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# The Christmas Experiment

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# THE CHRISTMAS EXPERIMENT*

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What will you be doing with your class the last periods before the Christmas break? If you have a strong digestive system, try this production of foamy peanut brittle. It was first suggested in the *Journal of Chemical Education*, August 1972, by Richard C. Adams of Pleasant Hill High School, Pleasant Hill, Oregon 97401. However, the outline given was for a 90-minute lab, and I have modified it for a 40-minute lab. I have found that with my modifications, all of my students – good or poor – can do this lab.

## Methods and Materials

You will need table sugar, glucose syrup with a dash of vanilla added per test tube, protein pellets (cheap pre-Christmas sale peanuts), sodium bicarbonate with a pinch of salt, margarine (a cube of about 3 cm to a side) and alumninum foil (a square of about 30 cm to a side). I use 20 x 140 mm test tubes.

I arrange enough equipment for one class. As my first class comes in, each person receives a copy of the lab. They are told to read the entire experiment, then pick up the apparatus and get started. As each student comes to get the apparatus, ask, "What will you do with the aluminum foil?" If they can answer, they start; if not, they reread the experiment. I instruct the students to return each test tube as it is used, and I refill them for the next class. If I have a small class, students work individually. This is best, as students can finish in about 30 minutes. The laboratory outline is as follows:

## Procedure

Object:

To investigate the partial thermal degradation of mixed saccharides with protein inclusions.

Materials:

1. Full test tube of white solid is sucrose.
2. Full test tube of liquid is glucose solution.
3. Quarter test tube of pellets is protein.

4. Eighth of test tube of white solid is sodium bicarbonate.

5. Piece of yellow solid in container is margarine.

Method:

a. Into an Erlenmeyer flask, pour a test tube of sucrose and a test tube of glucose solution.

b. Set Erlenmeyer flask on ring of ringstand, clamp the neck of the flask to the ringstand, and heat the flask with a Bunsen burner.

c. Heat this solution until it comes to a gentle boil – you don't want to burn it. Stir constantly.

d. During this time, one person should stir and the other should get the aluminum foil and grease it lightly with margarine. Use only a bit of margarine; you will need most of the margarine in the next part.

e. Now add the remainder of the piece of margarine to the flask. Increase the heat, and heat and stir until it foams and turns a dark brown.

f. Once it turns brown, add the protein pellets, and continue to heat and stir until it thickens.

g. Turn off the flame. Leave the clamp attached to the flask and use this clamp as a holder. Put the flask next to the greased aluminum foil. Add the sodium bicarbonate to the flask. Stir very fast, and while it is foaming, pour onto the aluminum foil. Use your stirring rod to scrape as much as you can from the flask.

h. The mixture has to cool, so while it is cooling, wash your apparatus using hot water. This takes quite a bit of washing. Leave the clamp attached so you don't burn your hands. Also, wash your desk top.

**Discussion**

I find that hot water cleans everything up, but this takes some direction from the teacher. Don't tell students to eat the results, but as each desk is checked to see if it is clean, take a bit of the product and try it. Usually it is pretty good, but occasionally some form of caustic comment is appropriate. Don't eat too much. Every student will want you to test his result, and, by the end of the day, that's a lot of peanut brittle.

Remember, this is the last period before Christmas, so depending on the class, end with a bit of chemistry: Why did the mixture foam when the bicarbonate was added? Why use two sugars? (It prevents crystallization.)

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**Metric Punch**
(30-35 people)

1.38 ℓ pineapple juice
1.0 ℓ $H_2O$
0.9 kg $C_{12}H_{22}O_{11}$
9 g $C_3H_4(OH)(COOH)_3$
1.0 ℓ ginger ale
1.0 kg frozen hydrogen oxide
Add $C_2H_5OH$ – containing liquid as you please.
Mix all of the above, adding ginger ale last.

– Agnes Hunt,
Birmingham Board of
Education, Birmingham,
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**PEMAP**

The President's Environmental Merit Awards Program, similar to the Presidential Fitness Awards Program, was initiated in 1971 by the President of the United States to say "Thank you!" to millions of young Americans who devoted time and energy to improving environmental quality.

Primary through high school students, sponsored by their teacher or club leader, have undertaken environmental projects ranging from testing water quality to studying traffic patterns and received awards which are judged and administered locally. A kit of suggested activities and rules for organization are now available from the Environmental Protection Agency for the 1975-76 school year.

During the 1974-75 school year only twelve schools in Iowa were enrolled in the program. Kits and enrollment information are available from PEMAP, 401 M Street, S.W., Washington, D.C. 20460.