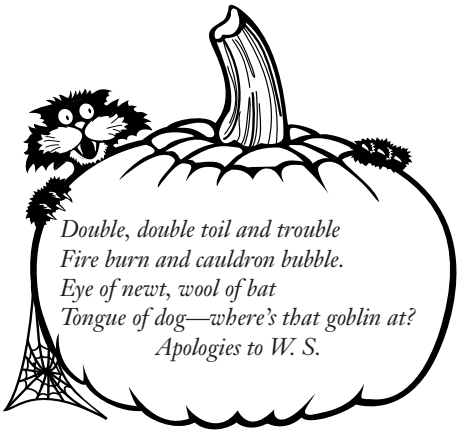
The Foaming Pumpkin

Favourite Holiday Demonstrations

Introduction

Place a beaker of green solution inside a plastic pumpkin, chant an incantation while you add a yellow liquid and stand back! Foamy ooze and steam will erupt out of the pumpkin's eyes and nose.



Concepts

- Catalysts
- Decomposition reaction

Materials

Hydrogen peroxide, H_2O_2, 30%, 70 mL
Flinn demonstration tray, large (optional)
Sodium iodide solution, NaI, 2 M, 5 mL
Beaker, 250-mL
Ceramic square or cardboard square, 6″ × 6″
Dishwashing liquid (Dove®), 10 mL
Food colouring, green (optional)
Graduated cylinder, 10-mL
Graduated cylinder, 100-mL
Pumpkin, plastic

Safety Precautions

Hydrogen peroxide, 30%, will act as an oxidizing agent with practically any substance. This substance is severely corrosive to the skin, eyes and respiratory tract; a very strong oxidant; and a dangerous fire and explosion risk. Do not heat this substance. Sodium iodide is slightly toxic by ingestion. Although the dishwashing liquid is considered non-hazardous, do not ingest the material. Do not stand over the reaction; steam and oxygen are produced quickly. Wear appropriate chemical splash goggles, chemical-resistant gloves and a chemical-resistant apron. Please review current Safety Data Sheets for additional safety, handling, and disposal information. Wash hands thoroughly with soap and water before leaving the laboratory.

Procedure

1. Place the plastic pumpkin in a plastic tray that is several inches deep.
2. Using a 100-mL graduated cylinder, measure out 70 mL of the 30% hydrogen peroxide and add to the 250-mL beaker. Rinse the graduated cylinder thoroughly.
3. Measure 10 mL of dishwashing liquid into the 10-mL graduated cylinder and add it to the beaker containing the hydrogen peroxide. Add a few drops of green food colouring, if desired, and stir. Place the beaker inside the pumpkin.
4. Measure 5 mL of 2 M sodium iodide solution using a clean 10-mL graduated cylinder.
5. Tell students you will now call forth the evil spirit of the "Great Pumpkin."
6. Quickly, but carefully, add the sodium iodide to the 250-mL beaker inside the pumpkin.
7. Immediately cover the top of the pumpkin with the 6″ × 6″ square. Hold the square in place with a hand or weight.
8. Watch as the "spirit" erupts from the eyes and nose.

Disposal

It is recommended that you consult your local school board and/or municipal regulations for proper disposal methods that may apply before proceeding.

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Tips

- The foam will erupt almost immediately, so quickly cover the opening. The cover should be either held down or heavy enough by itself to prevent the foam from erupting out of the top.
- You may want to do this demonstration in a large demonstration tray since there is a lot of foam produced. Cleanup, however, is easy due to the presence of extremely safe final products and the generous amount of detergent.
- The beaker will get hot, so let it cool before handling.
- The slight brown tinge of the foam at the beginning is due to free iodine produced by the extreme oxidizing ability of the 30% hydrogen peroxide.
- Another catalyst that will catalyze this reaction is manganese(IV) oxide, MnO_2.
- The square can be coloured orange to match the pumpkin's colour.
- Place a glowing splint in the foam and it will relight, showing the presence of oxygen.
- A dropcloth may be necessary to prevent the foam from landing on carpeting or floors. The iodine may stain the material.

Discussion

This demonstration evolves a good deal of heat as shown by the steam coming off of the foam as it is produced. The reaction, therefore, is exothermic. The action of a catalyst is demonstrated. The catalyst is the $I^-(aq)$ ion which speeds up the decomposition of the hydrogen peroxide. The decomposition of hydrogen peroxide produces steam and oxygen gas. The oxygen gas and water vapour cause the dishwashing liquid to foam.

$$2H_2O_2(aq) \xrightarrow{I^-(aq)} 2H_2O(g) + O_2(g) + \text{Energy}$$

Answers to Worksheet Questions

1. Describe what happened in this demonstration.

   Hydrogen peroxide and dishwashing solution were added to a 250-mL beaker. A small amount of sodium iodide was added, which caused thick foam to erupt from the pumpkin.

2. Write the chemical equation for the decomposition of hydrogen peroxide.

   $2H_2O2(aq) \rightarrow 2H_2O(g) + O_2(g)$

3. Why does the dishwashing solution foam?

   The water vapour and oxygen gas get trapped in the dishwashing liquid, causing it to foam.

4. What was the purpose of the sodium iodide? Was it consumed during the reaction?

   The sodium iodide served as a catalyst, which is a substance that speeds up a reaction but is not consumed during the reaction. It was not consumed during the reaction.

Reference

Stone, C. H. J. Chem. Ed. 1944, 21, 300.

Flinn Video Series

A video of the *The Foaming Pumpkin* activity, presented by Bob Lewis, is available at flinnsci.ca.

Materials for *The Foaming Pumpkin* are available from Flinn Scientific Canada Inc.

Catalogue No.	Description
HJ0008	Hydrogen Peroxide, 30%, 500 mL
SJ0084	Sodium Iodide, 100 g
AP5429	Demonstration Tray, Large

Consult www.flinnsci.ca or your *Flinn Scientific Canada Catalogue/Reference Manual* for current prices.

Name: _____

The Foaming Pumpkin Demonstration Worksheet

Discussion Questions

1. Describe what happened in this demonstration.

2. Write the chemical equation for the decomposition of hydrogen peroxide.

3. Why does the dishwashing liquid foam?

4. What was the purpose of the sodium iodide? Was it consumed during the reaction?