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We will start momentarily at 2pm ET

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CHEMISTRY HAIKU OF THE DAY!

"Still too small to see. . .
Bonds beneath the microscope.
AFM sneaks up!" 5-7-5

Submitted by David Mork
Professor at Concordia College, Moorhead, MN

Got a #chemhaiku share it with us on twitter or submit it to our webpage!

http://acswebinars.org/chem-haiku

Upcoming ACS Education Webinars

"Holiday Chemistry"

Target Grades: 9-12
Date: Thursday, November 29, 2012
Time: 6:30-8PM ET
Presenters: Michael Tinnesand and Erica Jacobsen

Just in time for holidays! The presentation will provide examples of labs, activities, demonstrations, and articles connect holiday themes with fundamental science concepts.

Register at http://bit.ly/OIxKhZ

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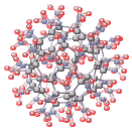

Thursday, October 25, 2012
Nanomaterials and the Quantum World Around Us
Dr. Bill Coish
Dr. Darren Griffin

Thursday, November 1, 2012
Finance 201 – Startup Equity: What Investors Want
Dr. Joseph Steig
Teresa Esser

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ONE WORD

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ACS WEBINARS™
October 18, 2012

ACS Chemistry for Life®

The Sweetest Day and the Chemistry of Sweetness

Sally Mitchell
East Syracuse Minoa High School

Dr. Sara Risch
Popz Microwave Popcorn

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The Sweetest Day and the Chemistry of Sweetness

October 18, 2012

sally B mitchell

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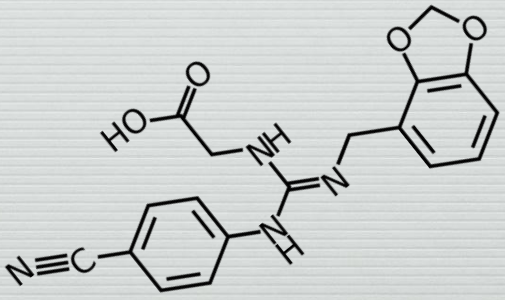
The Sweetest Day

October 20, 2012
(The 3rd Saturday of October)



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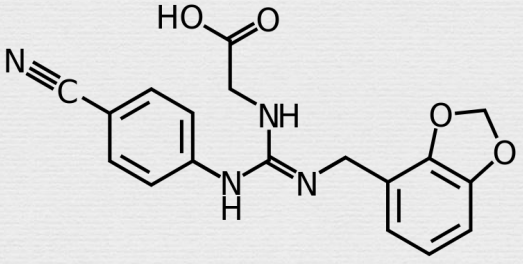
Sally Mitchell

- Teaches Chemistry at East Syracuse Minoa Central High School

- Incorporates Food Chemistry into her chemistry lessons



ACS Chemistry for Life

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History of the Sweetest Day

- October 8, 1921

- Herbert Birch Kingston gave away ~20,000 boxes of candy to “newsboys, orphans, old folks, and the poor”. Remember, this was during the Great Depression.

- Cleveland, Ohio

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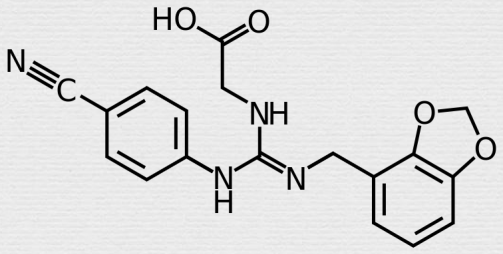
What is “sweet?”

- Different sugars give different impressions of sweetness

- Using different sugars will yield different results



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Taste Buds

13

Which of the following animals does not have the ability to detect the sweetness of sugars?

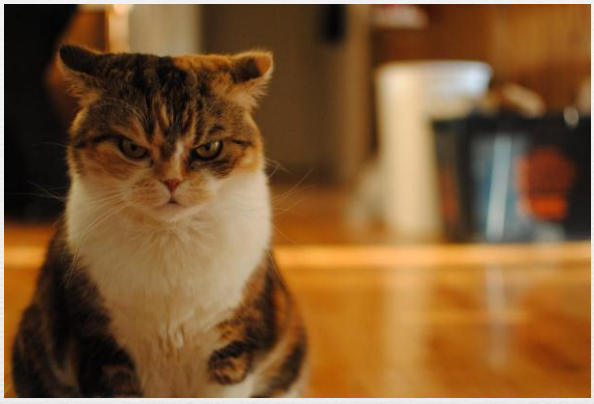
A. cats

B. dogs

C. mice

D. horses

14



Answer: A

Cats, dolphins, and some other obligate carnivores have lost the taste receptors for sweetness in their evolutionary history.

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Sugars

- Adds and balances flavor
- Heating in different ways creates unique colors and flavors
- Derived from a plant source

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Honey

- 50% fructose 50% glucose
- What does honey do to our baked goods?
- What candies have honey in them?

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In Europe

- First encountered on 11th Century Crusades to the Holy Land
- Venice became the hub for sugar trade
- Confections arose from Latin *conficere* meaning “to put together” or “to prepare”
- Sugar could mask bitterness of some drugs

18

Sugar Cane

- Produced in the Caribbean, India, and Brazil
- In the USA: Florida, Hawaii, Louisiana, and Texas

19

Sugar Beets

- Sucrose grown in the USA
- 30% of sucrose produced in the world is from sugar beets

20

Chemistry of Sugar

$C_x(H_2O)_y$

- Carbon is the backbone of sugar
- All sugars contain Carbon, Hydrogen, and Oxygen
- Simple monosaccharides: glucose, fructose, and galactose
- Disaccharides: lactose, sucrose, and maltose

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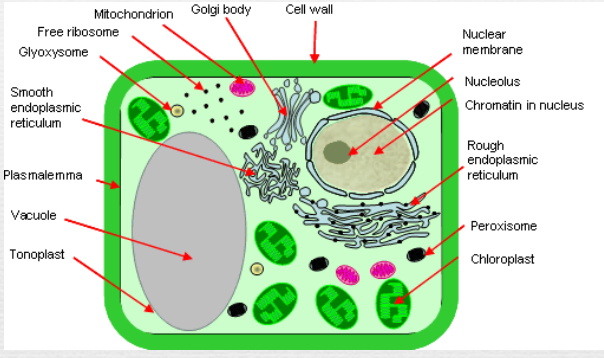
The Need for Sugar



- The body needs it as a source of energy
- Plants need it for production of cellulose, hemicellulose, and pectin

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Food and Cooking

- Helps to retain moisture in a baked good
- Keep frozen desserts from solidifying into a solid block of ice
- Holds food particles together, sugars give bulk
- Helps prevent spoilage microbes from growing

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Types of Sugar

Common Forms:

- Glucose
- Fructose
- Sucrose
- Lactose

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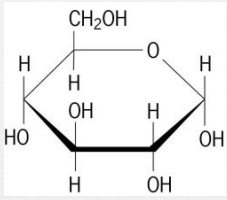
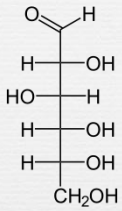
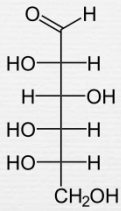


Glucose



D-Glucose



L-Glucose

- Also called dextrose
- Photosynthesis
- Less sweet than sucrose
- Less soluble in water than sucrose

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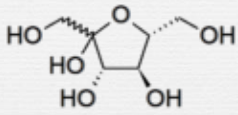
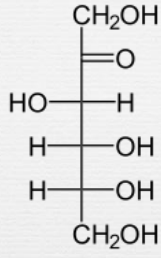
Fructose





- Also called levulose, an isomer of glucose
- Sweetest of common sugars
- Most soluble in water of the sugars
- Different shapes of the molecule give different effects on the taste receptors

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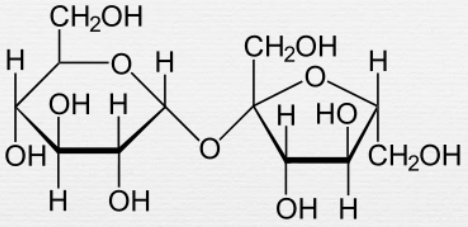
Sucrose



- First source was sugar cane
- Originated in New Guinea and carried to Asia
- 2nd most soluble sugar
- Inverts to fructose and glucose in presence of acid

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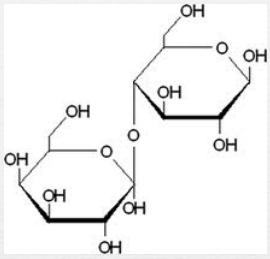
Brown Sugar

Molasses

28

Lactose



- Found only in milk
- Disaccharide consisting of glucose and galactose
- Sweetened condensed milk

29

Caramelization

- Sugar breaks apart chemically and forms new substances with different tastes, it doesn't really melt.

30

What is your favorite sweet?

A. ice cream

B. chocolate bar

C. fudge

D. Cookie

E. Other

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Chocolate

32

Raw Cacao Beans

33

Nibs

34

Cocoa

35

Chocolate Bloom

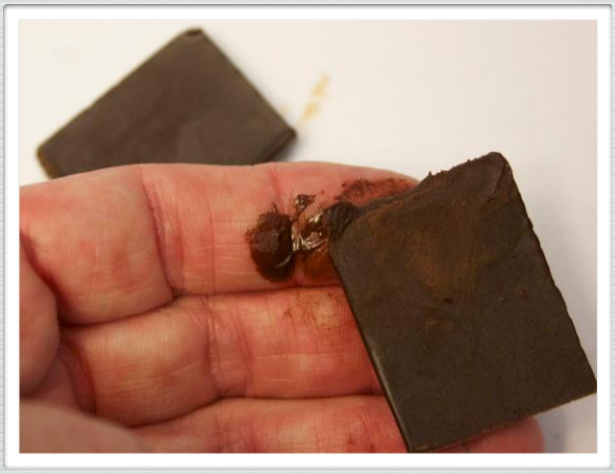
36

White Chocolate and Cocoa Butter

37

Tempered Chocolate

38



Un-tempered Chocolate

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Making Fudge

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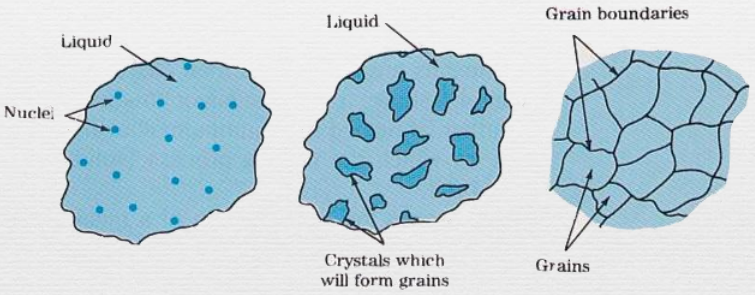
Crystal Formation



http://www.benbest.com/cryonics/ggrowth.jpg

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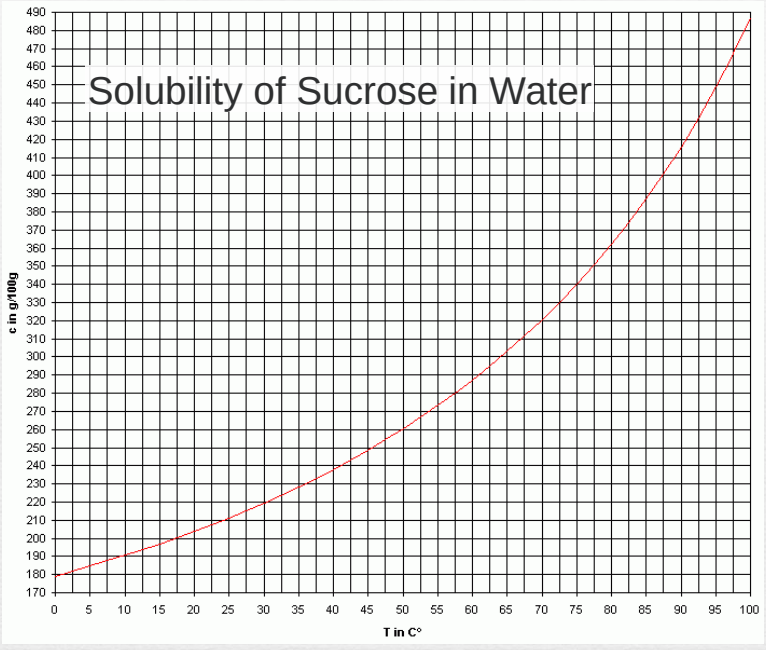
Thermometer set for soft ball

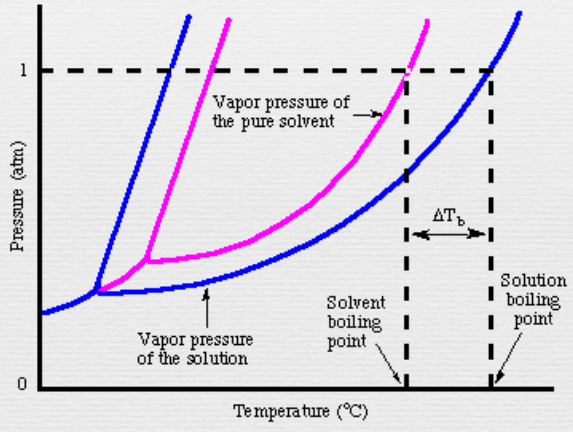
Pan is buttered on the sides

42



http://www.crystalgrowing.com/alte-version/recipes/SUGAR/SUGAR.HTM 43

Boiling Point Elevation



http://img.sparknotes.com/figures/A/a355d48810a7fa33761d1f32c3099d7b/bpel.gif 44

Soft Ball Stage

45

Temperature	Stage Used in Cooking	Description of syrup dropped in cold water	Used to make product
110–112°C	Thread	Forms 5-cm threads	Syrup (hot fudge)
112–115°C	Soft ball	Ball that flattens	Fondant, fudge, pralines
118–120°C	Firm ball	Ball that holds its shape	Caramels
132–143°C	Hard ball	Ball is hard and firm	Divinity, nougat
149–154°C	Soft crack	Hard, pliable threads	Taffy
149–154°C	Hard crack	Hard, brittle threads	Brittles, lollipops
160–177°C	Caramel	Syrup tan to brown	Flan, caramel cages

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Seed Crystallization

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Finished Product

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Peanut Butter Fudge

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Cookies and Cream Fudge

51

Caramel

52

Divinity

53

Taffy

54

Brittles and Lillipops

55

Helpful Hints

- Accurate thermometer and double check with the soft ball test
- Wash down sides of pan so there are no seed crystals clinging to the side of the pan
- Do not disturb the fudge while it cools
- Be patient
- Beat vigorously to create many seed crystals

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Recipes can all be found on my website

http://www.esmschools.org/webpages/smitchell/

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ChemMatters

Chocolate

Miller, Judy, organic, Apr 87/16

Chocolate-Covered Cherries

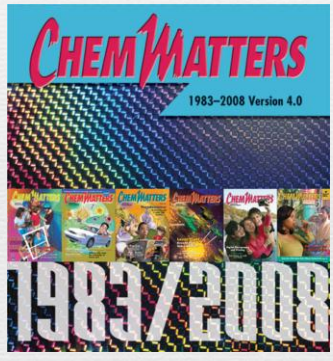
Wood, Clair, *Puzzles*, enzymes, Apr 87/20

Chocolate—How Sweet It Is!

Baxter, Roberta, *Cover Story,* chocolate, Dec 99/4

Peanut Brittle

Catelli, Elizabeth, sugar, Dec 91/4



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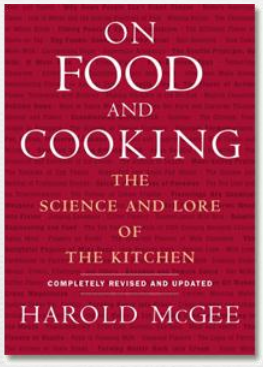
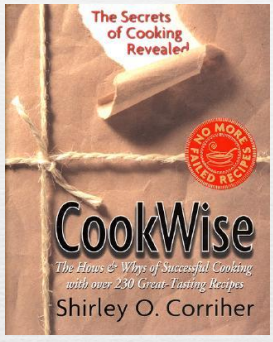
Books





"On Food and Cooking" by Harold McGee

"Cookwise" by Shirley O. Corriher

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Popz Microwave Popcorn

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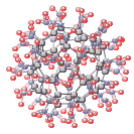

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Oh! Convective heat transfer
You make fluids hot."

Amanda

5-7-5

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