# Answer on the question #63446, Chemistry / General Chemistry

**Question:**

6.6B When 50.0 ml of 0.0100 M AgNO3 and 50.0 mL of 0.100 M HCl are mixed in a coffee-cup calorimeter, the temperature of the mixture increases from 22.30°C to 23.11°C. The temperature increase is caused by the reaction:

AgNO3(aq) + HCl(aq) -> AgCl(s) + HNO3(aq)

Calculate ΔH for this reaction, assuming that the combined solution has a mass of 100.0g and a specific heat of 4.184J/gK.

**Solution:**

Enthalpy change for the reaction $\Delta H$ is the ratio of quantity of heat released $Q$ to the number of the moles reacted $n$:

$$\Delta H = \frac{Q}{n}.$$

As we see from the reaction equation, the number of the moles of silver nitrate and chloric acid that take part in the reaction are equal:

$$n(HCl) = n(AgNO_3).$$

Checking the amount of reactant mixed, we get that the amount of chloric acid is 10 times higher than the amount of silver nitrate. That means that chloric acid was added in excess. The number of the moles reacted is equal to the number of the moles of silver nitrate, so we should use it for the calculation of enthalpy change.

$$n = n(AgNO_3) = cV = 50.0 \cdot 10^{-3}(L) \cdot 0.0100(M) = 0.500 \cdot 10^{-3}(mol)$$

Going to the quantity of heat released, we get the following relation:

$$Q = cm\Delta T,$$

where $c$ is the specific heat, $m$ is the mass of the system and $\Delta T$ is the change in temperature.

When we substitute the values, we get the quantity of heat:

$$Q = 4.184\ (J\ g^{-1}\ K^{-1}) \cdot 100(g) \cdot (23.11 - 22.30)(K) = 339(J).$$

Finally, enthalpy change:

$$\Delta H = \frac{339(J)}{0.500 \cdot 10^{-3}(mol)} = 677808\ J\ mol^{-1} = 677.808\ kJ\ mol^{-1}.$$

**Answer :** $677.808\ kJ\ mol^{-1}$