

# C is for Cookie

## Summary

Students make cookies and, in the process, review the organization of the periodic table, utilize conversion factors, and observe some of the chemical and physical reactions involved in cooking.

## Main Core Tie

Science - Chemistry

[Standard 3 Objective 2](#)

## Time Frame

1 class periods of 90 minutes each

## Group Size

Small Groups

## Materials

- [student sheet](#)  
(attached)
- Plastic sheeting
- Tape
- Parchment paper
- Dishrags (1 per group)
- Baking tray (1 per 2 lab groups)
- Mixing bowl (1 per lab group)
- Mixing spoon (1 per lab group)
- Measuring spoons (1 set per lab group)
- Butter (15 T)
- Sugar (40 T)
- Egg substitute (14 T)
- Vanilla (22 t)
- Flour (2.58 c)
- Cream of Tartar (1/4 t)
- Baking soda (2 t)
- Salt (1/2 t)
- Cinnamon (1/2 t)
- Molasses (3T)
- Oats (3/4 c)
- Raisins (1/4 c)
- Baking powder (1/8 t)
- Brown sugar (2 T)
- Milk (1/2 t)
- Chocolate chips (1/2 c)
- Peanut butter (1.5 c)

## Background for Teachers

### Time needed:

One 90 minute period for completing the lab portion, plus some of an additional period for in-class

help on calculating the empirical formulas (or else abandon the empirical formulas section and have students complete the lab as homework.)

#### Safety considerations:

sanitation, ovens (hot!), food allergies (peanuts, etc.)

#### Student Prior Knowledge

Organization of the periodic table, percent composition, conversion factors (factor-label unit conversions), chemical and physical changes

#### Instructional Procedures

Several days prior to class, reserve the foods lab ovens. You will need 1 oven for every 2 lab groups. If you prefer to do the entire lab in the foods lab, it would involve less moving around. I prefer to do the mixing in the Chem lab and just go to the foods lab for baking.

If desired, cut out and laminate the provided recipe cards.

Before class, cover a lab table in plastic sheeting and tape it down. On this, place all of the ingredients.

At each lab station, provide a bowl, mixing spoon, and measuring spoons. Cup measures are unnecessary, as students should practice conversion factors by converting cups to tablespoons and teaspoons.

In the foods lab, set one oven to 400F, one to 300F, and three to 350F. If possible, leave these on all day. (The foods instructors have said that this is preferable.)

In class, pass out the student sheet and read the directions with the students. Emphasize that students should wash their hands before beginning the lab, and practice good sanitation throughout. Also mention that there are not enough supplies for sampling, say, chocolate chips. Point out that the units for atomic mass in the "Periodic Table of Yumminess" are in units of g/Tbs rather than g/mol, and that some of the "elements" are actually compounds. There was an attempt, in arranging the table, to align "elements" by properties in columns, but a lot of it is pretty vague. "Elements" are placed in periods by mass. The masses were determined by measuring one tablespoon of each ingredient on a scale.

Demonstrate a conversion from cups to tablespoons, and then a determination of mass in the compound (determine the number of grams in the compound from the "atomic masses".)

Point out that the only measuring implements are tablespoons/teaspoons (each group had a set of 5 measuring spoons, including  $\frac{1}{2}$  and  $\frac{1}{4}$  tbs and tsp.)

Pass one numbered recipe card to each group (see the attached recipes). The number is their "compound number" for the compound they will be synthesizing.

Allow students to move to the lab area to begin. Give them a deadline for when all of their cookies must be on the cookie sheet and ready to go to the foods lab to bake. Leave at least 30 minutes for baking and returning from the foods lab.

Instruct students to find another group with the same baking temperature as their group, and share a cookie sheet with them. Parchment paper is used instead of Pam spray to line the cookie sheets, making cleanup much easier...each group can just toss their parchment when done and the cookie sheet is ready to go again for next period. It also enables students to lift their cookies off the sheet if their baking time is different from the other groups' on their tray.

As students place their cookies on their baking sheet, they should begin cleanup, washing their bowls, mixing spoons, and measuring spoons with soap and hot water, then wiping down their lab table with dishrags. If time is an issue, groups can take their washing up to the foods lab to complete there while the cookies bake.

Students should bring their lab paper with them to work on while their cookies are baking.

Make sure to "fully observe" some of your students' compounds! All of the flourless peanut

butter recipes are highly recommended. I suggest you use real butter, as the shortbread and chocolate chip shortbread cookies turn out much better (although the recipe may need to be adjusted to have less flour or more sugar and butter.)

### Bibliography

Lesson Design by Jordan School District Teachers and Staff.

### Authors

[Utah LessonPlans](#)