

Bowwow Barker Training 001: Captivating Chemistry

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Biblical Integration

Colossians 1:16-17: "All things were created through [Jesus] and for him . . . and in him all things hold together."

Objective

Use the super sleuth skills of precision, measurement, and observation to discover how baking and science intertwine using principles of chemistry.

Vocabulary

- **Chemistry:** the branch of science that deals with the properties, composition, and structure of elements and compounds; how these elements and compounds can change; and the energy that is released or absorbed when they do
- **Chemical reaction:** the process by which one or more substances change to produce different substance(s)
- **Acid:** any substance that tastes sour in a water solution; reacts with bases to form salts; and promotes chemical reactions
- **Base:** any substance that is slippery to the touch in a water solution; tastes bitter; reacts with acids to form salts; and promotes certain chemical reactions
- **Reactant:** a substance consumed in a chemical reaction
- **Activation energy:** the amount of energy needed to start a chemical reaction, such as the combination of two or more substances
- **Product** (as related to chemical reactions): the result when reactants are combined in a chemical reaction
- **Homogeneous** (as related to a mixture): a substance that is mixed or blended so well that all of the ingredients will not separate, even over time

Materials

- 2 $\frac{3}{4}$ cup flour (and a little extra to dust on the cake pan)
- 1 $\frac{1}{2}$ cups sugar
- 2 cups coca powder
- 1 teaspoon baking soda
- 1 tablespoon brown sugar
- $\frac{3}{4}$ cup Oil
- 4 tablespoons vinegar
- 1 $\frac{3}{4}$ cup hot water
- Butter or margarine to coat the inside of the cake pan
- Measuring cups
- Measuring spoons
- Large bowl for mixing
- Spoon for mixing ingredients
- Cake pan
- Pencil
- Data sheet (included below)

Lesson: Captivating Chemistry

Have you ever been cooking or baking when suddenly, your ingredients make a noise or take on a different shape when combined?

You're witnessing a chemical reaction!

Kitchen chemistry is a great way to witness how science, cooking, and baking intertwine. In order to create a chemical reaction, there must be an **acid** and a **base**. These components are called **reactants**.

When the reactants are combined, **activation energy** is created. The reactants create a new a substance, also known as a **product**. The product looks (and perhaps sounds or tastes) different from the original acid and base.

In baking, chemical reactions usually occur to produce a new substance (such as cake batter) that will help the baked item taste better than the individual taste of all the raw ingredients (such as a cup of flour or teaspoon of baking soda).

The chemical reactions in baking also help batter and dough rise, which is necessary for fluffy cakes, bread, or cookies!

Colossians 1:16-17 states, "All things were created through [Jesus] and for him . . . and in him all things hold together."

When God created the world, He intertwined many processes—like baking and science—to show that in Him all things hold together. It's no accident baking and

science are connected. It is only through God we can see the beauty and connection of the incredible world He created!

Today, you will use your own materials to see a chemical reaction take place in your kitchen.

Procedure

- #1. Gather all ingredients and answer Question #1 on the data sheet.
- #2. Coat the inside of the cake pan with butter or margarine. Sprinkle with flour to lightly coat the butter.
- #3. Preheat oven to 350° F.
- #4. In the large bowl, combine the flour, sugar, brown sugar, cocoa powder, and baking soda. Stir well. Write down your answers for Questions #2 and #3 on the data sheet.
- #5. Add the vinegar to the dry ingredients. Take a moment to answer Question #4 on the data sheet.
- #6. Add the hot water and the oil to the bowl. Mix well, until the batter is **homogenous**. Once it is mixed, answer Question #5 on the data sheet.
- #7. Pour the batter into the prepared cake pan. Bake for 45 minutes.
- #8. While the cake bakes, answer Questions #6-8 on the data sheet.
- #9. Once cooked, remove from the oven and cool.
- #10. After the cake is cool, sprinkle with powdered sugar if desired.

(Recipe adapted from: <https://www.yummly.com/recipe/Chocolate-Cake-with-Vinegar-897760>)

Data Sheet

- 1) **Observe** the ingredients. Which ingredient do you think is the base? Which do you think is the acid?
- 2) **Observe** the bowl with the dry ingredients. What do you see?
- 3) **Hypothesis**: What do you think will happen when the wet ingredients are added to the bowl with the dry ones?
- 4) After adding the vinegar, observe the bowl. What do you see?
- 5) After combining all the ingredients, did you observe any changes?
- 6) **Analysis**: Was your hypothesis from Question #3 correct? Why or why not?
- 7) Read Colossians 1:16-17 together. Can you identify more examples of how science intertwines with other areas of life?

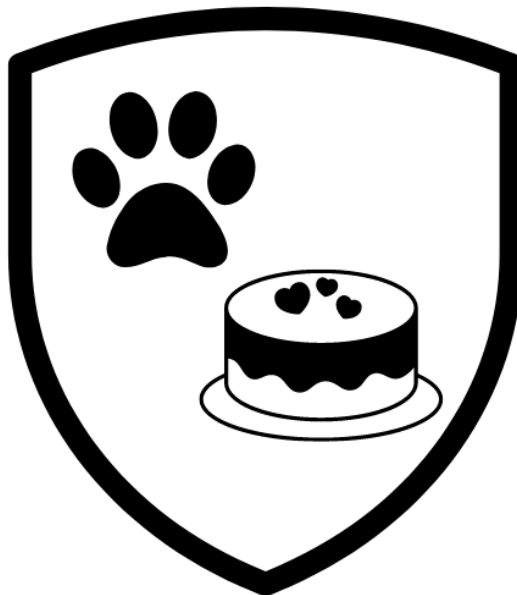
Conclusion

You created a chemical reaction! It started when the baking soda (the base) combined with the vinegar (the acid).

These two components created a chemical reaction that produced a salt-like substance to flavor the cake. It also created small gas bubbles, which helped the cake rise in the oven.

What a tasty way to explore science!

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