

**CALORIMETRY****Introduction:**

You will be investigating enthalpy changes ( $\Delta H$ s) for the following reactions: dissociation of the salts ammonium nitrate, calcium chloride, and sodium chloride. Assuming that the reactions will take place at constant pressure, heat ( $q$ ) absorbed or released and  $\Delta H$  are interchangeable. So,

$$\Delta H = q$$

$$q_{\text{rxn}} = -q_{\text{sur}}$$

$$q_{\text{sur}} = m \times C \times \Delta T ,$$

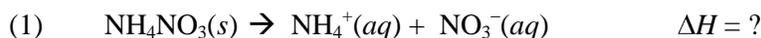
where  $m$  = mass of distilled water (density = 1.00 g/mL),

$C$  = specific heat of water = 4.184J / g  $\cdot$   $^{\circ}$ C,

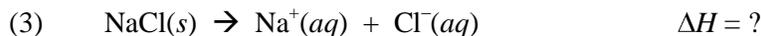
and  $\Delta T$  is determined experimentally ( $T_f - T_i$ ).

**Your mission:**

Determine the enthalpy changes (in *kJ/mol*) for the following reactions:



AND

**Recommended procedure:**

(*CP students*, remember, your *Methodology* must reflect what YOU did—i.e., the amounts of substances that YOU used, etc. The following *procedure* is merely RECOMMENDED.)

Clean and dry a calorimeter and stirrer. CAREFULLY insert a thermometer through the rubber stopper. (Applying some soap to the thermometer helps.)

Measure about 100.0 mL of distilled water into a graduated cylinder; record the precise volume (remembering significant digits). Pour the water into the calorimeter and close the lid. Wait several minutes to allow the temperature of the apparatus to equilibrate before recording the initial temperature ( $T_i$ ) from the thermometer.

In the meantime, weigh out about 5.00 – 10.00 g of whichever salt you are investigating; record the precise mass (remembering significant digits). After recording the initial temperature, lift the lid just enough to pour the salt into the calorimeter. Close lid immediately, and stir (gently). Take temperature readings every 30 seconds, or so, until you are certain that the temperature increase, or decrease, has reached a maximum, or minimum. Record the maximum or minimum temperature,  $T_f$  (remembering significant digits, of course).

This completes the data collection for *one* trial on one salt. You should perform at least two trials per each salt—six trials total.

So get going.