Lab: Mass Percent

FOR THE TEACHER

Summary
In this lesson, students will develop a theory of how to calculate percent composition using household items such as lentils and beans.

Resource Type Lab Grade Level Middle school

Objectives
By the end of this lesson, students will
• Have a better understanding of mass percent.

Chemistry Topics
This lesson supports students' understanding of
• Percent composition

Time
Teacher Preparation: 15 minutes
Lesson: 50 minutes (one class period)

Materials
For each group:
• Cup of legumes (a mixture of beans and lentils)
• Balance
• Calculator

Safety
No specific safety precautions need to be followed.

Teacher Notes
I thought it was easy to do with the students, no safety precautions necessary, and it’s a good activity that helps them develop scientific inquiry skills.

FOR THE STUDENT

Student Activity Sheet: Mass Percent Lab

Lesson

Background
The percent composition of a component in a compound is the percent of the total mass of the compound that is from a specific component. Percent compositions, or mass percent, exist in many aspects of daily life. For example, FDA requires that nutrition labels list food as a percent of the recommended daily value. On all
nutrition labels, a known serving size is broken down in five categories: total fat, cholesterol, sodium, total carbohydrate, and protein. The mass of each category that is in the food, except protein, is converted to a percent of daily value—what part of a person’s total suggested serving is in the one serving size in the container. These calculations are based on the masses of each category recommended per day per person who has a 2,000 Calories diet.

For a chemistry example, consider the compound NaCl. You know that there is one atom of sodium for every one atom of chlorine, but that doesn’t mean that 50% of the compound by mass is sodium. You need to know the mass of sodium and the mass of chlorine to make that calculation.

Problem
How is percent composition calculated?

Prelab Questions
Obtain a sample of beans and lentils. Talk with your lab partner and answer the following questions:

a. What information will you need to calculate the mass percent of each component?
b. How will you get that information?
c. What materials do you need? Why?
d. Your sample contains a mixture of beans and lentils. Predict which you think has the higher mass percent. Why?

Procedure
Create a procedure for your experiment and write it below. Why do you think that this procedure will be appropriate?

Data
Create a data table to record the information that you gather. Make sure to label all numbers with correct units.

Calculations
What is the mass percent of beans in your mixture? What is the mass percent of lentils? Show all work (including sig figs and labels).

Analysis
1. Which substance had the highest mass percent? Was your prediction correct?
2. Would changing the amount in the original sample change the results? Why?
3. What are the possible sources of error in your lab?
4. Would you change your procedure if you were to repeat the experiment? Why?