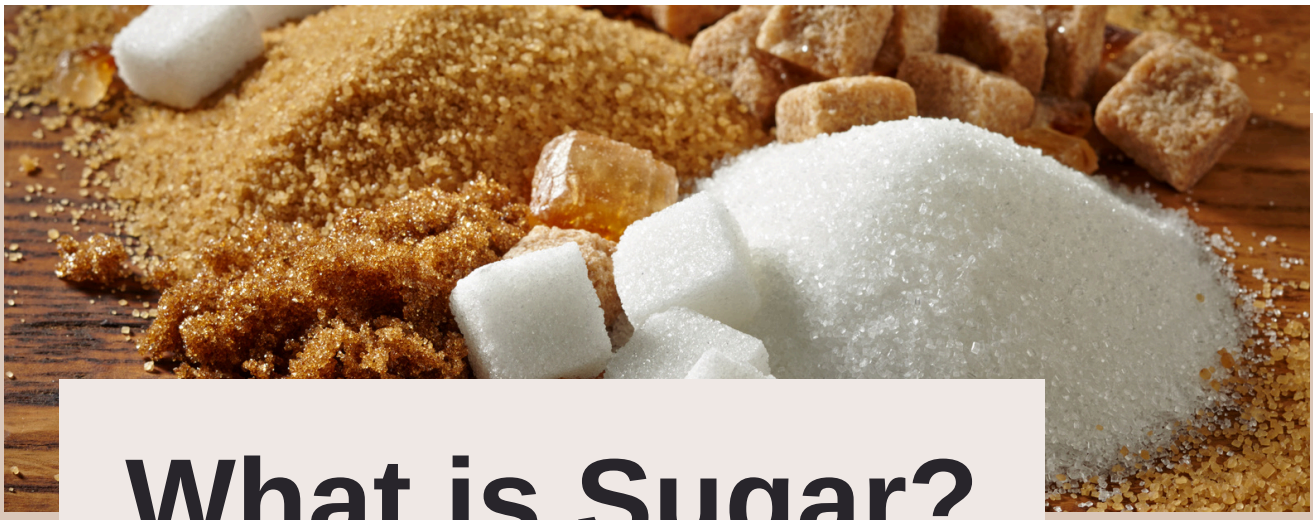
STATION 1



What is Sugar?

At this station you will discover what sugar is and where it comes from.

Step 1: Watch the video, What is Sugar?

Step 2: Answer the questions on your handout.

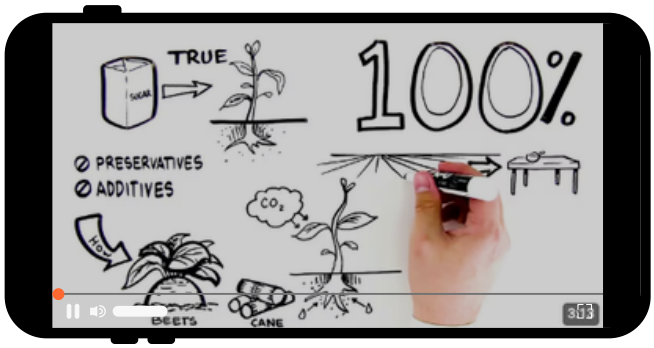
1. How long have humans been eating sugar?
2. What is the scientific name for sugar?
3. Do humans “make” sugar? Why or why not?

STATION 2

Field-to-Table

At this station you will discover that sugar comes from two plants.

Step 1: Watch the video, Field to Table.

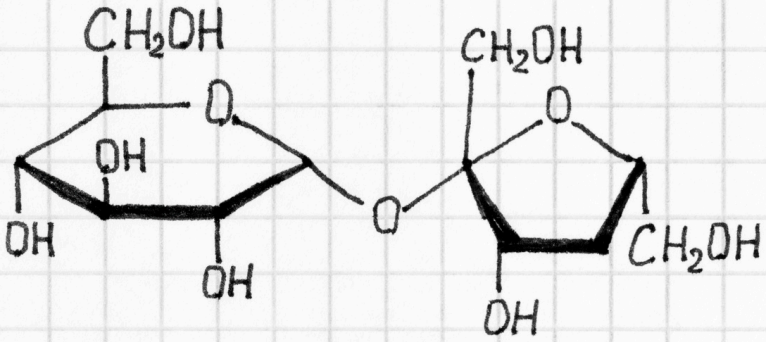


SCAN ME!

Step 2: Answer the questions on your handout.

1. Summarize the field-to-table process of sugar cane or sugar beets.
2. How are sugar cane and sugar beets similar? How are they different?
3. What happens to the parts of the plant that are leftover?

STATION 3



Molecular Structure of Sucrose

At this station, you'll learn how sugar's tiny molecules shape the way it tastes, dissolves, and cooks.

Step 1: Read the article, ***Inside Sugar: The Molecular Structure of Sucrose***

Step 2: Answer the questions on your handout.

1. Why do scientists study sugar at the molecular level?
2. List the elements that make up sucrose.
3. Explain how a sucrose molecule is formed from two smaller sugars. What are those two sugars?

STATION 3

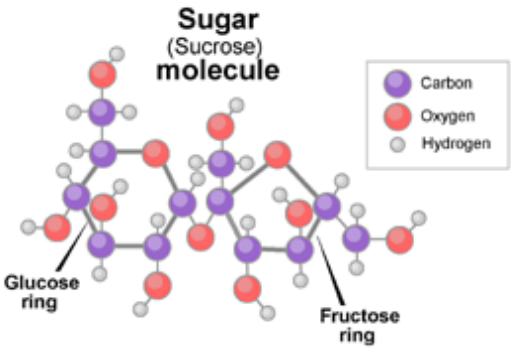
Inside Sugar:
The Molecular Structure of Sucrose

Sugar may look simple, but at the microscopic level it is made of tiny building blocks called molecules. The most common sugar in our diets is sucrose, which comes from plants like sugar cane and sugar beets. Even though sucrose tastes sweet and dissolves easily in drinks, those qualities come from its specific molecular structure. Scientists study sugar at the molecular level to explain how it behaves in foods and how our bodies use it for energy. While molecules are far too small to see, they are constantly interacting in everything we eat. These invisible interactions explain why sugar melts when heated, dissolves in water, and caramelizes when cooked. Without its unique structure, sugar would not behave the way it does in cooking and baking.

Sucrose is a type of carbohydrate, meaning it is made mostly of carbon, hydrogen, and oxygen atoms. It forms when two smaller sugars—glucose and fructose—join together through a chemical bond. These simpler sugars are called monosaccharides, and when they link up, they create one sucrose molecule, a disaccharide. You do not need to memorize the exact shape of sucrose, but diagrams show that its atoms are arranged in a way that allows the molecule to store chemical energy. This stored energy is important for living organisms, including humans.

When you eat sugar, your body breaks sucrose back down into glucose and fructose during digestion. These simpler sugars enter the bloodstream and are used by cells as fuel. Glucose is especially important because it powers muscles, the brain, and many chemical reactions in the body. Because sucrose is broken down quickly, foods high in sugar can provide a burst of short-term energy. This is why sugary foods often make people feel energized at first, followed by a drop once that energy is used.

Although all sugars are made from similar atoms, slight differences in molecular structure affect how they behave. The way atoms are arranged influences how sweet a sugar tastes, how easily it dissolves, and how our bodies process it. Some sugars dissolve very easily in water, while others crystallize more readily, which is important in making candy. Food scientists and bakers use this knowledge to control texture, flavor, and appearance in recipes. By understanding the molecular structure of sucrose, scientists can improve foods, explore alternative sweeteners, and explain why sugar is such a powerful ingredient in everyday life.



STATION 4

The Geography of Sweet Crops

At this station you will explore the geography of sugar by mapping where farms and processing facilities are found across the United States.

Step 1: Examine the map, ***Where in the U.S. Does Sugar Come From?***

Step 2: Answer the questions on your handout.

1. What two main crops are used to produce most of the sugar in the United States?
2. Describe how the growing conditions for sugar beets and sugar cane differ in the United States.
3. Based on the map, what relationship do you notice between where sugar is grown and where sugar processing factories are located?

STATION 4

WHERE IN THE U.S.
does sugar come from?
6 Quick Facts

1
Sugar is grown and/or refined in **16 states** across the U.S.

2
Sugar beets grow best in places wher the **temperatures are generally cooler.**

3
At sugar beet factories and sugar cane refineries across the country, the sugar from the plants is **purified into the sugar** shipped to grocery stores and food manufacturers.

4
Sugar cane is grown in **warmer, tropical climates.**

5
Sugar beet factories are located near the farms to **shorten the distance farmers need to travel** with their beets.

6
Some raw **cane sugar** is also imported to the U S. for refining.

sugar beet factory
sugar beet growth
sugar cane refinery
sugar cane growth

the Sugar association
There's more to sugar.

STATION 5

Alternative Sweeteners

At this station, you will explore honey and maple syrup as alternative sweeteners and compare them to traditional sugar.

Step 1: Read the article ***Sweet Alternatives.***

Step 2: Answer the questions on your handout.

1. What is an alternative sweetener?
2. How are honey and maple syrup made?
3. Why might someone choose honey or maple syrup instead of sugar?

STATION 5

Sweet Alternatives

An alternative sweetener is any substance used to sweeten food or drinks instead of traditional table sugar (sucrose). Alternative sweeteners can come from plants, animals, or processes found in nature. Honey and maple syrup are considered alternative sweeteners because they sweeten foods but are not refined crystal sugar. Unlike artificial sweeteners, these alternatives are minimally processed and still contain some nutrients or natural compounds.

How is Honey Made?

Honey is made by bees, not machines. Bees collect nectar from flowers using their long tongues and store it in a special stomach called a honey stomach. Inside the bee, enzymes begin breaking down the sugars in the nectar. When the bee returns to the hive, it passes the nectar to other bees, who continue this process.
The bees spread the nectar inside honeycomb cells and fan their wings to evaporate excess water. As the water content drops, the nectar thickens and becomes honey. The bees seal the honeycomb with wax to store it. Humans harvest honey from hives by removing the honeycomb and extracting the honey, usually by spinning it out without heavy processing.

How is Maple Syrup Made?

Maple syrup comes from maple trees, especially sugar maple trees. In early spring, when temperatures rise above freezing during the day and fall below freezing at night, sap flows inside the trees. Farmers collect this sap by tapping small holes in the tree trunk.

Maple sap looks like clear water and contains only a small amount of sugar. To make maple syrup, the sap is boiled to evaporate most of the water. As the water evaporates, the sugars become more concentrated, and the sap thickens into maple syrup. It takes about 40 gallons of sap to make one gallon of maple syrup, showing how concentrated and valuable the final product is.

Comparing Sugar, Honey, and Maple Syrup

Traditional table sugar (sucrose) is made by refining sugar cane or sugar beets. It is almost 100% sugar and provides energy but no vitamins or minerals.

Honey contains mostly simple sugars like glucose and fructose, along with small amounts of vitamins, minerals, antioxidants, and antibacterial compounds. It has slightly more calories than sugar by volume but may offer small health benefits when used in moderation.

Maple syrup is also mostly sugar, but it contains minerals such as calcium, potassium, and manganese, as well as antioxidants. Like honey, it provides energy while offering tiny nutritional advantages over refined sugar.

While sugar, honey, and maple syrup are all forms of sugar and should be consumed in moderation, honey and maple syrup are often chosen for their flavor, natural origins, and small nutritional benefits. Understanding how these sweeteners are made and how they differ helps explain why they play unique roles in cooking, baking, and everyday food choices.

STATION 6

Sugar Byproducts

At this station, you'll investigate how leftovers from sugar production become valuable resources.

Step 1: Read the article, ***Sugar Byproducts: More Than Just Sugar***

Step 2: Answer the questions on your handout.

1. Why is bagasse considered a renewable source of energy?
2. What is molasses, and at what stage of the sugar production process is it produced?
3. What is filter mud, and what valuable substances does it contain?

STATION 6

Sugar Byproducts: More Than Just Sugar

A byproduct is a material created while making a main product. In sugar production, refined sugar is the main product, but processing sugar cane and sugar beets also creates leftover fibers, syrups, and organic materials that are often reused instead of thrown away. As sugar is extracted and refined, byproducts such as bagasse, molasses, and filter mud are produced. Although they may seem like waste, these materials are valuable and are used in agriculture, energy production, and other industries, helping producers use as much of the plant as possible.

Bagasse: Leftover Plant Fibers

Bagasse is the dry, fibrous material that remains after sugar cane is crushed to extract its juice. This material looks similar to shredded straw or dry grass. Even though it contains very little sugar, bagasse is extremely useful.
Many sugar mills burn bagasse as a renewable energy source to produce electricity and heat for the factory. Some facilities create enough energy from bagasse to power their entire operation and even send electricity to nearby communities. Bagasse is also used to make paper products, cardboard, and biodegradable packaging, reducing the need for wood-based materials.

Molasses: Thick and Sweet

Molasses is a thick, dark syrup that remains after most of the sugar crystals have been removed from sugar juice. It still contains sugars, minerals, and flavor compounds, giving it a strong taste and dark color.
Molasses is commonly used in:

- Baking (such as gingerbread and cookies)
- Animal feed
- Fermentation to produce yeast, alcohol, and biofuels

Unlike refined sugar, molasses contains small amounts of iron, calcium, and potassium. While it is still a form of sugar, its unique flavor and nutrients make it useful for both food and industrial purposes.

Filter Mud: Nutrients from Processing

Filter mud (sometimes called press mud) is a soft, muddy material left over after sugar juice is filtered during processing. It is made up of plant particles, soil, organic matter, and nutrients. Rather than being waste, filter mud is often used as a fertilizer or soil conditioner. Farmers apply it to fields to improve soil health, increase organic matter, and return nutrients to the land where sugar crops are grown. This practice helps close the loop between agriculture and processing.

Why Sugar Byproducts Matter

Sugar byproducts show that sugar production is about more than making sweeteners. By reusing bagasse, molasses, and filter mud, producers reduce waste, save energy, and support sustainable farming practices. These byproducts play an important role in agriculture, energy production, and food manufacturing, making sugar one of the most fully utilized crops in the world. Understanding sugar byproducts helps us see how science, geography, and industry work together to create efficient food systems.