

# Groups in the Periodic Table and Reactions (rates and energy)

Opportunities for Breadth: the topic can be broadened to look at positions in the PT and link to its construction by Mendeleev and other scientists			
Challenge: pupils are challenged to explain why there are the trends in the groups, using information from the periodic table. Pupils are challenged to link the properties of the elements to their uses			
Links to Sequencing for Learning:			
This unit links to previous work on the Periodic Table done in Y7 (groups and properties) and in Y9 (electronic configuration)			
This unit prepares pupils for work later in Y11 on fuels and Earth Science			
Section	What we are learning (Key knowledge)	Key words	Assessment
Alkali metals	What are the main properties of alkali metals? How do alkali metals react with water? Why do alkali metals have different reactivities?	Shielding, observations, electronic configuration, trend, physical properties, chemical properties	Prior knowledge
Halogens	How do the physical properties of the halogens change, going down group 7? How can we test for chlorine gas? How do halogens react with metals and hydrogen?	Shielding, toxic, electronic configuration, trend, physical properties, chemical properties	Retrieval Qs of keywords
Halogen displacement	How can displacement reactions be used to work out the reactivity of the halogens? How can we explain the reactivity of the halogens? What happens to halogen atoms and halide ions during displacement?	Displacement, reactivity, trend, physical properties, chemical properties	MUM: 6 mark Q on displacement reactions
Noble Gases	Why are noble gases unreactive? How can noble gases be used? What trends are there in the physical properties of the noble gases?	Density, inert, unreactive, trend, physical properties, chemical properties	Predicting properties
Rates of reaction	What changes can occur as a reaction proceeds? How can we investigate rates of reaction? How are graphs used to show rates of reaction?	Effect, particles, temperature, reaction rate	Practical skills: collecting gas method
Factors affecting rates of reaction	What has to happen for two particles to react? How does the speed of particles affect the rate of reaction? Why do changes in temperature, concentration, surface area and pressure affect rates of reaction?	Concentration, reaction rate	Practical skills: disappearing cross method
	<i>Investigate the effects of changing the conditions of a reaction on the rates of chemical reactions.</i>	Surface area, reaction rate	Decreasing mass method
Catalysts	What is a catalyst? How do catalysts work? What are enzymes used for?	Catalyst, enzyme, reaction	Past paper Qs
Endothermic / exothermic	What are exothermic and endothermic reactions? What are some examples of exothermic and endothermic reactions? How can heat changes in solutions be investigated? How can exothermic and endothermic reactions be explained in terms of bonds?	Endothermic, exothermic, surroundings	Past paper Qs
(H)	Energy changes How are exothermic and endothermic reactions modelled? How are energy changes in reactions calculated?	Endothermic, exothermic, surroundings, calculations	Calculations
	Revision		Cover sheet
	End of Unit Test		EUT
	Test Feedback		Test feedback sheet

## Fuels, Earth and Atmospheric Science

Opportunities for Breadth: considering the impact of climate change, analysing data and causal links			
Challenge: pupils are challenged to explain the impact of global warming on climate change			
Links to Sequencing for Learning: This unit links to previous work on The Earth done in Y8, The Periodic Table and Bonding in Y9 and Groups in the Periodic Table in Y11 This unit is the last topic covered in the curriculum.			
Section	What we are learning (Key knowledge)	Key words	Assessment
1	Crude Oil What are hydrocarbons? Why is crude oil so useful? Why is crude oil a non-renewable, finite resource?	Distillation, finite, non-renewable, hydrocarbon	Prior knowledge
2	Fractions of Crude Oil How is crude oil separated into useful fractions? What are the same and uses of the main fractions from crude oil? What are the differences in the molecules found in different fractions from crude oil?	Fractions, chain, viscosity, boiling point, flammability, ignition	Retrieval Qs of keywords
3	Alkanes and Alkenes What is the main type of hydrocarbon found in crude oil? What are the features of an homologous series of compounds? Why do alkanes form an homologous series?	Alkanes, alkenes, double bond, saturated, unsaturated, homologous, trends, physical, chemical	Retrieval Qs on fractions and their trends
4	Combustion What happens during the complete combustion of hydrocarbons? What happens during the incomplete combustion of hydrocarbons? What problems does incomplete combustion cause?	Incomplete combustion, complete combustion, carbon monoxide, toxic	Predicting products and balancing equations
5	Air pollution Why do some hydrocarbon fuels release sulfur dioxide when they are used? Why are oxides of nitrogen produced by engines? What problems are caused by acid rain?	Pollution, oxides of nitrogen, sulphur dioxide, acid rain	Prior knowledge of acid rain
6	Cracking Why is cracking needed? What happens during the cracking of crude oil fractions? What are the advantages and disadvantages of hydrogen and petrol as vehicle fuels?	Supply and demand, cracking, useful	Balancing equations

7	<p>The Early Atmosphere</p> <p>What are the names of some common gases produced by volcanic activity?</p> <p>What evidence is there for the composition of the Earth's early atmosphere?</p> <p>How do scientists explain the formation of the oceans?</p>	Percentage, atmosphere, cyanobacteria	Prior knowledge of early earth
8	<p>The Changing Atmosphere</p> <p>Why did the amount of carbon dioxide in the atmosphere change?</p> <p>How did primitive organisms change carbon dioxide and oxygen levels?</p> <p>What is the test for oxygen?</p>	Volume, chemical test, relight	Past paper Qs
9	<p>The Atmosphere Today</p> <p>What are the names of some greenhouse gases?</p> <p>How is the greenhouse effect caused?</p> <p>What is the link between fossil fuel combustion and climate change?</p>	Evidence, causal link, greenhouse gas, global warming	Past paper Qs
10	<p>Climate Change</p> <p>What human activities influence the climate?</p> <p>What problems might climate change cause?</p> <p>How might we limit the impact of predicted climate change?</p>	Global warming, effect, affect, climate change, weather patterns, impact	Past paper Qs
11	Revision		Class assessment sheet
12	End of Unit Test		EUT
13	Test Feedback		Test feedback sheet

## Hydrocarbons, Alcohols, Carboxylic Acids and Polymers

Opportunities for Breadth: looking at links between homologous series and their functional groups			
Challenge: pupils are challenged to apply knowledge of types of substance and acids to the new chemicals studied in this topic			
Links to Sequencing for Learning: This unit links to previous work on Alkanes and Alkenes and Fuels in Y11 This unit links to future studies on materials science in Y11			
Section	What we are learning (Key knowledge)	Key words	Assessment
1	Alkanes and Alkenes What are the names, formulae and structure of the four smallest alkanes? What functional group is present in all alkenes? How is the position of this functional group shown in alkene names?	Alkanes, alkenes, double bond, saturated, unsaturated, homologous, functional group	Recall keywords
2	Alkanes and Alkenes What products are formed by the complete combustion of hydrocarbons? How can bromine water be used to distinguish between alkanes and alkenes? What are the structures of the reactants and products when bromine and ethene react?	Alkanes, alkenes, double bond, saturated, unsaturated, homologous, trends, physical, chemical	Recall keywords
3	Alcohol How are alcoholic drinks produced? What chemical reaction occurs during fermentation? How can we make alcoholic solutions more concentrated?	Alcohol, fermentation, concentration	Recall calculations on concentration
4	Alcohol What are the names, formulae and structure of the four smallest alcohols? What functional group is present in all alcohols? What are some chemical properties of alcohols?	Alcohols, homologous, functional group	Past paper Qs
5	Core practical <i>Investigate the temperature rise produced in a known mass of water by the combustion of the alcohols ethanol, propanol, butanol and pentanol.</i>	Combustion	Practical skills: combustion of alcohol
6	Carboxylic acids How are carboxylic acids produced? What are the names, formulae and structures of the first four carboxylic acids? How does the functional group in all carboxylic acids influence their chemical properties?	Carboxylic acid, homologous, functional group, properties	Past paper Qs

7	<p>Addition Polymers</p> <p>What is a polymer?</p> <p>What monomers join together to form DNA, starch and proteins?</p> <p>How do ethene molecules join together to form poly(ethene)?</p>	Polymer, monomer, natural	Past paper Qs
8	<p>Polymer properties</p> <p>How do chloroethene molecules join together to form poly(chloroethene)?</p> <p>How do you deduce the structure of a monomer from the structure of a polymer and vice versa?</p> <p>How are the uses of a polymer related to its properties?</p>	Polymer, monomer, properties	Past paper Qs
9	<p>Condensation Polymers</p> <p>What is meant by condensation polymerisation?</p> <p>Which two functional groups react together to form a polyester?</p> <p>How do you draw the structure of a polyester?</p>	Polymer, monomer, condensation, molecule	Past paper Qs
10	<p>Problems with Polymers</p> <p>What problems are associated with making polymers?</p> <p>What problems are associated with the disposal of polymers?</p> <p>What are some advantages and disadvantages of recycling polymers?</p>	Polymer, monomer, biodegradable, disposal, recycling	Past paper Qs
11	Revision		Class assessment sheet
12	End of Unit Test		EUT
13	Test Feedback		Test feedback sheet

## Qualitative Analysis: Tests for Ions, Bulk and Surface Properties of Matter, including Nanoparticles

Opportunities for Breadth: comparing quantitative analysis to qualitative analysis Challenge: pupils are challenged to make choices of suitable materials depending on the properties and the required use			
Links to Sequencing for Learning: This unit links to previous work on qualitative analysis done in Y10 and materials science covered in Y11 This unit is the last topic covered in the curriculum.			
Section	What we are learning (Key knowledge)	Key words	Assessment
1	Testing for positive ions – flame tests How are metal ions identified using flame tests? Why might chemists analyse substances using machines instead of chemical tests? How is the information from flame photometers used?	Flame spectrometry, photometry, ion	Recall ions
2	Testing for positive ions – NaOH test Why must the test for an ion only detect that ion? How are metal ions identified using sodium hydroxide solution? How are ammonium ions and ammonia detected?	Unique, ion, precipitate	Recall ions
3	Testing for negative ions How are carbonate ions and carbon dioxide detected? How are sulfate ions detected? How are halide ions detected?	Unique, ion, precipitate	Recall negative ions
4	Core Practical <i>Identify the ions in some unknown salts, using the tests for the specified cations and anions.</i>	Unique, ion, precipitate	Practical skills: identifying ions
5	Choosing materials What are ceramics? What are ceramics, polymers and metals like? How are materials chosen for a given use?	Materials, properties, uses	Past paper Qs
6	Composite materials What are composite materials? What are composite materials like? How are materials, including composite materials, chosen for a given use?	Composite, matrix, reinforcement	Past paper Qs
7	Nanoparticles Why do nanoparticulate materials have different properties from bulk materials? What are some of the uses of nanoparticles? What are some of the possible risks from nanoparticles?	Nanoparticle, surface area to volume ratio	Past paper Qs
8	Revision		Class assessment sheet
9	End of Unit Test		EUT
10	Test Feedback		Test feedback sheet

