

Cambridge IGCSE Chemistry

Topic 6: Chemical energetics

Energetics of a reaction

Notes





Describe the meaning of exothermic and endothermic reactions

- An exothermic reaction is one that transfers energy to the surroundings so the temperature of the surroundings increases.
 - o Examples of exothermic reactions include; combustion, many oxidation reactions and neutralisation.
 - o Everyday examples of exothermic reactions include; self-heating cans (e.g for coffee) and hand warmers.
- An endothermic reaction is one that takes in energy from the surroundings so the temperature of the surroundings decreases.
 - o Examples of endothermic reactions are thermal decomposition and the reaction of citric acid and sodium hydrogencarbonate.
 - o Some sports injury packs are based on endothermic reactions.



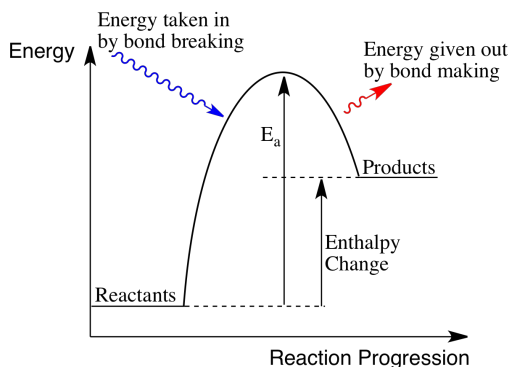
(Extended only) Describe bond breaking as an endothermic process and bond forming as an exothermic process

- During a chemical reaction:
 - o Energy is taken in to break bonds in the reactants - endothermic.
 - o Energy is released when bonds are formed in products - exothermic.
 - o 'buses take many routes' (break bonds- take in energy, make bonds- release energy).
- Energy needed to BREAK > energy RELEASED
ENDOTHERMIC
- Energy needed to BREAK < energy RELEASED
EXOTHERMIC

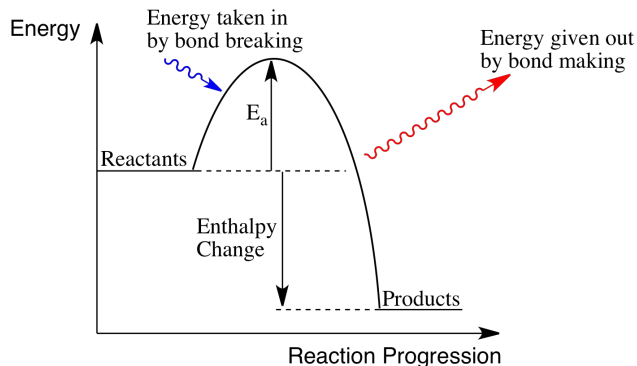




Endothermic reaction



Exothermic reaction



- Reaction profiles can be used to show the relative energies of reactants and products, the activation energy and the overall energy change of a reaction.
- The arrow shows overall energy change.
- Arrows on energy level diagrams show the activation energy (energy required to start a reaction - labeled as 'E_a' on diagram).
- You can recognise which diagrams are exo/endothermic by looking at whether the reactants or products have more energy.

(Extended only) Draw a labeled energy level diagrams for exothermic and endothermic reactions using data provided

- See above information - apply this to drawing your own energy level diagrams.

(Extended only) Calculate the energy of a reaction using bond energies

1. Add together all the bond energies for all the bonds in the reactants – this is the 'energy in'.
2. Add together the bond energies for all the bonds in the products – this is the 'energy out'.
3. Calculate the energy change: energy in – energy out.

If the energy out > energy in, the energy change will be negative showing an exothermic reaction and if the energy out < energy in, the energy change will be positive showing an endothermic reaction.

