Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_

CTE Science Laboratory Investigation

CHEMICAL LEVENING AGENTS

**Introduction**

For a long time, yeast was used to leaven bread. This rather simple process involved yeast, a fungus, given food at an appropriate temperature. If the conditions were correct, the yeast will consume the food, some type of sugar, and produce carbon dioxide through the process of cellular respiration. Interestingly, the same combination of ingredients will produce carbon dioxide and alcohol if the yeast are not supplied with oxygen; this process is called fermentation and is used to produced alcoholic beverages.

 However, this process takes time because enzymes within the yeast need to take in sugar and cleave the molecule to create energy and release carbon dioxide. Instead of leavening bread with biological means, bakers in the 1800s discovered that chemicals could be used, instead. Baking soda, more accurately known as sodium bicarbonate, was initially used. It is a base, so when it reacts with an acid, the resulting solution is neutralized and releases carbon dioxide. The reaction is much quicker than that of yeast and sugar, which is nice, but that also means that the time between the addition of the acid to the baking powder and cooking must be minimized. If not, all the carbon dioxide will leave the dough or batter, and the resulting food will be flat.

 Sodium bicarbonate works well, but it requires the person preparing the food to add an appropriate amount of acid at the proper time. To make the system more dependable, baking powder was developed. Baking powder contains sodium bicarbonate, but also powdered acids, obviating the need for the cook to add acid and reducing the chance of error. Most baking powders produced today are “double acting,” which means that they have two types of acid: one will react with the sodium bicarbonate at room temperature and the other will react at the higher temperatures encountered when cooking. The low-temperature acid used is potassium bitartrate, and the high-temperature acid used is usually sodium aluminum sulfate or sodium aluminum phosphate.

 In addition to leavening, baking soda can help foods brown and create other tasty molecules. A complex set of reactions collectively known as the Maillard reactions occur when amino acids combine with sugars to create new molecules that give foods color and taste. This happens best in basic conditions; the sodium bicarbonate in baking powder can help create these conditions.

**Materials**

 Non-stick pan Pancake mix

 Spatula Timer

 PENCIL

**Procedures**

In this section, each group will make a very small batch of pancakes and cook them for the same amount of time. The only variation in the recipe will be the amount of baking soda added.

My group will add \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ tsp of baking soda.

Ingredients:

1 cup all purpose flour

1/2 tsp baking powder

\_\_\_\_\_ tsp baking soda

1/2 tsp salt

2 tsp sugar

1 egg

1 tbsp melted butter

1 cup buttermilk

1. Add all the dry ingredients together and mix thoroughly.

2. Combine the wet ingredients together, mixing to combine.

3. Add the wet ingredients to the dry ingredients, and mix to combine completely.

4. Separate your batter into two portions. Let one portion sit out at your station.

5. Cook the other portion immediately on a lightly oiled or buttered pan. Cook for exactly 1.5 minutes on each side.

6. After the second portion of your batter has sat for at least 10 minutes, cook that portion for the same amount of time.

7. Compare the two pancakes that you produced, as well as those that other groups made.

**Analysis**

QUESTION 1: Fill in the chart below to compare your pancakes

|  |  |  |
| --- | --- | --- |
| **Amount of Baking Soda** | **Cooked Immediately** | **Cooked After Resting** |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |