

The Stoichiometry of Cooking:

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Students' Guide

Goals

- To understand the meaning of stoichiometry
- To relate to chemistry via everyday phenomena so that new concepts are better internalized

The Activity

In this activity, the importance of stoichiometry is emphasized by showing the effect of changes in ingredients on a final product. The analogy to stoichiometry deals with relative amounts of ingredients, with measurement of weights and volumes, and with the analysis of the chemistry that is involved in baking.

Materials for Each Group

- Plastic ware for weighing, measuring, and mixing
- A tray with six muffin tins
- 6 cake trays
- 240 g (1 cup) sifted flour
- 180 g (3/4 cup) sugar
- 10 g (2 teaspoons) baking powder
- 60 ml (1/4 cup) shortening
- 1.25 g (1/4 teaspoon) salt
- 120 ml (1/2 cup) milk
- 2.5 ml (1/2 teaspoon) vanilla
- 2 eggs
- Favorite frosting

SAFETY

Never eat in the laboratory! If you want to eat the cakes, make them in the kitchen (out of the lab), in chemical-free vessels.

Use a new balance or a kitchen balance instead.

The Stoichiometry of Cooking: Students' Guide, page 2

Instructions

Follow the instructions and make your own cupcakes. Make sure that you know the variation in your recipe.

Before You Bake

When you bake at home you use measuring cups. Here, you weigh the ingredients in grams. Why? What can you learn from the gram weight of the ingredients? _____

Pour a little batter into a plastic cup and measure its pH: _____

Is the batter acidic or basic? Why? _____

Easy Cupcakes

What You will Need:

- 240 g (1 cup) sifted flour
- 180 g (3/4 cup) sugar
- 10 g (2 teaspoons) baking powder
- 60 ml (1/4 cup) shortening
- 5 g (1/4 teaspoon) salt
- 120 ml (1/2 cup) milk
- 2.5 ml (1/2 teaspoon) vanilla
- 2 eggs
- Favorite frosting

Recipe:

1. Preheat the oven to 350 degrees Fahrenheit.
2. Sift all dry ingredients and set aside.
3. Measure all liquid ingredients, and combine in a separate container.
4. Combine dry and wet ingredients in a large mixing bowl.
5. Blend for 1/2 minute on low speed, scraping the sides of the bowl constantly.
6. Beat an additional three minutes on high speed, again scraping the bowl occasionally.
7. Place cupcake papers in muffin tins, and pour the batter into the cups, filling them halfway up to the top.
8. Bake for 20-25 minutes.
9. Cover with favorite frosting after it cools.

The Stoichiometry of Cooking: Students' Guide, page 3

After You Bake

Fill in the following table about properties of the cake:

Property	Description
Moisture	
Texture	
Consistency	
Height	
Taste	

Explain your results: _____

Summary

Define stoichiometry: _____

How does baking stoichiometry affect your cake product? _____

