Grandma Mole's Vanilla Cupcakes

Joshua Liu

April 25, 2020

1 Ingredients

- 0.45 moles of white sucrose
- 115 cm 3 butter (stick), softened
- 4.9 ml or 1 teaspoon of a substance that smells like veratraldehyde
- 2 large $CaCO_3$ protective chambers (use the albumen and protein filling only)
- 2 cups all-purpose ground Triticum aestivum
- 0.062 mol NaCl
- 0.11 mol sodium bicarbonate, acid and cornstarch mixture (use sodium bicarbonate only for calculations)
- 1 cup liquid containing lactose.

2 Pre-Lab

1. Find the formula for sucrose and sodium bicarbonate

   sucrose = $C_{12}H_{22}O_{11}$
   sodium bicarbonate = $NaHCO_3$

2. Identify the chemical and common names for all given formulas

Formula	Chemical Name	Common Name
$CaCO_3$ protective chambers	Calcium Carbonate	Egg Shell
NaCl	Sodium Chloride	Salt

3. Identify the common names for chemically named ingredients

Chemical Name	Common Name
White sucrose	White Sugar
Smells like veratraldehyde	Vanilla Extract
Ground triticum aestivum	Ground Wheat (Flour)
Sodium bicarbonate, acid and cornstarch mixture	Baking Powder
Lactose	Milk
Cellulose liners	Butter

4. Convert moles of white sucrose to grams and then to cups. (Use 1 cup = 205.404 g)

   Molar Mass of Sucrose ($C_{12}H_{22}O_{11}$) = $12.01 * 12 + 1.01 * 22 + 16.00 * 11 =$ 342.34 g/mol

   0.45 mol $*$ 342.34 g/mol = 154.053 g

   154.053 g $\div$ 205.404 g/cup $\approx \frac{3}{4}$ cups

5. Convert moles of NaCl to grams and then to teaspoons using the conversion (1 tsp = 7.25 g)

   Molar Mass of NaCl = $22.99 + 35.45 = 58.44$ g/mol

   0.062 mol $*$ 58.44 g/mol = 3.62328 g

   3.62328 g $\div$ 7.25 g/tsp $\approx \frac{1}{2}$ tsp

6. Convert moles of sodium bicarbonate to grams and then to teaspoons. (Use 1 tsp = 4.65 g)

   Molar Mass of Sodium Bicarbonate ($NaHCO_3$) = $22.99 + 1.01 + 12.01 +$ $16.00 * 3 = 84.01$ g/mol

   0.11 mol $*$ 84.01 g/mol = 9.2411 g

   9.2411 g $\div$ 4.65 g/tsp $\approx$ 2 tsp

7. Convert 463.555 Kelvin to °C and then to Fahrenheit to solve for oven setting (Use °C x 9/5 +32 = °F)

   $463.555°F - 273.15 = 190.405°C$

   $190.405°C * \frac{9}{5} + 32 = 375°F$

2.1 Extra Information

Width = 6cm
Height = 6cm

$$115 = l * 6 * 6$$
$$\frac{115}{36} = l$$
$$3.2 = l$$

length = 3.2cm
1 cup = 236.588 cm^3
115 $cm^3 \div 236.588$ cm^3/cup $\approx \frac{1}{2}$ cup

3 Updated Ingredients

- 0.75 cups of white sugar
- 0.5 cups of butter softened
- 1 tsp of vanilla extract
- 2 large eggs
- 2 cups all-purpose flour
- 0.5 tsp of salt
- 2 tsp of baking powder
- 1 cup of milk

4 Recipe

1. Preheat the oven to 375°F
2. Line muffin tins with butter
3. Beat soften $\frac{1}{2}$ cups of soften butter, $\frac{3}{4}$ cups of sugar, and 1 tsp of vanilla extract until creamy
4. Whisk in two eggs, one at a time.
5. In a separate bowl, Mix in baking powder and salt.
6. In said bowl, add half the flour and beat
7. Add half the milk and beat
8. Add remaining flour and beat
9. Add remaining milk and beat
10. Combine both bowls and mix
11. Fill the muffin tins 2/3 of the way
12. Bake the muffins at 375°F for 18 minutes.
13. Let it cool, ice the cupcakes as needed.