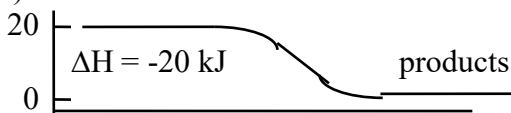


Answers to Chapter 10 Study Questions

1. a) reactants

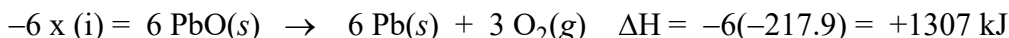


- b) exothermic
 c) Reactants have greater heat content.
 d) Heat is released.
2. a) exothermic b) exothermic c) endothermic
 d) exothermic e) exothermic f) endothermic
3. a) $C_{10}H_8(s) + 12 O_2(g) \rightarrow 10 CO_2(g) + 4 H_2O(l) \quad \Delta H = -5159 \text{ kJ}$
 b) exothermic

$$c) 258 \text{ kJ} \times \frac{10 \text{ mol } CO_2}{5159 \text{ kJ}} = 0.500 \text{ mol } CO_2$$

$$d) 1.86 \text{ g } C_{10}H_8 \times \frac{1 \text{ mol } C_{10}H_8}{128.0 \text{ g } C_{10}H_8} \times \frac{5159 \text{ kJ}}{1 \text{ mol } C_{10}H_8} = 75.0 \text{ kJ (or } -75.0 \text{ kJ)}$$

4. (i) $Pb(s) + 0.5 O_2(g) \rightarrow PbO(s) \quad \Delta H = -217.9 \text{ kJ}$
 (ii) $3 Pb(s) + 2 O_2(g) \rightarrow Pb_3O_4(s) \quad \Delta H = -734.7 \text{ kJ; therefore:}$



Exothermic

5. $Q \text{ (J)} = \text{specific heat (J/g } ^\circ\text{C)} \times \text{mass (g)} \times \Delta T \text{ (} ^\circ\text{C)}$; $\Delta T = 90.0 - 25.0 = 65.0^\circ\text{C}$
 $392 \text{ J} = \text{specific heat} \times 48.0 \text{ g} \times 65.0^\circ\text{C}$

$$\text{specific heat} = \frac{392 \text{ J}}{48.0 \text{ g} \times 65.0^\circ\text{C}} = 0.126 \text{ J/g } ^\circ\text{C}$$

6. a) $\Delta T = 19.23 - 24.78 = -5.55^\circ\text{C}$
 b) Water got colder, so heat was used up and the process is **endothermic**.
 c) $Q \text{ (J)} = \text{specific heat (J/g } ^\circ\text{C)} \times \text{mass (g)} \times \Delta T \text{ (} ^\circ\text{C)}$
 $Q = 4.18 \text{ J/g } ^\circ\text{C} \times 60.0 \text{ g} \times -5.55^\circ\text{C} = -1390 \text{ J} = \mathbf{1390 \text{ J}}$ (used up)
 d) molar mass (NH_4Cl) = $14.0 + 4.0 + 35.5 = 53.5 \text{ g/mole}$

$$5.03 \text{ g } NH_4Cl \times \frac{1 \text{ mol } NH_4Cl}{53.5 \text{ g } NH_4Cl} = \mathbf{0.0940 \text{ moles } NH_4Cl}$$

$$e) \frac{1390 \text{ J}}{0.0940 \text{ mol } NH_4Cl} \times \frac{1 \text{ kJ}}{1000 \text{ J}} = \mathbf{14.8 \text{ kJ/mol}} (= 14,800 \text{ J/mol})$$