

Scheme of work – Cambridge IGCSE[®] Chemistry (0620)

Unit 5: Reaction rates

Recommended prior knowledge

Pupils should have an understanding of particle theory (Unit 2) and be familiar with taking accurate measurements (Unit 1).

Context

This unit builds on ideas from Units 1 and 2. The concepts of this unit will be reinforced in later units.

Outline

This unit starts with the explanation of collision theory and its importance to reaction rates. There is a considerable range of practical work that can be carried out, which can be used to develop or assess practical skills. Links with enzymes as a biological catalyst and role of light in photosynthesis can be made with IGCSE Biology. This unit is cross-referenced to assessment objectives A1–5, B1–7, C1–4 and Unit 2.

(Please note: **(S)** in **bold** denotes material in the Supplement (Extended syllabus) only)

Syllabus ref	Learning objectives	Suggested teaching activities	Learning resources
6.1(S)	Describe bond breaking as endothermic and bond forming as exothermic	<p>Emphasise that a collision between two particles with sufficient energy is necessary for a reaction to occur (a successful collision). Not all collisions between particles are successful. Relate to the dodgem fairground ride.</p> <p>Use mnemonic – ‘Mexo Bendo’:</p> <ul style="list-style-type: none">• Mexo is making is exothermic• Bendo is breaking is endothermic <p>Students can be introduced to energy level diagrams to explain the two different stages in chemical reactions. This can be linked to the concept of activation energy.</p>	

Syllabus ref	Learning objectives	Suggested teaching activities	Learning resources
7.1	Describe the effect of concentration, particle size, catalysts (including enzymes) and temperature on the rate (speed) of reactions	Simple test tube experiments using different sized marble chippings and hydrochloric acid of different concentrations give a quick visual impression of the factors affecting rate of reaction.	Video clip introduction to rates: www.bbc.co.uk/schools/gcsebitesize/science/add_ocr/chemical_synthesis/rates.shtml
7.1	Describe a practical method for investigating the rate (speed) of a reaction involving gas evolution. Note: Candidates should be encouraged to use the term <i>rate</i> rather than <i>speed</i> .	Reactions can involve metals and dilute acids or carbonates and dilute acids. Gas syringes (or measurement of displacement of water by gas in upturned measuring cylinder) can be used to measure the volume of gas produced. Rules for drawing graphs and the terms independent and dependent variables should be introduced. Measurement of mass decrease in reaction involving evolution of gas could also be demonstrated. Extension – following the progress of a precipitation reaction.	Various practical experiments to illustrate reaction rates: www.practicalchemistry.org/experiments/intermediate/rates-of-reaction/topic-index.html Various practicals Fig 8.1.1-8.1.3: <i>Chemistry for IGCSE, R. Norris & R. Stanbridge, Nelson Thornes, 2009, ISBN 9781408500187, p 96-97.</i>
7.1(S)	Devise a suitable method for investigating the effect of a given variable on the rate (speed) of a reaction	Particle size, concentration and temperature can easily be changed for both the above types of reaction. Extension – use of data loggers to record experimental results.	<i>Chemistry Experiments, J. A. Hunt, A. Geoffrey Sykes, J. P. Mason, Longman 1996, Experiments H8-H11.</i>
7.1(S)	Interpret data obtained from experiments concerned with rate (speed) of reaction	This allows the use of spreadsheets and graphing to plot volume vs. time data to determine the speed of a reaction.	

Syllabus ref	Learning objectives	Suggested teaching activities	Learning resources
7.1(S)	Describe and explain the effects of temperature and concentration in terms of collisions between reacting particles	Emphasise a collision of sufficient energy is required for a chemical reaction. Not all collisions lead to chemical reactions. Relate to everyday life.	www.richardanderson.me.uk/keystage4/GCSEChemistry/m3ratesofreaction.php Video clip that uses animations of atoms to explain collision theory: www.bbc.co.uk/learningzone/clips/collision-theory-and-rates-of-reaction/10668.html
7.1	Describe the application of the above factors to the danger of explosive combustion with fine powders (e.g. flour mills) and gases (e.g. mines)	Custard powder explosion experiment in tin with tight fitting lid may be demonstrated.	Explosive milk Fig 8.3.3: <i>Chemistry for IGCSE</i> , R. Norris & R. Stanbridge, Nelson Thornes, 2009, ISBN 9781408500187, p101.
7.1(S)	Describe the role of light in photochemical reactions and the effect of light on the rate (speed) of these reactions	Emphasise need of light for photosynthesis and link to Cambridge IGCSE Biology.	