

Bread and Butter Lab

Today you will be making bread and butter. The butter serves as an example of physical change. The bread will serve as an example of a chemical change which occurs when yeast metabolizes sugar (the yeast feeds on the sugar and produces CO₂ gas, kinda like you do when you breathe). Through the addition of energy, in the form of thermal kinetic energy, the ingredients (flour, oil, water, yeast, salt and sugar) will change into new substance known as bread. When the yeast uses the sugar for energy the chemical reaction is:



1. Underline the reactants and circle the products in the chemical reaction above.
2. Describe how the chemical reaction above demonstrates the law of conservation of matter.

Materials:

1/3 cup warm water; 1 teaspoon yeast; 2 tsp sugar; 2 Tablespoon Oil; 1 cup bread flour; ½ teaspoon salt

Procedures:

Mix the water, yeast and sugar in a bowl until the sugar and yeast are dissolved. Add the remainder of the ingredients and knead until the dough is smooth. Divide into four equal balls. Allow dough to rise 10 minutes. Bake at 400°F for 12 minutes.

Anticipation Guide: Bread Information: Web Site "Science of Cooking – Bread Science 101" http://www.exploratorium.edu/cooking/bread/bread_science.html

Directions before reading: Show me what you already know. Read the statements below and indicate whether you think the statement is true or false in the Before Reading column. Compare your responses with someone sitting next to you after you complete your responses.

Directions after reading: After reading information related to each statement, decide whether you still think it is true or false. Cite the sources and information that support your final answer.

	Before Reading		After Reading	
	TRUE	FALSE	TRUE	FALSE
1. There are three forms of leaveners.	TRUE	FALSE	TRUE	FALSE

Support and Source:

2. Yeast is a living leavener.	TRUE	FALSE	TRUE	FALSE
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Support and Source:

3. Yeast produces oxygen which causes bread to rise.	TRUE	FALSE	TRUE	FALSE
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Support and Source:

4. Sugar is the stretch gum-like substance that fills with bubbles of gas as the yeast goes to work.	TRUE	FALSE	TRUE	FALSE
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Support and Source:

5. The hot temperatures in the oven cause the yeast to die.	TRUE	FALSE	TRUE	FALSE
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Support and Source:

Anticipation Guide: *Butter Information: Web Site "The Science of Butter"*
<http://www.educationaltoyfactory.com/makingbutter.htm>

Directions before reading: Show me what you already know. Read the statements below and indicate whether you think the statement is true or false in the Before Reading column. Compare your responses with someone sitting next to you after you complete your responses.

Directions after reading: After reading information related to each statement, decide whether you still think it is true or false. Cite the sources and information that support your final answer.

	Before Reading		After Reading	
	TRUE	FALSE	TRUE	FALSE
1. The thin white liquid present shortly after you start shaking the butter is only water.	TRUE	FALSE	TRUE	FALSE

Support and Source:

2. Cream floats to the top of milk because it has air in it.	TRUE	FALSE	TRUE	FALSE
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Support and Source:

3. Leaving the cream out over night lets the fat globules to make crystals	TRUE	FALSE	TRUE	FALSE
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Support and Source:

4. Bacteria are not always a bad thing.	TRUE	FALSE	TRUE	FALSE
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Support and Source:

5. Bacteria adds flavor to the butter.	TRUE	FALSE	TRUE	FALSE
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Support and Source:

Instructions

I break the kids into groups of four for this lab. All students wash their hands. I have a student with each ingredient posted around the room. One student measures out the water and pours it in the bowl. The next student measures the yeast and pours it in the bowl. The next student measures the sugar and pours it in the bowl. The next student has the oil. Then I have a student on the other side of the room with the flour. The reason the student is on the opposite side of the room is because it takes a moment to dissolve the sugar and yeast in the warm water. Lastly the salt is added. The students then mix the dough until it is smooth. They then knead the dough on a clean piece of waxed paper that I have taped down on their lab table. I give each child a number. I take parchment paper and divide it into 16 rectangles. I number each rectangle. I do this with two sheets of parchment paper resulting in 32 rectangles. I then have the students put their roll on their assigned number. The rolls fit neatly on two large cookie sheets. While the dough rises we complete the anticipation guide. Students first read through the anticipation guide and answer if they think the statements are true or false. Then, depending on the group, we either read the information from the website together, or I print then information from the website and the students read the selection independently. After the anticipation guides have been completed the students make the butter. The directions for how to make the butter are on the website. I modify these directions by just pouring some heavy whipping cream into a baby food jar with a pinch of salt. Then we put the lid on and shake like crazy for about 8 minutes. Sometimes the butter doesn't end up looking like butter but that's okay because it will taste wonderful!

This lab could be modified to have the teacher demonstrate the baking of the bread and students could simply discuss the process. I have designed this so that the anticipation guides can be used together or separately. I use this in my interactive notebook. If you print the first three pages booklet then it fits perfectly into a composition notebook.

Bread and Butter Lab

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1. Underline the reactants and circle the products in the chemical reaction above.
2. Describe how the chemical reaction above demonstrates the law of conservation of matter.

The matter is not created or destroyed. The molecules are rearranged to form new molecules.

Materials:

1/3 cup warm water; 1 teaspoon yeast; 2 tsp sugar; 2 Tablespoon Oil; 1 cup bread flour; 1/2 teaspoon

Procedures:

Mix the water, yeast and sugar in a bowl until the sugar and yeast are dissolved. Add the remainder of the ingredients and knead until the dough is smooth. Divide into four equal balls. Allow dough to rise 10 minutes. Bake at 400°F for 12 minutes.

Anticipation Guide: Bread Information: Web Site "Science of Cooking – Bread Science 101" http://www.exploratorium.edu/cooking/bread/bread_science.html

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Directions after reading: After reading information related to each statement, decide whether you still think it is true or false. Cite the sources and information that support your final answer.

	Before Reading		After Reading	
1. There are three forms of leaveners.	TRUE	FALSE	TRUE	FALSE

Support and Source:

Leaveners come in two main forms baking powder/soda or yeast.

2. Yeast is a living leavener.	TRUE	FALSE	TRUE	FALSE
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Support and Source:

Yeast, on the other hand, is a live, single-celled fungus.

3. Yeast produces oxygen which causes bread to rise.	TRUE	FALSE	TRUE	FALSE
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Support and Source:

Once reactivated, yeast begins feeding on the sugars in flour, and releases the carbon dioxide that makes bread rise (although at a much slower rate than baking powder or soda).

4. Sugar is the stretch gum-like substance that fills with bubbles of gas as the yeast goes to work.	TRUE	FALSE	TRUE	FALSE
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Support and Source:

This is because wheat flour contains two proteins, *glutenin* and *gliadin*, which, when combined with water, form gluten. As you knead the dough, the gluten becomes more and more stretchy. This gum-like substance fills with thousands of gas bubbles as the yeast goes to work during rising.

5. The hot temperatures in the oven cause the yeast to die.	TRUE	FALSE	TRUE	FALSE
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Support and Source:

As the temperature of the cooking dough rises, the yeast eventually dies, the gluten hardens, and the dough solidifies.

Anticipation Guide: *Butter Information: Web Site "The Science of Butter"*
<http://www.educationaltoyfactory.com/makingbutter.htm>

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Directions after reading: After reading information related to each statement, decide whether you still think it is true or false. Cite the sources and information that support your final answer.

	Before Reading		After Reading	
1. The thin white liquid present shortly after you start shaking the butter is only water.	TRUE	FALSE	TRUE	FALSE

Support and Source:

Eventually, you will have a lump of yellow butter and some liquid buttermilk.

2. Cream floats to the top of milk because it has air in it.	TRUE	FALSE	TRUE	FALSE
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Support and Source:

Fat is lighter than water, so fat floats to the top of a container of milk. There it can be skimmed off and collected as cream.

3. Leaving the cream out overnight lets the fat globules to make crystals	TRUE	FALSE	TRUE	FALSE
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Support and Source:

When you let cream warm to room temperature, hard crystals form inside the balloons of fat.

4. Bacteria are not always a bad thing.	TRUE	FALSE	TRUE	FALSE
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Support and Source:

In addition, the warmth lets special bacteria grow. These bacteria produce acids that keep other, bad bacteria from growing.

5. Bacteria adds flavor to the butter.	TRUE	FALSE	TRUE	FALSE
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Support and Source:

They also give butter a good flavor.