37. 0.1375 g of solid Mg is burned in constant-volume bomb calorimeter that has a heat capacity of 3024 J/°C (Water is included in this calorimeter) The temperature increases by +1.126°C. Calculate the heat of reaction in units of kJ/g of Mg and kJ/mol of Mg.

38. A quantity of 200.0 mL of 0.862 M HCl is mixed with 200.0 mL of 0.431 M Ba(OH)\(_2\) in a constant pressure calorimeter of negligible heat capacity. The initial temperature of both solutions is 20.48°C. What is the final temperature of the mixed solution? Note that the molecular and net ionic equations along with the \(\Delta H_{\text{rxn}}\) are given below.

Also make the assumptions that \(c_{\text{soln}} = c_{\text{water}}\) and \(\text{Density}_{\text{soln}} = \text{Density}_{\text{water}}\)

Mol. Eq: \(2\ \text{HCl (aq) + Ba(OH)}_2\ (\text{aq}) \rightarrow 2\ \text{H}_2\text{O(l) + BaCl}_2\ (\text{aq})\)
Net Ionic: \(\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O (l)}\) \(\Delta H_{\text{rxn}} = -56 \text{ kJ/mol}_{\text{rxn}}\)
102. The enthalpy of combustion of benzoic acid, C₇H₇O₂, is commonly used as the standard for calibrating constant-volume bomb calorimeters; its value has been accurately determined to be $-3226.7 \text{ kJ/mol}$ (This is $\Delta H_{\text{Rxn}}$.) When 1.9862 g of benzoic acid are burned in a particular bomb calorimeter, the temperature rises from 21.84°C to 25.67°C. What is the heat capacity of this bomb calorimeter? The mass of water in the bomb calorimeter is exactly 2000g.

107. An excess of Zn metal is added to 50.00 mL of 0.100 M AgNO₃ solution in a constant-pressure calorimeter. As a result of the reaction, $\text{Zn(s)} + 2 \text{Ag}^+ (\text{aq}) \rightarrow \text{Zn}^{2+} (\text{aq}) + 2 \text{Ag(s)}$, the temperature rises from 19.25°C to 22.17°C. If the heat capacity of the calorimeter is 98.6 J/°C, calculate the enthalpy change for the above reaction in units of kJ/mol_Rxn.

(Assume the solution has the density of water and specific heat of water. Ignore the specific heats of the metals.)