Chemistry Virtual Lab: Fusion and Cooling of Lauric Acid

I. Purpose:
Determination of heat of fusion of lauric acid

II. Procedure:

Determining Heat of Crystallization of Lauric Acid

1. Examine the cooling curve for lauric acid and determine its **freezing point**.

2. A sample of melted lauric acid is in a test tube. The mass of the empty dry test tube is **16.33 grams**.

3. This test tube with lauric acid is held in a rack until it begins to freeze (time on graph above) is near 150 seconds when it is placed into a calorimeter that contains **165 grams** of water at **18.3°C**.

4. While the test tube with lauric acid is in the calorimeter the student stirs the water and records the highest temperature of the water to be **20.7°C**.

5. After the lauric acid in the test tube has completely solidified it was removed from calorimeter, dried massed. The mass of the test tube and lauric acid was **27.84 grams**.

6. Determine the heat of crystallization of lauric acid.

III. Analysis:

Data:

<table>
<thead>
<tr>
<th>Freezing Point of Lauric Acid (as determined by graph):</th>
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</thead>
<tbody>
<tr>
<td>Mass of empty dry test tube: (Written on test tube)</td>
</tr>
<tr>
<td>Mass of test tube and lauric acid:</td>
</tr>
<tr>
<td>Mass of lauric acid:</td>
</tr>
<tr>
<td>Mass of water in calorimeter:</td>
</tr>
<tr>
<td>Initial temperature of water in calorimeter:</td>
</tr>
<tr>
<td>Final temperature of water in calorimeter:</td>
</tr>
<tr>
<td>Change in water temperature in calorimeter:</td>
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</tbody>
</table>
Calculations: Show all work with Sig Figs and Units

a.) Calculate the heat gained by the water in the calorimeter. (If your answer is the $\Delta T$ of the $H_2O$ you will get a zero on this lab.)

b.) Find the change in temperature of the glass test tube in the calorimeter. (Hint: What temperature did the glass test tube start at? What was its final temperature?)

c.) Determine the heat released by the glass. $C_p\text{ glass} = 0.84 \text{ J/g.$}^\circ\text{C}$

d.) Find the heat released by the lauric acid. (Hint: Heat absorbed by water is equal to the heat released by the lauric acid and the glass test tube.)

e.) Determine the heat of crystallization of lauric acid in units of J/g.

IV. Conclusion Questions:

1. Write the chemical formula and determine the molar mass of lauric acid.

2. Determine the molar heat of lauric acid in units of kJ/mol.

3. Write an equation for the crystallization of lauric acid. Include phase notation and the molar heat of crystallization.

4. How does the heat of fusion compare with heat of crystallization for a substance? Which process is exothermic?

5. In which region of the graph is the kinetic energy constant?