



GCSE Chemistry – Atomic Structure & The Periodic Table



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Learning about this topic is important because:

The periodic table provides chemists with a structured organisation of the known chemical elements from which they can make sense of their physical and chemical properties. The historical development of the periodic table and models of atomic structure provide good examples of how scientific ideas and explanations develop over time as new evidence emerges. The arrangement of elements in the modern periodic table can be explained in terms of atomic structure which provides evidence for the model of a nuclear atom with electrons in energy levels.

This builds on:

Y7 Particles – The particle model theory of matter, Y8 Atoms, Elements & Compounds, Y9 The Periodic Table

This leads to:

4.2 Structure & Bonding

We will learn:

- The names and symbols of the first 20 elements in the periodic table, the elements in Groups 1 and 7, and other elements in this specification.
- How to name compounds of these elements from given formulae or symbol equations How to write word equations for the reactions in this specification.
- How to write formulae and balanced chemical equations for the reactions in this specification.
- How to describe, explain and give examples of the specified processes of separation
- How to suggest suitable separation and purification techniques for mixtures when given appropriate information.
- Why the new evidence from the scattering experiment led to a change in the atomic model.
- The difference between the plum pudding model of the atom and the nuclear model of the atom.

We will develop/practise skills including:

Safe use of a range of equipment to separate chemical mixtures.

WS 2.1

Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.

WS 2.2 Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment.

WS 1.1 Understand how scientific methods and theories develop over time.

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 4.3 Use SI units (eg kg, g, mg; km, m, mm; kJ, J) and IUPAC chemical



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• How the position of an element in the periodic table is related to the arrangement of electrons in its atoms and hence to its atomic number • Possible reactions and probable reactivity of elements from their positions in the periodic table • How properties of the elements in Group 0, 1 & 7 depend on the outer shell of electrons of the atoms and predict properties from given trends down the group.	nomenclature unless inappropriate.
Some of the vocabulary that we will use includes: Element A pure substance made of only one type of atom. It cannot be chemically broken down into simpler substances. Atom The smallest particle of an element. It has a nucleus and electrons. Compound A substance formed when two or more different elements are chemically bonded together. Electron A small, negatively charged particle that moves around the nucleus in energy levels. Nucleus The central part of an atom that contains protons and neutrons. Proton A positively charged particle found in the nucleus of an atom. Neutron A neutral (no charge) particle found in the nucleus of an atom. Sub-atomic particle The particles within an atom: Protons, neutrons and electrons.	You could learn more about this topic by: Free Science Lessons Topic Playlist Atomic structure and the periodic table - GCSE Chemistry (Single Science) Revision - AQA - BBC Bitesize 
Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in	



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lots of different ways. The key pieces of work in this topic are:

Quick Check Homework's

Assessed extended writing task

Educake Quizzes

End of topic test



GCSE Chemistry – Structure & Bonding



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Learning about this topic is important because:

Chemists use theories of structure and bonding to explain the physical and chemical properties of materials. Analysis of structures shows that atoms can be arranged in a variety of ways, some of which are molecular while others are giant structures. Theories of bonding explain how atoms are held together in these structures. Scientists use this knowledge of structure and bonding to engineer new materials with desirable properties. The properties of these materials may offer new applications in a range of different technologies.

This builds on:

Y8 Atoms, Elements & Compounds, Y9 The Periodic Table, Y9 Introduction to Bonding, GCSE Atomic Structure and The Periodic Table

This leads to:

4.4 Chemical changes

We will learn:

How to work out the charge on the ions of metals and non-metals from the group number of the element, limited to the metals in Groups 1 and 2, and non-metals in Groups 6 and 7.

How to identify, describe and represent Ionic, Covalent and Metallic bonding, including being able to describe the properties of a substance based on its structure and bonding.

How to predict the melting point, conductivity and hardness of a substance based on its structure and bonding.

How to deduce the molecular formula of a substance from a given model or diagram in these forms showing the atoms and bonds in the molecule.

In chemical equations, the three states of matter are shown as (s), (l) and (g), with (aq) for aqueous solutions.

We will develop/practise skills including:

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 1.4 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 4.1 Use scientific vocabulary, terminology and definitions.

WS 4.2 Recognise the importance of scientific quantities and understand how they are determined.



GCSE Chemistry – Structure & Bonding



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Why alloys are harder than pure metals in terms of distortion of the layers of atoms in the structure of a pure metal. Nanoscience refers to structures that are 1–100 nm in size, of the order of a few hundred atoms. Nanoparticles may have properties different from those for the same materials in bulk because of their high surface area to volume ratio.	WS 4.3 Use SI units (eg kg, g, mg; km, m, mm; kJ, J) and IUPAC chemical nomenclature unless inappropriate. WS 4.4 Use prefixes and powers of ten for orders of magnitude (eg tera, giga, mega, kilo, centi, milli, micro and nano). WS 4.5 Interconvert units.
Some of the vocabulary that we will use includes: Molecule Two or more atoms chemically bonded together. Ionic (bonding) Bonding where electrons are transferred, forming oppositely charged ions that attract. Covalent (bonding) Bonding where atoms share pairs of electrons. Metallic (bonding) Bonding in metals where positive metal ions are held together by a “sea” of delocalised electrons. Lattice A lattice is a regular, repeating 3D arrangement of particles in a solid.	You could learn more about this topic by: Free Science Lessons Topic Playlist Bonding, structure and the properties of matter - GCSE Chemistry (Single Science) Revision - AQA - BBC Bitesize 
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 Quick Check Homework's Educake Quizzes	



GCSE Chemistry – Structure & Bonding



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GCSE Chemistry – Chemical Analysis



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Learning about this topic is important because:

Analysts have developed a range of qualitative tests to detect specific chemicals. The tests are based on reactions that produce a gas with distinctive properties, or a colour change or an insoluble solid that appears as a precipitate.

Instrumental methods provide fast, sensitive and accurate means of analysing chemicals, and are particularly useful when the amount of chemical being analysed is small. Forensic scientists and drug control scientists rely on such instrumental methods in their work.

This builds on:

KS3 - Chemical Reactions, Introduction to Bonding and Periodic Table

KS4 - 4.1 Atomic Structure & The Periodic Table and 4.2 Structure & Bonding

This leads to:

KS4 - 4.3 Quantitative Chemistry

We will learn:

How pure substances can be distinguished from mixtures using melting point and boiling point data.

That a formulation is a mixture that has been designed as a useful product. Formulations include fuels, cleaning agents, paints, medicines, alloys, fertilisers and foods.

That chromatography can be used to separate mixtures and can give information to help identify substances. It involves a stationary phase and a mobile phase.

Different compounds have different R_f values in different solvents

$R_f = \text{distance moved by substance} / \text{distance moved by solvent}$

How to identify common gases using simple chemical tests.

Flame tests can be used to identify some metal ions (cations). Compounds of these metals produce distinctive colours in flame tests

Sodium hydroxide solution can also be used to identify some metal ions (cations) from the colour of the precipitate formed.

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 4.1 Use scientific vocabulary, terminology and definitions.

WS 2.2 – plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.

WS 2.3 Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment.

WS 2.4 – carry out experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations.

WS 2.6 – make and record observations and measurements using a range of apparatus and methods.



GCSE Chemistry – Chemical Analysis



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The chemical tests used to identify some common anions (carbonate, sulfate and the halides). Elements and compounds can be detected and identified using instrumental methods; they are accurate, sensitive and rapid. Flame emission spectroscopy is an example of an instrumental method used to analyse metal ions in solutions. The line spectrum produced can be analysed to identify metal ions present and measure their concentrations.	MS 1a Recognise and use expressions in decimal form. MS 1c Use ratios, fractions and percentages. MS 1d Make estimates of the results of simple calculations.
Some of the vocabulary that we will use includes: Formulation A mixture designed as a useful product, with each component present in carefully measured amounts. Stationary Phase The part of a chromatography system that does not move (e.g. the paper in paper chromatography). Mobile Phase The solvent that moves through the stationary phase, carrying the substances being separated. Precipitate An insoluble solid formed when two solutions react. Chromatography A technique used to separate and identify substances in a mixture. Flame Emission Spectroscopy A method used to identify metal ions by the colours of light they emit when heated in a flame. Chromatogram The result of a chromatography experiment, showing the separated substances as spots or peaks.	You could learn more about this topic by: Free Science Lessons Topic Playlist Chemical analysis - GCSE Chemistry (Single Science) Revision - AQA - BBC Bitesize 
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 Assessed Required Practical Task	



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Required Practical 6 and 7 Quick Check Homework Educake Quizzes



GCSE Chemistry – Chemical Changes



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Learning about this topic is important because:

Understanding of chemical changes began when people began experimenting with chemical reactions in a systematic way and organising their results logically. Knowing about these different chemical changes meant that scientists could begin to predict exactly what new substances would be formed and use this knowledge to develop a wide range of different materials and processes. It also helped biochemists to understand the complex reactions that take place in living organisms. The extraction of important resources from the earth makes use of the way that some elements and compounds react with each other and how easily they can be 'pulled apart'.

This builds on:

KS3: Y8 Introduction to bonding, Y8 Chemical reactions, Y9 Structure & Bonding (Ionic bonding)

This leads to:

GCSE:

Y10 – 4.4.1 Reactivity of metals - extraction of metals & 4.4.2 Reactions of acids

A-level:

Y13 - 3.3.9.2 Acylation (RP 10), 3.1.14 Electrode Potentials, 3.1.12 Acids & Bases

- Describe observations of reactions of different metals with oxygen, water and dilute acids and use this to determine order of reactivity.
- The different methods of how to extract metals and how to determine which method to use for different metals using the reactivity series.
- What oxidation and reduction are in terms of electrons and loss/gain of oxygen and be able to identify when this occurs
- Know the products of the reactions between acids and metals metal oxides, hydroxides and metal carbonates and be able to name salts produced in these reactions.
- Write formula for salts produced in these reactions.
- Know the different practical methods for producing soluble salts and when it is appropriate to use each method.
- Be able to explain what electrolysis is and how it works, and when and why it won't work.
- Understand the difference between electrolysis of a molten and aqueous substance and be able to predict the products in both cases.
- Know the names and charges of the two electrodes and predict the products produced at each and explain how and why this has occurred.
- How to write half and full equations to show what is happening during electrolysis.

AT 1 – use of appropriate apparatus to make and record a range of measurements accurately, including volume of liquids.

AT 8 – the determination of concentrations of strong acids and strong alkalis.

WS 2.4 – carry out experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations.

WS 2.6 – make and record observations and measurements using a range of apparatus and methods.

MS 1a – recognise and use expressions in decimal form.

MS 1c – use ratios, fractions and percentages.

MS 2a – use an appropriate number of significant figures.

AT 6 Mixing of reagents to explore chemical changes and/or products



GCSE Chemistry – Chemical Changes



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Some of the vocabulary that we will use includes:

Reactivity: How readily a substance takes part in a chemical reaction, especially how easily a metal loses electrons.

Oxidation: The loss of electrons (often involves gaining oxygen)

Reduction: The gain of electrons (often involves losing oxygen)

Salt: An ionic compound formed when the hydrogen ion (H^+) in an acid is replaced by a metal ion.

Solution: A mixture formed when a solute dissolves in a solvent.

Soluble: Able to dissolve in a given solvent (usually water).

Evaporation: The process where a liquid changes into a gas at temperatures below its boiling point.

Filtration: A separation technique used to separate an insoluble solid from a liquid using filter paper.

Crystallisation: A method used to obtain a solid in crystal form from a solution by evaporating some solvent.

Aqueous (aq): A substance that is dissolved in water.

Molten: A substance that has been melted and is in the liquid state.

Electrolysis: The decomposition of an ionic compound using electricity when it is molten or dissolved in water.

Electrolyte: A molten or aqueous substance that contains free-moving ions and can conduct electricity.

Anode: The positive electrode in electrolysis, where oxidation occurs.

Cathode: The negative electrode in electrolysis, where reduction occurs.

You could learn more about this topic by:

Kerboodle - textbook and resources

[The reactivity series of metals - Reactions of metals - AQA - GCSE Combined Science Revision - AQA Trilogy - BBC Bitesize](#)

[Naming salts narrated guide - YouTube](#)

[Neutralisation of Acids and Salt Production \(4.2.3\) | AQA GCSE Chemistry Revision Notes 2018 | Save My Exams](#)

[What Is Electrolysis | Reactions | Chemistry | FuseSchool - YouTube](#)

[Difference Between Molten and Aqueous Electrolysis | Compare the Difference Between Similar Terms](#)



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

Quick Check Homework Educake Quizzes



GCSE Chemistry – 4.3 Quantitative Chemistry



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Learning about this topic is important because:

Chemists use quantitative analysis to determine the formulae of compounds and the equations for reactions. Given this information, analysts can then use quantitative methods to determine the purity of chemical samples and to monitor the yield from chemical reactions. Chemical reactions can be classified in various ways. Identifying different types of chemical reaction allows chemists to make sense of how different chemicals react together, to establish patterns and to make predictions about the behaviour of other chemicals. Chemical equations provide a means of representing chemical reactions and are a key way for chemists to communicate chemical ideas.

This builds on:

Year 9 Chemical Reactions topic

Year 8 Atoms, Elements and compounds topic

This leads to:

Year 12 3.1.2 Amount of substance

We will learn:

- The law of conservation of mass and the reasons why reactions appear to lose or gain mass.
- How to calculate the relative formula mass of an element or compound and calculate the percentage by mass of an element in a compound.
- What a mole is and how to calculate the number moles of a substance given the mass, concentration or volume.
- What Avogadro constant is and how it can be used to calculate the number of particles reacting.
- Calculate the mass, volume or concentration of a reactant or product using a balanced symbol equations when given mass, volume or concentration or another substance in the reaction.
- Calculate molar ratio of reactants/ products in a reaction.
- Know what uncertainty is relating to an experiment and how it occurs and be able to calculate uncertainty about the mean.

We will develop/practise skills including:

Balancing symbol equations

Using observed changes in mass to explain what is happening in a reaction taking place in a non-closed system

Maths Skills

Using math mathematical formula

Rearranging equations



GCSE Chemistry – 4.3 Quantitative Chemistry



- What a limiting reagent is and be able to identify which reagent is limiting and which is in excess in a reaction.

Some of the vocabulary that we will use includes:

Conservation of mass

In a chemical reaction, mass is not created or destroyed. The total mass of reactants equals the total mass of products.

Relative formula mass (Mr)

The sum of the relative atomic masses (Ar) of all atoms in a chemical formula. Used for compounds.

Relative atomic mass (Ar)

The average mass of an atom of an element compared to 1/12 of a carbon-12 atom.

Avogadro constant

6.02×10^{23} particles per mole. It tells how many atoms, ions, or molecules are in 1 mole.

Percentage yield

A measure of how much product is actually obtained compared to the maximum possible (theoretical) amount.

Formula: $(\text{actual yield} \div \text{theoretical yield}) \times 100$

Atom economy

A measure of how much of the reactants end up in the desired product. Higher atom economy means less waste.

Concentration

The amount of a substance (solute) dissolved in a certain volume of solution.

Common unit: mol/dm^3 (moles per cubic decimetre)

You could learn more about this topic by:



[Quantitative chemistry - GCSE Chemistry \(Single Science\) Revision - AQA - BBC Bitesize](#)

[The Whole of AQA -QUANTITATIVE CHEMISTRY. GCSE Chemistry or Combined Science Revision Topic 3 for C1 - YouTube](#)

[GCSE Chemistry - Moles, Concentration & Volume Calculations #29 - YouTube](#)

[GCSE Chemistry - The Mole \(Higher Tier\) #25 - 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



GCSE Chemistry – 4.3 Quantitative Chemistry



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Assessed Required Practical
Educake Quizzes
Quick Check Homework's
Required Practical 2 - Titration



GCSE Chemistry – 4.9 Chemistry of the Atmosphere



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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



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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
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