



**Mission:** How can different processes affect final properties?

**Age:** 8+

**Materials cost:** \$8

**Time:** 4 hours (1 hour active) (Set-up: 15 min Activity: 30 min Clean-up: 15 min)

## What you need:

### Materials:

- Masking tape
- 3-4 lemons
- 4 cups hot water
- 1 cup sugar

### Equipment:

- 1/2 cup measuring cup
- Grater or lemon zester
- Ice cube tray or muffin pan
- Mixing bowl
- Small stirring spoon
- Knife
- Pen

## What to do:

1. First prepare the ingredients. With help from a grown-up, mix the hot water and sugar in a mixing bowl, stirring with a spoon until all of the sugar is dissolved. Put this mixture in the refrigerator for about one hour. While your sugar water is chilling, use a grater to grate 1 teaspoon lemon rind. Be sure to grate only the outer yellow surface of the lemon, the white stuff below tastes bad! Then cut the lemons in half with the knife and squeeze them over a measuring cup to make 1/2 cup of juice. Be sure to remove any seeds that sneak in. Add the grated rind to this lemon juice.
2. Prepare your ice cube trays or muffin pan. You will make two types of lemon ices: "A – Still" and "B – Stirred". Use the masking tape and pen to label half of your tray or pan with an "A – Still" and the other half with a "B - Stirred."
3. After an hour, add the lemon mixture to the cooled sugar water and stir. Pour the mixture into your prepared tray or pan, filling each compartment about 3/4 full. Save any leftover mixture in the refrigerator for further experiments!

4. Put the tray in the freezer and wait 30 minutes. While you're waiting, write down what you think you'll see when you remove the tray.
5. Now remove the tray and observe what has happened. Has anything changed? Write down your observations, and then use the spoon to stir each of the compartments on the "B – Stirred" side, scraping the edges of the compartment as you stir. Do not disturb the "A – Still" side. Place the tray back into the freezer for 30 minutes.
6. Continue stirring the "B – Stirred" side every 30 minutes for approximately 3 hours, or until both types are frozen. Make observations each time you take the tray out. When do the ices start to become solid? What changes occur? Which completely freezes first?
7. Now eat your ices. How do they taste?

### Clean-up:

After enjoying your lemon desserts, wash your dishes and tray or pan.

## LEMON FREEZE

### SIDE A - STILL

### SIDE B - STIRRED

Which side will freeze first? Check the box to make your prediction.		
30 Minutes		
1 Hour		
1 Hour 30 Minutes		
2 Hours		
2 Hours 30 Minutes		
3 Hours Final Observations		