

# Sugar Sheriffs

## *A lesson from the New Jersey Agricultural Society Learning Through Gardening Program*

Grades: 3-5

Overview: Students will experiment to see which beverages they drink contain the most sugar. At the same time, they will learn the differences between volume and density.

Objectives: The student will be able to:

- Define density
- Explain the difference between density and volume
- Compare the sugar content in popular drinks based on their density
- Read nutrition labels to determine the sugar content of drinks.
- Calculate the number of grams in sugar cubes



### Materials:

*per group:* procedure sheet, sugar cubes, measuring cup, funnels, 4 clear plastic cups, copies of beverage nutrition labels, and sample beverages, such as cola, grape drink, juice box, orange drink, and milk

*per student:* lab sheet and data sheet

*per class:* 1 clear plastic drink pitcher filled  $\frac{3}{4}$  with water, 1 can diet cola, 1 can regular cola

### Introduction:

Ask students, "What do you drink when you are thirsty?" Ask them, "How do these drinks keep your body healthy?" and "Why are some drinks healthier than others?"

Lead students to discuss the calcium, sugar, and vitamin content of different beverages.

Ask students if they have ever heard of the word 'density.' Explain that density is how much matter is contained in a given space. If there is a lot of matter in the space the density is high. If there is less matter in that space the density is low. Use the classroom as an example. Have the students stand all around the room without touching each other, then have them stand as close together as possible. The density of the group increased when they put themselves in to the smaller space. A golf ball has a greater density than a ping pong ball because there is more matter in the same amount of space. Liquids can have different densities as well. Ask the students if they can think of any liquids that might have a higher density than another (maple syrup/honey/corn syrup). What do these have in common? Lead students to answer 'sugar.'

Show the class the container of regular cola and diet cola. Have them check the labels for volume. Both are the same. Ask the students if they think the cans will sink or float. Using the plastic pitcher, drop the cola into the water. Repeat with the diet cola. Ask students what happened to the two cans. (The cola sinks and the diet cola floats.) Ask students why the regular cola sank. They should respond that the sugar increased its density.

Explain to the students that they are going to conduct an experiment to compare the sugar content in popular drinks to that of milk and then read nutrition labels to support their findings.

### Procedure:

1. Divide the students into small groups. Students fill their 4 test glasses with  $\frac{1}{4}$  cup of milk.
2. Students measure  $\frac{1}{8}$  cup of a beverage sample.
3. Place the funnel into the first test glass of milk.
4. Slowly pour the beverage onto the side of the funnel. Watch carefully as the beverage flows from the bottom of the funnel. (The sugary beverage should sink to the bottom of the milk.) Have students record what they see on their lab sheets.

5. Repeat steps 2-4 with the other beverages.
6. As a team, students are to decide if the drink contained more sugar than the milk, and estimate how many teaspoons of sugar are contained in ONE serving of that drink. They will place 2 sugar cubes (for every teaspoon of sugar) in front of each cup to show how much sugar they think is in that beverage.
7. After students have made all their predictions, show students the nutrition labels from the beverages to evaluate the sugar, calcium, and vitamin C content in each beverage. Students record their findings on their lab sheets.
8. Have students write their conclusions regarding this experiment and conclude which drink is healthiest and why.

*Teacher note: Labels may show that some sugary drinks contain vitamin A, vitamin C, calcium, and iron. Manufacturers may include additional nutrients on a voluntary basis.*

### Evaluation:

Students can explain the difference between volume and density.

Students can answer the question, "How can you use nutrition labels to select healthy beverages?"

Students can write a paragraph explaining their conclusions of the experiment.



# Sugar Sheriffs Procedure Sheet

1. Mark your cups 1 through 4.
2. Measure  $\frac{3}{4}$  cup of milk into each of your clear plastic cups.
3. Insert a funnel into cup #1.
4. Measure  $\frac{1}{8}$  cup of cola.
5. Very slowly pour the cola onto the side of the funnel.
6. Observe what happens as the cola flows through the funnel.
7. Repeat steps 3-6 for each of your other beverages. Watch carefully as the beverage flows through the funnel.
8. Look (from the side) at each of the cups. What do you notice? Record what you see under Observations on your lab sheet.
9. Discuss with your team the amount of sugar in teaspoons that are in a single serving of each beverage. Record this estimate on your data sheet. Divide your predicted number of teaspoons by 2 to get the predicted number of cubes. *Two sugar cubes = one teaspoon of sugar.* Place the appropriate number of sugar cubes in front of the cup. Multiply your prediction in cubes by 2, to figure your prediction in grams. Write your prediction on your data sheet.
10. Read the nutrition labels from the beverages. Record the actual number of grams of sugar on your data sheet and compare that amount to your prediction.
11. Continue reading the nutrition label and record the calories, the amount of calcium, and the amount of vitamin C in each beverage.
12. What can you determine from this investigations. Write your conclusion on your lab sheet.

# Sugar Sheriffs Lab Sheet

## Which drinks contain more sugar than milk?

*Your task is to determine which of your favorite beverages contain more sugar than milk. You will then read nutrition labels to decide if your predictions were correct. This experiment will provide you with information that should help you make healthier beverage choices.*

**Problem** Write the question you are trying to answer.

**Hypothesis** Write what you think the answer will be and why.

**Materials** List the materials you will use during your experiment.

**Procedures** Write the steps you took to complete the experiment.

**Observations** What did you see happen when the liquids were poured together?

**Conclusions** How will this information help you make healthier beverage choices?

Name \_\_\_\_\_

## Sugar Sheriffs Data Sheet

**Hypothesis:** How much sugar do you think one serving of each beverage contains?

<b>Beverage</b>	<b>Predicted number of teaspoons of sugar per serving</b>	<b>Multiply the number of sugar cubes by 2 to figure the predicted number of teaspoons per serving</b>	<b>Multiply each teaspoon by 2 to find the predicted number of grams of sugar per serving</b>	<b>Actual number of grams of sugar per serving</b>
<b>Cola</b>				
<b>Grape drink</b>				
<b>Fruit punch</b>				
<b>Juice box</b>				
<b>Milk</b>				

Record the facts from the nutrition labels.

<b>Beverage</b>	<b>Sugar in grams</b>	<b>Calories</b>	<b>Calcium</b>	<b>Vitamin C</b>
<b>Cola</b>				
<b>Grape drink</b>				
<b>Fruit punch</b>				
<b>Juice Box</b>				
<b>Milk</b>				