Test yourself: Chapter 6

1. Which one of these reactions is endothermic?
   A. The combustion of ethanol
   B. The thermal decomposition of copper(II) sulfate
   C. The reaction of hydrochloric acid with sodium hydroxide
   D. Respiration in plants

2. Which one of these enthalpy changes can not be measured directly?
   A. \( \text{Ca(OH)}_2(\text{aq}) + 2\text{HCl(\text{aq})} \rightarrow \text{CaCl}_2(\text{aq}) + 2\text{H}_2\text{O(l)} \)
   B. \( \text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O(l)} \)
   C. \( 4\text{C(graphite)} + 5\text{H}_2(\text{g}) \rightarrow \text{C}_4\text{H}_{10}(\text{g}) \)
   D. \( \text{KOH(s)} + \text{aq} \rightarrow \text{KOH(aq)} \)

3. Which one of the following statements about an endothermic reaction is correct?
   A. The energy absorbed in bond breaking is greater than the energy released in bond forming
   B. The energy absorbed in bond breaking is less than the energy released in bond forming
   C. The energy released in bond breaking is greater than the energy absorbed in bond forming
   D. The energy released in bond breaking is less than the energy absorbed in bond forming
4. Which one of these equations relates to the standard enthalpy change of formation of sodium chloride?

A. 2Na(s) + Cl₂(g) → 2NaCl(s)  
B. Na(s) + Cl(g) → NaCl(s)  
C. Na(s) + ½ Cl₂(g) → NaCl(s)  
D. Na⁺(s) + Cl⁻(g) → 2NaCl(s)  

5. Which statement about the enthalpy level diagram below is correct?

A. The reaction is endothermic  
B. More bonds are formed than are broken  
C. ΔH represents the enthalpy change of combustion of ethanol  
D. ΔH represents the enthalpy change of formation of carbon dioxide
6 An enthalpy cycle for finding the enthalpy change of reaction \( \Delta H_r \) is shown below.

\[
\text{reactants} \quad \Delta H_r \quad \text{products} \\
\Delta H_1 \quad \Delta H_2 \\
\text{elements}
\]

Which one of these equations relating to this enthalpy cycle is correct?

A \( \Delta H_r = \Delta H_1 + \Delta H_2 \)

B \( \Delta H_r = -\Delta H_2 - \Delta H_1 \)

C \( \Delta H_r = \Delta H_1 - \Delta H_2 \)

D \( \Delta H_r = \Delta H_2 - \Delta H_1 \)

7 Hydrogen reacts with chlorine to form hydrogen chloride:

\[ \text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{g}) \]

Which one of the values below gives the correct value for the enthalpy change for this reaction? (Use the bond energies \( E(\text{H–H}) = 436 \text{ kJ mol}^{-1} \), \( E(\text{Cl–Cl}) = 243 \text{ kJ mol}^{-1} \), \( E(\text{H–Cl}) = 432 \text{ kJ mol}^{-1} \))

A \( +185 \text{ kJ mol}^{-1} \)

B \( -185 \text{ kJ mol}^{-1} \)

C \( +92.5 \text{ kJ mol}^{-1} \)

D \( -92.5 \text{ kJ mol}^{-1} \)
A calorimetry experiment was carried out to find the enthalpy change of combustion of cyclohexanol. When 0.100 g of cyclohexanol was burnt it raised the temperature of 50.0 g of water by 17.8 °C.  

(specific heat capacity of water = 4.18 J g⁻¹°C⁻¹, molar mass of cyclohexanol = 100)

What is the enthalpy change of combustion?

A  372 kJ mol⁻¹
B  890 kJ mol⁻¹
C  1490 kJ mol⁻¹
D  3720 kJ mol⁻¹

Which one of these equations relates to the standard enthalpy change of atomisation of iodine?

A  \( \frac{1}{2} \text{I}_2(\text{s}) \rightarrow \text{I}(\text{g}) \)
B  \( \frac{1}{2} \text{I}_2(\text{g}) \rightarrow \text{I}(\text{g}) \)
C  \( \text{I}_2(\text{s}) \rightarrow 2\text{I}(\text{g}) \)
D  \( \text{I}_2(\text{s}) \rightarrow \text{I}_2(\text{g}) \)

An enthalpy cycle to find the enthalpy change of formation of propane, \( \text{C}_3\text{H}_8 \), is shown below.

Which of these equations gives the correct enthalpy change of formation of propane?

A  \( \Delta H^\circ_c[\text{C(\text{graphite})}] + \Delta H^\circ_c[\text{H}_2(\text{g})] - \Delta H^\circ_c[\text{C}_3\text{H}_8(\text{g})] \)
B  \( 3\Delta H^\circ_c[\text{C(\text{graphite})}] + 4\Delta H^\circ_c[\text{H}_2(\text{g})] - \Delta H^\circ_c[\text{C}_3\text{H}_8(\text{g})] \)
C  \( 3\Delta H^\circ_c[\text{C(\text{graphite})}] + 4\Delta H^\circ_c[\text{H}_2(\text{g})] + \Delta H^\circ_c[\text{C}_3\text{H}_8(\text{g})] \)
D  \( \Delta H^\circ_c[\text{C}_3\text{H}_8(\text{g})] - \Delta H^\circ_c[\text{C(\text{graphite})}] + 4\Delta H^\circ_c[\text{H}_2(\text{g})] \)