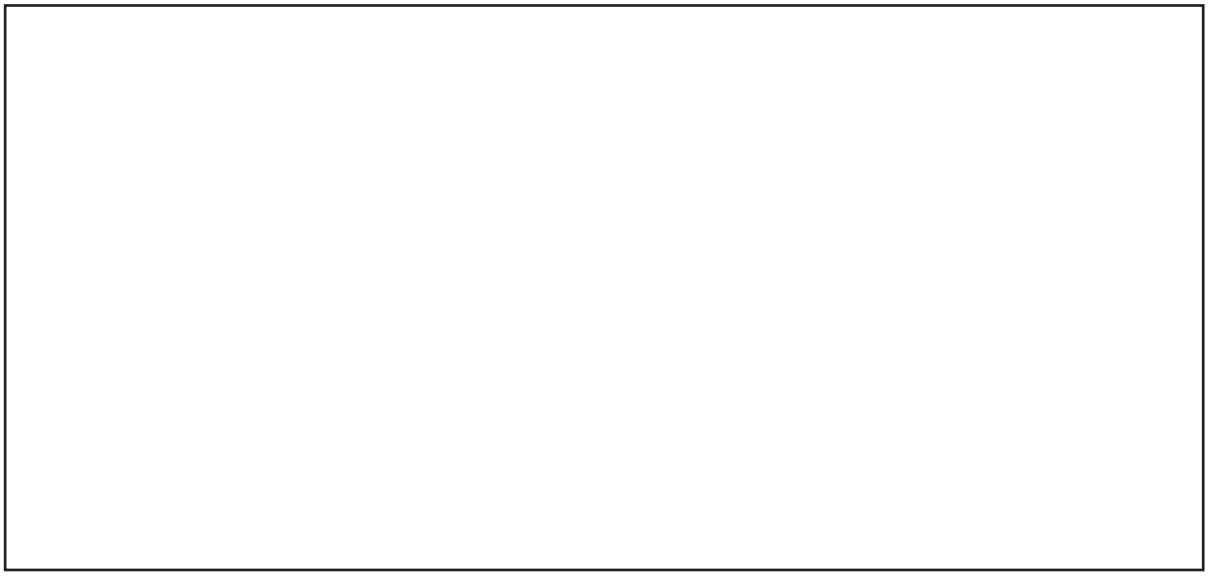
Name _____

Activity #6: Colorful Chemistry

BEFORE



AFTER



ACTIVITY #7: Making Pennies Look New

TIME: 45 Minutes

OBJECTIVE: Students will observe the chemical reaction that occurs when copper is placed in a mixture of vinegar and salt.

TEACHER BACKGROUND INFORMATION: The students will not see a major change in the penny until the vinegar and salt are mixed together. They might possibly see minor changes with just the salt or the vinegar.

Quarters and dimes have a solid copper inner core with a nickel and copper alloy on both sides of the core. Nickels are made of a nickel and copper alloy. It is suggested that you do not put these coins in the vinegar and salt mixture.

MATERIALS (per group of 3 students):

3 taster spoons
3 paper towels
1 foam tray
3 dull pennies
1 medicine cup containing 5 mL of salt
1 medicine cup containing 15 mL of vinegar
1 student page #35 for each member of the group

PROCEDURE:

1. Have the students go to their groups and pass out the materials.
2. Have the students brainstorm in their group words describing their penny. Each students records responses on section A of their student page (round, dirty, brown, dull, corroded, light, rough, etc.) The teacher may want to record student responses on the chalkboard.
3. Have the students predict what will happen when the penny is placed in the salt. Record their predictions in Part B of their student page. Now put the penny in the salt. What happened? Write observation.
4. Follow the same procedure in step 3 with the vinegar.
5. Pour the salt into the vinegar. Mix. Follow the procedure above using the mixture.
6. Describe the penny again. Compare before and after descriptions. What stayed the same? What was different? Complete Section E on the student page.

FORMATIVE EVALUATION: The students will record the results and conclusion of the experiment on their student page.

LANGUAGE ARTS EXTENSION: As an introductory activity, have the students read "A Surprise for Abe" by Lawrence Swinburne, Magic Times Series R, Macmillan Publishing Company. After the lesson, have students write stories about someone who might use this mixture and how they would use it.

Name _____

Activity #7: Making pennies Look New

A. Write Words which describe your penny

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

B. PENNY IN SALT

PREDICT	OBSERVE

C. PENNY IN VINEGAR

PREDICT	OBSERVE

D. PENNY IN SALT & VINEGAR

PREDICT	OBSERVE

E. Go back to part A. Cross out any words that do not describe your penny. Are there new words?

ACTIVITY #8: Little Fizz, Big Fizz (Is More Better?)

TIME: 60 Minutes

OBJECTIVE: Students will observe and record results when water and vinegar are added to baking powder.

TEACHER BACKGROUND INFORMATION: More water makes more bubbles. More vinegar makes more bubbles. The vinegar causes more bubbles than the water.

MATERIALS (per group of 3 students):

1 medicine cup with 10 mL of vinegar
1 medicine cup with 10 mL of water
4 medicine cups with 5 mL of baking powder
1 white foam tray
2 pipettes
1 piece of wax paper to cover foam tray
1 student page #35 for each group member

PROCEDURE:

1. Have the students go to their groups. All the groups will do Step 1 and then wait until the other groups are finished before going on to the next step. After all groups are finished with each setup, discuss and write each groups' results on the chalkboard before going to the next step.
2. With the pipette, put 2 drops of water in one of the cups of baking powder. Observe, discuss, and write down the results.
3. Add the rest of the water to the second cup of baking powder. Observe, discuss, and write down the results.
4. With the pipette, put 2 drops of vinegar into the third cup of baking powder. Observe, discuss and write down the results.
5. Add the rest of the vinegar to the fourth cup of baking powder. Observe, discuss, and write down the results.

FORMATIVE EVALUATION: The student page should reflect the observations made by the students during the activity.

SCIENCE EXTENSION ACTIVITY: Students can make a volcano by using clay to build a volcano in the shape of a mountain, leaving the top open. Put an empty 4 oz. juice can in the top of the mountain. Place 1/3 cup of vinegar in the can. Add three drops of red and 2 drops of yellow food coloring to the vinegar. Make the volcano erupt by adding a few tablespoons of baking powder or baking soda to the vinegar.

Name _____

Activity #8: Little Fizz, Big Fizz

1. With the pipette, put 2 drops of water in one of the cups of baking powder. Observe, discuss, and write down the results.

2. Add the rest of the water to the second cup of baking powder. Observe, discuss, and write down the results.

3. With the pipette, put 2 drops of vinegar into the third cup of baking powder. Observe, discuss, and write down the results.

4. Add the rest of the vinegar to the fourth cup of baking powder. Observe, discuss, and write down the results.

Liquid	5 mL BAKING POWDER
1. 2 DROPS OF WATER	
2. REST OF WATER	
3. 2 DROPS OF VINEGAR	
4. REST OF VINEGAR	

Conclusion: _____

_____

_____

_____

_____

ACTIVITY #9: Separating Beans From Macaroni

TIME: 60 Minutes

OBJECTIVE: By separating a bean and macaroni mixture, the students will observe a physical change and the basic characteristics of a mixture. The students will collect data and construct a bar graph of their groups' three mixtures.

TEACHER BACKGROUND INFORMATION: The students should observe that the separation process is a physical change. The materials are no longer mixed. A change has occurred, because the beans are still beans and the macaroni is still macaroni but no new material has been made. Since the beans and macaroni have not changed, the process is a physical change rather than a chemical change. Emphasize that a mixture may have different proportions of components. The number of beans and macaroni should be different each time a different cup is sorted.

This is an easy mixture to separate. But, it has all the components of more complicated separations, since physical separations are based on the properties of the components. For beans and macaroni, separation was based on physical appearance.

The students will be constructing a bas graph of the three mixtures from their group. If your class has not had experience constructing bar graphs, it would probably be best to instruct them step by step on how to construct their graph. The important aspects of the graph is a proper title, using two different colors for the beans and macaroni, labeling the bars across the bottom and the numbers of beans and macaroni placed along the left side of the graph.

MATERIALS:

30 medicine cups
30 sheets of graph paper, student page #38
1 student page #39 for each student
Crayons
Container for beans and macaroni mixture consisting of 2 cups beans and 2 cups macaroni (teacher supplied)

PROCEDURE:

1. Pour the beans and macaroni into the container and mix them together. Fill a medicine cup to the 15 mL mark for each student or have the students fill their own cup.
2. Have the students go to their groups and distribute the medicine cups and the observation sheets.
3. Have the students predict the number of beans and macaroni in their cup and write their predictions on their observation sheet. Have each student separate the beans from the macaroni in his/her cup by placing the beans in one pile and the macaroni in a separate pile.
4. Count the number in each pile and record totals on the observation sheet. Place all groups members' names on the sheet.
5. Have the students complete the observation sheet and discuss "What did we learn?" Ask "How did you separate the beans and macaroni? Were the beans and macaroni different or the same when they are mixed together? Did everyone have the same amount of beans and macaroni?"
6. Have the students return to their own seats and keep their observation sheets out. Pass out the graph paper.

7. Ask the students what an appropriate title for this graph would be. List their suggestions on the board. Lead them to realize that the best title is the one that tells exactly what the graph is going to show. Demonstrate writing the title at the top of the graph.
8. Ask the students how we could graph the beans and macaroni to best distinguish the bean column from the macaroni column. Discuss their suggestions. The easiest way is probably using two different colors. Put the color code on the graph. Demonstrate.
9. Starting on the first square from the bottom on the left side of the paper, have the students number up from 1 to 23. Demonstrate.
10. Have the students space the three names of students in their group at the bottom of the graph. Demonstrate. Demonstrate graphing a mixture and then let students complete their graph. Monitor the students' work.
11. After the students are finished have them put a star above the person in their group who had the most beans in their mixture. Discuss. Have them put a happy face above the person who had the least macaroni in their mixture. Discuss. Have them put a sun over the person who had the most items in their mixture. Discuss.

FORMATIVE EVALUATION: Completion of the bar graph will provide evidence that the students understand how to separate mixtures and graph their data.

Name _____

Activity #9: Separating Beans From Macaroni

Name _____

Activity #9: Separating Beans From Macaroni

Observation Sheet

STUDENT	BEANS	MACARONI
1		
2		
3		

How are beans different than macaroni?

Draw and color a bean:

Draw a piece of macaroni:

What did you learn?

ACTIVITY #10: Separating Sugar From Sand

TIME: 50 Minutes

OBJECTIVE: Students will learn through observation and investigation that the separation of sugar from sand is a physical change.

TEACHER BACKGROUND INFORMATION: Students will find that separating sugar from sand is not practical with a toothpick. It is difficult and takes a long time. The most effective way is to use water because sugar dissolves in water. Students will have this knowledge from previous experiments.

MATERIALS (per group of 3 students):

1 medicine cup with 5 mL of sugar
1 medicine cup with 5 mL of sand
1 stirrer
Pencils and crayons
3 toothpicks
3 hand lenses
1 paper towels (teacher supplied)
1 student page #41 for each student

NOTE: After STEP #5, give each group a plastic vial with 15 mL of water

PROCEDURE:

1. Review the term 'mixture.' Brainstorm ways that you might be able to separate a mixture.
2. Have students go to their groups and distribute the materials.
3. Have the students place a few grains of sand into the labeled space on their student page. Using the hand lens, have them describe what they see. Next, put a few grains of sugar in the second space. Use the hand lens to observe. What differences are there between them?
4. Pour the remaining cup of sand into the sugar and stir. Next, place a small amount of this mixture onto the student page. Observe with the hand lens. Can the students tell which is sugar and which is sand?
5. While looking through the hand lens use a toothpick to separate the two materials. Make piles of each on the observation sheet. What problems are there in separating the mixture? How long would it take to separate the complete pile? Is there an easier way to separate sand and sugar? What do you know about sugar? Students may need prompting in order to suggest sand does not dissolve in water but sugar does.
6. Discuss how water could be used to separate sand from sugar. Do the following:
    - Give each group the plastic vial of water.
    - Add the vial of water to the cup of sugar and sand.
    - Stir the mixture until only the sand is visible.
    - Discuss the whereabouts of the sugar.

The students should now see that they have, in fact, separated sand from sugar. The experiment may end here with the students completing the remaining section of the observation sheet.

TEACHER DEMONSTRATION: Carefully pour the water solution into an empty container, leaving the sand in the bottom of the medicine cup. The sugar may be recovering by setting this solution aside for a week or longer. (The sugar water solution will stay syrupy if poured into a medicine cup and left. It might evaporate more rapidly if poured into a large container.)

Name _____

Activity #10: Separating Sugar From Sand

Observation Sheet

SAND	SUGAR	SAND AND SUGAR

After using the hand lens, write words describing sand and sugar in each box above.

What did you learn?

Name _____

Colorful Chemistry Test

Fill in the blanks with the following words.

change **hand lens** **rust** **pipette** **solution**

1. A scientific instrument used to make things look bigger is a _____.
2. A change that happens to iron is _____.
3. A _____ is when something happens to make a thing different, even if we cannot see it.
4. When something is dissolved in water and all the parts look the same such as when salt is mixed with water, it is called a _____.
5. A scientific instrument used to move small amounts of water is called a _____.

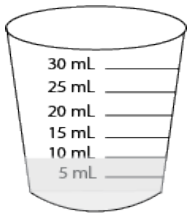
mixture **predict** **observe** **dissolves** **separate**

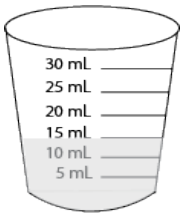
6. When two things are mixed together but one part is different from another part such as beans and macaroni, it is called a _____.
7. You _____ an object when you find out about it by using any of your senses -- sight, feel, hear, and smell.
8. When you take away a part or parts of a mixture, such as sugar from sand, you _____ it.
9. If you say something will happen before it happens, you _____ it will happen.
10. When something becomes part of a liquid and cannot be seen, we say it _____.

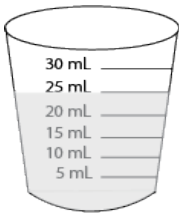
Circle the correct answer.

11. Which sense is the best to use to tell vinegar from water?
    A. smell
    B. sight
    C. hear

12. Which cup shows 10 mL of powder?

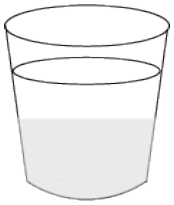
A. 

B. 

C. 

13. Which cup is a solution?

A. 

B. 

14. Which causes more bubbles in baking powder?
    A. 10 drops of water
    B. 2 drops of vinegar
    C. 10 drops of vinegar

15. Which of these rusts more rapidly when placed in water?
    A. a copper penny
    B. aluminum foil
    C. an iron nail

16. Rust forms the quickest in which one of these ziploc bags?
    A. a bag with steel wool and water
    B. a bag with steel wool
    C. a bag with steel wool and salt

17. Rust forms the quickest in which one of these ziploc bags?
    A. a magnet
    B. water
    C. toothpicks

18. If a scientist does not know what a liquid or powder is, she does not use her sense of
    A. smell
    B. taste
    C. touch

19. If you mix sugar with water, the sugar will
    A. dissolve
    B. sink to the bottom
    C. float

20. If you mix sand with water, the sand will
    A. dissolve
    B. sink to the bottom
    C. float

21. Grains of sand through a hand lens are
    A. all the same
    B. different shapes and colors
    C. different shapes, but the same colors

22. Grains of sugar through a hand lens are
    A. all the same
    B. different shapes and colors
    C. different shapes, but the same colors

23. Vinegar and water will
    A. mix
    B. sometimes mix
    C. not mix

24. Oil and vinegar will
    A. mix
    B. sometimes mix
    C. not mix

25. Oil and water will
    A. mix
    B. sometimes mix
    C. not mix

26. To make copper pennies shine you could use
    A. salt
    B. vinegar
    C. salt and vinegar

27. If you mix a little salt with water, the water will
    A. stay clear
    B. be cloudy
    C. turn dark

28. If you mix cornstarch with water, the water will
    A. stay clear
    B. be cloudy
    C. turn dark

29. When writing what you have observed in your journal, you should always write
    A. only 1 sentence
    B. the date
    C. 1 page

NUMBER OF NAILS & SCREWS IN A MIXTURE			
9			
8			
7		*	
6	*	*	X
5	X *	*	X
4	X *	*	X
3	X *	X *	X *
2	X *	X *	X *
1	X *	X *	X *
	Kacie	Bobby	Susan

* = 1 Nail

X = 1 Screw

USE THE ABOVE GRAPH TO ANSWER THE FOLLOWING QUESTIONS.

30. Who has the most nails in their mixture?
    A. Kacie
    B. Bobby
    C. Susan

31. Who has the most screws in their mixture?
    A. Kacie
    B. Bobby
    C. Susan

32. Who has the least number of items in their mixture?
    A. Kacie
    B. Bobby
    C. Susan

Colorful Chemistry Test Answer Key

1. hand lens
2. rust
3. change
4. solution
5. pipette
6. mixture
7. observe
8. separate
9. predict
10. dissolves
11. a
12. a
13. a
14. c
15. c
16. a
17. b
18. b
19. a
20. b
21. b
22. c
23. a
24. c
25. c
26. c
27. a
28. b
29. b
30. b
31. c
32. c

Colorful Chemistry

Performance Assessment Instrument

OBJECTIVE: Students will follow directions to complete a scientific procedure. Students will compare data with data collected by others.

MATERIALS (per group of 3 students):

1 cup of water
3 medicine cups - 1/student
3 plastic vials - 1/student
2 pipettes (shared) - 1/each color
1 foam tray - to hold materials
Yellow food coloring - dilute food coloring 4 to 5 drops/10 mL water*
Blue food coloring - dilute food coloring 3 to 4 drops/10 mL water*

PROCEDURE:

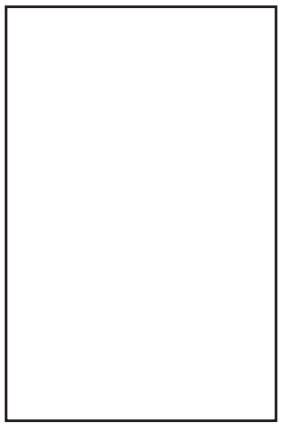
1. Have the students go to their groups and distribute the materials.
2. Teacher reads the directions aloud.
3. Measure 10 mL of water. Pour it into your plastic vial. Observe. Record.
4. Using your pipette, put 5 drops of yellow mixture into the vial of water. Observe and record results.
5. Using your pipette, put 5 drops of the blue mixture into the vial of water and yellow food coloring. Observe and record results.
6. Compare your results with the teacher's vial.
7. Compare your vial with the vials of the other students in your group. Are they the same?
8. Do not discard until the teacher observes.

* Other colors of dyes may be used. Different brands of food coloring use different dyes, so results may vary. Dilutions should be verified for the specific results you desire before doing this activity.

Colorful Chemistry

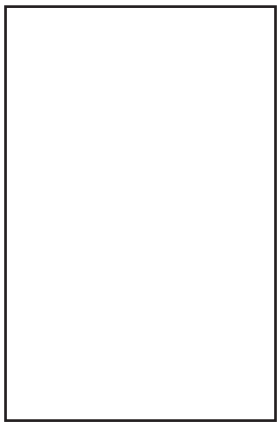
Name _____

#1



10 mL water

#2

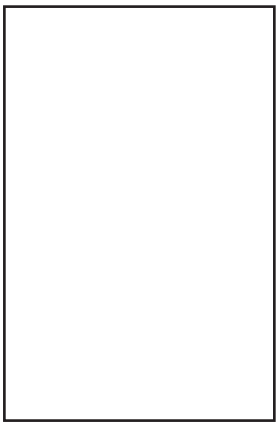


10 mL water

+

5 drops of yellow food coloring

#3



10 mL water

+

5 drops of yellow food coloring

+

5 drops of blue food coloring

Color vials above to show what happened when food coloring was added.

Student Record Sheet	1	2	3	4	5	6	7	8	9	10	11	12	Total
1.													
2.													
3.													
4.													
5.													
6.													
7.													
8.													
9.													
10.													
11.													
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29.													
30.													

Colorful Chemistry
Kit #15 -- I

Performance Assessment Instrument

(Grade 2-4)

Developed by:

Randy Clark, Kathy Hunter, Bev Halliday, Ramona Bonner, Cheryl Wilschetz, Marilyn Karns, Ken Webster, Mary Brown, Carey Price, Ginny Clark, Barb Bagent, Mary Masterson

June 1993

Edited by:
Michael Schneider

Colorful Chemistry

Introduction:

This performance assessment represent an attempt to create the necessary multiple and varied assessment instruments required by the Illinois School Improvement Plan. It utilizes materials already available in the M.A.S.H. Kit, Colorful Chemistry, and was designed by classroom teachers during a Master's level Education course at Southern Illinois University at Edwardsville. These teachers piloted the individual activities and rubrics during their development. The full assessment instrument was then piloted during a workshop jointly sponsored by Educational Service Center #16 and SIUE.

Outcomes & Objectives:

Sample outcomes and objectives, derived from the State Goals, have been provided for each activity. These are to provide assistance to the individual schools using this assessment and should not be construed as the only outcomes or objectives that could apply.

Reliability:

Using the Pearson Produce Moment Statistical Test, and a test/retest format, the reliability of this assessment instrument was determined to be 0.935. The Inter-Rater Reliability, using three raters and the Spearman Rank Order Correlation was determined to be between 0.70 and 0.95. Information on these statistical values is available through ESC #16.

Colorful Chemistry

Station #1 - Will it Dissolve?

LEARNER OUTCOME: As a result of their schooling, students will demonstrate their use of a variety of science process skills while performing an experiment.

MATERIALS: sand, sugar, salt, masking tape, pipette, hand lens, water, crayon, straw stirrer, medicine cup, wax paper (to cover student lab sheet), Station #1 student lab sheet, Station #1 student answer sheet, student direction card (teacher-made)

PROCEDURE:

1. The teacher will prepare the materials as follows:
   A. Place pre-cut wax paper sheets covering the station #1 student lab sheet.
   B. Put a few grains of each:
      Circle A - salt
      Circle B - sand
      Circle C - sugar
   C. Fill one small medicine cup with water.
   D. Place all materials at station.
   E. Place student answer sheet and crayon at station.

Station #2 - Measurement of Solids & Liquids

LEARNER OUTCOME: As a result of their schooling, students will choose the appropriate scientific equipment and demonstrate its use in an experimental setting.

MATERIALS (per student per station): pipette, 6 medicine cups, water, fluted container for holding water, sand Station #2 student worksheet (circles labeled 5, 20, 15 mL for water and 25, 30, 10 mL for sand)

PROCEDURE:

1. The teacher will prepare the materials as follows:
   A. Duplicate student worksheet.
   B. Duplicate class record sheet.
   C. Set out one pipette, six medicine cups, and 1 student worksheet for each student at this station.
   D. Fill one fluted container with water and one container with sand for each student at this station.
   E. After student completes measuring, teacher will observe & record student scores.

Station #3 - Separating Pennies, Beans, & Macaroni

LEARNER OUTCOME: As a result of their schooling, students will demonstrate their use of a variety of science process skills while performing an experiment.

MATERIALS: pennies, beans, macaroni, Student Work Sheet for Station #3, pencil, Student Directions Card (teacher-made)

PROCEDURE:

1. The teacher will prepare the materials as follows:
   A. Prepare ziploc bag with the following mixture:
      8 beans, 9 macaroni, 5 pennies
   B. Place prepared ziploc bag, student worksheet, and Student Directions Card at Station #3

Station #4 - Science Writing Prompt

LEARNER OUTCOME: As a result of their schooling, students will demonstrate their ability to design and explain the steps necessary to perform a simple experiment using standard English with a clear, logical organization of ideas.

MATERIALS: Direction Card (teacher-made), Prompt Sheets

PROCEDURE:

1. The teacher will prepare the materials as follows:
   A. A Direction Card which states:
      1. Take a direction sheet to your seat.
      2. Read the directions carefully.
      3. Use your own paper and pencil when you write.
      4. Put your name and date at the top.
   B. Direction Sheets (prompt)

Colorful Chemistry Scoring Rubric

Station #1 - Scoring Rubric:

	Total
1 point each for predictions (whether right or wrong) -	3 points
1 point each - correct response (dissolving) -	3 points
	6 points

Station #2 - Scoring Rubric:

Students will receive one point for each correctly measured cup. Students must get at least 2 water and 2 sand measurements correct for mastery.

Station #3 - Scoring Rubric:

	Total
1 point each for recording -	3 points
1 point each for accuracy (counting) -	3 points
1 point each for graphing -	3 points
	9 points

Station #4 - Scoring Rubric:

3 points ("exceeds" rating): In order to receive a 3, a student must do the following -

1. include materials used
2. exhibit a clear sequential understanding of the steps involved
3. state that the powder disappears or the water stays clear
4. use appropriate grade level writing skills

2 points ("meets" rating): In order to receive a 2, a student must do the following -

1. mention some, but not necessarily all, of materials used
2. exhibit at least partial knowledge of the steps involved
3. indicate in some way that the powder disappears
4. have a readable paper, but may contain some errors

1 points ("does not meet" rating): In order to receive a 1, a student must do the following -

1. obviously does not understand how to decide whether a substance dissolves
2. does not communicate the steps involved using at least readable writing skills

Colorful Chemistry Student Instruction Sheet

Student Instructions for Station #1:

A. Look at Circle A with your hand lens.
B. Do you think it will dissolve in water?
C. Write yes or no on your answer sheet.
D. Do the same for Circle B and Circle C.
E. Now add 3 drops of water on Circle A
F. Stir
G. Did it dissolve?
H. Write yes or no on your answer sheet.
I. Do the same for Circle B and Circle C.
J. Throw the wax paper away.

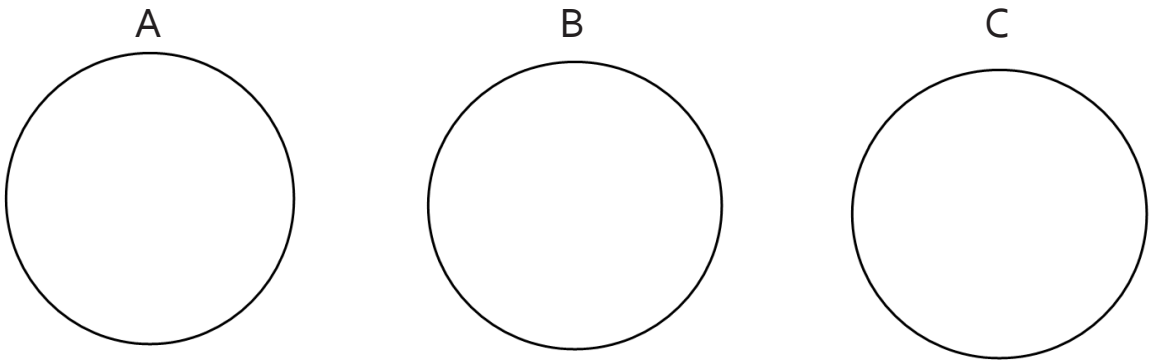
Student Instructions for Station #2:

A. Using the measuring equipment, measure 5 mL of water into the first medicine cup.
B. 20 mL of water into the second medicine cup.
C. 15 mL of water into the third medicine cup.
D. 25 mL of water into the fourth medicine cup.
E. 30 mL of water into the fifth medicine cup.
F. 10 mL of water into the sixth medicine cup.

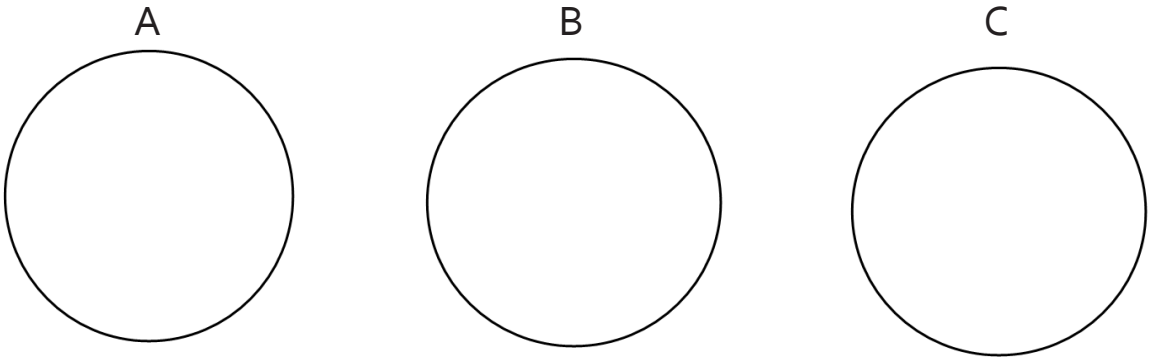
Student Instructions for Station #3:

A. Take baggie and put the items into groups that are the same.
B. Count the number of items in each group.
C. Record the number of items in each group on the student worksheet.
D. Make a bar graph showing the number of each item.
E. Place items back in the baggie.

Station #1 - Student Lab Sheet



Station #1 - Student Lab Sheet



STATION #1

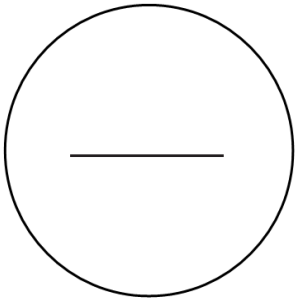
STUDENT RESPONSE SHEET

WRITE YES IN THE CIRCLE IF YOU THINK THE POWDER WILL DISSOLVE.

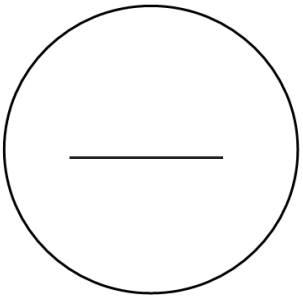
WRITE NO IN THE CIRCLE IF YOU THINK THE POWDER WILL NOT DISSOLVE.

DO THIS FOR CIRCLE A, CIRCLE B, AND CIRCLE C.

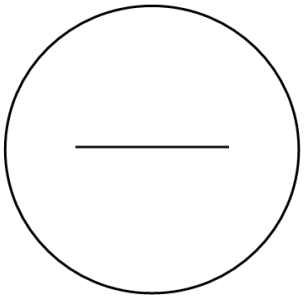
A



B



C

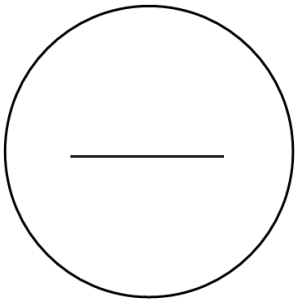


WRITE YES IN THE CIRCLE IF YOU THINK THE POWDER WILL DISSOLVE.

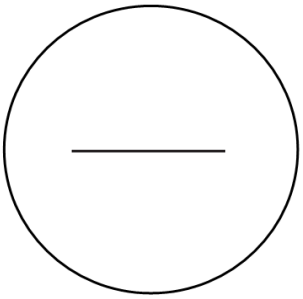
WRITE NO IN THE CIRCLE IF YOU THINK THE POWDER WILL NOT DISSOLVE.

DO THIS FOR CIRCLE A, CIRCLE B, AND CIRCLE C.

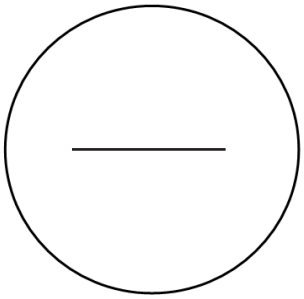
A



B



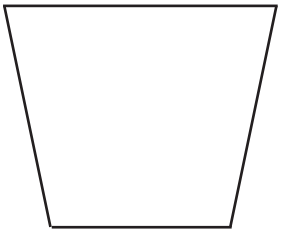
C



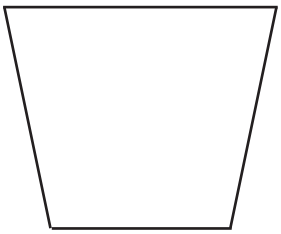
Station #2

STUDENT RESPONSE SHEET

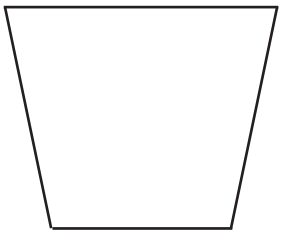
Measure the amounts of water and sand under each medicine cup picture into the real medicine cups in front of you. Draw a line on each of the medicine pictures to show how full you made each cup.



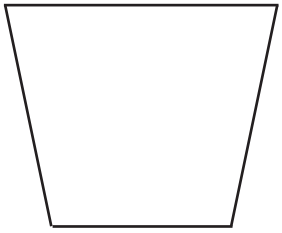
1. 5 mL water



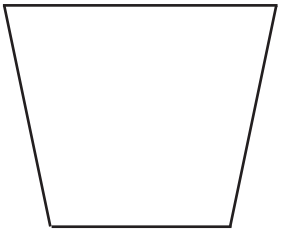
2. 20 mL water



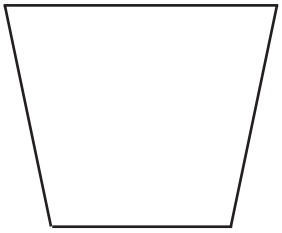
3. 15 mL water



4. 25 mL water



5. 30 mL water

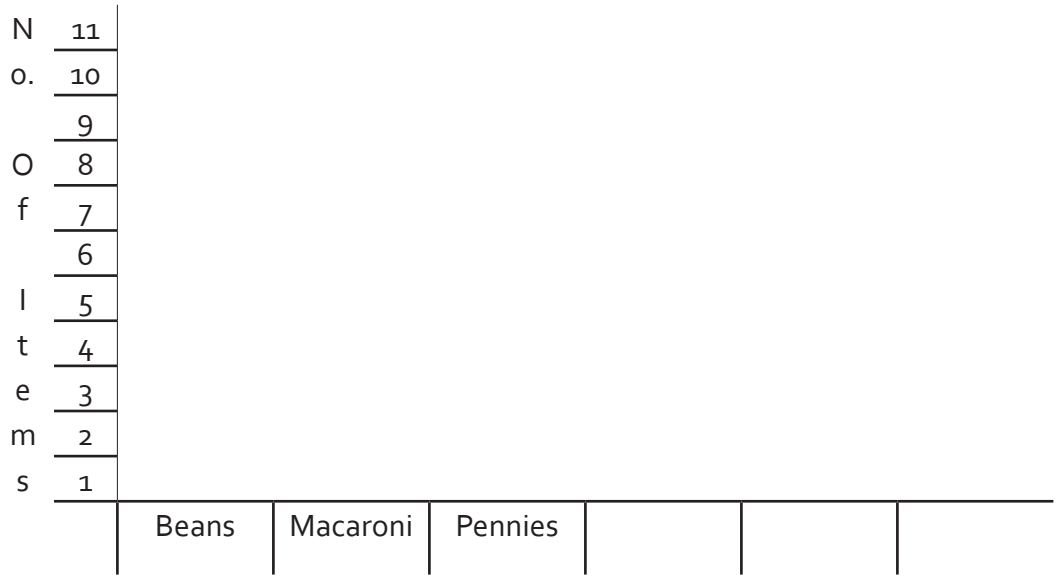


6. 10 mL water

Colorful Chemistry

Station #3 - Separating Pennies, Beans, & Macaroni

Separating Beans, Macaroni, & Pennies



Types of Items

Station #4 - Student Writing Prompt

The teacher gave Pat some powder. The teacher told Pat to find out if the powder will dissolve.

Write a paper telling how Pat will find out if the powder will dissolve.

Write your paper using the following guidelines:

- Be sure to tell what materials Pat will use.
- Tell the steps Pat would follow.
- Tell how Pat will know if the powder has dissolved or not dissolved.

Checkpoints to remember:

- Take some time to plan your paper on scratch paper.
- Organize your ideas carefully. Remember what you know about paragraphs.
- Use language and information appropriate for the students in your class.
- Check that you have correct sentences, punctuation, and spelling.

Give the paper to your teacher when you are finished.

Colorful Chemistry

Student's Name:	Station #1	Station #2	Station #3	Station #4	Total
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
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30.					

Station #1 - 6 points
Station #2 - 6 points
Station #3 - 9 points
Station #4 - 3 points

Percentages:	0-56	60-76	80-100
No. Correct:	0-14	15-19	20-24
Rating:	1	2	3
	Does not meet	Meets	Exceeds