

# LOLLIPOPS

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## Materials Needed

light Karo syrup (corn syrup)  
sugar  
water  
citric acid  
flavoring (concentrated candy flavoring preferred)  
food color (concentrated candy food colors preferred)  
lollipop sticks (available in craft stores)  
lollipop molds (for hard candies) or baking sheets  
non-stick cooking spray (Pam or equivalent)  
stirrer  
600-mL beaker  
burner and ring stand or hot plate  
beaker tongs  
thermometer (250°C or candy thermometer)  
measuring cups and spoons

## Safety

Safety glasses or goggles must be worn in the laboratory at all times.

If this experiment is performed in a chemistry laboratory, all work surfaces must be cleaned and free from laboratory chemicals. After cleaning worksurfaces, it is advised to cover all work areas with aluminum foil or a food-grade paper covering.

All glassware and apparatus must be clean and free from laboratory chemicals. Use only special glassware and equipment, stored away from all sources of laboratory chemical contamination, and reserved only for food experiments is recommended.

There are no safety hazards associated with the materials used in this experiment.

## Disposal

Generally, all waste materials in this experiment can be disposed in the trash or poured down the drain with running water. All disposal must conform to local regulations.

## Procedure

Measure 1 cup sugar into a 600-mL beaker.

Add 1/2 cup light Karo syrup.

Add 1/2 cup water.

Place over high heat and bring to a boil, stirring constantly.

Allow the mixture to boil, stirring, and watching the temperature. (Once boiling begins, the temperature will rise slowly from about 100°C to 135°C. After that, the temperature rise more rapidly to 150°C. During the first part of heating, only occasional stirring is needed. Above, 135°C, stirring is necessary to prevent any burning of the mixture.)

While the mixture is boiling, obtain a lollipop mold. Spray it with non-stick cooking spray.

When the mixture reaches 150°C (300°F) remove the beaker from the heat. Turn off the burner or hot plate.

Add 1/8 tsp. of candy flavor and, if needed, a pinch of citric acid. (See list of flavor/color suggestions, below.)

Add the appropriate food color, a small amount at a time, until desired color is obtained.

Stir well.

Pour into candy molds or pour approximately 2-inch circles onto a buttered (or sprayed) baking sheet. Add lollipop sticks.

Allow to cool to room temperature. Wrap with plastic lollipop bags or waxed paper.

**Flavor/Color suggestions:** (For extra sour, add additional citric acid.)

Root beer - Add 1 tsp. root beer concentrate. (No color needed)

Grape - Add 1/8 tsp. grape flavoring, a pinch of citric acid, and purple food color.

Cherry - Add 1/8 tsp. cherry flavoring, a pinch of citric acid, and red food color.

Orange - Add 1/8 tsp. oil of orange, a pinch of citric acid, and orange food color.

Lemon - Add 1/8 tsp. oil of lemon, a pinch of citric acid, and yellow food color.

Lime - Add 1/8 tsp. oil of lime, a pinch of citric acid, and green food color.

Cinnamon - Add 1/8 tsp. oil of cinnamon and red food color.

Bubble gum - Add 1/8 tsp. bubble gum flavoring and pink food color.

Licorice - Add 1/8 tsp. oil of anise and black paste food color.

(Note: Additional flavors and colors are available from candy supply companies and/or craft shops.)

## Explanation

The addition of water to sugar, for candy making serves two purposes. One is to keep the sugar from charring upon heating. The second is to form a sugar syrup. The final concentration of the sugar in the syrup will determine the type of candy that results. At 113°C (235°F) sugar concentration is about 85%, this is suitable for making fudge. At 132°C (270°F) the sugar concentration is about 90% and the syrup is suitable for making taffy. At 150°C (300°F), the sugar concentration is near 100% and the syrup is suitable for making hard candies and brittles.

To determine the concentration of sugar in the syrup, without a thermometer, the “cold water test” is used. Thin syrups will form a thread in the air. More concentrated syrups will form a ball when dropped into cold water. That ball will range from soft and malleable to hard and brittle. The stages of the cold water test are summarized below.

### Stages in Sugar Syrup Concentration

Cold Water Test	Boiling Point (°F)	Candy Type
Thread	230°-235°	Syrup
Soft ball	235°-240°	Fudge, fondant
Firm ball	245°-250°	Caramels
Hard ball	250°-265°	Marshmallows, nougat
Soft crack	270°-290°	Taffies
Hard crack	300°-310°	Hard candies, brittle

One of the goals in making candy is to minimize or prevent the crystallization of the sugar. Fudge, for example, contains microcrystals of sugar lubricated by the sugar syrup. If the crystals are too large, then the fudge will be coarse and grainy, not creamy. For other candies, crystallization is undesirable and an amorphous, glass-like product is desired. Generally, we are trying to obtain a supersaturated solution of sugar without any crystallization. If there are seed crystals present, or if the candy softens after it is made, crystallization of the sugar may occur. As an example, when chocolate separates from the cocoa butter, producing a visual discoloration of the candy, the sugar in the chocolate will have crystallized making the chocolate grainy in texture.

The addition of corn syrup is used in candy making to inhibit crystallization of the sugar

## References

McGee, Harold, *On Food and Cooking*, Charles Scribner's Sons, New York, NY, 1984.

Kendrick, Ruth A. and Pauline H. Atkinson, *Candymaking*, HP Books, 1987.