Unit 5 – Chapter 16: Electrochemistry **Name _____**
Assignment #2: Van't Hoff Factor on BP, FP & Osmotic Pressure **Period _____**

1) A solution is prepared by dissolving 27.0 g of urea, $(NH_2)_2CO$, in 150.0 g of water. Calculate the boiling point of the solution. Urea is a nonelectrolyte.

2) A 2.00-g sample of a large biomolecule was dissolved in 15.0 g of carbon tetrachloride. The boiling point of this solution was determined to be 77.85^0C. Calculate the molar mass of the biomolecule. For carbon tetrachloride, the boiling-point constant is $5.03^0C \cdot kg/mol$, and the boiling point of pure carbon tetrachloride is 76.50^0C.

3) The freezing point of *t*-butanol is 25.50^0C and K_f is $9.1^0C \cdot kg/mol$. Usually *t*-butanol absorbs water on exposure to air. If the freezing point of a 10.0-g sample of *t*-butanol is 24.59^0C, how many grams of water are present in the sample?

4) An aqueous solution of 10.00 g of catalase, an enzyme found in the liver, has a volume of 1.00 L at 27^0C. The solution's osmotic pressure at 27^0C is found to be 0.74 torr. Calculate the molar mass of catalase.

5) A water desalination plant is set up near a salt marsh containing water that is 0.10 *M* NaCl. Calculate the minimum pressure that must be applied at 20.0^0C to purify the water by reverse osmosis. Assume NaCl is completely dissociated.

6) Calculate the freezing point and the boiling point of each of the following solutions using the observed van't Hoff factors in Table 11.6

a. 0.050 *m* $MgCl_2$ b. 0.050 *m* $FeCl_3$

7) A 0.500-g sample of a compound is dissolved in enough water to form 100.0mL of solution. This solution has an osmotic pressure of 2.50 atm at 25^0C. If each molecule of the solute dissociates into two particles (in this solvent), what is the molar mass of this solute?