

**EXPERIMENT 11: A COLLIGATIVE PROPERTY OF SOLUTIONS**

Equipment: 250mL beaker, 6" test tube, thermometer, buret clamp, glass rod  
 Materials: cracked H<sub>2</sub>O(s), 5mL of 1m and 2m NaCl, 5mL of 1m and 2m urea

In this experiment we will learn why urea may be used as an anti-freeze and why salt is used to melt ice.

Colligative properties of solutions are those which depend primarily on the number of particles dispersed and the nature of the solvent, rather than the specific nature of the solute.

- A. Pack a 250 mL beaker with a mixture of cracked ice and NaCl until the beaker is 3/4 full. Clamp a 6" test tube vertically, open end up so that the bottom of the test tube is 1/4" above the bottom of the beaker. Add 5 mL of water to the test tube. Stir the water in the test tube with the thermometer until ice crystals appear. Remove the test tube from the freezing mixture and stir with a thermometer. Note the temperature at which the last crystal disappears. Record this temperature in the chart below.
- B. Repeat part A using 5 mL of either 1m NaCl or 1m urea (H<sub>2</sub>NCONH<sub>2</sub>) instead of water in the test tube. Record the temperature at which the last crystal appears.
- C. Repeat part A using 5 mL of either 2m NaCl or 2m urea. Record the temperature at which the last crystal disappears.

**TABLE OF RESULTS**

FREEZING POINTS OF:	water	1m NaCl	1m urea	2m NaCl	2m urea
OBSERVED					
THEORETICAL					

**SUMMARY QUESTIONS**

1. How do you account for the difference in freezing points of 1m and 2m NaCl?
2. How do you account for the difference in freezing points of 1m and 2m urea?
3. Compare the freezing points of 1m NaCl and 1m urea solutions; also compare the freezing points of 2m NaCl and 2m urea solutions. Account for the differences.
4. The freezing point of a solution depends upon the ..... of the solvent.
5. The freezing point of a solution depends on the nature of the ..... and ....., and the number of ..... in solution.
6. The lowering of the freezing point of a solution depends upon the ..... of the solute.
7. Other properties affected by the number of particles in solution, are ..... and ..... (see textbook)