



Name:  
Period:

### Title: How Low Can You Go?!

**Background:** During winter storms, salt is often spread on roads. The ice and snow melt as a result. Why? In this lab you will experiment with salt and ice to answer this question.

#### Pre-lab Questions:

1. What is the chemical formula for sodium chloride? What is its formula mass? Show work.
2. What is the mass of a mole of sodium chloride? What part of a mole is 5.84 grams? Show work.
3. What is the molarity of a solution of 5.84 g sodium chloride in 100mL water? Show work.
4. Calculate the molality of the same solution. Show work.

#### Materials:

150 mL beaker	ice	tap water
sodium chloride (fine)	plastic beaker	thermometer
sodium chloride (coarse)	2 plastic test tubes	graduated cylinder

#### Procedure:

1. Measure 5.84 g of sodium chloride (finely granulated) into a dry 150 mL beaker.
2. Measuring as accurately as possible with the equipment available to you in your lab drawer, measure out 100 mL of tap water and add it to the salt in your beaker. Swirl until dissolved.
3. Make an ice/sodium chloride “bath” in the plastic beaker by layering ice, then a *thin* sprinkling of coarsely granulated sodium chloride, and repeating these layers until the plastic beaker is full.
4. Fill an unmarked plastic test tube  $\frac{3}{4}$  full with tap water, then fill a marked plastic test tube  $\frac{3}{4}$  full of the solution you made in steps 1-2.
5. Place the tap water tube in the middle of your ice/sodium chloride bath.
6. Use the thermometer to read and record the temperature inside your test tube every 15 seconds. Lift the tube out of the ice bath every once in a while to look for ice crystals forming.

- As soon as you see crystals forming, remove both the test tube and the thermometer from the ice bath (otherwise they might break) and record the final freezing temperature of the water.
- Repeat steps 6-8 with your test tube with salt solution. When finished, empty your solutions and ice bath in the sink. Rinse everything well and wipe down your lab area with a sponge.

**Data:**

On your data table on the next page, circle the temperature at which ice crystals formed for each test tube.

Table 1: Temperature Measurements for Determining Freezing Points of Two Solutions

Time (sec)	0	:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00	5:30	6:00	6:30	7:00	7:30	8:00
Temp (°C) tap water																	
Temp (°C) sodium chloride solution																	

**Analysis Questions:**

- Describe the salt solution you made in steps 1-2 as either dilute, saturated, or supersaturated. If you can't decide, describe what you would do to determine which it is.
- List *three* things you could have done to affect the amount of salt that could dissolve in your water. *For each thing, explain why* this would change the amount of salt that could dissolve.
- Pretend you can become very tiny and climb inside a drop of the solution in each of your test tubes. Draw a picture of the particles you see in each of the drops.  
Test Tube 1: Test Tube 2:
- What was the temperature difference between the freezing points of your two solutions? Which had the lower temperature?

