EFFECT OF A SOLUTE ON FREEZING AND BOILING POINTS

Name _____

We use the following formulas to calculate changes in freezing and boiling point due to the presence of a nonvolatile solute. Freezing point is always lowered, boiling point is always raised.

$\Delta T_F = m \times d.f. \times k_F$

$\Delta T_B = m \times d.f. \times k_B$

$k_B H_2O = 0.52° C/m$

$k_F H_2O = 1.86° C/m$

m = molality of solution

k_F and k_B = constants for particular solvent

d.f. = dissociation factor (how many particles solute breaks up into: for a nonelectrolyte, d.f. = 1)

(Theoretical Dissociation Factor is always greater than observed effect.)

Solve the problems below.

1. What is the new boiling point if 25 g of NaCl is dissolved in 1.0 Kg of water?

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2. What is the freezing point of the solution in Problem 1?

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3. What are the new freezing and boiling points of water if 50. g of ethylene glycol (molecular mass = 62 g/mol) is added to 50. g of water?

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4. When 5.0 g of a nonelectrolyte is added to 25 g of water, the new freezing point is -2.5° C. What is the molecular mass of the unknown compound?

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