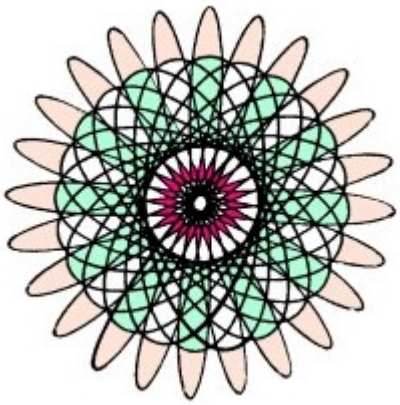

7.7 End-of-Chapter Material

ADDITIONAL EXERCISES

1. What is the work when 124 mL of gas contract to 72.0 mL under an external pressure of 822 torr?

2. What is the work when 2,345 mL of gas contract to 887 mL under an external pressure of 348 torr?

3. A 3.77 L volume of gas is exposed to an external pressure of 1.67 atm. As the gas contracts, 156 J of work are added to the gas. What is the final volume of the gas?

4. A 457 mL volume of gas contracts when 773 torr of external pressure act on it. If 27.4 J of work are added to the gas, what is its final volume?

5. What is the heat when 1,744 g of Hg increase in temperature by 334°C? Express your final answer in kJ.

6. What is the heat when 13.66 kg of Fe cool by 622°C? Express your final answer in kJ.

7. What is final temperature when a 45.6 g sample of Al at 87.3°C gains 188 J of heat?

8. What is final temperature when 967 g of Au at 557°C lose 559 J of heat?

9. Plants take CO_2 and H_2O and make glucose ($C_6H_{12}O_6$) and O_2. Write a balanced thermochemical equation for this process. Use data in Table 7.2 "Enthalpies of Formation for Various Substances".

10. Exercise 9 described the formation of glucose in plants, which take in CO_2 and H_2O and give off O_2. Is this process exothermic or endothermic? If exothermic, where does the energy go? If endothermic, where does the energy come from?

10. The basic reaction in the refining of aluminum is to take $Al_2O_3(s)$ and turn it into Al(s) and $O_2(g)$. Write the balanced thermochemical equation for

this process. Use data in Table 7.2 "Enthalpies of Formation for Various Substances".

11. Is the enthalpy change of the reaction

    $H_2O(\ell) \rightarrow H_2O(g)$

    zero or nonzero? Use data in Table 7.2 "Enthalpies of Formation for Various Substances" to determine the answer.

12. What mass of H_2O can be heated from 22°C to 80°C in the combustion of 1 mol of CH_4? You will need the balanced thermochemical equation for the combustion of CH_4. Use data in Table 7.2 "Enthalpies of Formation for Various Substances".

13. What mass of H_2O can be heated from 22°C to 80°C in the combustion of 1 mol of C_2H_6? You will need the balanced thermochemical equation for the combustion of C_2H_6. Use data in Table 7.2 "Enthalpies of Formation for Various Substances". Compare your answer to Exercise 13.

14. What is the enthalpy change for the unknown reaction?

    $Pb(s) + Cl_2(g) \rightarrow PbCl_2(s)\ \Delta H = -359$ kJ$PbCl_2(s) + Cl_2(g) \rightarrow PbCl_4(\ell)$

    $\Delta H = ?Pb(s) + 2Cl_2(g) \rightarrow PbCl_4(\ell)\ \Delta H = -329$ kJ

15. What is the enthalpy change for the unknown reaction?

    $P(s) + 3/2Br_2(\ell) \rightarrow PBr_3(\ell)\ \Delta H = -185$ kJ$PI_3(s) \rightarrow P(s) + 3/2I_2(s)\ \Delta H = ?PI_3(s)$

    $+ 3/2Br_2(\ell) \rightarrow PBr_3(\ell) + 3/2I_2(s)\ \Delta H = -139$ kJ

16. What is the ΔH for this reaction? The label *gra* means graphite, and the label *dia* means diamond. What does your answer mean?

    $C(s, gra) \rightarrow C(s, dia)$

17. Without consulting any tables, determine the ΔH for this reaction. Explain your answer.

$H_2O(\ell, 25°C) \rightarrow H_2O(\ell, 25°C)$

ANSWERS

1. 5.70 J

3. 4.69 L

5. 80.97 kJ

7. 91.9°C

9. $6CO_2(g) + 6H_2O(\ell) \rightarrow C_6H_{12}O_6(s) + 6O_2(g)$ ΔH = 2,799 kJ

11. $2Al_2O_3(s) \rightarrow 4Al(s) + 3O_2(g)$ ΔH = 3351.4 kJ

13. 3,668 g

15. ΔH = 30 kJ

17. ΔH = 1.897 kJ; the reaction is endothermic.