Lab: Percent Composition of Bubble Gum

FOR THE TEACHER

Summary
In this lab, students will be introduced to the concept of percent composition. Students will determine the amount of sweetener in various brands of gum by determining the mass difference of the gum before and after it is chewed.

Grade Level
High school

Objectives
By the end of this lesson, students should be able to
• define percent composition.
• calculate percent composition.

Chemistry Topics
• Quantitative Chemistry
• Percent Composition

Time
Teacher Preparation: 30 minutes
Lesson: 45 minutes

Materials
• Sugarless gum (one piece per student)
• Regular gum (one piece per student)
• balance
• wax paper/gum wrapper
• timer
• lab handout

Safety
• Food should never be consumed in a lab setting, make sure the activity is carried out not in a lab setting.

Teacher Notes
• Chapter 10.3 in the Prentice Hall Chemistry book will assist the student and teacher in learning about percent composition.
• It would be helpful for the teacher to discuss exactly what percent composition is and how to solve for it before he/she begins the lab.
• Students should not mix gums; measure and chew one piece at a time.
• For an advanced chemistry setting, the teacher may require the students to chew each piece 25 times then weigh the gum, chew for another 25 times then weigh the gum, etc. until 625 chews are reached.
For a lower level chemistry setting, the teacher may have more information already listed on the lab sheet to help guide the students through the lab more thoroughly.

**Cross-Disciplinary Extensions**

**Connect to Math**
(For the advanced chemistry group) Have the student draw a graph that plots the mass as a function of a number of chews as shown below. Do not draw a straight line between the dots but draw a curved line that will best approximate your data points. This will show the trend of the data and not tiny errors in measuring.

<table>
<thead>
<tr>
<th>Mass In grams</th>
<th>Number of Chews</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Connect to Social Studies, Reading, and Writing**
Have students research the history of chewing gum and write a report on the history.

**FOR THE STUDENT**

**LESSON**

**Percent Composition of Bubble Gum Lab**

**Background**
Percent composition is a common laboratory procedure that is used to identify a substance. In this lab we will assume that bubble gum has two components, “sugar” and “everything else.” “Everything else” is insoluble and is what will be left behind once you chew the gum and dissolve the sugar. So you will be able to calculate the percent of sugar in the gum, as well as the number of moles of sugar in the gum.

**Equipment**
- 2 sticks of gum (regular & sugarless)
- balance
- piece of wax paper OR gum wrapper
- lab sheet
- pencil
- timer

**Safety**
- Food should never be consumed in a lab setting; this activity should not be carried out not in a lab setting.

**Procedure**
1. Collect two sticks of gum (one regular and one sugarless) and a balance.
2. Set your balance to zero.
3. Unwrap your regular piece of gum but DO NOT CHEW IT YET! Place the gum wrapper on the scale and make sure that it does not show a mass (zero the balance).

4. Now place your unchewed piece of gum on the balance and record the mass in the data table below.

5. Next, place the piece of gum into your mouth and chew it for five minutes (set your timer!).

6. After five minutes, take the gum out of your mouth and place it back on the gum wrapper on the balance, weigh it and record the mass in the data table.

7. Now take the sugarless gum and complete steps 3-6 again.

8. Complete the data table below. Use the percent composition equation for guidance.

### Data Table

<table>
<thead>
<tr>
<th>Gum Sample</th>
<th>Mass of Unchewed gum (g)</th>
<th>Mass of Chewed gum (g)</th>
<th>Mass of Sugar in gum (g)</th>
<th>Percent Composition of Sugar in Gum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.) Regular Gum</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.) Sugarless Gum</td>
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<td></td>
</tr>
</tbody>
</table>

### Equation

To calculate Percent Composition you will use the following equation:

\[
\text{Percent Composition} = \frac{\text{Mass of the Sugar}}{\text{Total mass of the gum}} \times 100
\]

### Analysis

1. How did the percent composition of your two (regular and sugarless) gum samples compare to each other?

2. Sugar’s chemical formula is \( \text{C}_{12}\text{H}_{22}\text{O}_{11} \). What is the mass of one mole of sugar? In other words, find the molar mass of the sugar.

3. How many moles of sugar were present in your group’s regular gum?

\[
\frac{\text{Mass of sugar in regular gum}}{\text{1 mole}} = \text{answer}
\]

\[
\text{Molar mass of sugar}
\]