



GCSE Chemistry – 4.9 Chemistry of the Atmosphere



West Kirby
Grammar School

Learning about this topic is important because:

The Earth's atmosphere is dynamic and forever changing. The causes of these changes are sometimes man-made and sometimes part of many natural cycles. Scientists use very complex software to predict weather and climate change as there are many variables that can influence this. The problems caused by increased levels of air pollutants require scientists and engineers to develop solutions that help to reduce the impact of human activity.

This builds on:

KS3 Materials Science, 4.8 Chemical analysis, 4.1 Atomic Structure and the Periodic table, 4.2 Structure and Bonding, 4.3 Quantitative Chemistry

This leads to:

4.7 Organic Chemistry

We will learn:

The composition of the Earth's atmosphere and how this has changed over time.

How greenhouse gases act to keep the earth at a temperature suitable for life

How increases in the levels of greenhouse gases such as carbon dioxide and methane can lead to climate change

How we can measure the greenhouse gas emissions of a person, product or event using carbon footprints

How burning fossil fuels can release pollutants such as CO₂, CO, Carbon particulates, Sulfur oxides and nitrogen oxides, how these pollutants can affect the environment and how we can reduce their emissions.

Understand how peer review is an important process in developing scientific theories

We will develop/practise skills including:

WS 1.4 Explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments.

WS 1.2 Use a variety of models such as representational, spatial, descriptive, computational and mathematical to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts.

WS 1.3 Appreciate the power and limitations of science and consider any ethical issues which may arise.

WS 1.6 Recognise the importance of peer review of results and of communicating results to a range of audiences.

WS 4.1 Use scientific vocabulary, terminology and definitions.



GCSE Chemistry – 4.9 Chemistry of the Atmosphere



West Kirby
Grammar School

Some of the vocabulary that we will use includes: Greenhouse Gas A gas in the atmosphere that absorbs and emits infrared radiation, contributing to the greenhouse effect. Radiation The transfer of energy by waves or particles. Pollutant A substance that causes harm to the environment or living organisms. Climate The average weather conditions of a region over a long period of time. Carbon Footprint The total amount of greenhouse gases produced by a person, activity, product, or organisation, usually measured in carbon dioxide equivalents (CO₂). Peer Review The process in which scientists evaluate and check another scientist's work before it is published.	You could learn more about this topic by: Chemistry of the atmosphere - GCSE Chemistry (Single Science) Revision - AQA - Bitesize GCSE Science Revision Chemistry "The Atmosphere" - YouTube
Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are: End of topic test Assessed extended writing task Educake Quizzes Quick Check Homework	



GCSE Chemistry – 4.7 Organic Chemistry



West Kirby
Grammar School

Learning about this topic is important because:

The chemistry of carbon compounds is so important that it forms a separate branch of chemistry. A great variety of carbon compounds is possible because carbon atoms can form chains and rings linked by C-C bonds. This branch of chemistry gets its name from the fact that the main sources of organic compounds are living, or once-living materials from plants and animals. These sources include fossil fuels which are a major source of feedstock for the petrochemical industry. Chemists are able to take organic molecules and modify them in many ways to make new and useful materials such as polymers, pharmaceuticals, perfumes and flavourings, dyes and detergents.

This builds on:

KS3 Materials Science, 4.8 Chemical analysis, 4.1 Atomic Structure and the Periodic table, 4.2 Structure and Bonding, 4.3 Quantitative Chemistry, 4.9 Chemistry of the Atmosphere

This leads to:

4.5 Energy Changes

• We will learn:

- Crude oil – how is it formed? What is it composed of?
- How to describe how processes like fractional distillation and cracking can be used to process crude oil in to useful products and to help meet the demand for fuels.
- What are hydrocarbons? How do they react with oxygen?
- The general formula, molecular formula, displayed formula and names of the first four alkanes.
- How the properties of hydrocarbons depends on the size of the molecules.
- The general formula, molecular formula, displayed formula and names of the first four alkenes.
- The addition reactions of alkenes with hydrogen, water and halogens.
- Alcohols contain the functional group -OH. The molecular formula, displayed formula and names of the first four alcohols.
- How to describe what happens when alcohols are burned in air, react with sodium, are added to water, reacted with an oxidising agents.
- The two methods for the production of ethanol and the advantages and disadvantages of each.
- Carboxylic acids contain the functional group -COOH. The molecular formula, displayed formula and names of the first four carboxylic acids.

We will develop/practise skills including:

WS 1.2 Make models of alkane molecules using the molecular modelling kits.

WS 1.2, 4.1 Investigate the properties of different hydrocarbons.

WS 1.2 Recognise substances that are alkenes from their names or from given formulae in these forms. MS 5b Visualise and represent 2D and 3D forms including twodimensional representations of 3D objects.

AT 2, 5, 6 Opportunities when investigating reactions of alcohols.

AT 2, 5, 6 Opportunities within investigation of the reactions of carboxylic acids

WS 1.2 Use models to represent addition polymerisation.



GCSE Chemistry – 4.7 Organic Chemistry



• How to describe what happens when any of the first four carboxylic acids react with metal carbonates, dissolve in water or react with alcohols. • What is addition polymerisation? What is a repeating unit? How can we represent the structure of a polymer? How can we name an addition polymer? • What is condensation polymerisation? What kind of molecules react to form condensation polymers? How can we represent the structure of a condensation polymer? How can we identify the monomers of a condensation polymer? • Other naturally occurring polymers include DNA, proteins, starch and cellulose.	
Some of the vocabulary that we will use includes: Hydrocarbon A compound that contains only hydrogen and carbon atoms. Fractional Distillation A process used to separate a mixture of liquids with different boiling points. Cracking The process of breaking down long-chain hydrocarbons into smaller hydrocarbons, including alkenes and alkanes. Alkane A saturated hydrocarbon containing only single carbon-carbon bonds. Alkene An unsaturated hydrocarbon containing at least one carbon-carbon double bond. Homologous Series A family of compounds with the same functional group and similar chemical properties, where successive members differ by CH_2. Polymerisation The process in which many small molecules (monomers) join together to form a polymer. Alcohol An organic compound containing the –OH (hydroxyl) functional group. Carboxylic Acid An organic compound containing the –COOH (carboxyl) functional group.	You could learn more about this topic by: FreeScienceLessons - Organic Chemistry Playlist Organic chemistry - GCSE Chemistry (Single Science) Revision - AQA - BBC Bitesize 



GCSE Chemistry – 4.7 Organic Chemistry



West Kirby
Grammar School

Condensation

A reaction in which **two molecules join together and a small molecule, usually water, is produced.**

Monomer

A **small molecule that can join with other similar molecules to form a polymer.**

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are:

End of topic test

Assessed extended writing tasks

Quick Check Homework

Educake Quizzes



GCSE Chemistry – 4.5 Energy Changes



West Kirby
Grammar School

Learning about this topic is important because:

Energy changes are an important part of chemical reactions. The interaction of particles often involves transfers of energy due to the breaking and formation of bonds. Reactions in which energy is released to the surroundings are exothermic reactions, while those that take in thermal energy are endothermic. These interactions between particles can produce heating or cooling effects that are used in a range of everyday applications. Some interactions between ions in an electrolyte result in the production of electricity. Cells and batteries use these chemical reactions to provide electricity. Electricity can also be used to decompose ionic substances and is a useful means of producing elements that are too expensive to extract any other way.

This builds on:

Chemical Reactions (Year 9)

4.4 Chemical changes (GCSE)

This leads to:

4.6 Rate and Extent of Chemical Change

We will learn:

- The meaning of the terms endothermic and exothermic.
- How we can identify if a reaction is exothermic or endothermic using temperature changes.
- Examples of exothermic and endothermic reactions.
- The meaning of the term activation energy.
- How to draw and label reaction profiles for endothermic and exothermic reactions.
- What makes a reaction endothermic or exothermic in terms of bonds breaking and forming.
- The difference between a cell and a battery
- How a simple cell is made and how the voltage of the cell can give Information about the relative reactivities metals.
- The difference between a rechargeable battery and a non-rechargeable battery
- What a hydrogen fuel cell is and evaluate its use in comparison to rechargeable and non-rechargeable cells

We will develop/practise skills including:

Use of appropriate apparatus and techniques to make and record a range of measurements accurately, including mass, time, temperature, and volume of liquids and gases.

Making and recording of appropriate observations during chemical reactions including changes in temperature

Safe use and careful handling of gases, liquids and solids, including careful mixing of reagents under controlled conditions, using appropriate apparatus to explore chemical changes and/or products.

Translate information between graphical and numeric form.

Plot two variables from experimental or other data.

Some of the vocabulary that we will use includes:

Exothermic reaction

A reaction that transfers energy to the surroundings.

You could learn more about this topic by:

[Energy changes - GCSE Chemistry \(Single Science\) Revision - AQA - BBC Bitesize](#)
[AQA GCSE Science Revision Chemistry "Exothermic and Endothermic Reactions" - YouTube](#)





GCSE Chemistry – 4.5 Energy Changes



West Kirby
Grammar School

Activation energy

The minimum amount of energy that particles must have for a reaction to occur.

Catalyst

A substance that increases the rate of a reaction without being used up, by lowering the activation energy.

Bond energy

The energy needed to break one mole of a particular bond in a gaseous substance.

Cell

A device that produces electricity from a chemical reaction.

Battery

Two or more cells connected together to provide electrical energy.

Fuel cell

A cell that produces electricity from the reaction between a fuel (usually hydrogen) and oxygen, with fuel supplied continuously.

[GCSE Chemistry - Exothermic and Endothermic Reactions #43 - YouTube](#)

[GCSE Chemistry - Fuel Cells #45 - YouTube](#)

[GCSE Chemistry - Bond Energies #44 \(Higher tier\) - YouTube](#)

[AQA GCSE Science Revision Chemistry "Bond Energy Calculations" - YouTube](#)

[AQA GCSE Science Revision Chemistry "Cells and Batteries" \(Triple\) - YouTube](#)

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are:

End of topic test

Assessed extended writing homework

Assessed Required Practical homework

Educake Quizzes



KS4 Chemistry – 4.6 The rate and extent of chemical change



West Kirby
Grammar School

Learning about this topic is important because:

Chemical reactions can occur at vastly different rates. Whilst the reactivity of chemicals is a significant factor in how fast chemical reactions proceed, there are many variables that can be manipulated in order to speed them up or slow them down. Chemical reactions may also be reversible and therefore the effect of different variables needs to be established in order to identify how to maximise the yield of desired product. Understanding energy changes that accompany chemical reactions is important for this process. In industry, chemists and chemical engineers determine the effect of different variables on reaction rate and yield of product. Whilst there may be compromises to be made, they carry out optimisation processes to ensure that enough product is produced within a sufficient time, and in an energy-efficient way.

This builds on:

Particles Y7, Chemical Reactions Y8, 4.2 Structure and Bonding.

This leads to:

4.5 Energy Changes

We will learn:

How to Calculate rates of reactions in two different ways.

What factors affect the rates of a chemical reaction

What is Collision theory?

What is activation energy?

How does a Catalyst affect rate of reaction.

Practical skills.

How to calculate rate of reaction using a tangent and gradient from a graph.

What is a reversible reaction?

What is a dynamic Equilibrium.?

What is Le Chatelier's Principle?

What factors affect the yield of a chemical reaction.

Apply Le Chatelier's Principle to explain how factors affect the equilibrium and yield of product.

Energy changed during chemical reactions.

We will develop/practise skills including:

Be able to carry out a practical investigating rate either by the amount of product produced over time or the amount of reactant used up over time.

Be able to carry out a REQUIRED on the effect of Concentration on rate of reaction and be able to analyse the results and answer examination style questions.

Be able to draw rate time graphs.

Be able to analyse a rate time graph and draw tangents and gradients to the curve to calculate rate of reaction.

Some of the vocabulary that we will use includes:

Activation Energy

The **minimum energy that particles must have for a reaction to occur.**

You could learn more about this topic by:

[GCSE Science Revision Chemistry "Effect of Concentration on Rate" - YouTube](#)

[GCSE Science Revision Chemistry "Effect of Temperature on Rate" - YouTube](#)

[GCSE Science Revision Chemistry "Catalysts" - YouTube](#)





KS4 Chemistry – 4.6 The rate and extent of chemical change



West Kirby
Grammar School

Collision Theory

The theory that reactions occur when particles **collide with enough energy and in the correct orientation**.

Surface Area

The **total area of the exposed surface of a substance**.

Concentration

The **amount of a substance dissolved in a given volume of solution**.

Pressure

The **force exerted per unit area by particles colliding with the walls of a container**.

Temperature

A measure of the **average kinetic energy of particles**.

Frequent Collisions

Collisions that occur **more often between reacting particles**, increasing the rate of reaction.

Equilibrium

The state in a reversible reaction where the **forward and reverse reactions occur at the same rate**.

Yield

The **amount of product formed in a chemical reaction**.

[AQA GCSE Chemistry Topic 6: The Rate and Extent of Chemical Change Revision - PMT \(physicsandmathstutor.com\)](#)

[GCSE Science Revision Chemistry "Mean Rate of Reaction" - YouTube](#)

[GCSE Science Revision Chemistry "Effect of Surface Area on Rate" - YouTube](#)

[GCSE Science Revision Chemistry "Required Practical 5: Rates of Reaction" - YouTube](#)

[What Is Dynamic Equilibrium? | Reactions | Chemistry | FuseSchool - YouTube](#)

[Le Chatelier's Principle Part 1 | Reactions | Chemistry | FuseSchool - YouTube](#)

[Le Chatelier's Principle: Part 2 | Reactions | Chemistry | FuseSchool - YouTube](#)

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are:

Quick Check Homework's

Extended Response Questions

Educake Quizzes

End of topic test



GCSE Chemistry – 4.10 Using resources



Learning about this topic is important because: Industries use the Earth's natural resources to manufacture useful products. In order to operate sustainably, chemists seek to minimise the use of limited resources, use of energy, waste and environmental impact in the manufacture of these products. Chemists also aim to develop ways of disposing of products at the end of their useful life in ways that ensure that materials and stored energy are utilised. Pollution, disposal of waste products and changing land use has a significant effect on the environment, and environmental chemists study how human activity has affected the Earth's natural cycles, and how damaging effects can be minimised.

This builds on:

How metals are extracted in KS4 4.4 chemical changes

How ammonium salts are produced in KS4 4.4 chemical changes

Uses of Polymers in organic KS4 4.7

How Carbon dioxide is produced and its contribution to global warming in KS4 4.9 chemistry of the atmosphere

This leads to:

Chemical equilibria in KS5 3.1.6 Chemical Equilibria, Le Chatelier's principle

We will learn:

- The importance of limiting the use of the Earth's resources in order to keep sustainability
- How Potable water is different from other types of water and how it is processed
- The process involved in Waste water treatment
- Alternative methods of extracting metals such as bioleaching and phytomining of low copper ores
- The importance of Life cycle assessment and recycling for paper and plastic bags
- Ways of reducing the use of resources
- Corrosion and its prevention including sacrificial protection
- Useful materials such as Alloys, Ceramics, polymers and composites
- The Haber process, the raw materials and conditions used in industry
- Production and uses of NPK fertilisers

develop/practise skills including:

WS 1.4 Explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments.

WS 2.7

Evaluate methods and suggest possible improvements and further investigations.

WS 3.2 Translating data from one form to another.

WS 3.5 Interpreting observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions.

WS 3.8 Communicating the scientific rationale for investigations, methods used, findings and reasoned conclusions through paper-based and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms.

Some of the vocabulary that we will use includes:

Potable

Water that is **safe to drink**.

You could learn more about this topic by:

[Using resources - GCSE Chemistry \(Single Science\) Revision - AQA - BBC Bitesize](#)





GCSE Chemistry – 4.10 Using resources



West Kirby
Grammar School

Renewable

A resource that is **replaced naturally** as it is used.

Finite

A resource that is **limited and will eventually run out**.

Sustainable

Using resources in a way that **meets current needs without compromising future generations' ability to meet their needs**.

Phytomining

The process of **using plants to absorb metal compounds from soil, then burning the plants to obtain the metal**.

Bioleaching

The use of **bacteria to extract metal compounds from low-grade ores**.

Resources

Useful materials or substances that **can be used to meet human needs**.

Corrosion

The **destruction of metals by chemical reactions with substances in the environment**, such as oxygen and water.

Thermosoftening Polymer

A polymer that **softens when heated and can be reshaped**.

Thermosetting Polymer

A polymer that **does not soften when heated and cannot be reshaped once set**.

Sacrificial Protection

A method of preventing rusting where **a more reactive metal is attached to iron or steel and corrodes instead**.

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are: end of topic test and assessed homework

End of topic test

Assessed extended writing task

Assessed Required Practical task

Required Practical 8

Educake Quizzes

Quick Check Homework