

forces form between the individual ions and the water molecules. You will then be given an opportunity to test your rule with two other ionic compounds to determine if you can use it to make accurate predictions.

### Your Task

Develop a rule that chemists can use to determine if the enthalpy change of solution ( $\Delta H_{\text{solution}}$ ) for a given ionic compound will be endothermic or exothermic based on the properties of the solute.

The guiding question for this investigation is, **How can chemists use the properties of a solute to predict if an enthalpy change of solution will be exothermic or endothermic?**

### Materials

You may use any of the following materials during this investigation:

Consumables	Equipment
<ul style="list-style-type: none"> <li>• Calcium chloride, <math>\text{CaCl}_2</math>, 5 grams</li> <li>• Cesium chloride, <math>\text{CsCl}</math>, 5 grams</li> <li>• Lithium chloride, <math>\text{LiCl}</math>, 5 grams</li> <li>• Potassium chloride, <math>\text{KCl}</math>, 5 grams</li> <li>• Sodium chlorate, <math>\text{NaClO}_3</math>, 5 grams</li> <li>• Sodium chloride, <math>\text{NaCl}</math>, 5 grams</li> <li>• Sodium iodide, <math>\text{NaI}</math>, 5 grams</li> <li>• Distilled water</li> </ul>	<ul style="list-style-type: none"> <li>• 2 polystyrene cups (or a calorimeter)</li> <li>• Thermometer (or temperature probe and sensor interface)</li> <li>• Graduated cylinder (25 ml)</li> <li>• 3 beakers (each 250 ml)</li> <li>• Stirring rod</li> <li>• Electronic or triple beam balance</li> <li>• Timer or stopwatch</li> <li>• Support stand and ring clamp</li> <li>• Chemical scoop</li> <li>• Weighing paper or dishes</li> </ul>

### Safety Precautions

Follow all normal lab safety rules. Lithium chloride, calcium chloride, cesium chloride, sodium chlorate, and sodium iodide are all moderately toxic by ingestion and are tissue irritants. Your teacher will explain relevant and important information about working with the chemicals associated with this investigation. In addition, take the following safety precautions:

- Wear indirectly vented chemical-splash goggles and chemical-resistant gloves and apron while in the laboratory.
- Handle all glassware with care.
- Wash your hands with soap and water before leaving the laboratory.