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Chemistry

For the IB Diploma

> Chapter 12

Measuring enthalpy changes

➤ Exchange of heat energy with the surroundings

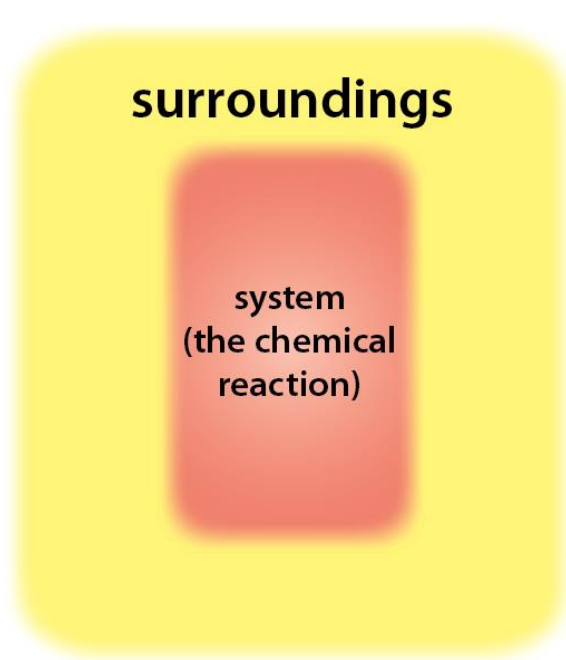


Figure 12.1: The Universe! We can divide the universe up into our chemical reaction (the system) and everything else (the surroundings).

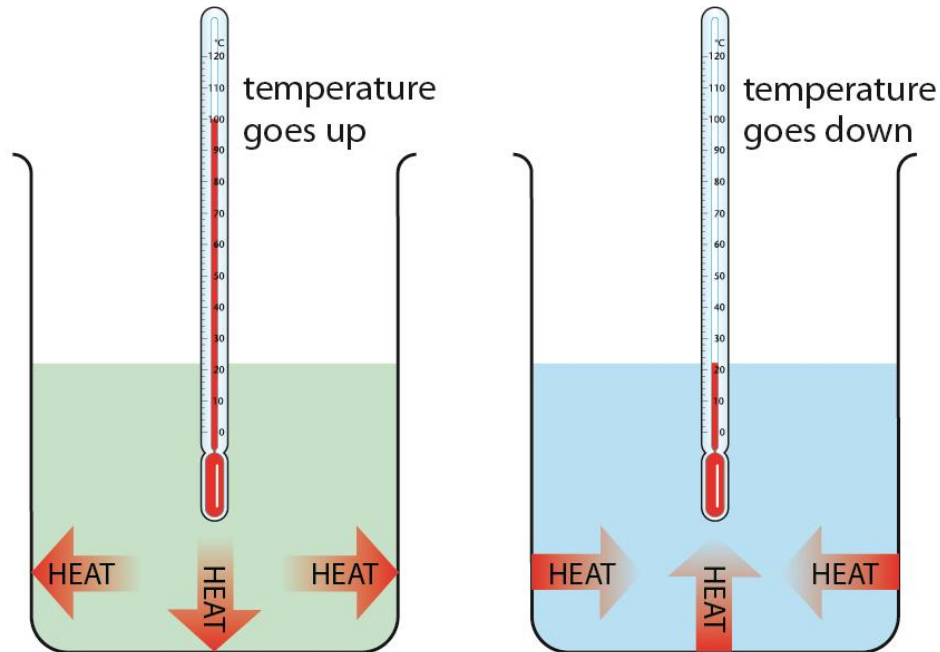


Figure 12.2: **a** The heat energy released in an exothermic reaction comes from the decrease in internal energy (the total energy of all the particles) of the system. **b** An endothermic reaction can be regarded as involving a conversion of heat to chemical energy as energy flows from the surroundings.

> Exothermic reactions

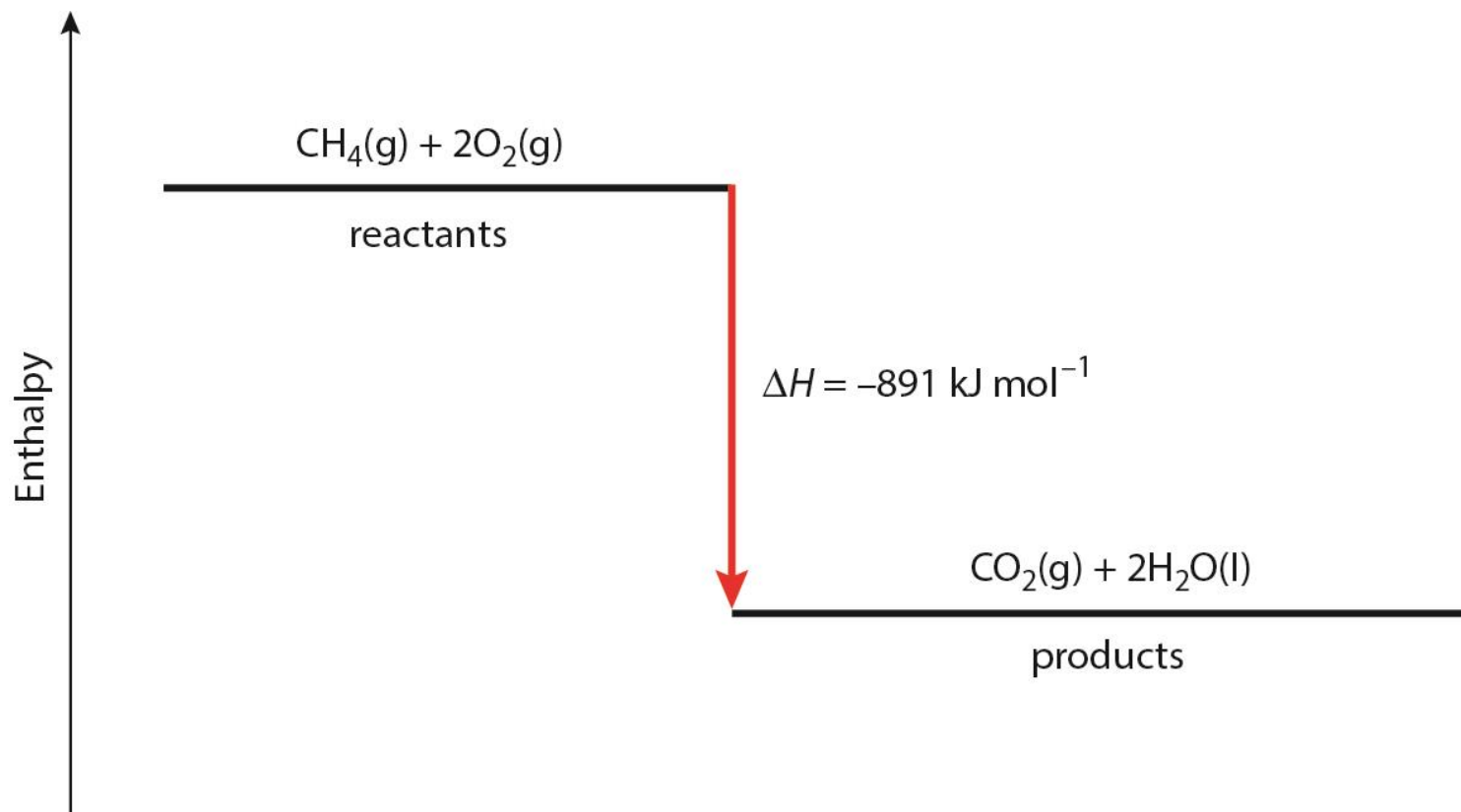


Figure 12.3: An enthalpy level diagram for the combustion of methane. No scale is shown on the vertical axis because we cannot measure the initial enthalpy or final enthalpy of the system.

> Endothermic reactions

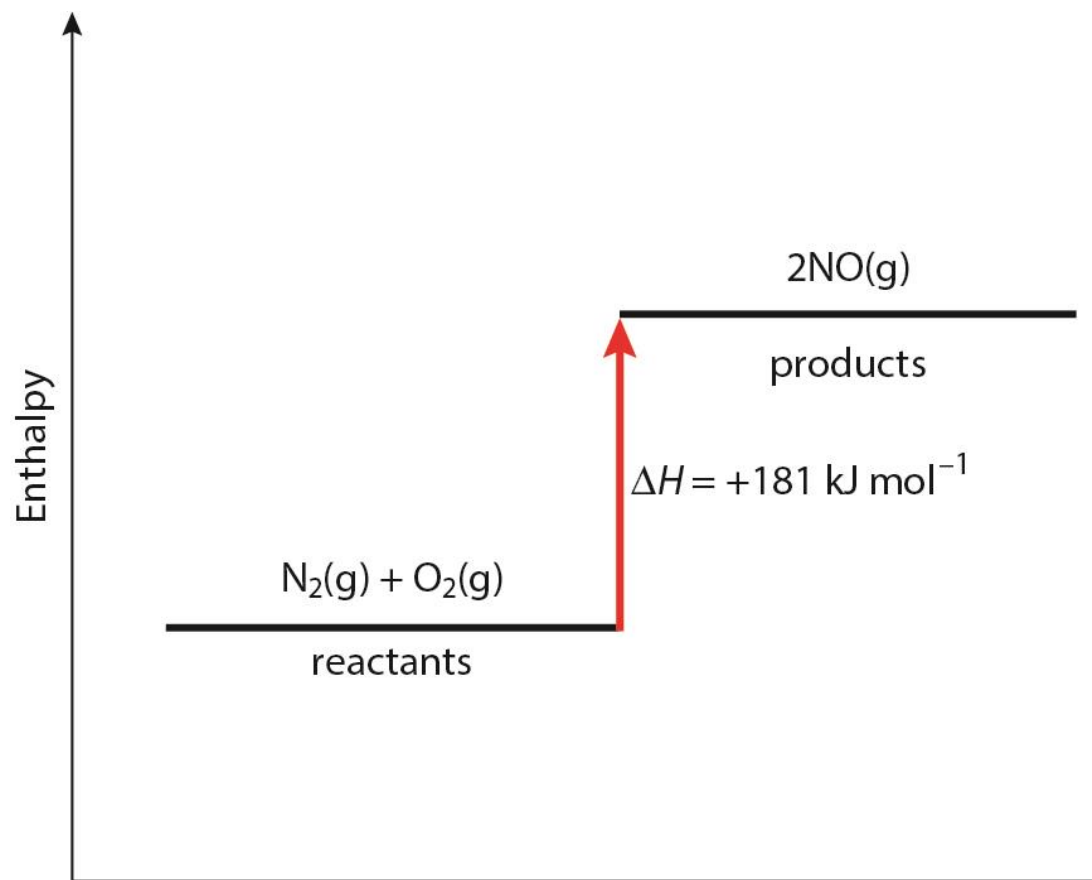


Figure 12.4: An enthalpy level diagram for an endothermic reaction.

> Reaction profile diagrams of exothermic and endothermic reactions

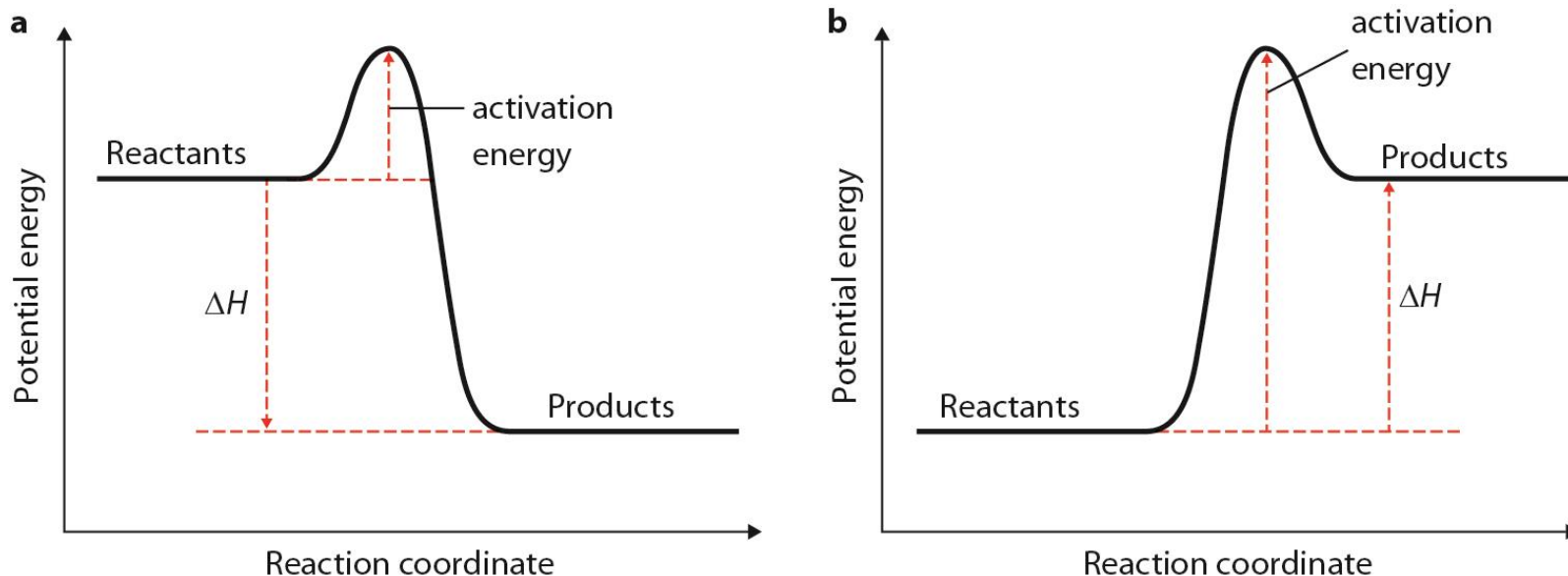


Figure 12.5: **a** Potential energy profile for an exothermic reaction;
b potential energy profile for an endothermic reaction.

➤ Experiments to measure the enthalpy of different reactions

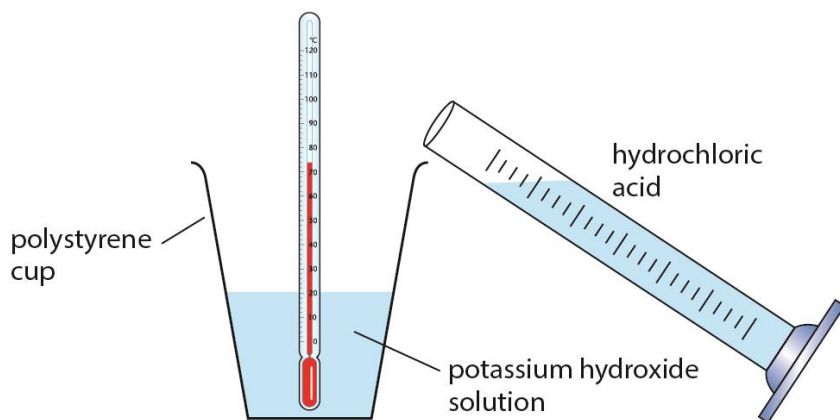


Figure 12.7: An experiment to work out the enthalpy change of neutralisation of potassium hydroxide.

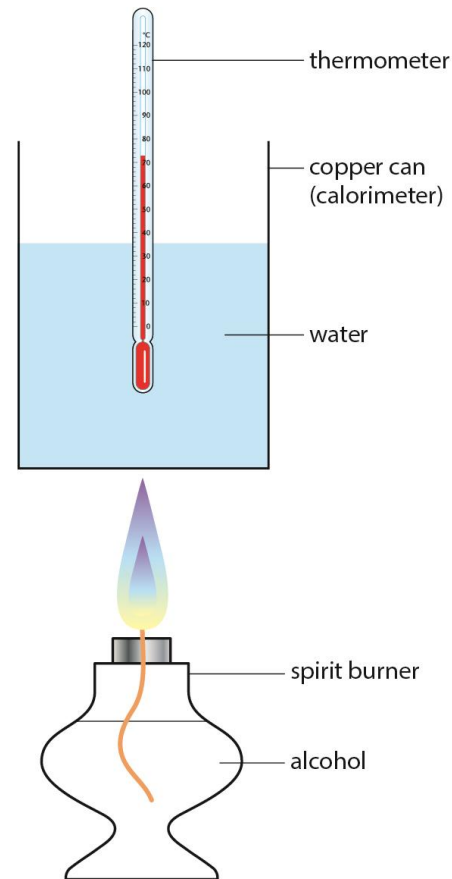
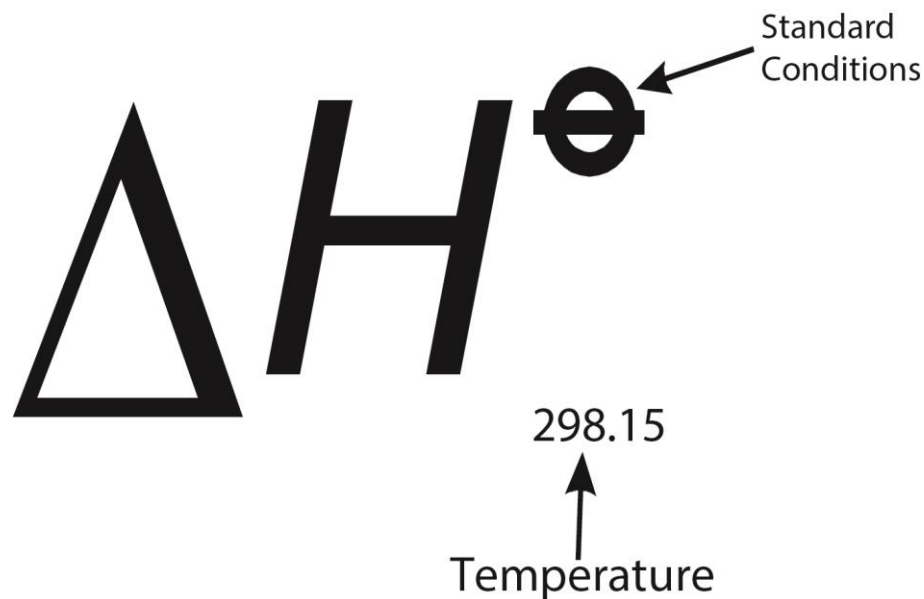


Figure 12.6: An experiment to work out the enthalpy change of combustion of an alcohol.

> Standard enthalpy change

Standard enthalpy change is the heat transferred under standard conditions



Standard conditions:

All values for enthalpy changes are quoted for standard conditions.