INV. 4 ACTIVITY—COMPARE TABLE SALT CRYSTALS

Focus Question: How do the crystals formed from evaporating dilute and saturated salt solutions compare?

In class we evaporated our saturated salt solutions and observed the unique salt crystals that formed…cube-shaped crystals with an "X" pattern in the center. If you evaporate a dilute salt solution, will the crystals look the same?

Materials:

- Salt
- Water
- Measuring cup
- Measuring spoons
- Teaspoon
- Aluminum foil
- Dinner plate
- Self-stick notes (2)

Instructions:

1. Use the measuring cup to measure ½ cup of water.
2. Use the measuring spoons to measure out 1 teaspoon of salt.
3. Add the 1 teaspoonful of salt to the ½ cup of water.
4. Use your teaspoon to stir the solution and dissolve the salt. This is your dilute salt solution.
5. Cut a strip of aluminum foil into two 4" x 4" squares of foil. Double fold (fold up twice) each side of the squares of foil to create small evaporation dishes.
6. Pour enough of the dilute salt solution into one of the dishes to cover the bottom of the dish.
7. Place this dish on a dinner plate. Leave room for the other dish.
8. Write "dilute salt solution" on a self-stick note and place the note on the plate below the dish.
9. Empty out the remainder of the dilute salt solution in the sink.
10. Measure out another ½ cup of water into the measuring cup.
11. Use the measuring spoon and teaspoon to make a saturated salt solution by adding a teaspoonful of salt at a time to the water, stirring the water until the salt dissolves, and then adding/stirring additional teaspoonfuls of salt until no more salt will dissolve into the solution.
12. Pour out enough of your saturated salt solution into the second aluminum foil evaporation dish to cover the bottom of that dish.
13. Place the dish on the dinner plate and label with a self-stick note ("saturated salt solution").
14. Place the dinner plate in an area that will remain undisturbed and allow the water to evaporate from the solution.
15. Compare the crystals that form. How are they the same? How are they different?

INV. 4 ACTIVITY—COMPARE SATURATION OF SOLIDS

Focus Question: Does it take the same amount of some common household solids to saturate a measure of water (60 mL)? How do they compare?

In class, we found that it takes different amounts of salt, Epsom salts, and citric acid to saturate 50 mL of water. What amounts of various household solids does it take to saturate a volume of water?

Materials

1 Liquid measuring cup, clear to measure 1/4 cup (60 mL)

1 Measuring spoon, 1 tsp (5 mL measure)

- Butter knife

3 Small spoon for stirring

3 Cups, plastic or glass, clear

- Salt
- Sugar
- Baking soda
- Water

Instructions

1. Collect the materials for this investigation, label the cups, and set up a data table in your science notebook. It could look something like this.

Trial	Salt	Sugar	Baking Soda
1			
2			
3			
Average			

2. Use the measuring cup to measure 1/4 cup of water. Pour it into one of the cups.
3. Use the measuring spoon to measure 1 teaspoonful of salt (5 mL).
4. Use the butter knife to level off the salt in the teaspoon.
5. Add the measured teaspoon of salt to the water. Use the small spoon to stir the solution.
6. Continue adding salt, one leveled teaspoonful at a time and stirring after each spoonful, until you get a saturated salt solution. (Look for undissolved salt crystals at the bottom of the cup.)
7. Record the number of teaspoons needed to saturate the 1/4 cup of water in the row for trial 1 for salt.
8. Empty the solution in the sink and rinse out the salt cup.
9. Start again and repeat Steps 2–7 for two more trials of salt. **Keep the last cup of salt water solution for Home/School activity 4B. Be sure the cup is labeled.**

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ACTIVITY—COMPARE SATURATION OF SOLIDS (Continued)

10. Average the amount of salt needed across the three trials.
11. Repeat the experiment for sugar and baking soda.

    Be sure to save the last sample of each solution you make so you can use those solutions in the next Home Activity—Compare Different Crystals. Make sure the cups are labeled with the type of solution.

12. Compare the average amounts of each substance.
13. Which substance required the least amount to saturate 1/4 cup of water?
    Which substance requires the most amount to saturate 1/4 cup of water?
14. What information does your data tell you?
    Which substance is the most soluble in water?
    Which substance is the least soluble? How do you know?

Important Note: If you are going to do the next **At-Home Activity—Compare Different Crystals**, be sure to save the last sample of each of your saturated solutions.

INV. 4 ACTIVITY—COMPARE DIFFERENT CRYSTALS

Focus Question: How do the crystals formed from different saturated solutions compare?

Compare the crystals formed when different saturated solutions evaporate.

Materials

- Saturated solutions from the previous Home Activity or the following materials
- Salt, baking soda, and sugar
- Water

1 Measuring cup (1/4 cup)

1 Measuring spoon, 1 teaspoon (5 mL)

- Clear cups and small stirring spoon
- Aluminum foil or small plastic or metal lids from storage containers
- Self-stick notes (3)
- Dinner plate

Instructions

1. If you saved some of the saturated solutions from Home/School 4A, skip to Step 7. Otherwise, make a saturated solution of each substance following Steps 2– 3.
2. Use the measuring cup to measure 1/4 cup of water.
3. Use the teaspoon to make a saturated salt solution by adding 1 teaspoon of salt at a time to the water, stirring until the salt dissolves, and then adding/stirring additional teaspoons of salt until no more salt will dissolve into the solution.
4. Pour the solution into a cup so you can reuse the measuring cup.
5. Wash out the measuring cup.
6. Repeat the process to make saturated solutions of sugar and another of baking soda.
7. Cut a strip of aluminum foil into three 4" x 4" squares of foil. Double fold (fold up twice) each side of the squares of foil to create small evaporation dishes. Or use small lids.
8. Pour enough of each saturated solution into separate dish or lids to cover the bottom of the dish.
9. Place this dish on a dinner plate.
10. Label each dish with a self-stick note ("saturated salt solution", "saturated sugar solution", and "saturated baking soda solution").
11. Place the dinner plate in an area that will remain undisturbed and allow the water to evaporate from the solutions. **Wait for several days for the water to evaporate.**
12. Compare the crystals that form. How are they the same? How are they different? Did they take the same amount of time to form?
13. Draw the crystals in your science notebook and write a description of each.

INV. 4 ACTIVITY—CLEAN UP AN OIL SPILL

Focus Question: What is the best way to clean up an oil spill using household materials?

Oil spills can be huge environmental disasters. Not only do they pollute the water and any shorelines they come in contact with, but they can kill wildlife and destroy their homes. Your challenge is to design ways to clean up oil with regular household materials. Remember it is just as important to contain the spread of the oil spill as much as the actual clean up. You might want to research oil spills for inspiration first before you begin your engineering challenge.

Materials

- Plastic tub
- Vegetable oil
- Tablespoon
- Water
- Household items that you think will help you contain the spill, absorb the spill, or remove the spill.

Instructions

1. Research oil spills on the Internet and find out how they occur, what scientists do to contain the spills, and what they do to clean up the spills.
2. Get a plastic tub or basin and fill it halfway with water.
3. Pour one tablespoonful of vegetable water into the water.
4. Observe the oil spill for a few minutes. How does it interact with the water?
5. Based on your research and observations, design a way to contain and then clean up the spill.
6. Record your trials and how successful they are. You might want to create a table to record your results like this.

Materials	Drawing of how it is used	Observations: how it interacts with oil	How effective are the materials?

7. Try other materials, or combination of materials, and record how they interact with the oil spill.
8. Which materials were effective in containing and cleaning up the oil spill?
   What properties of those materials made them effective?
   How are the household materials you used similar to successful materials used in environmental oil spills?

INV 4. ACTIVITY—SATURATION MEDIA RESOURCES

Online Resources on FOSSweb (Must log in to FOSSweb with username and password.)

Use these online resources to help review content from **Investigation 4 of Mixtures and Solutions**. The tutorials and virtual investigations provide interactive resources that review concepts from the FOSS active investigations. The virtual investigations often mimic the active investigations that were done in class.

For the articles in *FOSS Science Resources*, access the interactive eBook and make sure to click on the interactive links within the readings. Be sure to take notes on what you learn from all online resources and answer the questions from the articles in your science notebook.

Investigation 4 Resources

Online Activities

- **Tutorial**—Saturation
- **Virtual Investigation**—Solubility

Media Library

- **eBook readings (Interactive eBook)**
  - The Bends
  - A Sweet Solution
  - Sour Power
  - East Bay Academy for Young Scientist*s*
  - Drinking Ocean Water
  - Creative Solutions