Activity 1: Why does toast turn brown?

Note: This requires a hot stove, so please do this with an adult!

Materials

- 14 ounces of sweetened condensed milk
- ¼ cup of light corn syrup
- 1 cup of light brown sugar
- 1 stick salted butter
- 1 teaspoon of vanilla
- 1 teaspoon of salt (kosher sea salt works really well)
- A heavy baking pan
- A heavy saucepan or Dutch oven

Instructions

(1) Combine the butter, sugar, condensed mild, corn syrup, and salt in your heavy saucepan.

(2) **With an adult close by or helping**, heat your mixture over a medium flame with stirring until it is melted together and boiling, about 5-10 minutes.

(3) Stir and stir. Watch and see what happens as the mixture heats. **Does the color change? Does the smell change?**

(4) Keep stirring until the mixture turns into a firm ball. This should take 20-25 minutes. To test if it's ready, you can drop a spoonful into some ice water and see if it firms up. If you are using a candy thermometer, it should be about 240 degrees.

(5) Remove your saucepan from heat, stir in your vanilla and mix vigorously. **Be careful, and make sure you wear oven mitts.**

(6) Pour the mixture into a pan.

(7) Put your mixture in the fridge to cool for 2-3 hours or overnight.

(8) Cut into squares and eat one! **Does it taste just like sugar, or does it taste different? How?**

What you learned:

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Explanation:

Sugar is a **molecule** that is made up of **atoms** like carbon (C), hydrogen (H), and oxygen (O). The atoms are connected to each other through **chemical bonds**. It looks a bit like a Tinker Toy house with balls (atoms) and sticks (bonds) connected to make a larger shape!

Tinker toy house

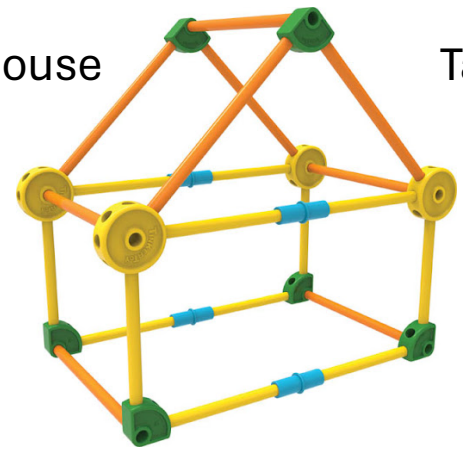
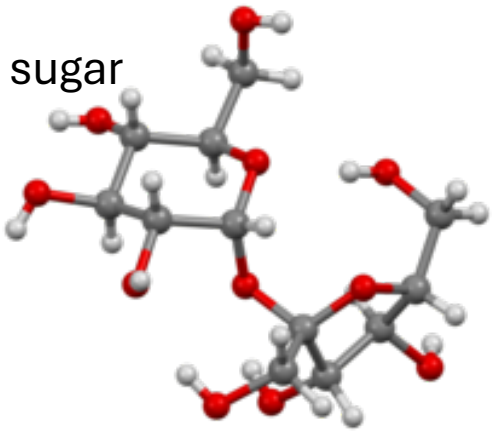
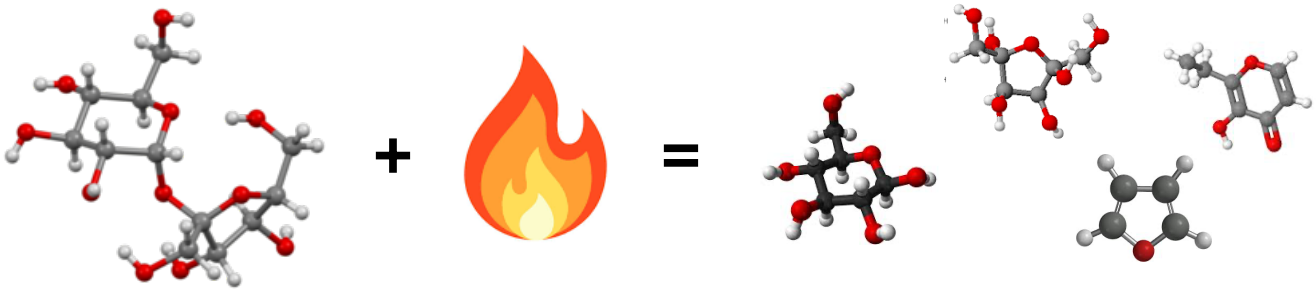


Table sugar

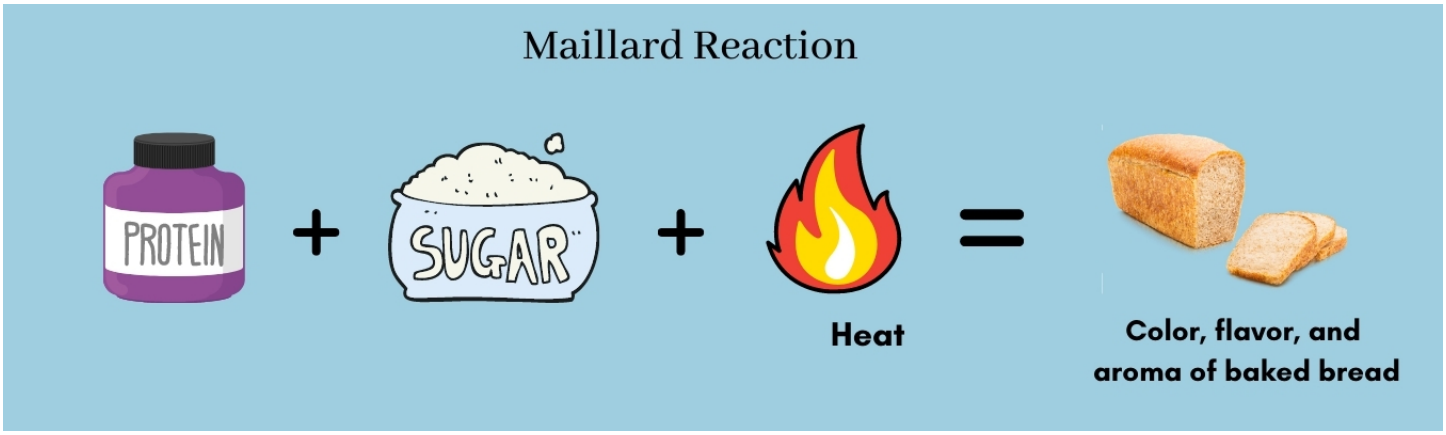


When you heat sugar, the heat energy breaks down some of the bonds between the atoms, so that the “Tinker Toy” structures become simpler… but also tastier! Take a look at the chemical reactions – see how the heat breaks the big shapes (sugars) down into smaller shapes (sugars).

Table sugar **Heat** **Simple (caramelized) sugars**

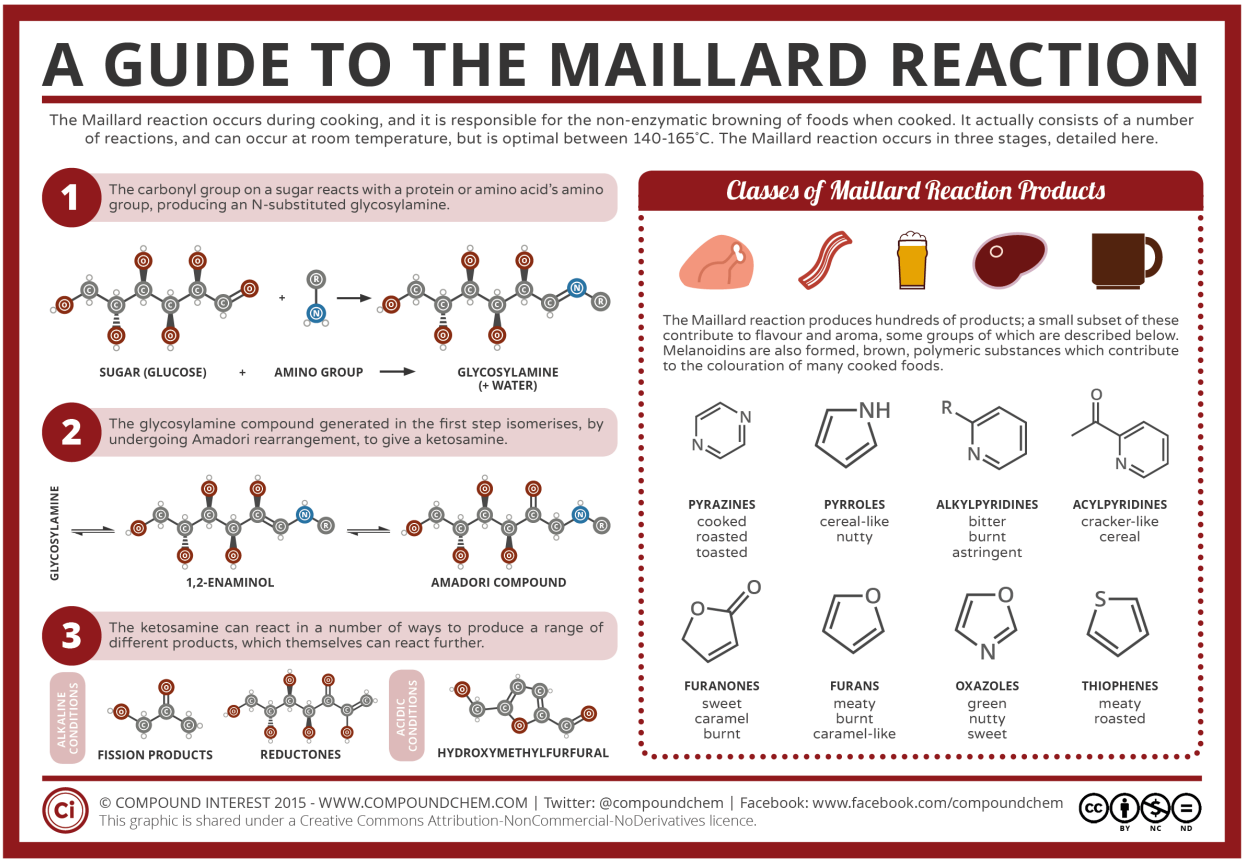


But there’s more! Bread (and caramel) have **<u>proteins</u>** in them. These are different molecules – think of them as Legos – that can “connect” to your broken-down sugars. Think of these as Tinker Toy houses with Lego garages. These new protein-sugar molecules are even more flavorful than the caramelized sugars alone. This is called the **<u>Maillard reaction</u>**, and it’s why so many seared foods taste good!



(images courtesy of foodresearchlab.com)

If you are interested in a more complicated explanation take a look below (courtesy of compoundchem.com).



You can also get additional information about the Maillaird reaction at: https://sciencenotes.org/maillard-reaction/ https://sciencenotes.org/carmelization-chemistry-why-sugar-turns-brown/