

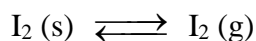
REVIEW QUESTIONS

Chapter 6

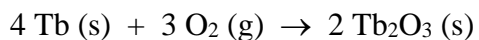
1. What is the change in internal energy (in J) of a system that releases 575 J of heat to its surroundings and has 425 cal of work done on it?
2. If an athlete expends 1700 kJ/h playing tennis, how long would she have to play to work off 1.0 lb of body fat? (One pound of body fat is equivalent to 4100 nutritional Calories)
3. A 27.7 g sample of ethylene glycol, a car radiator coolant, absorbs 588 J of heat from the car engine. What is the initial temperature of the engine, if its final temperature is 30.5°C? (C_s of ethylene glycol = 2.42 J/g°C)
4. When 155 mL of water at 20.0°C is mixed with 75.0 mL of water at 80.0°C, what is the final temperature? (Assume specific heat of hot and cold water are the same, and density of water = 1.00 g/mL)

5. A 1.500-g sample of a hydrocarbon is placed in a bomb calorimeter and undergoes combustion. The temperature of the calorimeter rises from 20.00°C to 23.55°C. If the calorimeter has a heat capacity of 40.3 J/°C, what is the heat of combustion (q_v) for this hydrocarbon in kJ/g?

6. The heat of sublimation for iodine is 62.4 kJ/mol, at 25°C and 1.00 atm. What is ΔE for the sublimation of iodine (shown below) under these conditions?

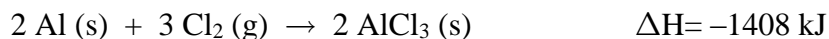


7. A bomb calorimeter with heat capacity of 1.500×10^3 J/°C was used to study combustion of terbium (Tb) in excess oxygen:

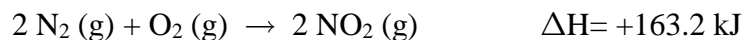


When 1.000-g of terbium was burned, a temperature increase of 3.908°C was observed. What is the ΔE for the reaction, in kJ/mol of Tb_2O_3 ?

8. One mole of nitrogen gas confined in a cylinder with a piston is heated from 0°C to 819°C at 1.00 atm.
- Calculate the work of expansion in Joules.
 - What would have been the temperature change if the gas had been heated with the same amount of energy in a container of fixed volume. (Assume the specific heat of N₂ is 1.00 J/g°C)
9. How many kJ of heat is produced when 5.00 g of Al reacts with excess chlorine, as shown below:



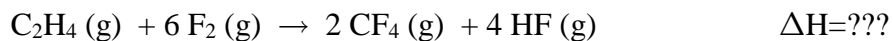
10. Consider the following reaction:



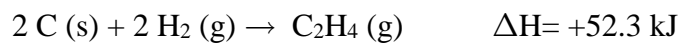
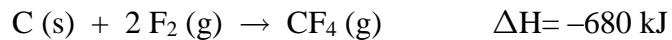
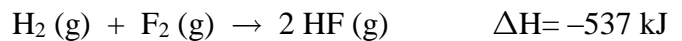
- How many grams of N₂ must react to produce an enthalpy change of 5.00 kJ?
- How much heat is transferred when 25.0 g of NO₂ is produced in this reaction?

11. When 6.50 g of solid NaOH is dissolved in 100.0 g of water in a calorimeter, the temperature rises from 21.6 °C to 37.8 °C. Calculate the change in enthalpy of solution in kJ/mol of NaOH. Assume specific heat of solution is the same as water.
12. When 1.025 g of naphthalene ($C_{10}H_8$) is burned in a bomb calorimeter, the temperature rises from 24.25°C to 32.33°C. Find ΔE_{rxn} for combustion of naphthalene in kJ/mol. Heat capacity of the calorimeter is 5.11 kJ/°C.
13. When 10.0 g of phosphorus is burned in oxygen gas to form solid P_4O_{10} , enough heat is generated to raise the temperature of 2960 g of water from 18.0°C to 38.0°C. Calculate the enthalpy of formation of solid P_4O_{10} under these conditions.

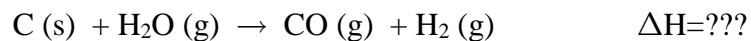
14. Calculate the enthalpy change for the reaction below:



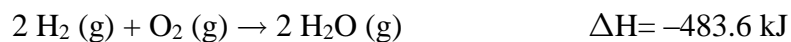
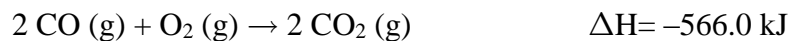
based on the following reactions:



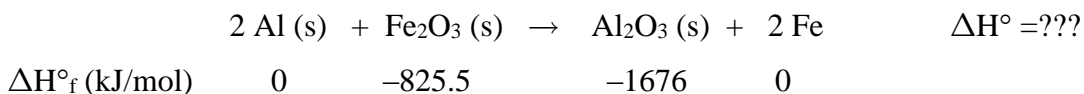
15. Determine the enthalpy change for the reaction below:



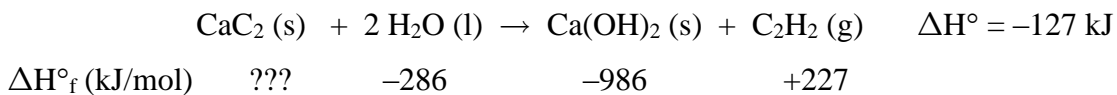
based on the following reactions:



16. Use enthalpies of formation given to determine the standard enthalpy of reaction for the following:

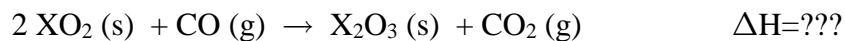


17. Use the enthalpies of formation and the enthalpy of reaction given below to determine the enthalpy of formation for solid CaC_2 .



18. The heat of vaporization of a liquid (ΔH_{vap}) is the heat required to vaporize 1.00 g of a liquid. In one experiment, 60.0 g of liquid nitrogen (b.p. -196°C) are poured into a Styrofoam cup containing 200. g of water at 55.3°C . Calculate the molar heat of vaporization of liquid nitrogen if the final temperature of the water is 41.0°C .

19. Ice at 0 °C is placed in a Styrofoam cup containing 361 g of a soft drink at 23.0 °C. Some ice remains after the ice and the soft drink reach an equilibrium temperature of 0 °C. Determine the mass of the ice that has melted. Assume the specific heat of the drink to be the same as pure water. (It requires 334 J of heat to melt 1 g of ice at 0 °C)
20. A quantity of 200. mL of 0.862 M HCl is mixed with 200. mL of 0.431 M Ba(OH)₂ in a Styrofoam cup. The initial temperature of both solutions is 20.48 °C. Calculate the heat of neutralization in kJ/mol of H₂O, if the final temperature of the solution is 26.30°C. (Assume specific heat and density of solution to be the same as water)
21. Determine the enthalpy change for the reaction below:



based on the following reactions:

