



California State University of Bakersfield, Department of Chemistry

Ice, Ice Baby



Standards:

HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen.

Introduction:

The freezing and boiling points a solution is directly affected by the amount of particles in it. Therefore, different solutions have different freezing points, depending on their molality and mass. In this experiment we will investigate the freezing properties of sugar and salt solutions.

Materials:

- Salt (2.92 g, 5.85 g, 8.775 g, 11.7 g)
- Sugar (30 g, 60 g, 90 g, 120 g)
- 800 mL of water
- 8 test tubes
- 8 beakers
- 1 basin
- Tap water
- 1 freezer
- Small cups
- 8 thermometers
- 1 black marker

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Safety:

- Always have an adult with you to help you during your experiment.
- Always wear eye protection and gloves when doing chemistry experiments

Procedure:

1. Mix 200 g of salt into 1 liter of water and pour the solution into the small cups. Place the cups in a freezer, and leave overnight. The ice will be used to form an ice bath in the basin.
2. On the 2nd day, label the 8 beakers and the test tubes with Salt 0.5 M, Salt 1.0 M, Salt 1.5 M, Salt 2.0 M, Sugar 0.5 M, Sugar 1.0 M, Sugar 1.5 M, Sugar 2.0 M.
3. Prepare these 8 varieties of solution in each beaker:
 - a. Salt 0.5 M – Mix 100 mL of water with 2.92 g salt
 - b. Salt 1.0 M – Mix 100 mL of water with 5.85 g of salt
 - c. Salt 1.5 M – Mix 100 mL of water with 8.775 g of salt
 - d. Salt 2.0 M – Mix 100 mL of water with 11.7 g of salt
 - e. Sugar 0.5 M – Mix 100 mL of water with 30 g of sugar
 - f. Sugar 1.0 M – Mix 100 mL of water with 60 g of sugar
 - g. Sugar 1.5 M – Mix 100 mL of water with 90 g of sugar
 - h. Sugar 2.0 M – Mix 100 mL of water with 120 g of sugar
4. Fill the basin with the ice cubes prepared earlier, to make an ice bath.
5. Pour the solution in each beaker into its respective test tube about 5 mL. Place a thermometer in each test tube. Then, place the 8 test tubes into the ice bath.
6. Using a table, record the temperature when the first ice crystals start to form.

Data and Observations:

Record your observations in this space

Salt	
	Temperatures
0.5 M	
1.0 M	
1.5 M	
2.0 M	

Sugar	
	Temperatures
0.5 M	
1.0 M	
1.5 M	
2.0 M	

1. Why did the salt freeze at a lower temperature? Explain in terms of molecules and ions.

References:

1. Analyzed and conducted by: Evelyn Arce, Maria Jessica Cruz, Taylor O’Conner, Javier Alex Chavez.
2. Hundreds of Science Fair Projects For Students. (n.d.). *Hundreds of Science Fair Projects For Students*. Retrieved August 4, 2014, from <http://www.all-science-fair-projects.com>

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