



Combined Science Chemistry Academic Overview 2018-2019

Science						
	Term 1.1	Term 1.2	Term 2.1	Term 2.2	Term 3.1	Term 3.2
Year 9	States of Matter Methods of Separating and Purifying Substances	Atomic Structure	The Periodic Table Ionic Bonding	Covalent Bonding Types of Substance	Acids	Acids End of Year Assessment Preparation and Feedback
Year 10	Calculations Involving Masses	Groups In The Periodic Table	Electrolytic Processes Obtaining and Using Metals Reversible Reactions and Equilibria	Rates of Reactions and Energy Changes	Fuels and Earth Science	End of Year Assessment Preparation and Feedback
Year 11	Revision of Topic 3	Catch-up and Examination Preparation	PPE 1 Feedback and Revision	PPE 2 Preparation and Feedback	Revision For GCSE Examinations	



Year 9 Combined Science Chemistry Curriculum Content Overview 2018-2019

Knowledge and Skills Students will be taught to....	Reading, Oracy, Literacy and Numeracy	Assessment
<ul style="list-style-type: none"> Recall and be able to write word, balanced symbol, ionic and half equations Recall the formulae of elements, simple compounds and ions Use and identify state symbols in chemical equations and describe the use of hazard symbols on containers Analyse and interpret information presented in a variety of forms including graphs, tables and written text Carry out practical activities in order to obtain results and explain their findings using correct scientific principles For each core practical explain; what equipment is used, how to carry out the practical, what is being changed (independent variable), what is being measured (dependent variable), what is being controlled and why Draw labelled diagrams of relevant practical equipment Describe the arrangements and explain the changes in the three states of matter Explain the different experimental techniques which can be used to separate mixtures Recall the structure of the atom and describe how atomic models have changed over time Recall what an isotope is and be able to calculate the relative atomic mass of an element from the abundances of the isotopes Describe how the periodic table has changed over time, comparing how it was arranged to how it is arranged today Describe and explain how ionic and covalent bonds form Describe and explain why materials can be classified as ionic, simple covalent, giant covalent or metallic Explain why some substances are acidic, whereas others are basic Construct neutralisation equations for the reactions of acids and bases and identify the solubility of the products 	<p style="text-align: center;">Reading</p> <ul style="list-style-type: none"> Edexcel combined science text book Recommended reading texts CGP revision guide PLC checklists <p style="text-align: center;">Numeracy</p> <ul style="list-style-type: none"> Recall of key values and quantities Recall, use and application of equations Conversion between units Working with numbers in standard form Drawing appropriate graphs and tables with suitable scales/ headings and plotting/ recording data Describing mathematical patterns in experimental data and explaining them using scientific concepts Perform calculations based on extracting data from both tables and graphs <p style="text-align: center;">Oracy and Literacy</p> <ul style="list-style-type: none"> Key words Writing a method for core practicals Six mark questions 	<p style="text-align: center;">Formative</p> <ul style="list-style-type: none"> Questioning in lessons Live student performance in lessons followed by questions Whole class feedback during lessons Regular peer and self assessment Book checks for general presentation, work completion and spellings Low stakes quizzing Learning checkpoints in between main assessments <p style="text-align: center;">Summative</p> <ul style="list-style-type: none"> 3 cumulative assessments throughout the year



Assessment Skills, Knowledge and Concepts Map

Key learning questions	Edexcel Combined Science Chemistry Year 9 Assessment Phase 1
	States of Matter & Methods of Separating and Purifying Substances
<ul style="list-style-type: none"><input type="checkbox"/> Explain the difference between a hazard and a risk<input type="checkbox"/> Compare the energy of the particles in a substance in the solid state, liquid state and gas state<input type="checkbox"/> What is it called when a solid changes straight into a gas?<input type="checkbox"/> Explain the difference between a pure substance and a mixture and how they would have different cooling curves<input type="checkbox"/> Describe how to separate a soluble solid from solution<input type="checkbox"/> Describe how to do simple distillation, fractional distillation, filtration and chromatography<input type="checkbox"/> Give the equation to calculate R_f values<input type="checkbox"/> In chromatography, what is the name of the phase which does not move?<input type="checkbox"/> What is meant by the term potable?<input type="checkbox"/> Describe the three stages of water purification<input type="checkbox"/> What is meant by deionised water?	<ul style="list-style-type: none"><input type="checkbox"/> Describe the arrangement, movement and the relative energy of particles in each of the three states of matter<input type="checkbox"/> Recall the names used for the interconversions between the three states of matter<input type="checkbox"/> Compare physical changes with chemical reactions<input type="checkbox"/> Explain the changes in arrangement, movement and energy of particles during these interconversions<input type="checkbox"/> Predict the physical state of a substance under specified conditions, given suitable data<input type="checkbox"/> Explain the difference between the use of 'pure' in chemistry compared with its everyday use and the differences between a pure substance and a mixture<input type="checkbox"/> Interpret melting point data to distinguish between pure substances and mixtures<input type="checkbox"/> Explain the experimental techniques for separation of mixtures by: simple & fractional distillation, filtration, crystallisation and paper chromatography<input type="checkbox"/> Describe an appropriate experimental technique to separate a mixture when knowing the properties<input type="checkbox"/> Describe what paper chromatography is and explain how it can be used to separate a mixture<input type="checkbox"/> Interpret a paper chromatogram: to distinguish between pure and impure substances, to identify substances by comparison with known substances and to identify substances by calculation and use of R_f values<input type="checkbox"/> Core Practical: Investigate the composition of inks using simple distillation and paper chromatography<input type="checkbox"/> Describe how: waste and ground water can be made potable, including the need for sedimentation, filtration and chlorination<input type="checkbox"/> Describe how: sea water can be made potable by using distillation<input type="checkbox"/> Describe how: water used in analysis must not contain any dissolved salts.
Key learning questions	Atomic Structure
<ul style="list-style-type: none"><input type="checkbox"/> Compare John Dalton's model of the atom to the modern day model of an atom<input type="checkbox"/> What is the relative mass and charge of a proton, neutron and electron?<input type="checkbox"/> Explain why all atoms do not have a charge<input type="checkbox"/> What does the mass number tell us about an atom?<input type="checkbox"/> What are isotopes?<input type="checkbox"/> Where are electrons found and why do they not contribute to the relative atomic mass?<input type="checkbox"/> What is relative atomic mass?<input type="checkbox"/> HT only – Explain how we work out the relative atomic mass using isotope masses and abundances	<ul style="list-style-type: none"><input type="checkbox"/> Describe how the Dalton model of an atom has changed over time because of the discovery of subatomic particles<input type="checkbox"/> Describe the structure of an atom as a nucleus containing protons and neutrons, surrounded by electrons in shells<input type="checkbox"/> Recall the relative charge and relative mass of: a proton, a neutron and an electron<input type="checkbox"/> Explain why atoms contain equal numbers of protons and electrons<input type="checkbox"/> Describe the nucleus of an atom as very small compared to the overall size of the atom<input type="checkbox"/> Recall that most of the mass of an atom is concentrated in the nucleus<input type="checkbox"/> Recall the meaning of the term mass number of an atom<input type="checkbox"/> Describe atoms of a given element as having the same number of protons in the nucleus and that this number is unique<input type="checkbox"/> Describe what isotopes are<input type="checkbox"/> Calculate the numbers of protons, neutrons and electrons in atoms given the atomic number and mass number<input type="checkbox"/> Explain how the existence of isotopes results in relative atomic masses of some elements not being whole numbers<input type="checkbox"/> HT ONLY: Calculate the relative atomic mass of an element from the relative masses and abundances of its isotopes



Key learning questions	Edexcel Combined Science Chemistry Year 9 Assessment Phase 2
	The Periodic Table and Ionic Bonding
<ul style="list-style-type: none"><input type="checkbox"/> Describe how Mendeleev arranged the elements in his version of the periodic table<input type="checkbox"/> Explain why Mendeleev left gaps in his version of the periodic table<input type="checkbox"/> Describe the differences between Mendeleev's periodic table and the modern periodic table<input type="checkbox"/> What does an elements period tell us about its electronic configuration?<input type="checkbox"/> What does an elements group tell us about its electronic configuration?<input type="checkbox"/> Where are the metals located on the periodic table?<input type="checkbox"/> Draw the electronic configuration of potassium<input type="checkbox"/> What is an ion?<input type="checkbox"/> How is an ion formed?<input type="checkbox"/> If the name on an ion end in –ide, what does this tell you about it?<input type="checkbox"/> If the name on an ion end in –ate, what does this tell you about it?<input type="checkbox"/> What is the difference between a cation and an anion?<input type="checkbox"/> What is ionic bonding?<input type="checkbox"/> What type of structure do ionic compounds have?<input type="checkbox"/> Give an advantage and disadvantage of using the following two models to represent ionic bonding: dot and cross diagrams, ball and stick models<input type="checkbox"/> Explain why ionic compounds have high melting and boiling points<input type="checkbox"/> State when ionic compounds conduct electricity<input type="checkbox"/> State when ionic compounds do not conduct electricity<input type="checkbox"/> Explain why ionic compounds can conduct electricity in some states.	<ul style="list-style-type: none"><input type="checkbox"/> Describe how Mendeleev arranged the elements known at that time, in a periodic table by using properties of these elements and their compounds<input type="checkbox"/> Describe how Mendeleev used his table to predict the existence and properties of some elements not discovered by then<input type="checkbox"/> Explain that Mendeleev thought he had arranged elements in order of increasing relative atomic mass but this was not always true<input type="checkbox"/> Explain the meaning of atomic number of an element in terms of position in the periodic table and number of protons in the nucleus<input type="checkbox"/> Describe how elements are arranged in the groups and periods of the periodic table<input type="checkbox"/> Identify elements as metals or non-metals according to their position in the periodic table, explaining this division in terms of atomic structure<input type="checkbox"/> Predict the electronic configurations of the first 20 elements in the periodic table as diagrams and in the form 2.8.1 etc.<input type="checkbox"/> Explain how the electronic configuration of an element is related to its position in the periodic table<input type="checkbox"/> Explain how ionic bonds are formed to produce cations and anions, including the use of dot and cross diagrams<input type="checkbox"/> Recall that an ion is an atom or group of atoms with a positive or negative charge<input type="checkbox"/> Calculate the numbers of protons, neutrons and electrons in simple ions given the atomic number and mass number<input type="checkbox"/> Explain the formation of ions in ionic compounds from their atoms, limited to compounds of elements in groups 1, 2, 6 and 7<input type="checkbox"/> Explain the use of the endings –ide and –ate in the names of compounds<input type="checkbox"/> Deduce the formulae of ionic compounds given the formulae of the constituent ions<input type="checkbox"/> Explain the structure of an ionic compound including a description of the lattice and electrostatic forces



Key learning questions	Covalent Bonding and Types of Substance
<ul style="list-style-type: none"><input type="checkbox"/> What is the definition of a covalent bond?<input type="checkbox"/> Why do atoms share electrons with each other in covalent bonding?<input type="checkbox"/> How many extra electrons does a single covalent bond provide to an atom?<input type="checkbox"/> What is a simple molecule?<input type="checkbox"/> Draw a dot and cross diagram to represent the following molecules: hydrogen, methane, carbon dioxide<input type="checkbox"/> Simple molecules have low melting points, explain why<input type="checkbox"/> Do simple molecules conduct electricity? Explain your answer<input type="checkbox"/> Give the definition of a polymer<input type="checkbox"/> Name the polymer that is made by joining lots of ethane molecules<input type="checkbox"/> Describe the similarities and differences between: diamond, graphite, graphene and fullerene<input type="checkbox"/> Name two uses of fullerenes<input type="checkbox"/> Explain why diamond has a high melting point<input type="checkbox"/> Describe the structure of a metal<input type="checkbox"/> What type of forces hold the particles in a metal together?<input type="checkbox"/> Explain why metals conduct electricity<input type="checkbox"/> Explain why metals are malleable	<ul style="list-style-type: none"><input type="checkbox"/> Explain how a covalent bond is formed when a pair of electrons is shared between two atoms<input type="checkbox"/> Recall that covalent bonding results in the formation of molecules<input type="checkbox"/> Recall the typical size (order of magnitude) of atoms and small molecules<input type="checkbox"/> Explain the formation of simple molecular, covalent substances, using dot and cross diagrams, including: H, HCl, H₂O, CH₄, O₂, CO₂<input type="checkbox"/> Explain why elements and compounds can be classified as: ionic, simple molecular (covalent), giant covalent and metallic<input type="checkbox"/> Explain how the structure and bonding of substances results in different physical properties<input type="checkbox"/> Explain the properties of ionic compounds including: melting/boiling points, forces between ions and conductivity<input type="checkbox"/> Explain the properties of typical covalent, simple molecular compounds including: melting/boiling points, forces between ions and conductivity<input type="checkbox"/> Recall that graphite and diamond are different forms of carbon and that they are examples of giant covalent substances<input type="checkbox"/> Describe the structures of graphite and diamond<input type="checkbox"/> Explain, in terms of structure and bonding, why graphite and diamond have different uses<input type="checkbox"/> Explain the properties of fullerenes including C₆₀ and graphene in terms of their structures and bonding<input type="checkbox"/> Describe, using poly(ethene) as the example, that simple polymers consist of large molecules containing chains of carbon atoms<input type="checkbox"/> Explain the properties of metals, including malleability and the ability to conduct electricity<input type="checkbox"/> Describe the limitations of particular representations and models, to include dot & cross, ball & stick models & 2/3D<input type="checkbox"/> Describe the properties of most metals



Key learning questions	Edexcel Combined Science Chemistry Year 9 Assessment Phase 3
	Acids
<ul style="list-style-type: none"><input type="checkbox"/> What is pH a measure of?<input type="checkbox"/> If a solution is neutral, what pH will it have?<input type="checkbox"/> What type of ions are released when an acid dissolves in water?<input type="checkbox"/> HT – Describe the relationship between the concentration of these ions and the pH of a solution<input type="checkbox"/> What range of pHs show that a substance is a base<input type="checkbox"/> What is an alkali?<input type="checkbox"/> What ions are present in an alkali?<input type="checkbox"/> State the products that are formed during a neutralisation reaction<input type="checkbox"/> Write an equation to show the reaction of a hydrogen ion with a hydroxide ion, include state symbols<input type="checkbox"/> HT – Give the definition of a strong acid<input type="checkbox"/> HT – Give the definition of a weak acid<input type="checkbox"/> HT – Describe the difference between the strength and the concentration of an acid<input type="checkbox"/> Describe the chemical test for hydrogen gas<input type="checkbox"/> Describe the chemical test for carbon dioxide gas<input type="checkbox"/> State whether the following salts will be soluble or insoluble in water – sodium hydroxide, silver nitrate, barium chloride, potassium iodide<input type="checkbox"/> What type of reaction is used to make insoluble salts?<input type="checkbox"/> What is the name of the process used to make a soluble salt?<input type="checkbox"/> Give the name of three indicators<input type="checkbox"/> Explain why universal indicator is not used during a titration<input type="checkbox"/> State which chemical goes into the burette during a titration<input type="checkbox"/> Describe how to put a chemical into the conical flask during a titration	<ul style="list-style-type: none"><input type="checkbox"/> Recall that acids in solution are sources of hydrogen ions and alkalis in solution are sources of hydroxide ions<input type="checkbox"/> Recall that the pH values of acids, alkalis and neutral<input type="checkbox"/> Recall the effect of acids and alkalis on indicators, including litmus, methyl orange and phenolphthalein<input type="checkbox"/> HT ONLY: Recall what the higher the concentration of hydrogen ions and hydroxide ions in a solution does to the pH of a solution<input type="checkbox"/> HT ONLY: Recall that as hydrogen ion concentration in a solution increases by a factor of 10, the pH of the solution decreases by 1<input type="checkbox"/> Core Practical: Investigate the change in pH on adding powdered calcium hydroxide or calcium oxide to a dilute hydrochloric acid<input type="checkbox"/> HT ONLY: Explain the terms dilute and concentrated, with respect to amount of substances in solution<input type="checkbox"/> HT ONLY: Explain the terms weak and strong acids, with respect to the degree of dissociation into ions<input type="checkbox"/> Recall what is formed when a base of any substance reacts with an acid<input type="checkbox"/> Recall what alkalis and bases are<input type="checkbox"/> Explain the general reactions of aqueous solutions of acids with: metals, metal oxides, metal hydroxides and metal carbonates<input type="checkbox"/> Describe the chemical test for: hydrogen and carbon dioxide (using limewater)<input type="checkbox"/> Describe a neutralisation reaction as a reaction between an acid and a base<input type="checkbox"/> Explain an acid-alkali neutralisation as a reaction in which hydrogen ions react with hydroxide ions<input type="checkbox"/> Explain why, when soluble salts are prepared from an acid and an insoluble reactant: excess reactant is added and excess insoluble reactant is removed<input type="checkbox"/> Explain why, if soluble salts are prepared from an acid and a soluble reactant: titration must be used and what is left after the reaction is only salt and water<input type="checkbox"/> Core Practical: Investigate the preparation of pure, dry hydrated copper sulfate crystals starting from copper oxide including the use of a water bath<input type="checkbox"/> Describe how to carry out an acid-alkali titration, using burette, pipette and a suitable indicator, to prepare a pure, dry salt<input type="checkbox"/> Recall the general rules which describe the solubility of all common types of substance in water<input type="checkbox"/> Predict, using solubility rules, whether or not a precipitate will be formed when named solutions are mixed together, naming the precipitate if any is formed<input type="checkbox"/> Describe the method used to prepare a pure, dry sample of an insoluble salt



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