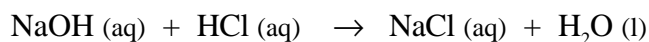


## CHEM 1

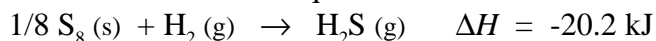
### Problem Set Ch. 6

1. How many kilocalories are in 5225 J?
2. How much heat in kilocalories has to be removed from 225 g of water to lower its temperature from 25.0 °C to 10.0 °C? (This would be like cooling a glass of lemonade.) Specific heat of water is 4.184 J/g•°C.
3. What is the molar heat of combustion of methanol (CH<sub>3</sub>OH) if combustion of 1.00 grams methanol causes a temperature rise of 3.68 °C in a bomb calorimeter that has a heat capacity of 6.43 kJ/°C. (CH<sub>3</sub>OH M<sub>m</sub> = 32g/mol)
4. A quantity of 1.00 x 10<sup>2</sup> mL of 0.500 M HCl is mixed with 1.00 x 10<sup>2</sup> mL of 0.500 M NaOH in a constant-pressure calorimeter having a heat capacity of 335 J/°C. The initial temperature of the HCl and NaOH solutions is the same, 22.50 °C, and the final temperature of the mixed solution is 24.90 °C. Calculate the heat change for the neutralization reaction



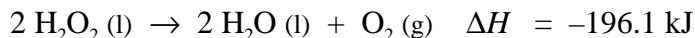
Assume that the densities and specific heats of the solutions are the same as for water (1.00 g/mL and 4.184 J/g•°C, respectively).

5. Consider the following balanced thermochemical equation sometimes used for H<sub>2</sub>S production:



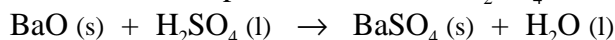
- a) Is this an exothermic or endothermic reaction?
- b) What is  $\Delta H$  for the reverse reaction?
- c) What is  $\Delta H$  when 1.0 mol S<sub>8</sub> reacts?

6. Liquid hydrogen peroxide is an oxidizing agent in many rocket fuel mixtures because it releases oxygen gas on decomposition:

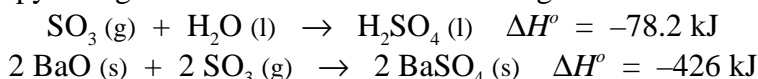


How much heat is released when 732 kg  $\text{H}_2\text{O}_2$  decomposes?

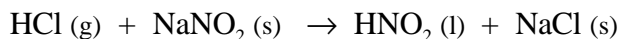
7. Barium oxide,  $\text{BaO}$ , can be used to neutralize pure sulfuric acid,  $\text{H}_2\text{SO}_4$ . The equation is



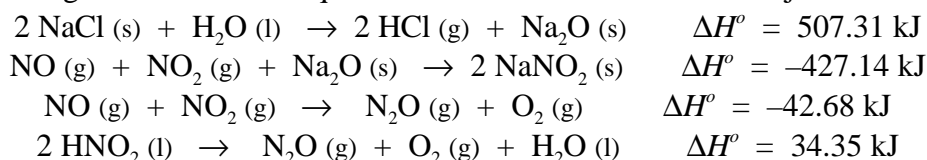
What is the standard enthalpy change of this reaction? The following thermochemical equations can be used.



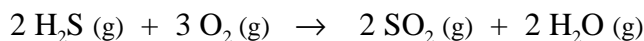
8. Calculate  $\Delta H^\circ$  for the following reaction, which describes the preparation of an unstable acid,  $\text{HNO}_2$ , nitrous acid.



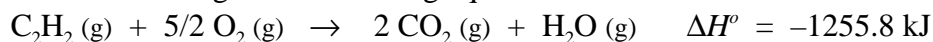
Use the following thermochemical equations. Calculate the answer in kilojoules.



9. Using the standard enthalpies of formation in Table 6.2 in your book, calculate the standard enthalpy change for the following reaction:



10. Acetylene burns in air according to the following equation:



Given that  $\Delta H_f^\circ$  of  $\text{CO}_2 (\text{g}) = -393.5 \text{ kJ/mol}$  and  $\Delta H_f^\circ$  of  $\text{H}_2\text{O} (\text{g}) = -241.8 \text{ kJ/mol}$ , what is  $\Delta H_f^\circ$  of  $\text{C}_2\text{H}_2 (\text{g})$ ?