

## INV. 3 ACTIVITY—SENSING CONCENTRATION

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**Focus Question:** How weak can you make a soft drink and still smell it or taste it?

In class we observed dilute and concentrated soft drink solutions and found that more dilute solutions are lighter in color and taste less sweet than a more concentrated solution of the same soft drink mix. If we make weaker and weaker solutions of a soft drink mix (more and more dilute), will there be a point where we can no longer smell the soft drink mix or taste it?

### Materials:

- Soft drink mix presweetened with sugar (not lemonade)
- Water
- Measuring spoons (tablespoon measure)
- Drinking glasses (clear glass or plastic if you have them)
- Self-stick notes

### Instructions:

1. Prepare a soft-drink solution according to the recipe on the container. If the container provides a 1-glass (or 1-serving) recipe, use that.
2. If you had to make a larger recipe, pour out a glass of the solution into a drinking glass. Label this solution “full strength solution” with a self-stick note.
3. Smell and taste it. Record your observations in your science notebook. Include drawings of what your solution looks like.
4. Dilute your solution 1 to 10 (1:10). Here’s how. Use the measuring spoons to measure out 1 tablespoonful of your drink solution into another clear drinking glass. Add 10 tablespoonfuls of water to this glass. Label this glass “1:10 solution”.
5. Smell and taste this solution. Record your observations in your science notebook. How does this solution compare to the full-strength solution?
6. Dilute your 1:10 solution into another clear drinking glass. Measure out 1 tablespoonful of solution and add 10 tablespoonfuls of water. Label this solution 1:100 on a self-stick note.
7. Smell and taste this new solution. Record your observations in your science notebook. How does this solution compare to the full-strength solution?
8. Continue diluting your solutions 1 to 10 following the same process until you discover you can no longer smell and taste the solution. This is the threshold of flavor for the soft drink mix.

**Extension:** Is the threshold of flavor the same for all soft drink mixes? Test other soft drink mixes following the same process and find out.

# INV. 3 ACTIVITY—LAYERING SOLUTIONS BOTTOM UP

**Focus Question: How does salt concentration affect how salt solutions will layer up?**

In class, you were given salt solutions of different concentrations and you needed to find out how to layer them in a straw when you put the different solutions down from the top of the straw. You determined that the most concentrated salt solution would sink to the bottom and the least concentrated salt solution would float on top of more concentrated because it is less dense. In this investigation, you will be adding salt solutions from the bottom of the straw. Will salt solutions behave in the same way as they did in class?

## Materials:

- Liquid measuring cup, at least 2 cup capacity
- 3 containers such as coffee mugs
- Spoon for stirring
- Teaspoon for measuring food coloring
- Table salt (sodium chloride)
- Water
- Food coloring
- Clear straws
- Cup for waste water
- Coffee filters (optional)
- Funnel

## Instructions

1. Measure 1 cup (250 mL) of water into the measuring cup.
2. Create a saturated salt solution in the measuring cup with the salt. Use the spoon to mix the salt into solution.
3. If there is a lot of salt left at the bottom of your solution after you reach saturation, filter the solution so that there are no solid salt crystals in the solution. Your family can help you with this.
4. Divide the solution equally into two mugs (125 mL in each mug).
5. Dilute the solution in one mug with an equal amount of water. For example, if you have  $\frac{1}{2}$  cup of salt solution to start, add  $\frac{1}{2}$  cup of water to the mug. After the solution is mixed, pour off half of it so you have only  $\frac{1}{2}$  cup of this solution (125 mL).
6. Put plain water ( $\frac{1}{2}$  cup or 125 mL) into the third mug.
7. Use the food coloring to dye one solution red, one blue, and the last one green. Use about  $\frac{1}{2}$  tsp of food coloring to each  $\frac{1}{2}$  cup of solution (125 mL). **Be careful in using the food coloring as it stains.**
8. Use a straw to try to layer the salt solutions like we did in class. Here's how.
  - a. Put a straw straight up and down part way into one solution.
  - b. Put your finger over the top opening of the straw and lift the straw out of the solution. You should see a volume of salt solution in the straw when you draw it out.
  - c. Put this same straw into a different solution. This time keep your finger on top of the straw until just before you dip it into the second solution. Then put your finger back over the top of the straw.
  - d. Does this second solution layer at the bottom of the straw or not?
  - e. Try to layer the three solutions in the straw.
  - f. In what order did you have to successfully layer the three solutions?
9. Why do you think the solutions layered (or didn't layer) the way they did?

# INV. 3 ACTIVITY—DIET AND REGULAR COLA DENSITY

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**Focus Question:** How does the density compare between diet and regular cola?

**Materials:**

- 1 12-oz. can of diet cola
- 1 12-oz. can of regular cola
- Large tub, basin, or sink
- Water

**Instructions:**

1. Fill the tub or sink with water.
2. Place the two cans of cola into the tub at the same time.
3. Observe. What do you notice?
4. Draw what you see in your science notebook.
5. Develop a model to explain why the two cans of cola do not behave the same way when placed in water. (Hint: Look at the list of ingredients for the two types of cola.)

# INV. 3 ACTIVITY—CONCENTRATION MEDIA RESOURCES

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

Use these online resources to help review content from **Investigation 3 of Mixtures and Solutions** at the end of the Investigation. 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 3 Resources:

### Online Activities

#### • Tutorials

- *Concentration*
- *Density*

#### • Virtual Investigations:

- *Saltwater Concentration*

### Media Library

#### • eBook readings (Interactive eBook)

- Solutions Up Close
- Concentrated Solutions
- The Air
- Famous Scientists
- Carbon Dioxide Concentration in the Air
- The Frog Story

#### • Streaming Videos

- *Why Are Oceans Salty?*