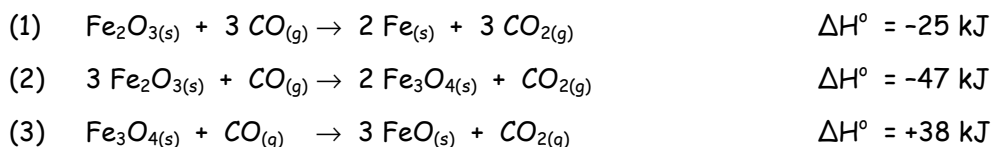


Calculate the heat of formation of  $\text{MnO}_2(\text{s})$ . (-519.7 kJ)

10. When one mole of  $\text{CH}_4$  (g) burns in a bomb calorimeter containing 21.00 kg of water, the temperature of the water rises by  $9.140^\circ\text{C}$ .
- Write the balanced reaction for the complete combustion of methane.
  - Use heats of formation to calculate the  $\Delta H$  for the combustion per mole of methane ( $-802.5 \text{ kJ/mol}$ )
  - Use the calorimetry data above to calculate the heat of combustion ( $\Delta H$ ) per mole of  $\text{CH}_4$  ( $-803.1 \text{ kJ}$ )
11. If a reaction is endothermic, which is higher, the enthalpy of the reactants or of the products?
12. In an experiment, 3.116 g of solid lithium hydroxide is mixed with 200.0 mL of 0.750 M solution of nitric acid in a coffee cup calorimeter. A neutralization (double displacement) reaction occurs and the temperature of the nitric acid goes from  $24.5^\circ\text{C}$  to  $31.4^\circ\text{C}$ .
- Write the balanced chemical reaction for the reaction that occurs. Include the states of all reactants and products.
  - Calculate the molar enthalpy of reaction ( $\Delta H$ ) per mole of lithium hydroxide. ( $-44.4 \text{ kJ/mol LiOH}$ )
  - State three assumptions that should not significantly affect the accuracy of the results.

13. Consider the following equations:



Calculate  $\Delta H$  for the reaction:  $\text{FeO}_{(s)} + \text{CO}_{(g)} \rightarrow \text{Fe}_{(s)} + \text{CO}_{2(g)}$  ( $-17 \text{ kJ}$ )