



High Touch High Tech[®]

Science Experiences That Come To You

Maple Candy

Maple syrup is great on pancakes and waffles, but what is another way to use this yummy syrup? In this activity, you can make Maple Candy! This delicious treat can be soft, like taffy, or hard. By using cookie cutters, you can make fun shapes.

*****Ask an adult for help with this activity******

Maple syrup is a concentrated solution of sugar and water. Depending on the maple tree, amino acids give the maple syrup a distinct flavor. Each type of maple tree has different tastes!

After a maple tree is tapped, the sap is collected and loaded onto trucks. It is taken to a sugarhouse and must be gently boiled. This causes water evaporation so the sugar is more concentrated. This process makes the syrup sweeter and denser. As the syrup cools, sugar molecules form crystals. If the maple syrup has a high concentration of sugar, the cooling process creates more crystals.

This is the same procedure to create maple candy. First, you will gently heat the maple syrup. This will cause evaporation and make the sugar content more concentrated. Then, you will allow it to cool down and create sugar candies!

Supplies & Ingredients:

- Adult assistance
- Baking pan or hard candy molds
- Cooking oil if using candy molds
- Wax paper if using baking pan
- ½ cup pure maple syrup (make sure it is not imitation syrup)
- Stove
- Saucepan
- Large stirring spoon
- Candy thermometer or digital thermometer that can withstand temperatures of at least 310°F (154°C)
- Metal measuring teaspoon (**Must be metal, high heat can dissolve plastic**)



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Instructions:

1. Place the baking pan or hard candy mold on the counter beside the stove.
2. If using a baking pan, cover with sheet of wax paper. Lightly grease with oil.
3. If using hard candy mold, lightly grease with oil.
4. Pour $\frac{1}{2}$ cup real maple syrup into saucepan over medium heat
5. Heat syrup in saucepan, uncovered, on stove
6. Using a large spoon, stir syrup
7. Use thermometer to carefully measure temperature of the syrup as it heats up
8. Bring maple syrup to a boil
 - Allow syrup to cook, uncovered
 - Keep measuring temperature
 - **Stir frequently so it does not burn**
9. When temperature reaches 230 to 235° F, carefully use a metal measuring spoon to take a sample of the heated syrup (approx. 1 tsp)
10. Quickly pour the 1 tsp of heated syrup onto the baking pan or candy mold
 - **Do not touch sample! It is very hot!**
 - *How is the consistency of the sample? Is it soft? What color is it?*
11. As the sample heats up, take 4 more samples at each interval. Keep track of the temperature of each sample
 - 240 to 250° F
 - 255 to 260° F
 - 270 to 280° F
 - 300 to 310° F
12. Allow the samples to cool to room temperature
13. Observe the five samples and compare
 - What is the color of each?
 - Is it transparent or dark?
 - What is the consistency of each sample?
 - Is it sticky, smooth, rough?
 - How easy is it to scoop?



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- Is it caramelized?
 - Is it flexible or does it break?
14. Now try tasting each sample
- What is the difference in the samples?
 - Which is the sweetest?
 - Which has the best texture?
 - Which sample do you like best?

You now have your favorite maple candy. Remember which temperature? Try making more candies using your thermometer.

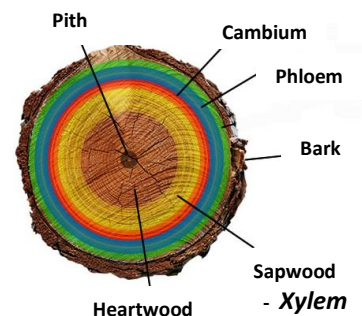
Get creative with the size of your candy drops and the shape. Try a different maple syrup to learn more about making candies.

The Science Behind it:

What is gooey, sweet and perfect on pancakes? Maple Syrup! This delicious sugary substance comes from the sap of maple trees. To find out how the maple syrup 'travels' from the big maple tree to your pancakes, first you can learn more about the science of trees.

Every tree has a trunk. Inside the trunk are a number of rings. Every year, the tree grows a new layer, which creates a new ring.

- **Bark** – The outside layer of the trunk
 - The protective layer for the tree
- **Phloem** - The inside layer of the bark
 - Helps carry sugar from the leaves to the rest of the tree
- **Cambium** – Thin layer of living cells
 - Makes new cells that help the tree grow wider each year
- **Sapwood** – The scientific name is *xylem*
 - Network of living cells
 - Brings water and nutrients from the roots to the branches and leaves
- **Heartwood** – Dead sapwood in the center of the trunk
 - The hardest wood of the tree – provides strength and stability





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- **Pith** – Spongy living cells in the center of the tree trunk
 - Essential nutrients for the tree are transported through the pith

Sap flows through the center portion of the trunk layer called sapwood or *xylem*. Within the sapwood are active living cells that bring water and nutrients from the roots, up through the trunk, and toward branches and leaves. During the warmer parts of the day, the sapwood is actively transporting nutrients. This process produces carbon dioxide. This carbon dioxide distributes between the cells of the sapwood. The movement of carbon dioxide creates pressure within the cells. As the sugar from the sap interacts with the carbon dioxide, it creates pressure within the sapwood. When the tree is **tapped**, the intense pressure forces the sap out of the tree!

The sap in maple trees has a very high concentration of sugar. (It is much higher than other trees.) During the summer months, photosynthesis produces carbohydrates to use for growth. In the Fall, the temperatures cool down, and the trees stop growing. The tree stores excess carbohydrates as starch. The starch is converted to sugar, which will then dissolve in sap. There are specific amino acids in the sap that give maple syrup its delicious flavor.

Maple Syrup Fun Facts:

- Vermont is the largest producer of maple syrup in the United States.
- Canada is the world's largest producer of maple syrup.
- A farm that produces maple syrup is called a "sugarbush" or "sugarwood".
- Tapping removes less than 10% of the tree's sugar. This amount is too small to hurt a healthy tree.
- Producers are regulated to only tap healthy trees.
- "Sap Season" lasts about 6 weeks. This is when the temperature is ideal.
- Color of syrup depends on the time of year.
- About 40 gallons of sap are needed for 1 gallon of maple syrup!

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