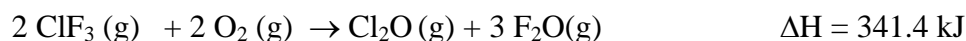
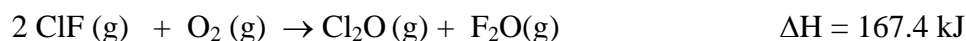


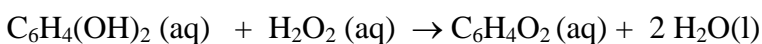
Introduction to Natural Science, Spring 2007
Chemistry Workshop – Week 1

1. A biology experiment requires the preparation of a water bath at 37 °C (body temperature). The temperature of the cold tap water is 22.0 °C and the temperature of the hot tap water is 55.0 °C . if a student starts with 90.0 g of cold water, what mass of hot water must be added to reach the desired temperature?
2. a 5.00 g sample of aluminum pellets (specific heat capacity 0.89 J °C⁻¹ g⁻¹) and a 10.00 g sample of iron pellets (specific heat capacity 0.45 J °C⁻¹ g⁻¹) are heated to 100 °C. The mixture of hot iron and aluminum is then dropped into 97.3 g of water at 22.0 °C. Calculate the final temperature of the metal and water mixture assuming no heat loss to the surroundings.
3. A 0.1964 g sample of quinone (C₆H₄O₂) is burned in a bomb calorimeter that has a heat capacity of 1.56 kJ °C⁻¹. The temperature of the calorimeter increases by 3.2 °C. Calculate the energy of combustion of quinone per gram and per mole.

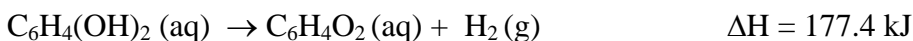
4. Given the following data, calculate ΔH for the reaction: ClF (g) + F₂ (g) → ClF₃ (g)



4. The bombardier beetle uses an explosive discharge as a defensive mechanism. The chemical reaction involved is the oxidation of hydroquinone by hydrogen peroxide to produce quinone and water as given below.



Calculate ΔH for the above reaction using the following information.



5. The Ostwald process for the commercial production of nitric acid from ammonia and oxygen involves the following steps. Calculate ΔH⁰ for the following reactions using ΔH_f⁰ data from standard tables.
 - 4 NH₃ (g) + 5 O₂ (g) → 4 NO (g) + 6 H₂O (g)
 - 2 NO (g) + O₂ (g) → 2 NO₂ (g)
 - 3 NO₂ (g) + H₂O (l) → 4 HNO₃ (aq) + NO (g)