1. A 50.0 mL sample of 0.100 M AgNO₃ and a 50.0 mL sample of 0.100 M HCl are mixed in a coffee cup calorimeter, forming AgCl(s). The initial temperature of the solutions is 24.30°C, and the final temperature is 25.10°C. Assume that the mixture’s total mass is 100.0 g and that its specific heat capacity is the same as that of pure water. Assume that no heat is lost to the surroundings. Determine DH for the reaction in kJ/mol, and explain the sign (positive or negative) for the reaction.

2. Calculate DH for the reaction P₄O₁₀(s) + 6PCl₅(g) → 10Cl₃PO(g) given the information below:
   - P₄(s) + 6Cl₂(g) → 4PCl₃(g)  \[ DH = -1225.6 \text{ kJ} \]
   - P₄(s) + 5O₂(g) → P₄O₁₀(s)  \[ DH = -2967.3 \text{ kJ} \]
   - PCl₃(g) + Cl₂(g) → PCl₅(g)  \[ DH = -84.2 \text{ kJ} \]
   - PCl₃(g) + ½ O₂(g) → Cl₃PO(g)  \[ DH = -285.7 \text{ kJ} \]

3. For the following chemical reactions, predict the sign of ΔS for the system. Note that this should not require any detailed calculations.
   A) Fe(s) + 2HCl(g) → FeCl₂(s) + H₂(g)
   B) 3NO₂(g) + H₂O(ℓ) → 2HNO₃(ℓ) + NO(g)
   C) 2K(s) + Cl₂(g) → 2KCl(s)
   D) Cl₂(g) + 2NO(g) → 2ClNO(g)
   E) SiCl₄(g) → Si(s) + 2Cl₂(g)

4. Write a thermochemical reaction to represent the combustion of Fe(s) with oxygen gas to produce iron(III) oxide if DH for the reaction is -1652 kJ/mol. How much heat is released when 10.0 g Fe and 3.00 g O₂ react? You may assume that the percentage yield for the reaction is 100%.

5. A 95.0 g sample of H₂O at 22°C is added to a 55.0°C sample of water. If the final temperature of the resulting water sample is 37°C, then what mass of hot water was added?