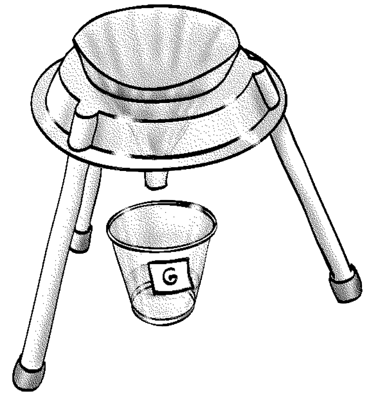
LETTER TO PARENTS

Cut here and paste onto school letterhead before making copies.

SCIENCE NEWS

Dear Parents,

Our class is beginning a new science unit, the **FOSS Mixtures and Solutions Module.** We will be studying basic concepts in chemistry, finding out how materials interact with each other. Children will learn what happens when simple materials, like gravel, salt, and water, are put together. They will also learn techniques for separating the resulting mixtures and solutions. As our studies continue, we will investigate combinations of materials, like baking soda and calcium chloride (the salt used to melt ice on roads), that react when mixed, producing new products, like chalk, carbon-dioxide gas, and table salt. These are exciting discoveries.



The U.S. Consumer Products Safety Commission (CPSC) requires the following label to be on student sheets associated with the use of these chemicals in the FOSS investigations: calcium chloride, citric acid, diatomaceous earth, Epsom salts, and kosher salt. It is a reminder to the students to exercise particular safety precautions when working with materials in the classroom.

WARNING — This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

You can bring chemistry to life at home by exploring familiar household materials in a scientific way. Some of the interesting chemicals you may have at hand include baking soda, baking powder, alum, table salt, Epsom salts, flour, sugar, cornstarch, and vinegar. Add to these a few pieces of "laboratory equipment" such as jars, margarine tubs, plastic cups, and spoons, and you are ready to extend the classroom experiences into your home. A reminder: just like we do at school, you and your child should review and follow important safety procedures, even when working with the most familiar materials.

- Have a plan before starting an investigation.
- Avoid skin contact with experimental materials, and clean up spills immediately.
- Rinse with water if materials contact skin, eyes, or clothes, and wash hands after completing experiments.
- Never taste the experiments.

Watch for the home/school connection sheets I will be sending home with your child. These suggest ways for the whole family to investigate interesting aspects of chemistry.

We are looking forward to many weeks of exciting investigations with mixtures and solutions. If you have any questions or comments, or have expertise you would like to share with the class, please drop me a note.

Name ________________________________

Date ________________________________

SEPARATING MIXTURES

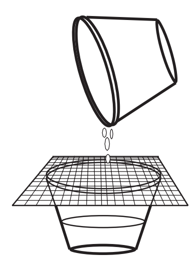
PART 1. Prepare three cups. Put one level spoon (5-ml spoon) of each solid material in its cup. Observe the three solid materials. Fill in the property chart below.

	Color	Texture	Particle shape	Particle size	Other
Gravel					
Powder (diatomaceous earth)					
Salt (sodium chloride)					

PART 2. Add 50 ml of water (one full syringe) to each cup. Stir and observe. Write your observations here.

Gravel and water
Powder and water
Salt and water

PART 3. Separate all three mixtures with filters.



a. Place a screen over an empty, labeled cup.

b. Stir the mixture thoroughly.

c. Pour the mixture through the screen filter.

d. If the screen filter doesn't separate the mixture, repeat the process with a filter paper.

Were you able to separate the mixtures? Record your results.

	Screen	Filter paper
Gravel		
Powder		
Salt		

Name ___________________________

Date ___________________________

THINKING ABOUT MIXTURES

1. What is a mixture? Give some examples.

2. What is a solution? Give some examples.

3. Is salt and water a mixture? A solution? Is it both a mixture and a solution?

4. How do you know when a solid and a liquid form a solution?

5. How can mixtures be separated?

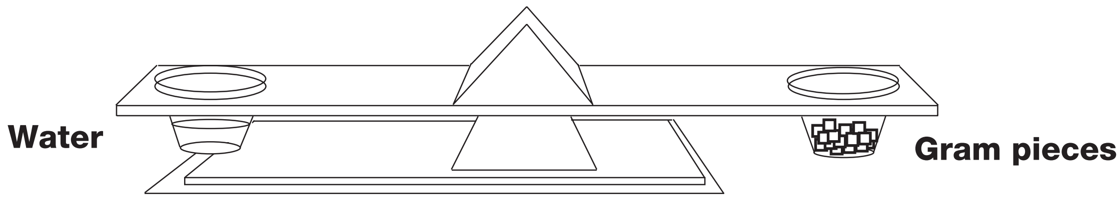
6. How are screen filters and paper filters alike? How are they different?

Name ____________________

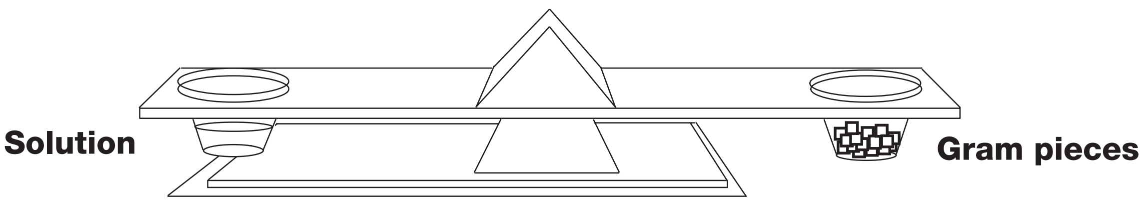
Date ____________________

MAKING A SOLUTION

1. Weigh 50 ml of water. Record its mass on line 2 in the box below.



2. Make a solution with one level spoon of salt and 50 ml of water.
3. Carefully weigh the solution. Record its mass on line 1 in the box below.



4. Calculate the number of grams of salt you put in the water to make the solution, by subtracting to find the difference.

1. Mass of salt-and-water solution	________	**g**
2. Mass of 50 ml of water	________	**g**
3. Mass of salt	________	**g**

How could you separate the salt from the water in the solution?

____

____

____

____

Name ____________________________________

Date ____________________________________

RESPONSE SHEET—SEPARATING MIXTURES

Kim wrote in his journal,

A solution is not a mixture, it is just a solution.

Is he confused? How would you explain mixtures and solutions to Kim?

Name ___________________________________

Date ___________________________________

Mixtures and Solutions Journal

Name ___________________________________

Date ___________________________________

Name ____________________

Date ____________________

SEPARATING A DRY MIXTURE

Challenge: Design a method to separate a mixture of gravel, salt, and powder.

PART 1. Prepare the solid mixture.

a. Label a plastic cup "dry mixture."

b. Put one 5-ml spoon of salt in the cup.

c. Put one 5-ml spoon of gravel in the cup.

d. Put one 5-ml spoon of powder in the cup.

e. Stir the mixture with a stick.

PART 2. Describe your plan for separating the mixture so that the salt is in one cup, the gravel is in a second cup, and the powder is in a third cup.

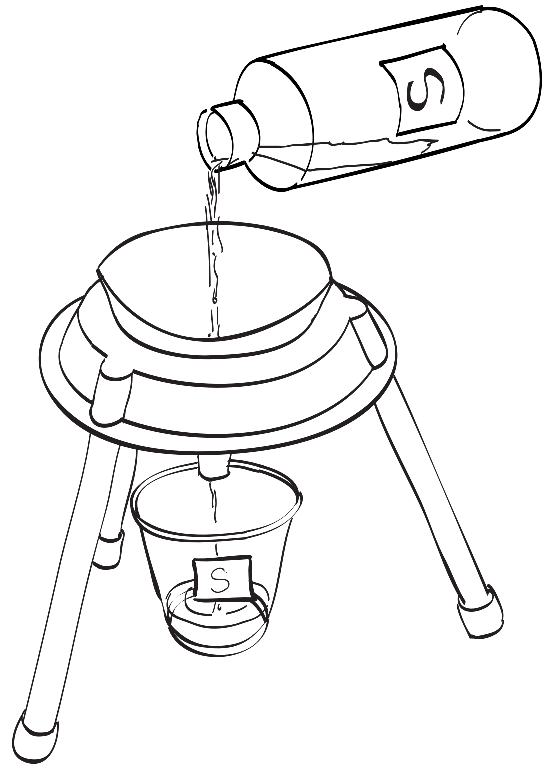
PART 3. Summarize the results of your plan. Describe how you might improve your separation.

Name ____________________

Date ____________________

SATURATING A SOLUTION

Steps for determining the amount of solid material required to saturate 50 ml of water.

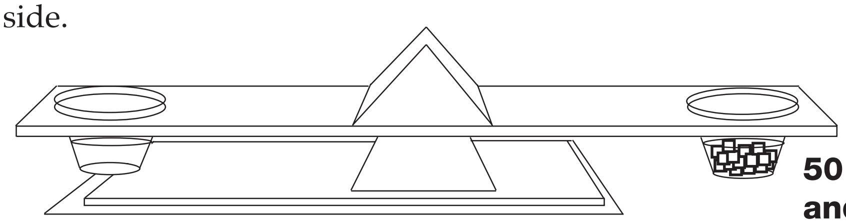


1. Put a filter paper in the funnel. Sprinkle it with water.

2. Place the labeled cup under the funnel.

3. Pour the saturated solution from the bottle into the wet filter.

4. Place the saturated solution on one side of the balance and 50 ml of water on the other side.



5. Add gram masses to the water until it balances. The amount of mass added to the water is equal to the mass of the solid material dissolved in the saturated solution.

6. Record the results in your journal.

Name ___________________________

Date ___________________________

RESPONSE SHEET—REACHING SATURATION

Jasmine and Mack were making instant iced tea. In the 1/2-liter glasses, Mack put two spoonfuls of iced-tea powder and Jasmine put four spoonfuls. Both filled their glasses half full with water from the tap. Mack stirred his mixture and it all dissolved. Jasmine stirred hers, and it didn't all dissolve.

"I think you have a saturated solution," said Mack. "Why don't you add more water?"

"I know another way to make it dissolve," said Jasmine.

Would Mack's suggestion to add more water work? Explain your answer.

What could Jasmine do to make the powder dissolve?

Name ________________________________

Date ________________________________

CHEMICAL DATA SHEET

Challenge: Can you identify the mystery chemical?

Here is a table of properties for five chemicals.

Chemical name	Appearance	Amount needed to saturate 50 ml of water
Sodium chloride	**Small white grains**	14 grams
Baking soda	**Small white grains**	3 grams
Epsom salts	**Small white grains**	48 grams
Citric acid	**Small white grains**	60 grams
Alum	**Small white grains**	6 grams

Record your observations about the mystery chemical.

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The mystery chemical is ______________________________

SOFT-DRINK RECIPES

Name ______________________ Date ______________

SOLUTION 1. 1 spoon of powder in 1000 ml of water

SOLUTION 2. 3 spoons of powder in 1000 ml of water

List all the ways that the solutions are the same.	List all the ways that the solutions are different.

SOLUTION A. 2 spoons of powder in 1000 ml of water

SOLUTION B. 2 spoons of powder in 500 ml of water

List all the ways that the solutions are the same.	List all the ways that the solutions are different.

My recommended recipe for soft drink is ______________________________

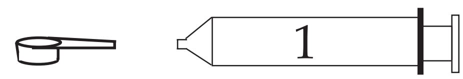
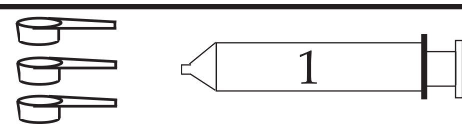
Name ______________________

Date ______________________

SALT CONCENTRATION

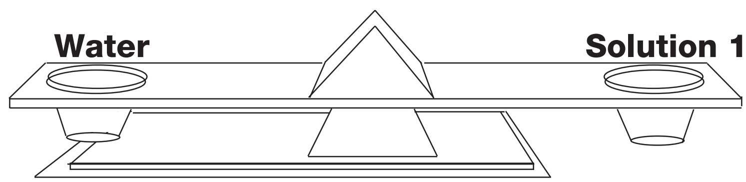
PART 1. Make salt solutions 1 and 2.

a. Label two cups "Solution 1" and "Solution 2."
b. Use the 5-ml spoon to measure salt for solutions 1 and 2.
c. Use the syringe to measure the water.
d. Stir with a stirring stick.

Solution 1	**1 spoon of salt** **50 ml of water**	
Solution 2	**3 spoons of salt** **50 ml of water**	

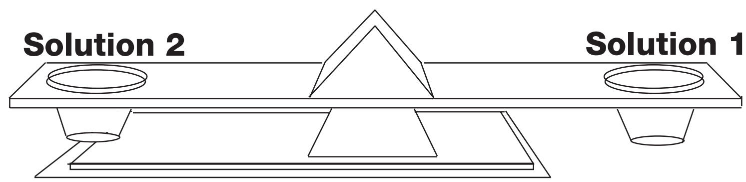
PART 2. Use the balance to make the comparisons described below.

Compare **50 ml of water** and **50 ml of solution 1.**



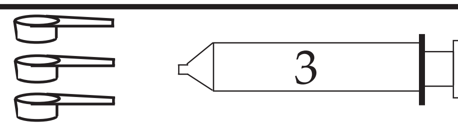
Circle the solution that is heavier.

Compare **50 ml of solution 2** and **50 ml of solution 1.**



Circle the solution that is heavier.

PART 3. Make a third salt solution in a third labeled cup.

Solution 3	**3 spoons of salt** **150 ml of water**	

Discuss in your group which solution is more concentrated, solution 2 or solution 3. Write your prediction here. ______________________

PART 4. Use the balance to compare solution 2 and solution 3.

Time out! Discuss your plan with your group before using the balance.

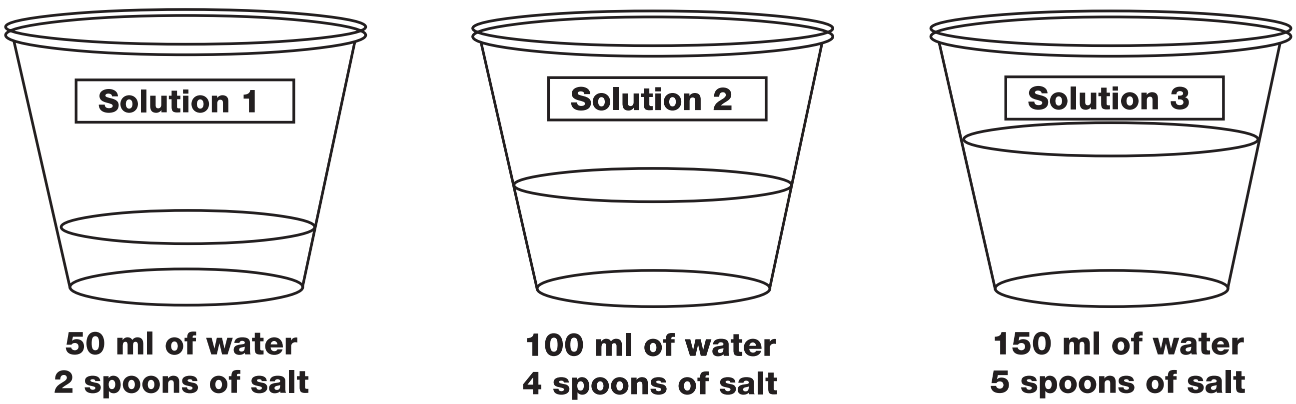
Which solution proved to be more concentrated? ______________________

Name ____________________

Date ____________________

RESPONSE SHEET—CONCENTRATION

In comparing three solutions Julie wrote in her journal that solution 3 was the most concentrated because it had the most water and the most salt. What can you tell Julie about concentration?



FIZZ-QUIZ PLACE MAT

Name ______________________ Date ____________

1	2	3
1 spoon of calcium chloride and 1 spoon of baking soda in 50 ml of water	**1 spoon of calcium chloride and 1 spoon of citric acid in 50 ml of water**	**1 spoon of baking soda and 1 spoon of citric acid in 50 ml of water**

DIRECTIONS

1. Number three cups and place them on the numbered circles.
2. Put the solid materials in cup 1 (one spoon of calcium chloride and one spoon of baking soda).
3. Carefully add 50 ml of water to cup 1.
4. Observe the results and record observations on the *Fizz-Quiz Observations* sheet.
5. Repeat the procedure for cups 2 and 3. (Take turns putting the chemicals into cups.)

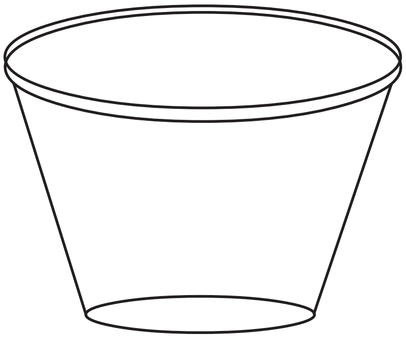
Name ____________________

Date ____________________

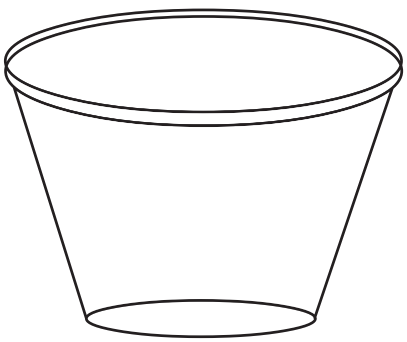
FIZZ-QUIZ OBSERVATIONS

Follow the *Fizz-Quiz Place Mat* directions to make the mixtures. Record the results. Draw and describe what you observed.

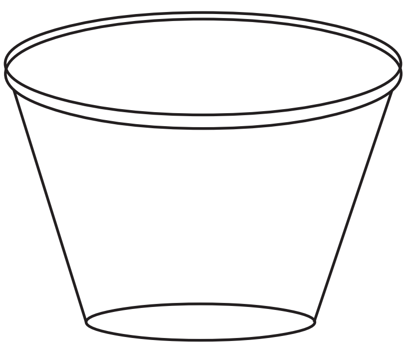
Cup 1 1 spoon of calcium chloride, 1 spoon of baking soda, and 50 ml of water



Cup 2 1 spoon of calcium chloride, 1 spoon of citric acid, and 50 ml of water



Cup 3 1 spoon of baking soda, 1 spoon of citric acid, and 50 ml of water



Which chemicals reacted to form a gas? ____________________

Which chemicals reacted to form a precipitate? ____________________

Name ______________________________

Date ______________________________

RESPONSE SHEET—FIZZ QUIZ

Tarren wrote in his journal,

After I mixed calcium chloride, baking soda, and citric acid together in water, I saw bubbles and lots of fizzing. A short time later I saw a new white material on the bottom of the cup. A reaction took place.

After the same experiment Julie wrote,

After I mixed calcium chloride, baking soda, citric acid, and water, it dissolved.

Who wrote the better observation? Why do you think so?

Who has the better conclusion? Why do you think so?

Describe the differences between dissolving and reacting.

Name ____________________

Date ____________________

PROJECT IDEAS

- Look in *FOSS Science Stories* or books in the library for ideas about projects you might like to present to the class.
- Find out if each mixture makes a solution with water: flour, baking soda, alum, cooking oil, rubbing alcohol, or any other material you'd like to test.
- Research diatomaceous earth. Where does it come from? How is it used?
- Research sodium chloride. How does salt get to the table? Why are some people on low-salt diets?
- Find citric acid. It's in many of the foods we eat. Read product labels and list products that contain citric acid.
- Research citric acid. What citrus fruits is it found in? How is it important in our diets?
- What effect does temperature have on saturation? Try experimenting with different temperatures of water—hot, iced, and so forth.
- Try dissolving a second material in a saturated salt solution. Will it dissolve? Will a third material?
- Investigate baking powder. What are the ingredients in baking powder? How does it react in water? How are baking powder and baking soda the same and how are they different?
- Investigate drinks. Many liquid products (for example, soft drinks) are complex solutions made of several materials dissolved in water. The order in which the ingredients appear on the label corresponds to their relative amount in the product. The substance listed first is the most concentrated, the second the next concentrated, and so forth. Bring the product to class and report on its contents in terms of concentration.
- Investigate limiting chemicals. Is the baking soda all used up in the reaction between calcium chloride and baking soda? Design an experiment to find out.
- Design a new filtering system for separating mixtures.
- Mix up a new mixture or solution and take it apart.
- Design a crystal mobile. Use the crystal formula in the home/school connection or research a new one using table salt, rock salt, sugar, Epsom salts, or borax.
- How do they get the fizz in soda? (See the resource *Soda Science: Designing and Testing Soft Drinks.)*
- Investigate rock candy. How is it made?
- Design an experiment that results in a new precipitate.

NOTE: You may collect and analyze information for your project using sound recorders, computer research, and cameras.

Name ____________________

Date ____________________

PROJECT PROPOSAL

1. What is the question or the project that you are proposing?

2. What materials or references will you need to complete the project?

3. What steps will you follow to complete the project?

Name ____________________

Date ____________________

PRESENTATION GUIDELINES

You will have exactly 3 minutes to present your project to the class. In those 3 minutes you should answer these questions.

- What were you trying to find out (your question)?
- What materials or references did you need to do your project?
- What procedure did you follow to complete your project?
- What did you learn from doing your project?

When you begin speaking, you will see the *green card* held up for 2 1/2 minutes. When you see the *yellow card,* you have 30 seconds left. When you see the *red card,* it means you can finish your sentence, but you must stop within the next few seconds.

Practice your presentation so you will be sure it is at least 2 1/2 minutes long, but not more than 3 minutes long. Be sure you have included all of the information asked for above.

Name ____________________

Date ____________________

PRESENTATION GUIDELINES

You will have exactly 3 minutes to present your project to the class. In those 3 minutes you should answer these questions.

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Practice your presentation so you will be sure it is at least 2 1/2 minutes long, but not more than 3 minutes long. Be sure you have included all of the information asked for above.

Name ___________________________________

Date ___________________________________

MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 1: SEPARATING MIXTURES

Andy had a box of animal crackers. He counted them out and found 20 cookies:

7 elephants
6 tigers
5 monkeys
2 zebras

If Andy put all the animal crackers back into the box and took one out without looking, what is the probability of his choosing

a. an elephant? ________________

b. a tiger? ____________________

c. a monkey? __________________

d. a zebra? ____________________

Does the sum of the probabilities *a, b, c,* and *d* equal 1?

Name ______________________________

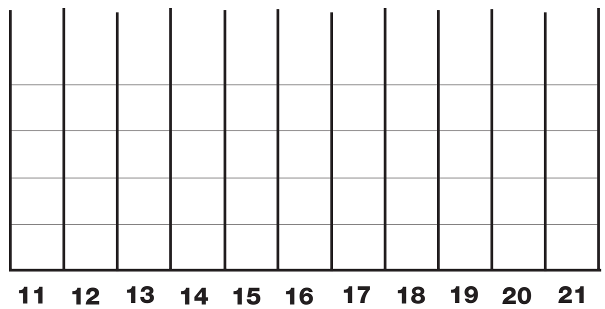
Date ______________________________

MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 2: REACHING SATURATION

A science class was doing an experiment to determine how much salt it takes to saturate 50 ml of water. Here are the groups' results.

Group 1 — 14 g
Group 2 — 16 g
Group 3 — 15 g
Group 4 — 14 g
Group 5 — 15 g
Group 6 — 12 g
Group 7 — 14 g
Group 8 — 20 g



Can you make a histogram of the class results?

Review the data and the histogram to determine these numbers.

Mean ____________________

Median ____________________

Mode ____________________

Range ____________________

DEFINITIONS

Mean is the total divided by the number of groups. Mean is the same as average.

Median is the number that is in the exact middle when the numbers are arranged from smallest to largest.

Mode is the number that occurs most often.

Range is the largest number minus the smallest number.

Name ____________________

Date ____________________

MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 3: CONCENTRATION

Students in Mrs. Lorenzo's class decided to sell fruit drinks after school to raise money for a field trip. In order to know what flavors to sell, they surveyed the fifth grade to find out what flavors were their favorites. Here are the results.

Flavor	Cherry	Grape	Orange	Berry
Room 14				
Boys	4	3	2	8
Girls	7	2	1	3
Room 15				
Boys	3	2	2	7
Girls	6	3	0	5
Room 16				
Boys	6	3	0	7
Girls	6	2	2	5

Graph the results and answer the questions.

- Which flavor did the fifth grade prefer?

  ____

- Which flavor did the girls prefer?

  ____

- Which flavor did the boys prefer?

  ____

- Which flavors would you recommend selling after school? What are your reasons?

  ____
  ____
  ____
  ____

Bonus question: What percentage of the class preferred each flavor?

Cherry ______ % Grape ______ % Orange ______ % Berry ______ %

Name ___________________________________

Date ___________________________________

MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 4: FIZZ QUIZ

Rachel was interested in the reactions that produce carbon-dioxide gas. She wondered if there was some way to predict how much gas a reaction would produce. She did the series of seven experiments recorded below and measured the amount of carbon dioxide released by each one.

Baking soda	Calcium chloride	Carbon dioxide
1 spoon	1 spoon	800 ml
1 spoon	2 spoons	1600 ml
1 spoon	3 spoons	1600 ml
2 spoons	1 spoon	800 ml
2 spoons	2 spoons	1600 ml
2 spoons	3 spoons	2400 ml
3 spoons	1 spoon	800 ml

Based on Rachel's experimental results, answer the questions.

1. How many milliliters of gas would be produced if 3 spoons of baking soda reacted with 3 spoons of calcium chloride?

2. How many milliliters of gas would be produced if 2 spoons of baking soda reacted with 1.5 spoons of calcium chloride?

3. Rachel wanted to produce exactly 2000 ml of carbon dioxide. How much baking soda and calcium chloride should she use?

Name ____________________________

Date ____________________________

HOME/SCHOOL CONNECTION

INVESTIGATION 1: SEPARATING MIXTURES

Materials

Make a mixture known as oobleck. You will need

- 1 Mixing bowl
- 1 Spoon
- 1 Measuring cup
- Cornstarch
- Water

1. Put about a cup of cornstarch in the mixing bowl.
2. *Slowly* add water to make a mixture, stirring as you go.
3. When the starch is all wet, it will turn into oobleck.

Explore the properties of oobleck.

- Is it a solid or a liquid?
- What happens when you place solids, like coins or spoons, on the surface?
- What happens when you try to push your hand gently into the oobleck? When you try to push your hand hard and fast into the oobleck?
- Pick up a handful of oobleck. Can you hold it?
- Can you cut a ribbon of oobleck with scissors?
- What happens to the properties of oobleck when you change the amounts of the two ingredients in the mixture? More water? More cornstarch?

NOTE: If you want to keep oobleck to work with it another day, store it in a covered container in the refrigerator.

WARNING — This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

Name ______________________________

Date ______________________________

HOME/SCHOOL CONNECTION

INVESTIGATION 2: REACHING SATURATION

Did you know you can make your own silly putty right at home? Here's what you will need.

Materials

20 ml	White household glue (Colored glue won't work.)
5 ml	Saturated borax solution (See Step 1.)
•	Water
1	Plastic bag
•	Food coloring
2	Plastic cups or small jars (Baby-food jars work great.)

PROCEDURE FOR SILLY PUTTY

1. In a plastic cup mix 15 ml (1 tablespoon) of borax with enough water to dissolve it (about 40-50 ml). This will make a saturated solution.

2. In a separate plastic cup mix 20 ml (4 teaspoons) of white glue with 5 ml (1 teaspoon) of water and a few drops of food coloring.

3. Add 5 ml of the saturated borax solution to the cup of glue.

4. Mix the mixture for a few minutes and watch what happens.

5. Now test your silly putty for stretching, bouncing, newsprint transfers, and so forth. How long will it stretch? How high will it bounce? Record your observations and bring them to class.

6. Place the putty in a plastic bag to preserve it.

Name ___________________________________

Date ____________________________________

HOME/SCHOOL CONNECTION

INVESTIGATION 3: CONCENTRATION

You can grow some crystals in your home laboratory. Choose one of the approaches described below. Use safe laboratory procedures when working with chemicals.

ALUM OR EPSOM SALTS CRYSTALS

1. Evaporate an alum solution and save the crystals (see Step 3).
2. Prepare a supersaturated alum solution by dissolving alum in very hot water (close to boiling) until no more will dissolve. Cool the solution. Pour it into a jar.
3. Tie one alum crystal to the end of a thread. This is the seed crystal.
4. Hang the seed crystal in the jar of supersaturated alum solution and wait several days for the crystal to grow.
5. Remove the crystal, make another supersaturated alum solution, cool it, pour it into the jar, and put the crystal into the solution. Repeat this process for bigger and bigger crystals.

BLUING CRYSTALS

Materials

1/4 cup	Water
2 tablespoons	Bluing
2 tablespoons	Salt
2 tablespoons	Ammonia (without detergent)

1	Plastic cup or jar
•	Food coloring
1	Small lump of clay (if you use pipe cleaners)
•	Pipe cleaners, charcoal, sponges, or a paper-towel tube

1. Make a solution with the water, liquid bluing, salt, and ammonia.
2. Place a lump of clay on the bottom of the clear plastic cup or jar. Push three or four pipe cleaners into the clay. Put drops of food coloring on the tips of the pipe cleaners.
3. Pour the solution into the cup so that it covers the clay and all but 1 cm of the pipe cleaners.
4. Set the cup where it will not be bumped or disturbed. Crystals will start to form in a few hours.

NOTE: The solution may be poured over broken charcoal, sponges, or sections of cardboard paper-towel tubes instead of clay and pipe cleaners. Whichever material you use, part of it must extend above the surface of the liquid.

OBSERVATIONS

Draw and write about the crystals.