The Barfing Pumpkin Lab: Chemical or Physical Change?

Background: C5.2C, C1.1A, C1.1C, C1.1E: Chemical and physical changes are based on knowing the difference between chemical reactions and changes in states of matter. A chemical change involves one or more substances changing into entirely new substances; the chemical composition changes. When iron (Fe) rusts it changes into iron oxide (Fe_2O_3). Iron no longer exists as single iron atoms but oxygen atoms combine with iron atoms to form a new substance we call rust. **With chemical changes the changes take place at the level of atoms.**

Example: Decomposition of hydrogen peroxide

$2\ H_2O_2\ (aq) = 2\ H_2O\ (l) + O_2\ (g) + heat$

This reaction takes a very long time to happen so we speed it up with a catalyst, potassium iodide (KI):

- $H_2O_2\ (aq) + I^-\ (aq) = H_2O\ (l) + OI^-\ (aq)$
- $H_2O_2\ (aq) + OI^-\ (aq) = H_2O\ (l) + O_2\ (g) + I^-\ (aq)$

A physical change is a change in which no new substance is formed. After a physical change the atoms are still in the same arrangement. When ice is melted into a liquid and then boiled into steam, the chemical composition of water (H_2O) does not change; how close or how far apart these water molecules are from each other does change. When you tear a piece of paper it's still a piece of paper all that has changed is its physical appearance.

In this experiment you will carve a pumpkin then mix chemicals inside of it and decide if a chemical or a physical change takes place.

Part I

A. Title of Experiment: _____

B. Problem: If a change takes place is the change a chemical or a physical change?

C. Hypothesis: _____

D. Purpose: _____

E. Variables: Independent _____ (what are you testing)

Dependent _____ (what are you observing)

Controls _____ (what is staying the same)

Part II

A. Materials:

- One small pumpkin/group
- Equipment to carve a pumpkin/group
- Two 50 mL beaker/group
- One 100 mL graduated cylinder/group
- 50 mL of dish soap
- 2 teaspoons of KI (potassium iodide)
- 100 mL of H_2O_2 (hydrogen peroxide) (15% -30%)
- Goggles
- Apron
- Gloves
- Garbage bags to protect lab tables

B. Hazards:

- H_2O_2 is corrosive to eyes
- KI is slightly toxic
- Wear goggles

C. Procedure

1) Carve your pumpkin. Make sure to keep your lid, the top part of your pumpkin. Clean your mess as instructed by your teacher.
2) Go to stock station and measure 50 mL of dish soap in a 50 mL beaker, go back to your lab table and pour inside your pumpkin.
3) Go to stock station and measure 2 teaspoons of KI and place in a 50 mL beaker, go back to your lab table and pour the KI into your pumpkin.
4) Go to stock station and measure 100 mL of H_2O_2 in a 100 mL graduated cylinder, take it back to your lab station and pour it into you pumpkin, place the lid on your pumpkin.
5) Clean everything up; throw away trash in trash can.

D. Data: Design a data table that addresses the following:

Observations

How long did the change take?
Did something new form that wasn't there before? Explain.
Was heat released?
Was there a change in color? Explain.
Any other observations?

References:

http://cldfacility.rutgers.edu/content/catalytic-decomposition-hydrogen-peroxide-potassium-iodide

http://www.pbslearningmedia.org/asset/odc08_vid_barfingpumpkin/

http://www.stevespanglerscience.com/lab/experiments/oozing-pumpkins-sick-science