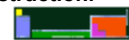


Revised August 2011



AP LAB 17c: Freezing Point Depression

Aim To determine the freezing point of some solutions and use the freezing point depression method to determine Molar Mass

Apparatus Test tubes, thermometer, 400-mL beaker, 100-mL graduated cylinder, stirring rod

Chemicals Ice, $C_{12}H_{22}O_{11}$ (sucrose), NaCl, Urea

Method

PART A:

$\frac{3}{4}$ fill a beaker with ice and cover the ice with three large spoonfuls of NaCl. Add tap water to fill the beaker. Stir the ice-salt mixture making sure that the temperature drops to at least -5°C or 6°C . This is the ice-bath.

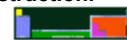
PART B:

1. Completely dissolve 5.85 grams of NaCl in 100. mL of deionized water.
2. Completely dissolve 34.2 grams of sucrose in 100 mL of deionized water.
3. Place a test tube that is $\frac{1}{4}$ full of water in the ice-bath prepared in PART A. Stir the water in the test tube using a thermometer. When the first crystals appear record the temperature. (This is freezing point of the pure solvent).
4. Repeat step # 3 above, this time replacing the test tube with water with the NaCl solution.
5. Repeat step # 3 above, this time replacing the test tube with water with the sucrose solution.

PART C:

1. Dissolve 6.0 grams of urea in 100 mL of deionized water.
2. Repeat step # 3 in PART B above, this time replacing the test tube with water with the urea solution.

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Results

PART B

Substance	Freezing Point in °C
Pure Water	
Salt solution	
Sucrose solution	

PART C

Substance	Freezing Point in °C
Urea solution	

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Conclusion/Calculation

In all calculations take the molal freezing point depression constant of pure water to be 1.86 °C/m.

1. Calculate the van't Hoff factor for the salt solution and the sugar solution. Comment on your calculated values.

2. Calculate the molar mass of urea.

3. The actual molar mass of urea is 60.1 g mol^{-1} . Calculate the percentage error.