SCIENCE LAB PREP WORK

LAB DATE: January 29, 2007

LAB TITLE: Chemical & Physical Changes

INTRODUCTION:

Chemistry is the study of the composition of substances, their properties, and the changes that they undergo. The scientists who reported success in making element 118 carried out a BIG change. They combined two elements to create a completely new one. In this lab we will look at the types of changes that chemists study – physical and chemical changes. The food we eat undergoes many changes, both physical and chemical. Today you will explore some of those changes and classify them as physical or chemical.

PURPOSE:

To answer the following questions –

1. What is a physical property?
2. What is a chemical property?
3. What is a physical change?
4. What is a chemical change?
5. How can you tell if a change is chemical or physical?

Hypothesis:

1. What is a physical property?

I hypothesize that a physical property is what an object is like. For instance what the object tastes like smells like and feels like.

2. What is a chemical property?

I hypothesize that a chemical property is something a particular object has. For instance what the objects atoms are like a apple would have a different chemical property than a pear.

3. What is a physical property change?

I hypothesize that a physical property change is the change of a physical property.

4. What is a chemical change?

I hypothesize that a chemical change is a change in the objects chemical property.

5. How can you tell if a change is chemical or physical?

I hypothesize that the difference between a chemical or physical change is that is a chemical change occurs in an object in is not usually visible by the human I but if a physical change were to take place you could see it change.

MATERIALS & EQUIPMENT:

- ❒ Toaster
- ❒ Loaf of bread
- ❒ Hershey's Kisses
- ❒ Soda cans
- ❒ Paper cups
- ❒ pH paper
- ❒ Alka-Seltzer tablets
- ❒ Water
- ❒ Cookie Mix
- ❒ Cookies
- ❒ Rock salt
- ❒ Gallon-size freezer bags
- ❒ Quart-size freezer bags
- ❒ Measuring cup
- ❒ Ice
- ❒ Spoons
- ❒ Apples
- ❒ Bread dough
- ❒ Slices of bread
- ❒ Salad dressing
- ❒ Powdered drink mix
- ❒ 1 Quart plastic bottle

PROCEDURE:

This lab is adapted from a hands-on activity called “Physical and Chemical Changes in Food” written by Amy Rowley and Jeremy Peacock at the University of Georgia. During this lab period, you will travel to 10 stations. At each station you will find a card outlining the procedure to be carried out (see attachments). Prepare a data table that will allow you to record the following information for EACH station: Task Name, Observations, Type of Change (Physical or Chemical), and Supporting Evidence.

Data Tables:

The bread that is not toasted is very soft but has a rugged texture. And it is very fluffy it appears to have very small holes and when I stretch it you can see dough like texture inside. It smells like grain. The bread that is toasted is very hard and rough like sandpaper. It appears very dark and hardened. It smells burnt. In the comparison of the two pieces of bread it seems that the toasted bread is thinner. When slicing the bread you can see that the inside is softer that the outside.

The Hershey Kiss is very hard and solid. As it melts in my mouth it smoothes out and forms a chocolate ball and gets softer and softer until all of the Hershey Kiss is gone and just a puddle of chocolate is left on my tongue. So, it went from a solid to a liquid.

The flat Coke is not bubbling at all compared the Coke, which is bubbling a lot. The flat Cokes taste does not last as long as the Cokes. However they are the exact same color. They have the same pH measurement between three and four.

The Alka-Seltzer tablet is very soft and when you look at it closely it is a lot of

little grains stuck together. When in the water the tablet is bubbling a lot on all sides and the bubbles are building up on the bottom and the tablet is beginning to float to the top of the water. The bubbles on the bottom seem to be larger than the bubbles on the top I think that this is because the bubbles on the top don't combined with other bubbles, compared to the bubbles on the bottom of the Alka-Seltzer tablet which cannot rise to the top because they are under the tablet and they combined with other bubbles. After the Alka-Seltzer tablet dissolved I saw a thin white layer of wet powder on the top of the water. The waters pH was 6.

The cookie dough mixture was a soft grain and made small clumps when compressed. The grains were very small when we ate it in my mouth it joined and made a cement like mixture. The cookie was very tough and hard to break and if you looked closely you could see the little grains in the cookie just darker and joined together. When I split the cookie in half I the inside was more moist and looked more like dough than the outside of the cookie. It smelled chocolaty. One difference between the cookie and the mix was the cookie was darker and harder than the mix.

The Kool-Aid solution is very yellow. When adding the ice it became a slushy yellow.

The slice of apple is very rough and has small bumps on it were bubbles could form if it was under water. It smells a mix of sweet and sour. Some droplets of water have collected on the apple above water in the small groves in crested into its

skin. The part of the apple that is submerged has bubbles forming in the small grooves causing it to float. The water seems to magnify the apple a small amount when it is in water. Underwater it does not seem as rough as it does not under water.

The bread is very gooey and it is very soft and adhesive. And smells like grain. It is still soft but not as adhesive.

In the bottle of salad dressing that has not been shaken seems to have separated the two substances in it. The lighter substance on the top, which appeared to be oil and the heavier substance on the bottom. As a result of shaking the two substances mixed and the salad dressing appears to be a lighter color than the salad dressing labeled do not shake.

Very small grains with a variety of sizes and I would say it is a solid. When the Kool-Aid mix was added to the water the larger pieces fell first and the smaller grains followed. After we stirred the water they mixed.

DATA ANALYSIS:

I performed the experiments in the lab procedure to help me understand the purpose of the lab. I learned about what the difference was between a chemical change and a physical change. The experiments helped me better understand what the difference was between bread and toast. And what was inside the bubbles of the coke and how bread rises. I also learned about the brown that forms on apple slices when they are exposed to

the air. I can relate to the brown on the apple slices because every day I have a few slices of apple for lunch and I have always wondered why the outside turned brown. I was surprised to discover that the apple slices turned brown just because they were exposed to the air. And I was surprised to find out the process of bread cooking in the oven I knew that yeast had to do with the rising of bread but I did not know how the yeast made the bread rise. One more thing I was surprised to discover was that the bubbles that were formed from the chemical reaction between the Alka-Seltzer tablet and the water was Carbon Dioxide. Now that I know the difference between a physical change and a chemical change I can tell which of the stations that we went to were an example of a physical or chemical change. In the first station when we toasted the bread at first I thought I thought that it was a physical change, which in fact it was a chemical change. In the second station when I put the Hershey Kiss on my tongue and let it melt, that was an example of a physical change because the chemical structure of the chocolate did not change, it was the state of the chocolate going from solid to liquid which is a chemical change. The third station which was the coke bubbling and the carbon dioxide that was being released was an example of a physical change. The change that occurs when we added the Alka-Seltzer tablet to the water was an example of a chemical change. When the tablet was dropped into the water a chemical reaction took place and the chemical structure of the water was changed the result from this reaction was Carbon Dioxide. While the cookies were baking a chemical reaction was taking place. The freezing of the Kool-Aid is an example of a physical change. It was a physical change because the Kool-Aid went from a liquid to a solid thus not changing the chemical structure of the water. When salt is added to the water it lowers the freezing point of the water. So when the salt

was added to the ice it made the ice into a slushy form and that froze the Kool-Aid into a slushy form as well. I do not recall a chemical or physical change in the apple slices station. When bread is cooked it goes through a chemical change. The yeast converts the sugars in the dough into Carbon Dioxide creating pockets. The Carbon Dioxide being a gas wants to rise making the bread rise with it. So it is a chemical change because the yeast changes the chemical structure. The salad dressing is an example of a physical change. This is because shaking the bottle does not change the chemical structure it merely temporarily changes the suspension. The Kool-Aid dissolving into the water is an example of a physical change because again the Kool-Aid is not changing the water chemical structure. It would be interesting to conduct further research to find out why the pH was the same in the flat coke and the coke. Any possible sources of error may include that I had know idea what the answer to the purpose questions was so I did not know what to record on my observations not giving helping me write my data analysis.

QUESTIONS TO CONSIDER:

1. What do you think causes toast to brown?

When the acids and sugars in the bread are heated, they interact with each other in a way that is known as the Maillard reaction. The molecules of the acids and sugars combine to form new aromas and flavors. The Maillard reaction is responsible for the brown color on the toast.

2. What is the approximate melting point of chocolate? How do you know this?

The approximate melting point of chocolate is 98 degrees Fahrenheit. I know this because my average body temperature is 98 degrees Fahrenheit and when the chocolate got to 98 degrees Fahrenheit it melted in my mouth.

3. What gas fills the bubbles in a newly opened can of soda? Where does it come from?

The bubbles in soda are filled with carbon dioxide. The carbon dioxide was dissolved in the soda. And when you open a bottle of soda the Carbon Dioxide is being released.

4. What gas fills the bubbles released from the Alka-Seltzer tablet?

When the Alka-Seltzer tablet is added to the water the bubbles that seem to be released from the tablet are Carbon Dioxide and they are not released but merely a chemical reaction is taking place causing Carbon Dioxide to form and rise to the top.

5. Is it possible, when baking, to observe both physical and chemical changes? Provide an example.

Yes, for example when you are boiling water that is a physical change because the water is still water just in a different state. An example of a chemical change is when you burn paper because the entire chemical structure of the paper is changed.

6. Road workers add salt to roads in the winter to keep them from icing. Using this as an example, explain why salt was added to the ice when freezing the drink.

We added salt because it lowers the freezing point of water.

7. How did submerging the apples in water prevent them from browning?

When sliced apples that are submerged under water they are less vulnerable to something called oxidation. Oxidation is when the chemicals in the apple react with the oxygen in the air in such a way causing the apple slices to turn brown. The apple slices being submerged under water help this chemical reaction to not take place. Chefs do this to make their apples more appealing to their costumers. They also squeeze lemon juice or heat up the apple slices to prevent oxidation but it may change the taste of the apple so they usually use water.

8. What ingredient is most important in the rising of dough? Why?

Yeast, it is very important in the making of bread because it helps the dough rise by converting the sugars in the dough into Carbon Dioxide creating pockets. The Carbon Dioxide being a gas wants to rise making the bread rise with it. If you look at a slice of bread you can see many holes and pockets these holes are where the Carbon Dioxide was when the bread was baking.

9. Why do some salad dressings not separate while others do?

The salad dressing we used in the lab had two different substances that had mixed to create a mixture. A mixture is two or more different substances that retain their own chemical properties and can be separated. However some dressings don't separate and they form what is called a solution. A solution is also a mix of two or more different substances but it is harder to separate a solution than to separate a mixture.

10. Will any amount of drink mix dissolve in the given amount of water?

No, it is possible to add enough drink mix to an amount of water so that the water could not mix with it and make a solution.

Conclusion:

I learned about what the difference was between a chemical change and a physical change. The experiments helped me better understand what the difference was between bread and toast. And what was inside the bubbles of the coke and how bread rises. I also learned about the brown that forms on apple slices when they are exposed to the air. I was surprised to discover that the apple slices turned brown just because they were exposed to the air. And I was surprised to find out the process of bread cooking in the oven I knew that yeast had to do with the rising of bread but I did not know how the yeast made the bread rise. One more thing I was surprised to discover was that the bubbles that were formed from the chemical reaction between the Alka-Seltzer tablet and the water was Carbon Dioxide.

I have one additional question:

Why did the Carbon Dioxide escape from the Coke when it was heated?

I found this lab very effective.

WEB LINKS:

http://www.ric.edu/ptiskus/chemical/

http://www.exploratorium.edu/cooking/index.html

http://www.npr.org/templates/story/story.php?storyId=4244177

(this link will take you to a recording of an interview on NPR's "Science Friday" with Harold McGee, author, chef, and food scientists)