

ACTIVITY 4: BAKING WITH LIMITED INGREDIENTS



One way to limit food waste is to plan meals so that you use up as much of the ingredients as possible when you cook, and minimize the leftover food. In chemistry, this same principle applies to chemical reactions. The purpose of this experiment is to teach students about the concept of limiting reactants in a chemical reaction by using a baking activity with food ingredients to model **stoichiometry**. To allow this recipe to be done in any setting, this baking activity will involve a no-bake cookie recipe.

Materials:

- Wax paper
- Measuring cups and spoons
- Mixing bowls
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- Baking trays
- Copies of the recipe student handout
- Ingredients: sugar, butter, milk, cocoa powder, peanut butter, gluten-free quick-cooking oats, vanilla extract
- Glass mixing bowls (e.g., Pyrex)
- Hot plate (or microwave)

First, inform students that they will be baking a recipe with limited ingredients.

Teaching Tip:

If you have a peanut butter allergy concern, substitute sunflower butter into the recipe; similarly, with dairy, substitute plant-based milk/butter in the recipe.

Next, allow the students to form groups, or to partner up, before beginning to get the materials and start the recipe. Monitor, guide, and support students as they work their way through the recipe.

Then, after students have had time to make the recipe and their cookies are cooling off, have students discuss their responses to the discussion questions on the student handout for the recipe.

Last, engage the whole class in a conversation about their responses to the discussion questions. Help them make the connection between their baking with the ingredients and how the ratios of each can cause there to be more or less leftover (e.g., excess) afterward and how, by adjusting the amount of each ingredient they can limit the excess and prevent food waste.

Guide students to reflect on how the limited supply of one ingredient affected the quantity and quality of the final product. You can do this with hypothetical questions, such as: "what would happen if we didn't use any of the peanut butter in the recipe at all?" Encourage them to consider the impact of the limiting reactant and its ratio to other ingredients. Culminate this activity by having students observe one another's cookies to see what variations may have come out between groups following the same recipe. Discuss these differences against the procedural steps each group did. And make sure to enjoy some cookies along the way during the observations and discussion!