

QUANTITATIVE CHEMISTRY: ENERGY CHANGES

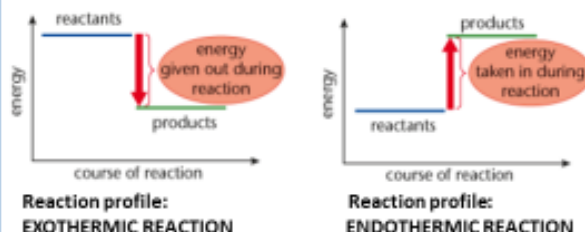
EXOTHERMIC AND ENDOTHERMIC

- Energy is **CONSERVED** in chemical reactions.
- The amount of energy in the **universe at the end** of a chemical reaction is **the same as before the reaction** takes place.

	EXOTHERMIC	ENDOTHERMIC
WHAT HAPPENS?	Transfers energy to the surroundings → Temperature of surroundings INCREASES	Takes in energy from the surroundings → Temperature of the surroundings DECREASES
WHY?	Energy released from forming new bonds > energy needed to break existing bonds	Energy needed to break existing bonds > Energy released from forming new bonds
EXAMPLES	Combustion, many oxidation reactions, neutralisation, reactions in hand warmers	Thermal decompositions, reaction of citric acid and sodium hydrogencarbonate, reactions in sports injury packs

REACTION PROFILES

- Chemical reactions can occur only when reacting particles collide with each other and with sufficient energy.
- ACTIVATION ENERGY:** The minimum amount of energy that particles must have to react.
- REACTION PROFILES:** Show the relative energies of reactants and products, the activation energy and the overall energy change of a reaction.



REQUIRED PRACTICAL: TEMPERATURE CHANGE (REFER TO PRACTICAL SHEET FOR FURTHER DETAIL)

- Investigation of the variables that affect **temperature changes** in reacting solutions, e.g. acid+metals, acid+carbonates, neutralisations, displacement of metals.
- E.G. Investigation of the temperature changes which take place when an acid is neutralised by an alkali.**
- In this investigation the temperature rise (**DEPENDENT VARIABLE**) is monitored as small volumes of NaOH solution are added to dilute HCl (**INDEPENDENT VARIABLE**) in an insulated cup.
- A line graph plotted → to work out how much sodium hydroxide (NaOH) was needed to fully react with the hydrochloric acid (HCl).