

**Pre-AP Chemistry/Chemistry**  
**Unit 11—Solutions**  
**Molarity of Kool-Aid**

### Introduction

Have you ever thought of the importance of solutions? Even if you haven't, the fact is that solutions are all around you. They are even inside of you; you and all other organisms are composed of cells containing solutions that support life. You inhale a solution when you breathe. You are immersed in a solution whether standing in a room or swimming in a pool.

You have learned about the process of solvation and the factors that affect solubility. The concentration of a solution is a measure of how much solute is dissolved in a specific amount of solvent or solution. Concentration may be described qualitatively using the words concentrated or dilute. In general, a concentrated solution contains a large amount of solute. Conversely, a dilute solution contains a small amount of solute.

### Purpose

In this lab, you will determine the concentration of several samples of Kool-Aid.

### Pre-Lab

1. Calculate the molar mass of sugar,  $C_6H_{12}O_6$ .
2. How many moles of sugar are in 2 grams?
3. How many moles of sugar are in 6 grams?
4. How many moles of sugar are in 12 grams?

### Procedure

1. Label three cups as the following: Cup 1, Cup 2, Cup 3.
2. Add the following amounts of Kool Aid to the correct Cup.

Cup 1	2 grams
Cup 2	6 grams
Cup 3	12 grams

3. Add 100 mL of water to each cup.
4. Stir the Kool Aid.
5. Observe solutions. Record observations in the data table
6. Taste solutions. Record observations in the data table.
7. Dump waste and leftovers into the laboratory sinks.
8. Wash out plastic cups.

### Calculations

1. How many liters of water were placed into each cup?
2. How many moles of water were placed into each cup?
3. If the density of sugar is 1.54 grams per milliliters, what is the volume of sugar in each cup?
4. Calculate the Molarity for each cup of Kool Aid produced in the laboratory.
5. Calculate the mass percent of sugar for each cup of Kool Aid produced in the laboratory.
6. Calculate the volume percent of sugar for each cup of Kool Aid produced in the laboratory.
7. Calculate the molality of sugar for each cup of Kool Aid produced in the laboratory.
8. Calculate the mole fraction for sugar for each cup of Kool Aid produced in the laboratory.
9. Calculate the mole fraction for water for each cup of Kool Aid produced in the laboratory.

### Analysis/Conclusion

1. In the experiment, which is the solute?
2. In the experiment, which is the solvent?
3. Which concentration that you tested was closest to the ideal concentration of the Kool-Aid for you?
4. What was wrong with the other solutions that you made for the experiment?
5. How is taste related to concentration? Explain your reasoning.