**Chemical Energetics Tutorial**

1. Write equations representing the enthalpy change of combustion of:-

(a) Carbon, C(s)

C+ O2=CO2

(b) Methane, CH4(g)

CH4 + 2O2= CO2 + 2

(c) Ethanol, C2H5OH(l)

(d) Octane, C8H18(l)

2. Write equations representing the enthalpy change of formation of:-

(a) Sodium iodide, NaI(s)

(b) Water, H2O(l)

(c) Ethanol, C2H5OH(l)

(d) Calcium carbonate, CaCO3(s)

(e) Sodium chlorate (V), NaClO3(s)

3. Which one of the following equations is correctly associated with the definition of the enthalpy change of formation of carbon monoxide?

A. C (s) + 1/2O2(g) → CO(g)

B. C (s) + O(g) → CO(g)

C. C (s) + CO2(g) → 2CO(g)

D. C (g) + 1/2O2(g) → CO(g)

4. Which reaction below involves enthalpy of formation?

A. 2H(g) + 1/2O2(g) → H2O(g)

B. CO(g) + 1/2O2(g) → CO2(g)

C. 2N(g) + 3H2(g) → 2NH3(g)

D. C(s) + 2H2(g) → CH4(g)

5. Which of the process is endothermic?

A. the condensation of steam

B. the electrolysis of water

C. the freezing of water

D. combustion of carbon

6. In which of the following would reactions will the enthalpy change correspond to an enthalpy change of formation?

A. 2NO(g) → N2(g) + O2(g)

B. K(s) + 2O2(g) + Mn(s) → KMnO4(s)

C. O2(g) + 2H2(g) → 2H2O(g)

D. Na(s) + Cl(g) → NaCl(s)

7. The enthalpy change ∆H associated with a chemical change does not depend upon

A. the number of stages involved in the change

B. The temperature at which the change occurs

C. the pressure at which the change occurs

D. the volume of the reactants

8. (a) Define the term enthalpy change of formation.

(b) When 2.76g of potassium carbonate, K2CO3 was added to 30.0cm3 of approximately 2 moldm-3 hydrochloric acid, the temperature rose by 5.2°C.

(i) Write an equation for this reaction.

(ii) Calculate the number of moles of potassium carbonate and hydrochloric acid separately and determine which reactant is in excess.

(iii) Calculate the enthalpy change of this reaction per mole of K2CO3. Assume that the specific heat capacities of all solutions are 4.2Jg-1K-1 and that all solutions have a density of 1.0gcm-3.

9. (a) Define the term enthalpy change of combustion.

(b) Write an equation for the combustion of glucose, C6H12O6 in excess oxygen.

(c) The heat released during the combustion of 1.80g of glucose raised the temperature of 4.0dm3 of water from 30.0° to 32.0°C. Calculate the enthalpy change of combustion for glucose. Assume that the specific heat capacities of all solutions are 4.2Jg-1K-1 and that all solutions have a density of 1.0gcm-3.

10. Based on the bond energy values in the *Data Booklet*, calculate:-

(a) The enthalpy change of combustion of ethane.

(b) The enthalpy change of formation of hydrogen chloride.

(c) The enthalpy change of reaction for CH3CH=CH2 + H2 → CH3CH2CH3