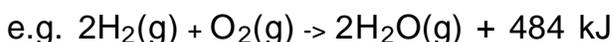


Chem12 Enthalpy : Notes/WS-10

A chemical reaction is a reaction in which new compounds are formed. The initial compounds are the **reactants**. The new compounds formed are the **products**. In a chemical reaction, heat is absorbed (**endothermic**) or released (**exothermic**).

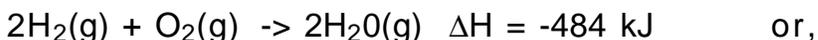
Enthalpy is the total energy (KE + PE) of the system (symbol H). H is also defined as the heat content of the system (or compound) in Joules per mole or kJ/mole. The energy change (**enthalpy change**) is given by ΔH .

$\Delta H = H (\text{Products}) - H (\text{Reactants})$ is also called the **Standard Heat of Formation**.



In this exothermic reaction 484 kJ of energy is released when two moles of H_2 combine with one mole of O_2 .

We can also write :



The second way is often preferred so ΔH represents the enthalpy change per mole of product formed.

ΔH is (-) if energy is released (exothermic), or (+) if energy is absorbed (endothermic).

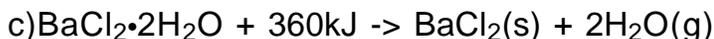
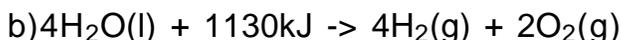
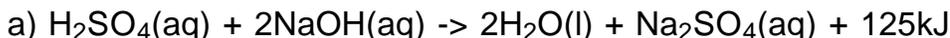
The equation above tells us a lot about the reaction, but does not tell us several things such as :

- How difficult is it to start the reaction?
- How rapidly does the reaction proceed?
- How do the molecules interact during the reaction?
- Does the reaction go to completion?

These questions belong to the study of **Kinetics**.

Exercises :

- 1) Balance each equation assuming one mole of H₂O, give ΔH and state whether the following equations are exothermic or endothermic.



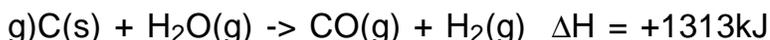
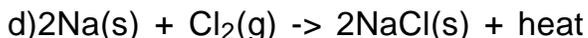
- 2) The equation for burning sucrose (table sugar) is:



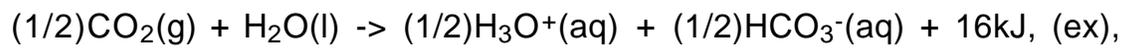
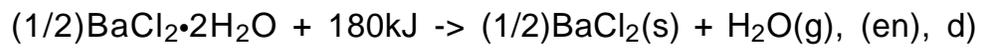
The energy released = 5647kJ/mole of sugar. Find the amount of energy released by burning 1.000 grams of sugar.

- 3) Tell whether the following reactions are endothermic or exothermic.

a) burning, b) photosynthesis, c) digestion



Answers : 1)a) $(1/2)\text{H}_2\text{SO}_4(\text{aq}) + \text{NaOH}(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + (1/2)\text{Na}_2\text{SO}_4(\text{aq}) + 62.5\text{kJ}$ (ex), b) $\text{H}_2\text{O}(\text{l}) + 282.5\text{kJ} \rightarrow \text{H}_2(\text{g}) + (1/2)\text{O}_2(\text{g})$ (en), c)



2) 16.50 kJ, 3)a) ex, b) en, c) en, d) ex, e) ex, f) en, g) en, h) ex.