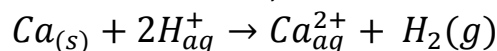


Answer on Question #67251, Chemistry / General Chemistry

During an experiment, a student adds 1.05 g of calcium metal to 200.0 mL of 0.75 M HCl. Temperature increase of 17.0 °C for the solution. The solution's final volume is 200.0 mL, the density is 1.00 g/mL, and the specific heat is 4.184 J/(g•°C), calculate the heat of the reaction, ΔH_{rxn} .



Solution:

The ΔH_{rxn} would be for one mole of Ca reacted or 2 moles of H^{+} , whichever is the limiting reactant.

$$n(\text{Ca}) = \frac{1.05}{40} = 0.026 \text{ (mol)}$$
$$n(\text{HCl}) = n(\text{H}^{+}) = 0.2 * 0.75 = 0.15 \text{ (mol)}$$

Moles of H^{+} is more than 2x moles of Ca, so Ca is limiting reactant

Now find ΔH in the experiment:

$$\Delta H = m * c_p * \Delta T$$
$$\Delta H = 200 * 1.00 * 4.184 * 17 = 14225,6 \text{ (J)}$$

Since the reaction is exothermic,

$$\Delta H_{\text{rxn}} = \frac{-\Delta H}{n(\text{Ca})} = \frac{-14225.6}{0.026} = -541.9 \text{ (kJ/mol)}$$

Answer: -541.9 kJ/mol.

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