1. Photocopy and turn in all of the information you recorded in your laboratory notebook for Introduction to Organic Chemistry Laboratory and for the Recrystallization and Melting Point experiment.

2. Calculate the % recovery of your unknown after recrystallization. How would you rate the quantity of product yield? Suggest possible sources of error that might contribute to a lessening of the yield.

3. Report the results of your solubility tests for each of the solvents tested. Copy and paste your data table from your lab notebook or use the template provided.

<table>
<thead>
<tr>
<th>Solvent</th>
<th>Water</th>
<th>Ethyl Acetate</th>
<th>Methanol</th>
<th>Hexanes</th>
<th>Toluene</th>
<th>Diethyl Ether</th>
<th>Acetone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solubility at room temperature</td>
<td></td>
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<tr>
<td>Solubility near bp of the solvent</td>
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<tr>
<td>Recrystallizes upon cooling?</td>
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</tbody>
</table>

3. Why is gravity filtration and not suction filtration used to remove suspended or undissolved impurities from a hot solution?

4. Why is suction filtration preferable to ordinary gravity filtration for separating purified crystals from the mother liquor after recrystallization?

5. The Drug Enforcement Administration (DEA) has just seized a large quantity of contaminated cocaine that is suspected to be causing drug users in the area to unexpectedly die from its ingestion. You have been given a sample of the batch in order to separate any pure cocaine from the contaminant. Assume that pure cocaine dissolves in water to the extent of 3.88 g per 100 mL at 100 °C and 0.85 g per 100 mL at 20 °C. Also assume that the single deadly contaminant is present (thus, forming a binary mixture) having a solubility in water of 0.66 g per 100 mL at 20 °C.

   (a) If we start with an impure sample containing 4.97 g of cocaine and 724 mg of the contaminant, how much water will be required to JUST dissolve all of the cocaine at the boiling point of water? How much of the contaminant will be present in the hot solution?

   (b) When the solution is cooled back down to room temperature, how much of the cocaine will remain in solution? How much cocaine will recrystallize out of the solution?
(c) How much of the contaminant will remain in solution at room temperature?

(d) Assuming everything goes perfectly, what is our expected percent recovery of pure cocaine?

(e) What might you do in order to achieve a near perfect separation of the two components so that you have can clearly identify the mysterious contaminant? In other words, how would we get the two components separated in pure form?

6. If you were given some impure solid material for which you did not know the identity, how would you go about choosing an optimum recrystallization solvent for this compound? Which properties are necessary and desirable for the solvent? Which properties are undesirable?

7. If, during a recrystallization, a solution is boiled for a long time, what is likely to happen to the solute? How about the solvent? How could you prevent or correct for this occurrence?

8. Why do we want to use COLD recrystallization solvent to wash our crystals for transferring and for after vacuum filtration.

9. Report the melting point range for your recrystallized product. Using your experimentally determined melting point, identify your unknown (as best you can from the list of compounds in APPENDIX VI of the Lehman text) and describe how came to your conclusion. Are you reasonably certain that you have correctly identified your unknown? Why or why not?

10. What further analyses might you perform in order to identify your product? What would you observe from these analyses if you were indeed correct in predicting your unknown from the melting point and solubility data?