

Cooking with Chemistry: Candy

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Some History

The “Christmas Experiment”:

Partial Thermal Degradation of Mixed Saccharides with Protein Inclusions, R. C. Adams, *J. Chem. Educ.*, **49**, 536, 1972

A “Spring Experiment”:

Partial Thermal Degradation of a Mixed Saccharides Triol Solution, D. A. Katz, 1995

A hands-on workshop:

Cooking with Chemistry, ChemEd97 at the University of Minnesota, 1997

Consumer Chemistry, a course for non-majors:

Cabrini College, 1995

Pima Community College, 2003

Safety with Food Chemistry Experiments

- Home economics laboratory, if possible.
- All apparatus must be new or never used with any laboratory chemicals.
- Materials used must be stored away from any possible contamination by laboratory chemicals.
- All chemicals must be food grade (USP grade is acceptable). Preferred they be new or in individual serving packets.
- Bench tops must be cleaned with a food safe cleaner.
- Bench tops covered with a food safe material.
- Balances and areas around balances must be cleaned.
- Food materials used for tasting must be in new, unopened packages or containers.
- Once a food material has been opened near any laboratory chemicals, it is considered to be contaminated.

Candy Sushi

Swedish fish
Fruit by the foot
Mini powdered doughnuts
Rice Krispie Treats
Red licorice
Jelly candies



Partial Thermal Degradation of Mixed Saccharides with Protein Inclusions aka, Peanut Brittle

R. C. Adams, J. Chem. Educ., 49, 536, 1972

- Directions written in “chemistry”
- Chemicals Needed:

sucrose crystals

3 M glucose

protein pellets

solidified mixed esters

4-hydroxy-3-methoxybenzaldehyde

sodium chloride

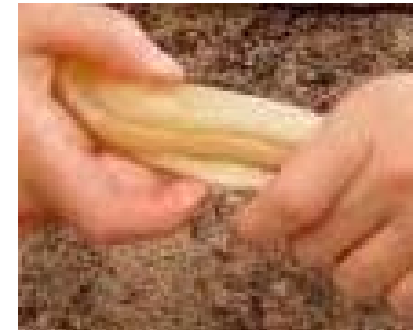
sodium bicarbonate

water



Partial Thermal Degradation of a Mixed Saccharides Triol Solution aka, Taffy

- Directions written in “chemistry”
- Chemicals Needed:
 - sucrose crystals
 - 3 M glucose
 - solidified mixed esters
 - glycerin
 - 4-hydroxy-3-methoxybenzaldehyde
 - sodium chloride
 - theobromine powder
 - menthol/menthone solution
 - limonene/monoterpene solution
 - food color



Lollipops

Materials Needed

light Karo syrup (corn syrup)

sugar

water

citric acid (a “pinch”)

flavoring (concentrated candy
flavoring preferred)

food color (gel candy food colors)

lollipop sticks and molds



Confuse your friends, use non-traditional colors with the flavors.

Rock Candy

aka Crystallized Sugar

Materials Needed

Sugar (up to 4 cups)

Water (1 cup)

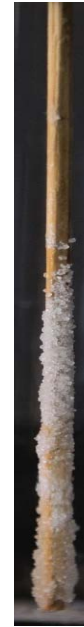
flavoring

Food color

Crystal growing is an art.

The best formed crystals grow slowly

**2 ½ to 3 cups sugar to one cup water
recommended**



Gummy Candy

Materials Needed

Knox[®] unflavored gelatin

Flavored gelatin dessert (Jell-o[®])

water

Candy molds

Optional: citric acid

Heat in microwave oven



Caramels

Materials Needed

sugar (white granulated sugar or a mixture of white and brown)

corn syrup (Karo)

water

unsalted butter

heavy whipping cream

salt

vanilla extract

Optional: chocolate



Tootsie Rolls

Tootsie Rolls® are not a fudge or a caramel, but somewhere in between.

Materials Needed

- unsweetened cocoa powder (Hershey's)
- powdered sugar
- dry milk powder
- corn syrup (Karo)
- unsalted butter
- salt

This is a non-bake recipe



Pop Rocks aka Fizzy Candy

Materials Needed

- granulated sugar
- corn syrup (Karo)
- water
- baking soda (sodium bicarbonate)
- citric acid
- flavoring extract
- food color (Use food coloring gel)
- Confectioner's sugar

Mainly some fizz – no “pop”



Determination of the Volume of CO₂ in Pop Rocks[®] A Pop Rocks Experiment

Uses the Ideal Gas Law.

Calculation of gas solubility in water.

Determination of mass of a gas.



Extraction and Identification of Artificial Food Colors

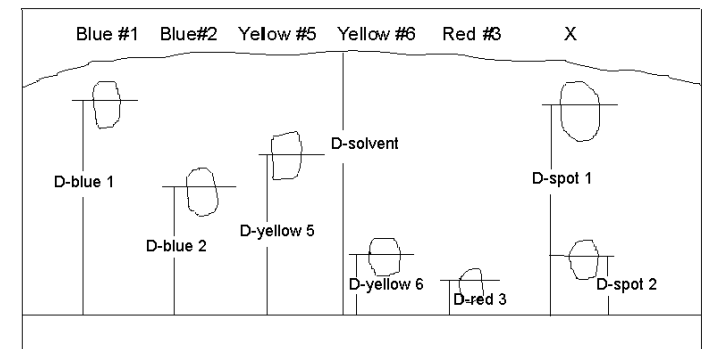
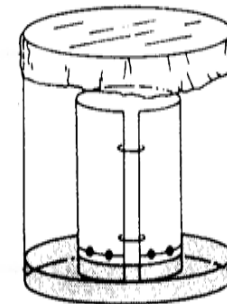
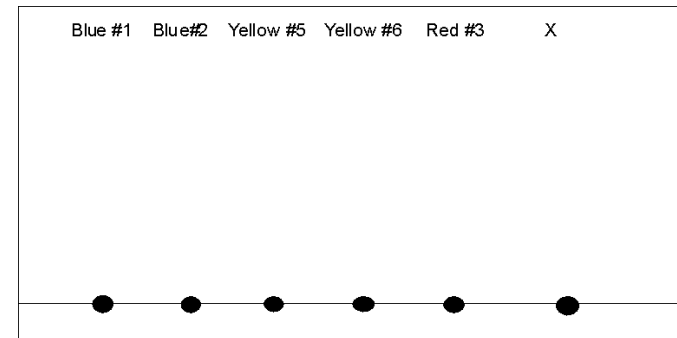
Artificial food colors extracted from foods

Originally used Amberlite liquid ion exchange resin

Now uses wool yarn

Paper chromatography used to separate and identify food colors

FD&C colors used as standards



Reference for the Chemistry of Candy Making

Edwards, W. P., *The Science of Sugar Confectionery*, Royal Society of Chemistry, Cambridge, UK, 2000.

References for Candy Making

Gehring, Abigail R., *Classic Candy*, Skyhorse Publishing, New York, NY, 2013.

Kendrick, Ruth A. and Pauline H. Atkinson, *Candymaking*, HP Books, 1987.

Sharrock, Jane, *Who Wants Candy*, HP Books, New York, 2004.

Torres, Jacques, *Dessert Circus: Extraordinary Desserts You Can Make at Home*, William Morrow Cookbooks, 1997.

Wilbur, Todd, *A treasury of Top Secret Recipes*, Plume, 1999.

Look up specific recipes on the Internet. You will find multiple versions for each recipe. Read comments to help you decide which recipes, or modifications, are most likely to succeed.

**Candy experiments
can be found at**

<http://www.chymist.com>

On the left hand menu, select:

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and the

National Chemistry Week 2014

(NCW 2014) page