Experimental Data: Example Calculation.

	Mass of CaO	Volume	Initial Temp	Final temp
①	1.511g	100.0mL	20.0°C	26.0°C
②	1.505g	100.0mL	19.8°C	21.0°C

$$CaO_{(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + H_2O_{(l)}$$

$m = 100.0g$
$c = 4.184 J/g°C$
$\Delta t = (26.0°C - 20.0°C)$

$Q = mc\Delta t$
$Q = (100.0g)(4.184 J/g°C)(6.0°C)$

$Q = 2510.4 J$
$Q = 2.5104 kJ$

↑ heat released from reacting 1.511g of CaO.

$\Delta H = -Q$
$\Delta H = -2.5104 kJ$

Molar enthalpy

$1.511g \times \frac{1 mol CaO}{56.08 g}$

$\frac{\Delta H}{mol} = \frac{-2.5104 kJ}{0.02694365 1 mol}$

$\Delta H = -93.2 kJ/mol$

$2NH_4Cl_{(aq)} + CaO_{(s)} \rightarrow CaCl_{2(aq)} + 2NH_{3(aq)} + H_2O_{(l)}$

$m = 100.0\,g$
$c = 4.184\,J/g°C$
$\Delta t = (21.0°C - 19.8°C)$

$Q = (100.0\,g)(4.184\,J/g°C)(1.2°C)$
$Q = 502.08\,J$
$Q = 0.50208\,kJ$

$\Delta H = -Q$
$\Delta H = -0.50208\,kJ$

Molar enthalpy

$1.505\,g\,CaO \times \frac{1\,mol\,CaO}{56.08\,g}$
$= 0.026836661\,mol$

$\frac{\Delta H}{mol} = \frac{-0.50208\,kJ}{0.026836661}$

$\Delta H = -18.7\,kJ/mol$

ΔH per mole

① $CaO_{(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + H_2O_{(l)}$ $\Delta H = -93.2\,kJ$

② $2NH_4Cl_{(aq)} + CaO_{(s)} \rightarrow CaCl_{2(aq)} + 2NH_{3(aq)} + H_2O_{(l)}$ $\Delta H = -18.7\,kJ$

Target → $NH_{3(aq)} + HCl_{(aq)} \rightarrow NH_4Cl_{(aq)}$

① ÷ 2 $\frac{1}{2}CaO_{(s)} + HCl_{(aq)} \rightarrow \frac{1}{2}CaCl_{2(aq)} + \frac{1}{2}H_2O_{(l)}$ $\Delta H = -46.6\,kJ$

② Flip ÷ 2 $\frac{1}{2}CaCl_{2(aq)} + NH_{3(g)} + \frac{1}{2}H_2O_{(l)} \rightarrow NH_4Cl_{(aq)} + \frac{1}{2}CaO_{(s)}$ $\Delta H = +9.35$

$NH_{3(aq)} + HCl_{(aq)} \rightarrow NH_4Cl_{(aq)}$ $\Delta H = -37.25\,kJ/m$

$\%\ Error = \left| \frac{-56.2\,kJ/mol - (-37.25\,kJ/mol)}{-56.2\,kJ/mol} \right| \times 100\%$

$= 33.7\%$ error