

Solubility and Saturation Grade 7 Matter and Energy

<h2>Lesson Plan</h2>	Assessment	Assessment for learning
	Cross-curricular	Math

**Big Ideas**

- Matter can be classified according to its physical characteristics
- The particle theory of matter helps to explain the physical characteristics of matter

**Overall Expectations**

2. Investigate the properties and applications of pure substances and mixtures
3. Demonstrate an understanding of the properties of pure substances and mixtures; and describe these characteristics using particle theory

**Specific Expectations**

- **2.2** Use scientific inquiry/experimentation skills to investigate factors (temperature, type of solute or solvent, particle size, stirring) that affect the solubility of a substance and the rate at which substances dissolve
- **3.7** Identify solutes and solvents in various kinds of solutions
- **3.8** Describe the concentration of a solution in qualitative and quantitative terms

**Learning Goal**  
To understand the relationship between temperature and solubility

**Description**  
In Part A of the lesson, students investigate the properties of solutes and solvents by testing solubility of sugar in water at different temperatures. In Part B, students use the properties of a super saturated solution to create rock candy.

**Materials**

- Ice
- Kettle
- Sugar
- Plastic Cups
- Measuring spoons
- Scale
- Beakers
- Wooden Skewers (Part B)
- Clothespin (Part B)

**Safety Notes**  
Be careful when handling boiling water as it can cause burns. Use appropriate safety precautions and equipment when dealing with hot water. Do not pour the boiling water in plastic cups

## Introduction

Discuss solubility and saturation with students:

When a solute is added to a solvent, it will dissolve to create a solution. Factors such as the temperature, the solutes and solvents being used, and pressure can all affect the rate at which the solute will dissolve.

A solute only dissolves into a solvent to a limited extent. The point at which the solvent can no longer dissolve any more of the solute is called the saturation point. At this point, any solute added to the solution will appear as a separate phase (precipitate if solid). Under certain conditions, additional solute can be dissolved beyond the saturation point, resulting in a greater concentration. When this occurs, the solution has become supersaturated.

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## Action

### Part A

Follow the procedure to complete the experiment:

1. Pour 100 ml of water at room temperature into a beaker.
2. Fill a plastic cup with sugar and record its mass using **Table 1**. (If you require additional sugar, be sure to weigh it and add it to your initial value).
3. Add ½ tablespoon of sugar to the water and stir it.
4. If the sugar is completely dissolved, repeat step 3. If not, move on to step 5.
5. Use **Table 1** to record the mass of the sugar that is left in the cup. Use the beginning and ending masses to determine how much sugar was added to the water.
6. Repeat the experiment with ice water and boiling water.

### Part B

Use the super saturated solution from part A to make rock candy:

(Based on the experiment: <https://sciencebob.com/make-your-own-rock-candy/>)

1. Use the solution created from Part A by adding sugar to boiling water. This solution is super saturated as the water can only hold that amount of sugar because it was heated. Allow it to cool for 20 minutes before continuing to the next step.
  2. Attach a wooden skewer into the clothespin so that it hangs down.
  3. Submerge the skewer into the beaker with the super saturated solution, ensuring that it hangs in the middle without touching the sides or bottom.
  4. Allow the beaker to fully cool and put it someplace where it will not be disturbed
  5. Wait 3-7 days for the sugar crystals to grow. You can add food colouring to make coloured crystals.
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### Extensions

1. Repeat the experiment with salt instead of sugar. Does the saturation point vary with different temperatures?
2. Find the saturation point of sugar in water at multiple temperatures and use the results to create a solubility graph.
3. Have students develop their own experiment where they test a different property of solubility such as type of solute or solvent, particle size, stirring.

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### Resources

1. The rock candy experiment was modified from the following website:  
<https://sciencebob.com/make-your-own-rock-candy/>
  2. Watch this Science North video about super saturated solutions (starting at the 2:15 mark): <https://www.youtube.com/watch?v=eHXdGegQEgc&feature=youtu.be>
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