

Chemistry Cookie Project –Chocolate Chip

- In this lab you will be converting a recipe from moles to standard cooking measurements and then using that recipe to bake some cookies!
- You will need the following tables in order to convert your recipe:

Molecular Formula Table

Use the following molecular formulas to calculate grams of ingredients.

NOTE: Most of these substances have extremely complex molecular formulas. I have greatly simplified your project by listing a representative formula only.

Anise	$C_{10}H_{12}O$
Baking Soda	$NaHCO_3$
Baking Powder	$NaHCO_3$
Brown Sugar	$C_{12}H_{22}O_{11}$
Butter	$C_9H_{14}O_6$
White (Cane) Sugar	$C_{12}H_{22}O_{11}$
Chocolate	$C_4H_8O_4$
Cinnamon	C_9H_8O
Cloves	$C_{10}H_{12}O_2$
Cream of tartar	$KHC_4H_5O_6$

Flour	$C_4H_8O_4$
Lemon Juice (extract)	$C_6H_8O_7$
Margarine	$C_9H_{12}O_6$
Milk	85% H_2O 15% $C_9H_{14}O_6$
Molasses	$C_{12}H_{22}O_{11}$
Pepper	$C_{17}H_{19}O_3N$
Salt	$NaCl$
Vanilla	$C_8H_8O_3$
Eggs	$C_6H_{12}O_3N_2$

Unit Conversions

Use the following conversions to get from grams to a standard cooking unit of measure.

1 teaspoon of baking soda = 2.84g
1 teaspoon of vanilla extract = 4.73g
1 large egg = 50g
1 cup flour = 141.95 g
1 teaspoon salt = 4.16 g
1 cup butter = 236.59 g
1 cup sugar = 198.73 g
1 cup brown sugar = 141.46 g
1 ounce chocolate chips = 28.35 g
1 tablespoon lemon juice = 14.20 g
1 teaspoon baking powder = 2.84 g

1 teaspoon cream of tartar = 2.84 g
1 teaspoon cinnamon = 2.84 g

Chocolate Chip Cookies

Yield: 4 Dozen 2-1/2 inch Cookies

Ingredients:

2.66 mol flour	0.31 mol packed brown sugar
0.0335 mol baking soda	0.624 mol eggs
0.036 mol salt	0.062 mol vanilla
1.084 mol butter (at room temp)	2.82 mol Chocolate Chips
0.44 mol sugar	

Conversion Instructions

Begin by converting moles to grams for each ingredient and record the grams in the table below. Next, convert the number of grams to your final baking measurement; again record the measurements in the table below. Complete all of your calculations on the "Cookie Calculations" sheet. Attach your calculation to this sheet when you turn in the lab.

Baking Instructions:

Preheat oven to 375°F. Stir flour with baking soda and salt; set aside. In large mixer bowl, cream butter with sugar, brown sugar, eggs and vanilla. Gradually blend dry mixture into creamed mixture. Stir in the Chocolate Chips. Drop tablespoon of dough per cookie onto ungreased cookie sheets. Bake at 375°F for 9 to 11 minutes or until golden brown.

Ingredient	Grams	Baking Measurements	Ingredient	Grams	Baking Measurements
Flour			Brown sugar		
Baking soda			Eggs		
Salt			Vanilla		
Butter			Chocolate Chips		
Sugar					

- Calculate the conservation of mass in grams (total weight of ingredients compared to finished product).

Total weight of the ingredients = _____ (total of grams from table above)

Weight of 6 cookies = _____ Total weight of all baked cookies = _____

- Your baked cookies should weigh less than the ingredients total. Why does seem like your cookies do not follow the conservation of mass?
- Give one example of a chemical change and a physical change.

