Pre Lab: Freezing Point Experiment
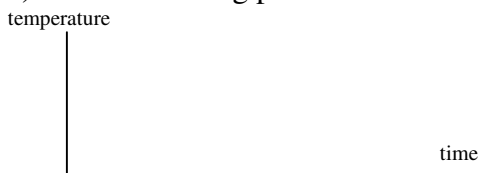
1) Define: Colligative properties.

2) List four Colligative properties.

3) Define: Molal freezing point depression constant, K_f.

4) Does the value of K_f depend on the nature of (solvent, or solute)?_____

5) a) Show a freezing point of 6.00 $°C$ on a cooling curve for a <u>pure</u> solvent.

temperature

time

    b) If the freezing point of a pure solvent is 6.00 $°C$, will the solvent which is
        contaminated with a <u>soluble</u> material have a freezing point (higher than, lower
        than, or same as) 6.00 $°C$? Answer: _____.
        Explain:_____

    c) Show a freezing point on the cooling curve for the above contaminated solvent.

temperature

time

6) Assume you had used a <u>well calibrated</u> thermometer to measure the freezing point of
    a solvent, can you tell from the cooling curve if the solvent is contaminated with
    soluble material?_____
How can you tell?
a) _____
b) _____

7) Show the freezing point on a cooling curve for a solvent contaminated with <u>insoluble</u> material.

temperature

time

8) What is the relationship between ΔT and molar mass of solute?

The larger the value of ΔT, the (larger, or smaller) the molar mass of the solute?

9) If some <u>insoluble</u> material contaminated your solution after it had been prepared, how would this effect the measured ΔT_f and the calculated molar mass of solute?
Explain: _____

10) If some <u>soluble</u> material contaminated your solution after it had been prepared, how would this effect the measured ΔT_f and the calculated molar mass of solute?
Explain: _____

11) a) Why did we have to use the <u>same</u> thermometer for finding, the freezing point of both, solvent and solution?

b) If your thermometer was not calibrated (reading 0.50 °C below the correct temperature), how would this effect your measured value of ΔT_f ?Answer: _____
Explain: _____
_____

12) How would the freezing point of a <u>solution</u> change if the unknown had ionized or dissociated? Answer: _____
Explain: _____

13) If the solvent had been impure (that is, contaminated with soluble material);
   a) how would this effect ΔT_f ? Explain;_____
   b) how would this effect the calculated molar mass?
14) Why would you use weighing paper instead of filter paper for weighing the unknown sample?
<u>Exercise</u>:
The freezing point of a cyclohexane sample is 6.20 °C. A solution is prepared by dissolving 0.4660 g of an unknown solute in 36.0 g cyclohexane. The freezing point of the solution is 4.11 °C. Calculate the molar mass of the unknown solute. K_f for cyclohexane is 20.0 °C.kg/mole.   <u>Answer</u>: 124 g/mole