

Learning Guide 4C – How Sweet It Is Chem 1010

Introduction

What is the difference between these three products?

Pepsi – carbonated water, high fructose corn syrup, caramel color, sugar, phosphoric acid, caffeine, citric acid, natural flavors

Pepsi Throwback – carbonated water, sugar, caramel color, phosphoric acid, caffeine, citric acid, natural flavors

Diet Pepsi – carbonated water, caramel color, aspartame, phosphoric acid, potassium benzoate, caffeine, citric acid, natural flavors

What is the purpose of each of these ingredients?

1) What does carbonated water contain?

Why is water the first ingredient?

Is this true for other beverages?

What is the carbon dioxide there for?

What happens if you leave a soda sitting out?

How is Pepsi made in when you buy it at a restaurant?

2) What is the purpose of these compounds?

HFCS, sugar, aspartame

What does the Nutrition Facts table say about the amount of sugars in each product?

Pepsi

Throwback Pepsi

Diet Pepsi

How much aspartame is found in Diet Pepsi?

3) What is the purpose of caramel color?

How is caramel color traditionally made?

How is caramel color made now?

What else is caramel color used in?

4) What is the purpose of adding phosphoric acid?

What concern has been raised by health food advocates?

Is it justified?

5) What is the purpose of the caffeine?

How much caffeine does a 12 oz can of Pepsi contain?

Where does the caffeine come from?

What is the half-life of caffeine in a healthy adult?

6) What is the purpose of citric acid?

Is there any truth to the concern that the acid in cola drinks will eat away your tooth enamel?

7) What is the purpose of the natural flavors?

What are some guesses as to what they may be?

8) What is the purpose of potassium benzoate?

Why is it found only in Diet Pepsi?

So what is Pepsi made of?

Pepsi =

Which of these are compounds, and which are mixtures?

Now let's focus on the sweeteners.

What are the five tastes that you can detect with your tongue?

Sugar

What does “Made with Real Sugar” mean on the Pepsi Throwback can?

Where does table sugar come from?

What kind of climates do they grow in?

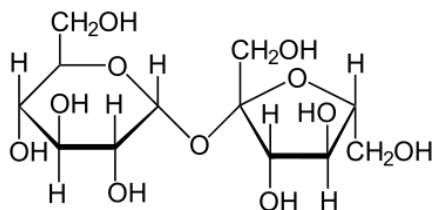
How much of the world's sugar comes from each?

Which has been used for a longer time?

What is the chemical structure of table sugar?

chemical name:

formula:

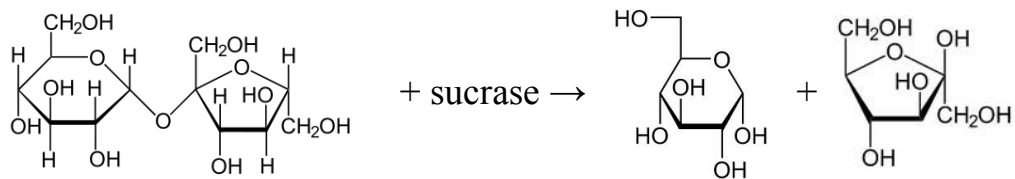


structure:

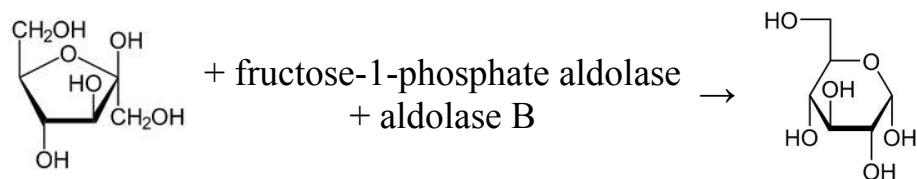
Why is it called a disaccharide?

What happens to sucrose during digestion?

1)



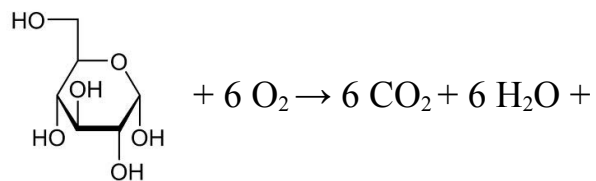
2)



3)

When you test your blood sugar, what compound is being detected?

4)



High Fructose Corn Syrup (HFCS)

So if Throwback Pepsi contains regular table sugar, what kind of sweetener is in regular Pepsi?

Throwback Pepsi:

regular Pepsi:

What can you tell just from the name?

How long has HFCS been used in Pepsi?

To understand where HFCS comes from, we need to look closely at a grain of corn.

What is the purpose of a grain of corn?

What are the parts of a corn grain?



bran

germ

endosperm

What do you get if you grind up the entire corn kernel?

1) whole grain cornmeal

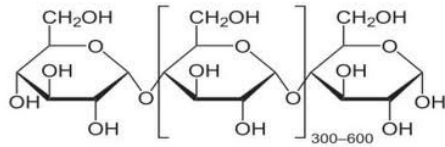
2) grits

3) regular cornmeal

What do you get if you remove and purify just the endosperm?

What is cornstarch used for in cooking?

What is the chemical structure of cornstarch?



Does it taste sweet?

How is cornstarch made into high fructose corn syrup?

cornstarch → corn syrup → HFCS

- 1) alpha-amylase breaks long chains of glucose into short ones
- 2) glucoamylase breaks short chains of glucose into glucose molecules
- 3) glucose-isomerase converts some glucose to fructose

What is corn syrup used for?

What is the 3rd step for? Why not just use corn syrup?

sweetener	structures	sweetness	comparison
table sugar (sucrose)			
glucose			
fructose			
corn syrup			
HFCS			

What other kinds of foods besides soda contain HFCS?

How do you know?

Are there some health concerns that have been raised about HFCS?

Aspartame

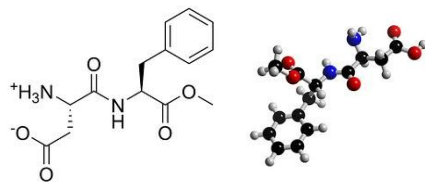
What sweetener is found in Diet Pepsi?

What brand name was aspartame originally known under?

How is it different from the sweeteners in Pepsi and Throwback Pepsi?

What does it look like?

What is its structure?



What two amino acids is it made from?

What happens to it when it is digested?

How was it discovered?

How does its sweetness compare to sugar?

sucrose =
aspartame =

What happens to aspartame when it is heated?

Are there claims of negative health effects from aspartame?

Have any been proven?

A 2007 medical review on the subject concluded that "the weight of existing scientific evidence indicates that aspartame is safe at current levels of consumption as a non-nutritive sweetener".

Is the customer free to decide?