C7 – Energy Changes

Lessons TBAT	Key Knowledge	Practical	Assessment
TBAT: **explain** the energy transfer in endothermic and exothermic reactions TBAT: **Describe** how exothermic and endothermic reactions can be used. TBAT: **construct** reaction profiles TBAT: **calculate** the energy	5.5.1.1 Energy transfer during exothermic and endothermic reactions 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. If a reaction transfers energy to the surroundings the product molecules must have less energy than the reactants, by the amount transferred. An exothermic reaction is one that transfers energy to the surroundings so the temperature of the surroundings increases. Exothermic reactions include combustion, many oxidation reactions and neutralisation. Everyday uses of exothermic reactions include self-heating cans and hand warmers. An endothermic reaction is one that takes in energy from the surroundings so the temperature of the surroundings decreases. Endothermic reactions include thermal decompositions and the reaction of citric acid and sodium hydrogencarbonate. Some sports injury packs are based on endothermic reactions.	An opportunity to measure temperature changes when substances react or dissolve in water. Required practical activity 10: investigate the variables that affect temperature changes in reacting solutions such as, eg acid plus metals, acid plus carbonates, neutralisations, displacement of metals.	End of topic test Maths focus Bond energy calculations

changes in reactions.	Students should be able to: • distinguish between exothermic and endothermic reactions on the basis of the temperature change of the surroundings • evaluate uses and applications of exothermic and endothermic reactions given appropriate information. Limited to measurement of temperature change. Calculation of energy changes or ΔH is not required. 5.5.1.2 Reaction profiles Chemical reactions can occur only when reacting particles collide with each other and with sufficient energy. The minimum amount of energy that particles must have to react is called the activation energy. 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. Students should be able to: • draw simple reaction profiles (energy level diagrams) for exothermic and endothermic reactions showing the relative energies of reactants and products, the activation energy and the overall energy change, with a curved line to show the energy as the reaction proceeds • use reaction profiles to identify reactions as exothermic or endothermic • explain that the activation energy is the energy needed for a reaction to occur.	Key stage 3 Chemical reactions • chemical reactions as the rearrangement of atoms • representing chemical reactions using formulae and using equations • what catalysts do Energetics • energy changes on changes of state (qualitative) • exothermic and endothermic chemical reactions (qualitative).

	5.5.1.3 The energy change of reactions (HT only) During a chemical reaction: • energy must be supplied to break bonds in the reactants • energy is released when bonds in the products are formed. The energy needed to break bonds and the energy released when bonds are formed can be calculated from bond energies. The difference between the sum of the energy needed to break bonds in the reactants and the sum of the energy released when bonds in the products are formed is the overall energy change of the reaction. In an exothermic reaction, the energy released from forming new bonds is greater than the energy needed to break existing bonds. In an endothermic reaction, the energy needed to break existing bonds is greater than the energy released from forming new bonds. Students should be able to calculate the energy transferred in chemical reactions using bond energies supplied.	

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