# Long Term Plan: Chemistry Year 10

ARCHBISHOP SENTAMU ACADEMY
Church of England

**"Science is simply the word we use to describe a method of organising our curiosity."**

The programme for Y10 and 11 differs in comparison to KS3. There are4 sets in each population. X/Y1, 2, 3 and 4 classes will be taught combined science content and will see a subject specialist teacher three times a fortnight. Set 5 is the triple science group who will see their teachers on a 5,5,4 split.

There are 2 data collection points for Y10

Staff use the **Curriculum Road Map** to ensure they teach the correct topic with enough time to cover the depth and breadth of our curriculum.

| Topic | Unit title | Key knowledge/ Content to learn and retain | Essential skills to acquire (subject & generic) | Anticipated misconceptions | Links to previous KS | Links to future KS | Opportunity for stretch for high prior attainers |
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| One | Bonding | **1. Types of Bonding**<br><br>**Ionic Bonding:**<br><br>Occurs between metals and non-metals.<br><br>**Electron Transfer:** Metals lose electrons to form positive ions (cations), and non-metals gain electrons to form negative ions (anions).<br><br>**Electrostatic Attraction:** The oppositely charged | **Diagram Drawing and Interpretation**<br><br>• Ionic Bonding Diagrams<br>• Covalent Bonding Diagrams<br>• Bonding Models:<br><br>**Comparing Structures and Properties**<br><br>• **Contrast Giant vs Simple Structures:** | **All ionic compounds conduct electricity in solid form**<br><br>**Reality:** Ionic compounds **do not conduct electricity** in solid form because the ions are **fixed in place** within the lattice structure and cannot move. They only conduct electricity when they are **molten** or **dissolved in water**, | **KS3**: At KS3, students are introduced to the basic structure of atoms, including the understanding that atoms are made up of **protons**, **neutrons**, and **electrons**, and the concept of **electronic structure** (i.e., how electrons | **GCSE Chemistry** is part of **KS4**, which covers key concepts in chemical reactions, atomic structure, and bonding. The **bonding unit** is central to understanding many of the topics that follow, including chemical | |

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| | | ions attract each other, forming a strong bond.<br><br>**Properties:** High melting/boiling points, conductive in molten or dissolved form, soluble in water, and brittle.<br><br>**Covalent Bonding:**<br><br>Occurs between non-metals.<br><br>**Electron Sharing:** Atoms share electrons to achieve a full outer shell.<br><br>**Properties:** Low melting/boiling points, non-conductive, and can be gases, liquids, or solids.<br><br>**Metallic Bonding:**<br><br>Occurs between metal atoms.<br><br>**Electron Sea Model:** Electrons are delocalized, forming a "sea" of electrons that move freely.<br><br>**Properties:** Conductive (both for heat and electricity), malleable (can be hammered into shapes), ductile (can be drawn into | **Explaining and Predicting Physical Properties**<br><br>● Link properties to bonding<br>● Practice Explaining: For example:<br><br>Why do ionic compounds have high melting points?<br><br>Why is graphite a good conductor of electricity?<br><br>**Recognizing Exceptions**<br><br>**Use of Keywords in Explanations**<br><br>● **Use accurate terminology** in your explanations, especially when describing:<br><br>**Ions** (cation/anion).<br><br>**Bond types** (ionic/covalent/metallic).<br><br>**Intermolecular Forces** (e.g., van der Waals forces, hydrogen bonds).<br><br>**Electrostatic Attraction:** For ionic bonding, this term is crucial when explaining the forces between oppositely charged ions. | where the ions are free to move.<br><br>**Correction:** Emphasize that **ionic compounds conduct electricity when molten or in solution** due to the presence of free-moving ions. In solid form, the ions are locked into the lattice and cannot move, which is why ionic solids are not conductive.<br><br>**Misconception: Molecules with similar structures always have similar properties**<br><br>**Reality:** While molecular structure is important in determining properties, there can be **differences in properties** even among molecules with similar structures. For example, **polar covalent molecules** (like $H_2$ O) have different properties from **non-polar covalent molecules** (like $O_2$ ), even though both may be gases at room temperature.<br><br>**Correction:** Teach students to recognize the **intermolecular forces** (e.g., hydrogen bonds, van der Waals forces) | are arranged in shells).<br>**GCSE**: At GCSE, this understanding is extended. Students need to know how **electrons are arranged in energy levels**, how the **periodic table relates to atomic structure**, and how the electronic configuration influences an atom's ability to bond. | reactions, properties of materials, and the reactivity of different substances. | |

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| | | wires), and have high melting/boiling points.<br><br>**2. Structure and Properties of Ionic Compounds**<br><br>**Giant Ionic Lattice Structure:**<br><br>Ionic compounds form a regular, repeating pattern of ions.<br><br>**Strong Electrostatic Forces:** Between positive and negative ions, requiring a lot of energy to break.<br><br>**Properties:** Hard, brittle, and conduct electricity only when molten or in solution.<br><br>**3. Structure and Properties of Covalent Compounds**<br><br>**Simple Molecular Structures:**<br><br>Small molecules (e.g., $H_2$ O, $CO_2$ ).<br><br>**Weak Intermolecular Forces:** These molecules have low melting and boiling points. | **Performing Practical Investigations**<br><br>**Practical Knowledge:** Be able to design and understand practical investigations where the properties of different materials are tested, such as:<br><br>Testing the **electrical conductivity** of substances (ionic in solution, metallic, etc.).<br><br>Measuring **melting/boiling points** of substances and linking the results to the type of bonding and structure. | that influence properties like boiling/melting points. For example, hydrogen bonding in water leads to higher boiling and melting points than expected for a small molecule. | | | |

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| | | **Non-conductive:** They don't conduct electricity because they have no free electrons or ions.<br><br>**Giant Covalent Structures:**<br><br>Large molecules (e.g., diamond, graphite).<br><br>**Strong Covalent Bonds:** High melting/boiling points due to the strong bonds between atoms.<br><br>**Examples:**<br><br>**Diamond:** Each carbon atom bonds to four others in a 3D structure; very hard and a good thermal conductor but doesn't conduct electricity.<br><br>**Graphite:** Carbon atoms form layers that can slide past each other; conducts electricity and is used as a lubricant.<br><br>**4. Properties of Metallic Bonding**<br><br>**Malleability and Ductility:** Metal atoms can slide past each other without breaking the bond due to the delocalized electrons. | | | | | |

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| | | **Electrical Conductivity:** Delocalized electrons are free to move, so metals can conduct electricity.<br><br>**High Melting and Boiling Points:** Strong metallic bonds require a lot of energy to break.<br><br>**5. Bonding and Electrical Conductivity**<br><br>**Ionic compounds** do not conduct electricity in solid form, but they do when molten or dissolved because the ions are free to move.<br><br>**Covalent compounds** generally do not conduct electricity, except for a few exceptions like graphite (which has free electrons).<br><br>**Metallic compounds** conduct electricity in all states (solid, liquid) because of the freely moving delocalized electrons.<br><br>**6. Polarity in Molecules**<br><br>**Polar Molecules:** Have uneven distribution of electrons (e.g., $H_2$ O). The molecule has a partial positive and partial | | | | | |

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| | | negative charge due to the difference in electronegativity between atoms.<br><br>**Non-Polar Molecules:** Have a symmetrical electron distribution, such as in $O_2$ or $CO_2$ .<br><br>**7. Simple vs Giant Structures**<br><br>**Simple Structures:** Like covalent molecules, typically have low melting and boiling points (e.g., $H_2$ O, $CO_2$ ).<br><br>**Giant Structures:** Include giant ionic lattices (e.g., sodium chloride) or giant covalent networks (e.g., diamond, graphite), with high melting and boiling points due to strong bonds between atoms. | | | | | |
| **SMSC & British Values** | British values in science | | | | | | |
| **Cultural Capital** | | | | | | | |
| **Career Link** | https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html<br>More information here. | | | | | | |

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| Two | Quantitative Chemistry | Mass, Mr and Moles<br><br>Concentration of Solution<br><br>(HT Only) Calculating reaction masses<br><br>Balancing Equations using moles<br><br>% Yield and Atom Economy | • Changing the subject of an equation<br>• Calculating percentage<br>• Using ratios<br>• Interpreting data presented in both graphical and tabular form.<br>• Using laboratory equipment and glassware<br>• Recording accurate data<br>• Calculating a mean<br>• Identifying anomalous and concordant results.<br>• Converting units | The difference between g/dm and mol/dm<br><br>Students often struggle to identify when they need to use molar coefficients in a calculation and when they don't<br><br>Calculating the Mr of of diatomic molecules, particularly in reaction mass calculations | At KS3 students have studied the mechanics of chemical reactions and have also been introduced to the idea of conservation of mass and balanced equations.<br><br>Students have also studied neutralisation reactions which builds directly into titration | Quantitative chemistry forms the basis of much of the work done during physical chemistry during A-Level. | Higher prior attainments can be challenged to work through multi-step problems involving different equations |
| **SMSC & British Values** | British values in science<br><br>Mathematical problems can be put into real world contexts to explore a variety of concepts and scenarios | | | | | | |
| **Cultural Capital** | Mathematical problems can be put into real world contexts to explore a variety of concepts and scenarios | | | | | | |
| **Career Link** | https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html<br>More information here.<br><br>As the central science, Chemistry opens doors to a range of STEM Field careers | | | | | | |

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| Three | Chemical changes | Reactivity of metals<br><br>reactions with acids<br><br>Electrolysis | Experimenting with chemical reactions in a systematic way and organising their results logically<br><br>Mixing of reagents to explore chemical changes and/or products.<br><br>investigate pH changes when a strong acid neutralises a strong alkali.<br><br>Measure the pH of different acids at different concentrations. (HT only)<br><br>Make order of magnitude calculations. (HT only) | Physical vs chemical changes.<br><br>Acids can burn and eat material away<br><br>Neutralisation means an acid breaking down<br><br>A base/alkali inhibits the burning properties of an acid | At KS3 students have studied the mechanics of chemical reactions<br><br>Students have also studied neutralisation reactions which builds directly into titration | Chemical changes links to the 3.1.12 Acids and bases (A-level only) topic in KS5. | Explaining how concentration and strength are linked. |
| **SMSC & British Values** | British values in science<br><br>Students following laboratory rules for the safety of all<br>Discussions on how certain developments have affected moments in life. | | | | | | |
| **Cultural Capital** | Neutralisation reactions and how they are useful in everyday life.<br>Uses of indicators.<br>Chemical reactions in everyday life. | | | | | | |
| **Career Link** | https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html<br>More information here.<br><br>As the central science, Chemistry opens doors to a range of STEM Field careers | | | | | | |
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| Four | Rates of reaction | | | | | | |
| **SMSC & British** | British values in science<br>Inherited disorders and issues around family planning | | | | | | |

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| **Values** | |
| **Cultural Capital** | Charles Darwin and the voyage of the beagle<br><br>Historical debate around evolution |
| **Career Link** | https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html<br>More information here.<br>Medical research<br>Family planning adviser<br>Genealogist |

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| Five - TRIPLE ONLY | Atmospheric Chemistry | The composition of the modern atmosphere and how this has changed from the formation of the Earth<br><br>Human impact on the atmosphere, including greenhouse gases, climate change and global warming.<br><br>The impact of major atmospheric pollutants on human health and the environment | Use of timelines<br><br>Extended Writing<br><br>Reading for comprehension<br><br>Evaluating the accuracy of data<br><br>Using data to make predictions about the outcome of experiments<br><br>Interpreting data presented in tabular or graphical form | Many students believe that oxygen is the most plentiful gas in the atmosphere, rather than Nitrogen.<br><br>Many students overestimate the concentration of carbon dioxide in the atmosphere<br><br>Many students confuse global warming with climate change | In KS3 students studied the atmosphere and discussed the impact of human activity on the climate. This unit builds on this by introducing a more analytical and quantitative approach to exploring human impact on the atmosphere and environment | At A-Level, students will study the impact of CFCs and the mechanism by which they have contributed to loss of ozone. | Students may be asked to compare interventions based on compromise between their environmental and economic impacts. |
| **SMSC** | British values in science | | | | | | |

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| **& British Values** | The effects of climate change, how every day actions contribute to climate change and what interventions can be put in place to prevent climate catastrophe |
| **Cultural Capital** | The effects of climate change, how every day actions contribute to climate change and what interventions can be put in place to prevent climate catastrophe |
| **Career Link** | https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html<br>More information here.<br><br>Climate scientist<br>Environmental campaigner<br>Meteorologist |

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| Sic - TRIPLE ONLY | Chemical Analysis | Pure and impure substances<br><br>Chromatography<br><br>Gas Testing<br><br>(Triple Only) Flame testing, ion testing and spectroscopy | Following written methods and flow charts<br><br>Interpreting chromatograms and other experimental results<br><br>Writing scientific methods<br><br>Measuring and recording accurate results<br><br>Safe use of laboratory equipment and glassware.<br><br>Presenting and | Students often confuse the results of the various ion tests.<br><br>Students often describe spectroscopy as being more “accurate” or “Reliable” as opposed to more “Sensitive” or “Precise” | Students have studied the idea of pure and impure substances, mixtures vs compounds and separation techniques at KS3. This unit extends this by introducing deeper analysis - not just separating mixtures but identifying their components. | Organic Analysis is studied in further depth at A-Level, where students will look at more complex spectroscopic methods, such as IR and MS spectroscopy. | Students could be presented with complex mixtures or a number of different solutions and challenged to produce viable methods of identification. |

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| | | | interpreting data in both tabular and graphical form. | | | | |
| **SMSC & British Values** | British values in science<br><br>Safe working in the lab, and respect for others workspaces. | | | | | | |
| **Cultural Capital** | The use of spectroscopic methods in real life applications, such as quality assurance and forensic investigation | | | | | | |
| **Career Link** | https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html<br>More information here.<br><br>As the central science, Chemistry opens doors to a range of STEM Field careers | | | | | | |

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| Six | **Revision and preparation for GCSE exams** |
| | Revisit to subject knowledge from across the course & use of PLC to ensure that students have a good grasp of all aspects of the specification<br>Use of retrieval quizzes and activities to identify gaps in SK and misconceptions<br>Support students in developing summary notes, flash cards etc to aid retrieval of key facts<br>Ensure that students have the necessary skills for effective revision<br>Focus on past exam questions and papers – command words and application of knowledge<br>Practice the application of knowledge that draws upon the practical aspects of the course<br>Timed completion of questions to support with pace through the exam paper<br>SLOP style activities to ensure that all are prepared for the aspects of maths that will be present on the exam papers |