A hand boiler is a closed glass container containing ethanol (C₂H₅OH) and a colored dye. In this lab, we will explore how heat affects changes in state, and perform a distillation to separate a mixture.

**CAUTION: Hand boilers are very fragile and break easily!**

1. Sketch the liquid level of the Hand boiler on the right.

2. Warm the bottom bulb (#2) with your hand. Record what is happening in the first column of the Observations and Explanations chart.

3. Transfer all the liquid to the bottom bulb (#2). Turn the hand boiler upside down. Carefully surround the lower bulb (#1) with ice. Keep the upper bulb (#2) warm with your hands (do not push down). Record what is happening in each bulb in columns 2 and 3 of the Observations and Explanations chart.

4. Sketch the results of this lab on the hand boiler to the right.
   - What do you observe about the liquids at the end?
   - How do you know that the original colored liquid is a mixture and not a pure substance?
   - What physical property are we exploiting to separate the two components?
<table>
<thead>
<tr>
<th></th>
<th>Step 2</th>
<th>Step 3: Bottom Bulb (#2)</th>
<th>Step 3: Cooled Bulb (#1)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Observations and Explanations</strong></td>
<td></td>
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<tr>
<td>What do you observe?</td>
<td></td>
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<tr>
<td>What is happening?</td>
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<tr>
<td>Sketch the energy transfer taking place.</td>
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<tr>
<td>Sketch the particle view of what is changing.</td>
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<tr>
<td>Thermochemical equation for the change</td>
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</tbody>
</table>
# 7 • Thermochemistry

## 7.2 Hand Boiler Lab - Changes in State

<table>
<thead>
<tr>
<th>Name of this change</th>
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