



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

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Project Title
The Effect of Electrolyte and Non-Electrolyte Solutes on the Freezing Point Depression of Water

Abstract

Objectives/Goals
The objective is to determine the effect of electrolyte and non-electrolyte solutes on the freezing point depression of water.

Methods/Materials
1. Prepare a solution of salt (NaCl) by adding 5.8 grams of salt to 100 mL of distilled water. This makes a 1 molal solution. 2. Prepare a solution of sugar by adding 34 grams of sugar to 100 mL of distilled water. This is a 1 molal solution. 3. Place a test tube that is 1/2 full with the NaCl solution in an ice bath. 4. When the 1st ice crystals appear on the inside wall of the test tube, record the temperature. This should be the freezing point of the liquid. 5. Repeat steps 3 and 4 two more times and take the average of the results. 6. Repeat steps 4 through 5 with the prepared sugar solution. 7. Repeat steps 4 through 8 with the 0.5 and 1.5 molal solutions of NaCl and sugar.

Results

Salt Water Solution

Solute Concentration (Molal)	Freezing Point Depression (C)			
	Trial 1	Trial 2	Trial 3	Average
0.5	-1.9	-1.9	-1.8	-1.86
1.0	-3.7	-3.7	-3.7	-3.7
1.5	-5.7	-5.7	-5.7	-5.7

Sugar Water Solution

Solute Concentration (Molal)	Freezing Point Depression (C)			
	Trial 1	Trial 2	Trial 3	Average
0.5	-0.9	-0.9	-0.9	-0.9
1.0	-1.9	-1.9	-1.9	-1.9
1.5	-2.8	-2.8	-2.8	-2.8

Conclusions/Discussion
The results of my experiment show freezing point depression of water at different molal concentration of salt and sugar. These results support my hypothesis. My hypothesis was that the higher the molality of a solution the greater would be its effect on the freezing point depression of water. Also salt (an electrolyte) would have a higher effect than sugar (a non-electrolyte). We can see from the data table and the graph that the freezing point depression is indeed higher at higher molality and at the same concentration level

Summary Statement
The project investigates the effect of electrolyte and non-electrolyte solutes on the freezing point depression.

Help Received
Valuable suggestions from Mr. Bob Ferazzi (science teacher).