



# Dallam School

## Curriculum Overview

Department: Chemistry  
Year Group: 10

| Autumn   |  | Spring   |  | Summer  |   |
|--|--|--|--|---|---|
| <b>Bonding (7 lessons)</b>   | <b>Atmosphere and Organic chemistry 1 (11 lessons)</b>   | <b>Mass and moles 1 (4 lessons)</b>  | <b>Energy changes (7 lessons)</b>  | <b>Sustainable development (14 lessons)</b>   | <b>Rates of reaction (13 lessons)</b>   |
| <b>Explore how atoms share and transfer electrons to form compounds</b>  | <b>Examine the use of crude oil and its derivatives</b>  | <b>Make a quantitative interpretation of chemical equations</b>  | <b>Develop a quantitative understanding of the energy shifts in a reaction</b>   | <b>Assess the sustainability of humanities use of the world's resources</b>   | <b>Investigate factors which affect the rate of a chemical reaction</b>   |
| By the end of this topic pupils will know ( <i>key knowledge, including tier 3 vocabulary</i> )  |  |  |  |   |   |
| <ul style="list-style-type: none"><li>➤ Ionic bonding occurs when atoms transfer electrons to form ions.</li><li>➤ Covalent bonding occurs when atoms of non-metals share pairs of electrons with each other.</li><li>➤ Metals are held together by metallic bonds.</li></ul> <p><b>Keywords</b></p> <ul style="list-style-type: none"><li>➤ ionic</li><li>➤ ion</li><li>➤ covalent</li><li>➤ bond</li><li>➤ delocalised electrons</li><li>➤ molecule</li><li>➤ diatomic</li></ul> | <ul style="list-style-type: none"><li>➤ Why the Earth's atmosphere has changed over time.</li><li>➤ How to use word and symbol equations to show how gases in the atmosphere were formed.</li><li>➤ How to evaluate the negative social, economic, and environmental consequences of different types of atmospheric pollution.</li><li>➤ The names, formula, properties, reactions, and uses of the homologous series known as alkanes / alkenes / alcohols / carboxylic acids.</li></ul> <p><b>Keywords</b></p> <ul style="list-style-type: none"><li>➤ (un)saturated</li><li>➤ functional group</li><li>➤ homologous series</li><li>➤ colourless</li></ul> | <ul style="list-style-type: none"><li>➤ The masses of atoms are compared by measuring them relative to the mass of atoms of carbon-12.</li><li>➤ The relative formula mass of a compound by is calculated from the sum of the relative atomic masses of the elements in it, in the ratio shown by its formula.</li><li>➤ Balanced symbol equations give the number of particles of substances involved in a chemical reaction.</li></ul> <p><b>Keywords</b></p> <ul style="list-style-type: none"><li>➤ relative atomic mass, <math>A_r</math></li><li>➤ relative formula mass, <math>M_r</math></li></ul> | <ul style="list-style-type: none"><li>➤ Energy is conserved in chemical reactions.</li><li>➤ A reaction where energy is shifted to the surroundings is called an exothermic reaction.</li><li>➤ A reaction where energy is shifted to the reacting substances is called an endothermic reaction.</li><li>➤ Breaking chemical bonds releases energy; forming them requires energy.</li><li>➤ The definition of activation energy.</li></ul> <p><b>Keywords</b></p> <ul style="list-style-type: none"><li>➤ exothermic</li><li>➤ endothermic</li><li>➤ activation energy</li><li>➤ bond energy</li></ul> | <ul style="list-style-type: none"><li>➤ Natural resources are finite.</li><li>➤ Methods of producing clean water and treating wastewater.</li><li>➤ Methods of extracting copper, such as electrolysis and smelting.</li><li>➤ Recycling metals saves energy and limited, finite metal ores, and reduces pollution.</li></ul> <p><b>Keywords</b></p> <ul style="list-style-type: none"><li>➤ finite</li><li>➤ (non-)renewable</li><li>➤ thermal decomposition</li><li>➤ bioleaching</li><li>➤ life cycle assessment</li><li>➤ blast furnace</li></ul> | <ul style="list-style-type: none"><li>➤ The rate of a chemical reaction is a measure of how reactants are used up over time.</li><li>➤ Particles must collide successfully to react.</li><li>➤ Increasing temperature, surface area, and concentration increases the rate of reaction.</li><li>➤ Some reactions are reversible, and the products react to re-form the original reactants.</li></ul> <p><b>Keywords</b></p> <ul style="list-style-type: none"><li>➤ collision theory</li><li>➤ anhydrous</li><li>➤ closed system</li><li>➤ equilibrium</li></ul> |

| Autumn   |  | Spring  |   | Summer   |  |
|--|--|---|---|--|--|
| Bonding<br>(7 lessons)   | Atmosphere and<br>Organic chemistry 1<br>(11 lessons)  | Mass and moles 1<br>(4 lessons)   | Energy changes<br>(7 lessons)   | Sustainable<br>development<br>(14 lessons)   | Rates of reaction<br>(13 lessons)  |
| <b>Explore how atoms share and transfer electrons to form compounds</b>  | <b>Examine the use of crude oil and its derivatives</b>  | <b>Make a quantitative interpretation of chemical equations</b>   | <b>Develop a quantitative understanding of the energy shifts in a reaction</b>  | <b>Assess the sustainability of humanities use of the world's resources</b>  | <b>Investigate factors which affect the rate of a chemical reaction</b>  |
| They will understand ( <i>key concepts</i> )   |  |   |   |  |  |
| <ul style="list-style-type: none"> <li>➤ How elements form compounds.</li> <li>➤ How an atom's placement in the periodic table relates to whether it forms a negative or positive ion.</li> <li>➤ Why atoms share electrons.</li> <li>➤ How double and triple covalent bonds arise.</li> </ul> | <ul style="list-style-type: none"> <li>➤ Why the Earth's atmosphere has changed over time.</li> <li>➤ How to use word and symbol equations to show how gases in the atmosphere were formed.</li> <li>➤ How to evaluate the negative social, economic, and environmental consequences of different types of atmospheric pollution.</li> <li>➤ How to name esters formed by reacting carboxylic acids and alcohols.</li> </ul> | <ul style="list-style-type: none"> <li>➤ Why chemical equations must be balanced.</li> <li>➤ Why relative atomic masses may not be whole numbers.</li> <li>➤ How to apply the principle of conservation of mass to chemical reactions, including those with an apparent mass change.</li> </ul> | <ul style="list-style-type: none"> <li>➤ How a reaction profile can be used to show the relative difference in the energy of reactants and products.</li> <li>➤ How to use reaction profiles to identify reactions as exothermic or endothermic.</li> </ul> | <ul style="list-style-type: none"> <li>➤ Different methods of producing safe drinking water and treating wastewater.</li> <li>➤ How to evaluate alternative biological methods of metal extraction.</li> <li>➤ How to carry out simple comparative Life Cycle Assessments.</li> <li>➤ How to evaluate ways of reducing the use of limited supplies of metal ores.</li> </ul> | <ul style="list-style-type: none"> <li>➤ How to use collision theory to explain how temperature, pressure, surface area, and concentration affect the rate of reaction.</li> <li>➤ How altering reaction conditions can maximise yield (Le Chatelier's principle).</li> <li>➤ Why compromise conditions are used in industrial processes.</li> </ul> |
| They will know how to ( <i>key skills</i> )  |  |   |   |  |  |
| <ul style="list-style-type: none"> <li>➤ Use 'dot and cross' diagrams to represent transfer and sharing of electrons in ionic and covalent bonding.</li> </ul>   | <ul style="list-style-type: none"> <li>➤ Write word equations for chemical reactions.</li> <li>➤ Write balanced symbol equations for chemical reactions.</li> <li>➤ Evaluate the quality of evidence.</li> <li>➤ Draw the chemical structure of alkanes, alkenes, alcohols, carboxylic acids, and esters and write balanced symbol equations for their reactions.</li> </ul>   | <ul style="list-style-type: none"> <li>➤ Calculate the relative atomic mass of an element from information about the relative abundance of its isotopes.</li> <li>➤ Calculate the relative formula mass of simple molecules and complex ionic compounds.</li> </ul>                             | <ul style="list-style-type: none"> <li>➤ Calculate the energy shifted in chemical reactions when supplied with bond energies.</li> <li>➤ Investigate the energy changes in reacting solutions.</li> </ul>   | <ul style="list-style-type: none"> <li>➤ Analyse and purify water samples.</li> <li>➤ Evaluate the impact of the use of natural resources on the environment.</li> </ul>   | <ul style="list-style-type: none"> <li>➤ Collect data on the rate of different chemical reactions.</li> <li>➤ Interpret graphs to determine the rate at a specific time in a reaction.</li> </ul>  |



# Dallam School

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|--|---|--|--|--|--|
| <b>Properties and structure (7 lessons)</b>  | <b>Mass and moles 2 (6 lessons)</b>   | <b>Organic chemistry 2 (4 lessons)</b>   | <b>Chemical analysis 2 (4 lessons)</b>   | <b>Chemical calculations (7 lessons)</b>   | <b>Redox (11 lessons)</b>  |
| <b>Link the structure / properties of a substance to its bonding</b>   | <b>Use the concept of moles to calculate reacting masses</b>  | <b>Explore the synthesis of man-made and natural polymers</b>  | <b>Analyse the results of chemical tests to identify the presence of specific ions</b>   | <b>Explore how chemical companies use calculations to ensure sustainable production</b>  | <b>Use half equations to describe a range of chemical processes</b>  |
| By the end of this topic pupils will know ( <i>key knowledge, including tier 3 vocabulary</i> )  |   |  |  |  |  |
| <ul style="list-style-type: none"><li>➤ Ionic bonding leads to formation of giant ionic lattice structures.</li><li>➤ Carbon can form many allotropes with properties related how each atom is bonded.</li><li>➤ Materials behave differently on very tiny scales, and this gives rise to many novel applications in material science.</li></ul> <p><b>Keywords</b></p> <ul style="list-style-type: none"><li>➤ intermolecular forces</li><li>➤ polymers</li><li>➤ fullerenes</li><li>➤ alloys</li><li>➤ nanoparticles</li></ul> | <ul style="list-style-type: none"><li>➤ Chemical amounts are measured in moles.</li><li>➤ The mass of one mole of a substance in grams is numerically equal to its relative formula mass.</li><li>➤ Balanced symbol equations tell you the number of moles of substances involved in a chemical reaction.</li><li>➤ A limiting reactant is used up first in a reaction.</li></ul> <p><b>Keywords</b></p> <ul style="list-style-type: none"><li>➤ mole</li><li>➤ Avogadro constant</li></ul> | <ul style="list-style-type: none"><li>➤ Polymers are made from long chains of covalently bonded molecules.</li><li>➤ The basic principles of addition and condensation polymerisation.</li><li>➤ Proteins are polymers made from different amino acid monomers.</li><li>➤ DNA is made up from monomers called nucleotides.</li></ul> <p><b>Keywords</b></p> <ul style="list-style-type: none"><li>➤ monomer</li><li>➤ polymer</li><li>➤ addition / condensation polymerisation</li><li>➤ amino acids</li><li>➤ nucleotides</li></ul> | <ul style="list-style-type: none"><li>➤ The flame colours produced by ions of Li, Na, K, Ca, and Cu.</li><li>➤ The precipitates formed in the reactions of positive ions which form insoluble hydroxides.</li><li>➤ The test for carbonate ions.</li><li>➤ The test for halide ions.</li><li>➤ The test for sulfate ions.</li><li>➤ Methods of modern instrumental analysis.</li></ul> <p><b>Keywords</b></p> <ul style="list-style-type: none"><li>➤ flame test</li><li>➤ precipitate</li></ul> | <ul style="list-style-type: none"><li>➤ In the chemical industry, atom economy is maximised to conserve resources and minimise pollution.</li><li>➤ A titration is used to measure what volumes of acid and alkali react together completely.</li><li>➤ A more concentrated solution has more solute in the same volume of solution than a less concentrated solution.</li></ul> <p><b>Keywords</b></p> <ul style="list-style-type: none"><li>➤ atom economy</li><li>➤ concentration</li><li>➤ titration</li><li>➤ end point</li></ul> | <ul style="list-style-type: none"><li>➤ Oxidation is the loss of electrons.</li><li>➤ Reduction is the gain of electrons.</li><li>➤ Simple electrical cells use the difference in reactivity of metals to produce a voltage.</li><li>➤ Electrolysis breaks down a substance using electricity; positive ions move to the cathode and negative ions move to the anode.</li></ul> <p><b>Keywords</b></p> <ul style="list-style-type: none"><li>➤ electrolyte</li><li>➤ anode</li><li>➤ cathode</li><li>➤ metal ore</li><li>➤ reduction</li><li>➤ oxidation</li></ul> |

| Autumn   |   | Spring   |   | Summer  |   |
|--|---|--|---|---|---|
| Properties and structure (7 lessons)   | Mass and moles 2 (6 lessons)  | Organic chemistry 2 (4 lessons)  | Chemical analysis 2 (4 lessons)   | Chemical calculations (7 lessons)   | Redox (11 lessons)  |
| Link the structure / properties of a substance to its bonding  | Use the concept of moles to calculate reacting masses   | Explore the synthesis of man-made and natural polymers   | Analyse the results of chemical tests to identify the presence of specific ions   | Explore how chemical companies use calculations to ensure sustainable production  | Use half equations to describe a range of chemical processes  |
| They will understand ( <i>key concepts</i> )   |   |  |   |   |   |
| <ul style="list-style-type: none"> <li>➤ How the state of an ionic compound determines whether it can conduct electricity.</li> <li>➤ Why substances made of simple molecules have low melting and boiling points.</li> <li>➤ How the structure of metals leads to their properties of good thermal and electrical conductivity, malleability, and ductility.</li> </ul> | <ul style="list-style-type: none"> <li>➤ How to use balanced symbol equations to calculate the masses of reactants and products.</li> <li>➤ Why limiting a quantity of reactant affects the amount of product it is possible to obtain.</li> </ul>                          | <ul style="list-style-type: none"> <li>➤ How addition polymerisation can form polymers from alkene monomers.</li> <li>➤ The key differences between addition / condensation polymerisation.</li> <li>➤ How polyesters are formed.</li> <li>➤ The role of polymerisation in synthesis of starch, cellulose, polypeptides, proteins, and DNA.</li> </ul> | <ul style="list-style-type: none"> <li>➤ How to identify positive ions through flame tests, and precipitations formed in reactions with sodium hydroxide.</li> <li>➤ How to identify negative ions including carbonates, halides, and sulfates.</li> <li>➤ The advantages of instrumental analysis, such as flame emission spectroscopy, compared to traditional chemical tests.</li> </ul> | <ul style="list-style-type: none"> <li>➤ How different factors affect the percentage yield.</li> <li>➤ Why it is important to maximise atom economy.</li> <li>➤ How to use a titration to determine the unknown concentration of a solution.</li> <li>➤ How to express concentration in a variety of units and convert between volumes in cm<sup>3</sup> and dm<sup>3</sup>.</li> </ul> | <ul style="list-style-type: none"> <li>➤ How a fuel cell works.</li> <li>➤ Why the chemical addition of oxygen results in the loss of electrons.</li> <li>➤ How electrolysis is used in the extraction of aluminium.</li> <li>➤ How the electrolysis of brine is used in the production of bleach and for killing bacteria in swimming pools and drinking water.</li> </ul> |
| They will know how to ( <i>key skills</i> )  |   |  |   |   |   |
| <ul style="list-style-type: none"> <li>➤ Evaluate the suitability of models used to represent the structure of molecules.</li> <li>➤ Calculate a surface area to volume ratio.</li> <li>➤ Assess the benefits and possible risks of the use of nanoparticle materials.</li> </ul>  | <ul style="list-style-type: none"> <li>➤ Calculate the number of moles or mass of a substance from data supplied.</li> <li>➤ Interpret balanced symbol equations in terms of mole ratios.</li> <li>➤ Use balanced symbol equations to calculate reacting masses.</li> </ul> | <ul style="list-style-type: none"> <li>➤ Use diagrams to represent the repeating units of polymers.</li> <li>➤ Name polymers from the monomers that are used in their synthesis.</li> </ul>  | <ul style="list-style-type: none"> <li>➤ Carry out flame tests to identify ions of Li, Na, K, Ca, and Cu.</li> <li>➤ Produce a flowchart to identify positive ions of Al, Mg, Ca, Cu(II), Fe(II), and Fe(III) in from the reaction with (excess) sodium hydroxide.</li> <li>➤ Test for the presence of carbonates, halides, and sulfates.</li> </ul>  | <ul style="list-style-type: none"> <li>➤ Calculate the percentage yield of a chemical reaction.</li> <li>➤ Calculate the atom economy of a reaction from a balanced equation.</li> <li>➤ Accurately measure the amount of acid and alkali that react together completely using a titration.</li> </ul>  | <ul style="list-style-type: none"> <li>➤ Write half equations for displacement reactions.</li> <li>➤ Write half equations to represent the reactions occurring at the anode and cathode during electrolysis.</li> </ul>   |