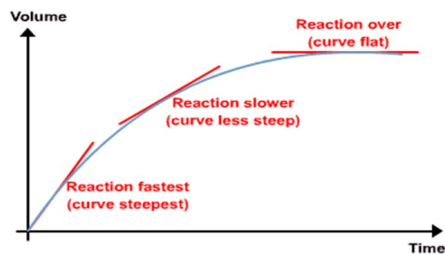


Key vocabulary:

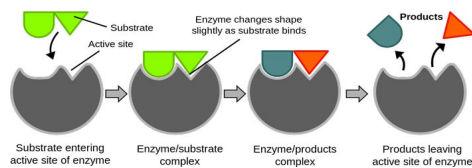
Core Knowledge

- Rate
- Reaction
- Exothermic
- Endothermic
- Concentration
- Catalyst
- Enzyme
- Reaction
- Profile
- Collision
- Frequency
- Effervescence
- Enzyme
- Substrate
- Complex
- Activation energy
- Precipitate
- Particles
- Pressure
- Compressed
- Surface area
- Proportion
- Volume
- Ratio

Rate of reaction – the speed of a reaction.
Activation energy – the minimum energy needed for a reaction to occur.
Exothermic change – a reaction that gives out heat energy overall resulting in a rise in temperature.
Endothermic change – a reaction that takes in energy overall resulting in a temperature decrease.
Concentration – a measure of how many particles are in a given volume (not area).
Catalyst – a substance that speeds up a chemical reaction but without being chemically changed
Enzyme – a biological catalyst made from protein molecules.
Reaction profile diagram – shows the energy changes that take place during a reaction.
Collision Frequency – number of collisions per unit time e.g. number of collisions per second.



$$\text{mean rate of reaction} = \frac{\text{quantity of product formed}}{\text{time taken}}$$



Powerful Knowledge

Rates of Reaction—Collision Theory

Factor affecting rate	Slower reaction	Faster reaction	Explanation
Surface area			The bigger the <u>surface area to volume ratio</u> the higher the collision frequency
Temperature			The higher the temperature the faster the particles move so the higher the collision frequency AND the greater the proportion of collisions equal to or exceeding the activation energy
Concentration/pressure			The higher the concentration/pressure the more particles there are in a given volume so the higher the collision frequency
Catalyst	<p>A catalyst lowers the activation energy by providing an alternative reaction pathway which means there is a greater proportion of successful collisions</p>		

Practical methods for following rate of reaction:

<p>Glass tube Gas syringe Hydrochloric acid Marble chips</p>	<p>HCl Mg zero 11.88 tare</p>	<p>Add dilute acid and start timing Sodium thiosulfate solution A cross drawn on paper Time how long it takes for the cross to disappear</p>
If a gas is made you can collect it in a gas syringe and read off the volume every 30-seconds.	Alternatively, if a gas is made you can allow it to escape and measure the decrease in mass every 30-seconds. Note that the cotton wool is to stop the solution spattering and not to stop the gas leaving.	If a precipitate (solid) is made use the 'disappearing cross' method to follow the rate.

Links to previous and future topics

Links to KS2:

There are no previous links to this content.

Links to KS3:

Some of the ideas from this unit link to the following topics

Particles

Diffusion

States of matter

Food and Digestion

Pressure

Links to KS4:

There are a number of links to content within this key stage

Biology:

Key Concepts in

Biology

Enzymes

Chemistry:

Diffusion

Haber process

Particles

Equilibria

Impressive reading

To complete the variety of experiments offered in this unit you will need to read and comprehend instructions from a number of method sheets and follow to accurately perform practical work and comply with lab rules and safety.

Impressive speaking

During class discussions you will present your findings from practical work by analysing your data and drawing conclusions using key terminology to present and share ideas to your peers.

Impressive writing

Here you will write conclusions which link results and theory using keywords and terminologies. In preparation for extended written responses to exam questions you will also practice engaging with a selection of past paper questions.

Resilience

Remembering the three methods to measure and the four factors effecting rate of reaction can be tricky! It is all about revisiting these new ideas. Spend 10-15 minutes after each lesson recapping what you have learnt to help build your core and powerful knowledge in these areas. Remember, never give up!

Employability

There are an extensive selection of careers that are linked to this topic:

Analytical Chemist, Chemical Engineer, Chemistry Teacher, Forensic Scientist, Geochemist, Hazardous Waste Chemist, Materials Scientist., Pharmacologist and many, many more!

Topic 6: Groups

Duration: 6 lessons

Composite:

Key Vocabulary:

Effervescence

Displacement

Oxidation

Reduction

Inertness

Flammability

Physical property

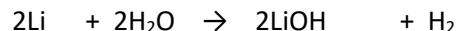
Electronic configuration

Relative

Predict

Group 1 The Alkali Metals and Water

Example: lithium + water → lithium hydroxide + hydrogen

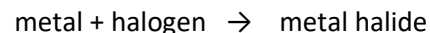


Observations: Effervescence (fizzing) due to hydrogen being produced; moves around on surface; melts and gets smaller; alkaline solution produced; crimson red flame when hydrogen is lit.

Reactivity increases down the group. The outer electron is lost more easily as it is further from the attraction of the nucleus and there is more electron shielding.

Group 7 Reactions of the Halogens

Reactivity decreases down the group. It is more difficult to gain an electron as the outer shell is further from the attraction of the nucleus and there is more electron shielding.



Example: sodium + chlorine → sodium chloride



Example: hydrogen + bromine → hydrogen bromide



The hydrogen halides formed readily dissolve in water to form acidic solutions.

Displacement Reactions

A more reactive halogen can displace (push out) a lesser reactive halogen from its compound in aqueous solution and can be used to compare reactivity.

Example: chlorine + sodium bromide → sodium chloride + bromine (orange/brown)

HIGHER LEVEL ONLY – explain why displacement reactions are REDOX reactions.

Test for Cl₂

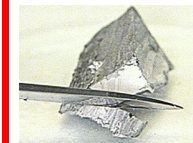
Damp blue litmus paper turns red then bleaches white.



Powerful Knowledge components critical to commit to long term memory:

Groups in the Periodic Table:

Group 1 The Alkali Metals - Li, Na and K



Soft metals that can be easily cut with a knife and have relatively low melting points

Group 7 The Halogens – Cl₂ Br₂ and I₂



Yellow/green gas

red/brown liquid

Grey solid

Group 0 The Noble Gases – He, Ne and Ar are unreactive gases as they already have a full outer shell of electrons.

Name	Use	Why
Helium	Balloons/ Airships	Less dense than air so rises
Neon	Fluorescent lights	Glow when electric current passed through
Argon	Light bulbs	Unreactive with metal filament

Links to previous and future topics

KS3 Elements, compounds and reactions

KS3 Acids and Alkalis

KS3 Metals and Reactivity

KS3 Microorganisms

KS3 The Periodic Table

KS3 Chemical Reactions

KS5 Periodic Table

KS5 Halogens

KS5 Redox

Impressive reading	Impressive speaking	Impressive writing	Resilience	Employability via:
Following written instructions in experiments and CC pdf	Should chlorine be added to drinking water?	Write up of practicals	Explaining concept of reactivity	Job opportunities water treatment, public health, chemical industry etc.

CULTURAL CAPITAL: Benefits and risks of adding chlorine to drinking water. <http://www.bioray.com/content/Chlorine.pdf> and John Snow articles. Also, http://www.bbc.co.uk/history/historic_figures/snow_john.shtml for shorter read.

SEND

- Opening activity/theme is Knowledge Recall to ensure learner buy in
- Opportunities for retrieval practice and building on prior knowledge using Knowledge Recall.
- Multi-sensory approach using reading, listening, watching, doing practicals, talking, observing demonstrations...
- Repetition of key vocabulary in every lesson
- Curriculum time allocated for the explicit teaching of key vocabulary
- Skills ordered logically and sequenced with an increase in complexity
- Links to prior learning explicitly highlighted to support non-verbal reasoning – then, now, next
- Activities are scaffolded with over-learning of previous content to encourage independence