

COLLIGATIVE PROPERTIES OF SOLUTIONS

Colligative Properties Lab

Making Ice Cream

Materials:

- ▣ 2 Boxes of Quart Size Ziploc Bags
- ▣ 2 Boxes of Gallon Size Ziploc Bags
- ▣ 1 Gallon of Milk
- ▣ 4 Pints of Heavy Whipping Cream
- ▣ 5 lbs of sugar
- ▣ 1 Bottle of Vanilla Flavoring
- ▣ 2 Boxes of Rock Salt or Ice Cream Salt
- ▣ 3 Bags of Ice
- ▣ 1 Container of Styrofoam Cups
- ▣ 1 Box of Plastic Spoons



Demonstration: Freezing and Boiling Point of Water

- ▣ The physical properties of a solution (solute dissolved in a solvent) are different from those of the pure solvent.
 - The boiling point of a salt water solution is higher than the boiling point of pure water
 - The freezing point of a salt water solution is lower than the freezing point of pure water
- ▣ Colligative Properties: Properties that depend on the number of particles of solute dissolved in a solution.

Freezing Point Depression

- ▣ Adding a nonvolatile solute to a solution lowers the freezing point:
- ▣ $FP_{\text{Solution}} = FP_{\text{Solvent}} - \Delta T_f$
- ▣ $\Delta T_f = K_f m$
- ▣ K_f = Freezing point constant of solvent
(Table 15-5 on Page 474)
- ▣ m = molality of solution

Example

What is the freezing point of a 1.18 m solution of sodium chloride in water?

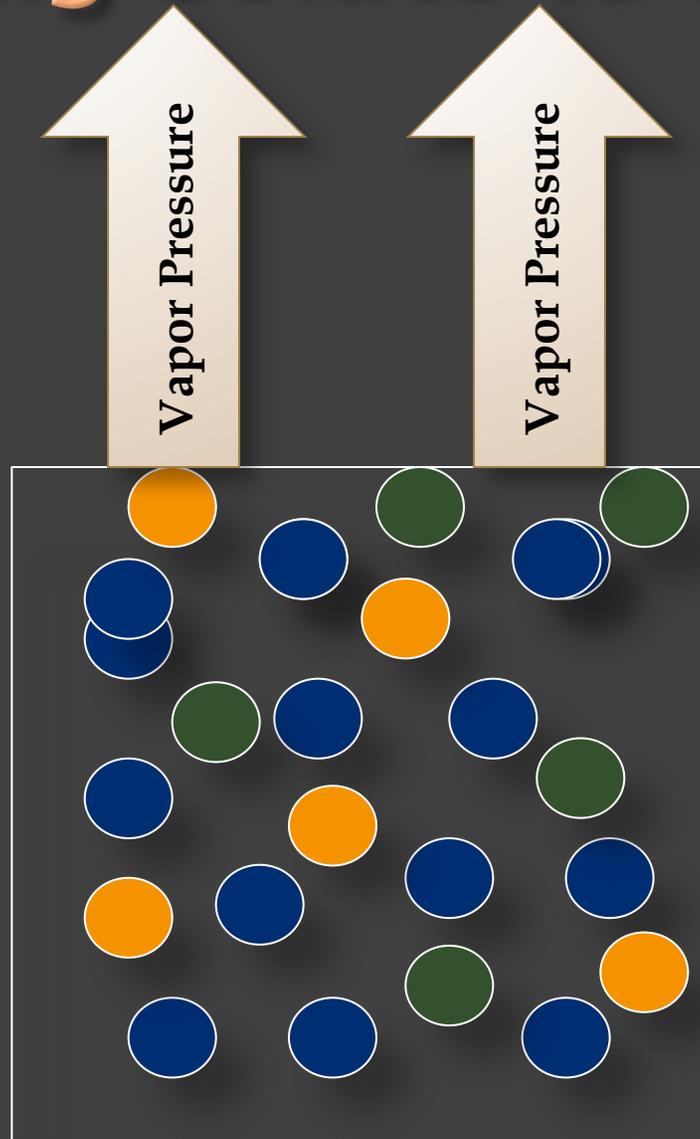
Boiling Point Elevation

- ▣ Adding a nonvolatile solute to a solution raises the boiling point:
- ▣ $BP_{\text{Solution}} = BP_{\text{Solvent}} + \Delta T_b$
- ▣ $\Delta T_b = K_b m$
- ▣ K_b = Boiling point constant of solvent
(Table 15-4 on Page 472)
- ▣ m = molality of solution

Example

What is the boiling point of a 1.18 m solution of sodium chloride in water?

Adding Solute to a Solvent



Vapor Pressure Lowering

- ▣ When a nonvolatile solute is added to a solvent, the solvent's vapor pressure is lowered
- ▣ Nonvolatile: Does not easily vaporize
- ▣ Ionic compounds (electrolytes) lower the vapor pressure more than molecular compounds (non-electrolytes)