

## 4.P: Determination of the Molar Mass by Freezing Point Depression (Pre-Lab)

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1. Camphor melts at 179.8°C and has a freezing point depression constant,  $K_f = 40\text{ }^{\circ}\text{C/molal}$ . When 0.186 g of an unknown organic solid is dissolved in 22.01 g of liquid camphor, the freezing point of the mixture is found to be 176.7°C. What is the molar mass of the solute?
  2. A particular unknown solid depresses the freezing point of PDB ( $K_f = 7.1^{\circ}\text{C/molal}$ ) by 3.5°C. If you dissolve the same solid in  $\text{H}_2\text{O}$  ( $K_f = 1.86^{\circ}\text{C/molal}$ ) to the same final molality as you had it in the PDB, what would the change in freezing point be?
  3. You are instructed to add about 2 g of the unknown solid when determining the freezing point of the solution. Suppose you accidentally add 5 g of solid. Will the measured freezing point of the solution be higher or lower as a result of this mistake? Explain.
  4. Cleaning PDB from the test tube after the experiment could be a long and arduous process. Describe the procedure that you will use to clean PDB (and the unknown solid) from your test tube after your experiments are complete.
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