Learning Objective: The student will safely determine the water of hydration for a salt using appropriate laboratory techniques.

Lesson Outline: 1-hour (50-minute) pre-laboratory lecture

<table>
<thead>
<tr>
<th>Suggested Time</th>
<th>Topic</th>
<th>Suggestions for In-Class Discussion/Activities</th>
</tr>
</thead>
</table>
| 2 minutes      | Pre-laboratory assignment | • Read the experiment.  
• Identify the hazards and risks in the experiment.  
• Include safety questions on the pre-laboratory quiz. |
| 15 minutes     | Introduce the experiment, and review the concept of water of hydration. (Assumes that topic has been covered in lecture. Otherwise, additional time may be needed.) | • Confer with the lecture instructor. |
| 5 minutes      | Discussion of safety principles from Unit 1 in the online course. | • Show the Introduction slide.  
• Differentiate between risk and hazard. (Slide: Risk vs Hazard)  
• Discuss the hazard assessment for the experiment using the RAMP framework. (This could be incorporated into the procedure section.) (Slide: RAMP) |
| 5 minutes      | Describe the experimental procedure, including replicate samples and any potential hazards. (Students should have a laboratory book with detailed procedures.) | • Be sure to illustrate the potential hazards, such as burns or contact with chemicals.  
• Ask students to describe how these hazards can be eliminated or risks minimized.  
• Ask students to explain why eye protection is needed for this experiment.  
• Discuss that glove usage is based on the hazard.  
• Ask students to explain why neoprene gloves may pose an increased risk for this experiment. |
| 3 minutes      | Outline the data that must be collected. | • Emphasize proper data collection techniques: use only pen, write data directly into the laboratory notebook and not onto a piece of scratch paper, write clearly, etc. |
| 10 minutes     | Overview of the calculations, including statistical calculations. | • Emphasize safe use of the calculator to avoid cross-contamination.  
• Do not round off calculations until the last step. Use rules for significant figures. |
| 10 minutes     | Discussion of potential experimental errors (random, systematic, and gross) and how statistics can help to identify the type of error. | • Remind students of the types of errors and their sources.  
• Ask students to describe the potential sources of error for the experiment.  
• Ask students to describe how the potential errors could be minimized or eliminated. |
| 5 minutes      | Cleanup and waste disposal. | • Remind students of waste disposal protocols.  
• Remind students to clean up their work station. |
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Remind students to wash their hands before leaving the laboratory.</td>
</tr>
</tbody>
</table>
**Sample Lesson Plan (20-minute pre-laboratory session)**

**Experiment:** Determining the Water of Hydration for a Salt

**Learning Objective:** The student will safely determine the water of hydration for a salt using appropriate laboratory techniques.

**Lesson Outline:** 20-minute pre-laboratory session

<table>
<thead>
<tr>
<th>Suggested Time</th>
<th>Topic</th>
<th>Suggestions for In-Class Discussion/Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 minutes</td>
<td>Introduce the experiment, and review the concept of water of hydration. (Assumes that topic has been covered in lecture. Otherwise, additional time may be needed.)</td>
<td>• Confer with the lecture instructor.</td>
</tr>
</tbody>
</table>
| 2 minutes      | Discussion of safety principles from Unit 1 in the online course. | • Show the Introduction slide.  
• Differentiate between risk and hazard. (Slide: Risk vs Hazard)  
• Discuss the hazard assessment for the experiment using the RAMP framework. (This could be incorporated into the procedure section.) (Slide: RAMP) |
| 10 minutes     | Describe the experimental procedure, including data collection and potential hazards. (Students should have a laboratory book with detailed procedures.) | • Emphasize proper data collection techniques: use only pen, write data directly into the laboratory notebook and not onto a piece of scratch paper, write clearly, etc.  
• Ask students to identify hazards and assess the risks.  
• Ask students to describe how these risks can be eliminated or minimized.  
• Ask students to explain why eye protection is needed for this experiment.  
• Ask students to explain why neoprene gloves may pose an increased risk for this experiment. Include some discussion about appropriate glove selection. |
| 2 minutes      | Overview of the calculations, including statistical calculations. | • Emphasize safe use of the calculator to avoid cross-contamination.  
• Do not round off calculations until the last step. Use rules for significant figures. |
| 2 minutes      | Discussion of potential experimental errors (random, systematic, and gross) and how statistics can help to identify the type of error. | • Remind students of the types of errors and their sources.  
• Ask students to describe the potential sources of error for the experiment.  
• Ask students to describe how the potential errors could be minimized or eliminated. |
| 1 minute       | Cleanup and waste disposal. | • Remind students of waste disposal protocols.  
• Remind students to clean up their work station.  
• Remind students to wash their hands before leaving the laboratory. |
| 1 minute       | Safety reminders. | • Re-emphasize critical safety precautions. |