**Topic 4 Exercise 1 – Enthalpy Changes**

The chemical potential energy of a substance is known as its **ENTHALPY** and has the symbol H.

During chemical reactions, the enthalpy can increase or decrease. The change in enthalpy during chemical reactions is called the **ENTHALPY CHANGE** (ΔH). It usually has units of kJmol-1.

Almost all reactions require an initial input of energy in order to break the bonds in the reactants. This energy is called the **ACTIVATION ENERGY** (Ea).

**1.** What is meant by the term ‘exothermic reaction’? Describe the energy changes which take place in an exothermic chemical reaction.

**2**. The combustion of methane is an exothermic reaction:

 CH4 + 2O2 🡪 CO2 + 2H2O ΔH = -890 kJmol-1

 Draw an enthalpy profile diagram for the combustion of methane. Label the reactants and products, enthalpy change and activation energy.

 Explain why the enthalpy increases before it decreases.

**3**. What will be the enthalpy change for the following reaction?

 CO2 + 2H2O 🡪 CH4 + 2O2

**4.** a) Calculate the heat energy released when 100 g of methane is burned

b) Calculate the heat energy released when 500 cm3 of methane is burned at 298 K and 300 kPa

c) Calculate the mass of methane required to produce 50,000 kJ of heat energy.

**5.** What is meant by the term ‘endothermic reaction’? Describe the energy changes which take place in an endothermic chemical reaction.

**6**. Photosynthesis is an endothermic reaction:

 6CO2 + 6H2O 🡪 C6H12O6 + 6O2 ΔH = +2802 kJmol-1

 Draw an enthalpy profile diagram for photosynthesis. Label the reactants and products, enthalpy change and activation energy.

**7**. What will be the enthalpy change for the following reaction?

 C6H12O6 + 6O2 🡪 6CO2 + 6H2O

**8.** a) Calculate the amount of light energy required to make 1000 g of glucose.

b) Calculate the amount of light energy required to absorb 500 cm3 of carbon dioxide is at 298 K and 100 kPa

c) Calculate the mass of glucose which can be made when a tree absorbs 10,000 kJ of light energy.