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	Calculations Involving Masses Electrolytic Processes Obtaining and Using Metals	Reversible Reactions and Equilibria Groups In The Periodic Table	Rates of Reactions and Energy Changes End of Year Assessment Preparation and Feedback
Year 10	Fuels and Earth Science Transition metals, alloys and corrosion	Quantitative analysis Dynamic equilibria	Qualitative analysis: tests for ions Hydrocarbons	Polymers Alcohols and carboxylic acids	Bulk and surface properties of matter including nanoparticles	End of Year Assessment Preparation and Feedback
Year 11	Catch-up and Examination Preparation	Catch-up and Examination Preparation	PPE 1 Feedback and Revision	PPE 2 Preparation and Feedback	Revision For GCSE Examinations	

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Year 9 Chemistry Curriculum Content Overview 2018-2019

Knowledge and Skills Students will be taught to….	Reading, Oracy, Literacy and Numeracy	Assessment
• 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 writen text • Carry out practical activities in order to obtain results and explain their findings using correct scientific principles • For each core pracical 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 dfferent 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 elemetn 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 classfied 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	**Reading** • Edexcel combined science text book • Recommended reading texts • CGP revision guide • PLC checklists **Numeracy** • 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 **Oracy and Literacy** • Key words • Writing a method for core practicals • Six mark questions	**Formative** • 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 **Summative** • 3 cumulative assessments throughout the year

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Assessment Skills, Knowledge and Concepts Map

Key learning questions	Edexcel Chemistry Year 9 Assessment Phase 1 States of Matter & Methods of Separating and Purifying Substances
☐ Explain the difference between a hazard and a risk ☐ Compare the energy of the particles in a substance in the solid state, liquid state and gas state ☐ What is it called when a solid changes straight into a gas? ☐ Explain the difference between a pure substance and a mixture and how they would have different cooling curves ☐ Describe how to separate a soluble solid from solution ☐ Describe how to do simple distillation, fractional distillation, filtration and chromatography ☐ Give the equation to calculate R_f values ☐ In chromatography, what is the name of the phase which does not move? ☐ What is meant by the term potable? ☐ Describe the three stages of water purification ☐ What is meant be deionised water?	☐ Describe the arrangement, movement and the relative energy of particles in each of the three states of matter ☐ Recall the names used for the interconversions between the three states of matter ☐ Compare physical changes with chemical reactions ☐ Explain the changes in arrangement, movement and energy of particles during these interconversions ☐ Predict the physical state of a substance under specified conditions, given suitable data ☐ 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 ☐ Interpret melting point data to distinguish between pure substances and mixtures ☐ Explain the experimental techniques for separation of mixtures by: simple & fractional distillation, filtration, crystallisation and paper chromatography ☐ Describe an appropriate experimental technique to separate a mixture when knowing the properties ☐ Describe what paper chromatography is and explain how it can be used to separate a mixture ☐ 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 Rf values ☐ Core Practical: Investigate the composition of inks using simple distillation and paper chromatography ☐ Describe how: waste and ground water can be made potable, including the need for sedimentation, filtration and chlorination ☐ Describe how: sea water can be made potable by using distillation ☐ Describe how: water used in analysis must not contain any dissolved salts.
Key learning questions	**Atomic Structure**
☐ Compare John Dalton's model of the atom to the modern day model of an atom ☐ What is the relative mass and charge of a proton, neutron and electron? ☐ Explain why all atoms do not have a charge ☐ What does the mass number tell us about an atom? ☐ What are isotopes? ☐ Where are electrons found and why do they not contribute to the relative atomic mass? ☐ What is relative atomic mass?	☐ Describe how the Dalton model of an atom has changed over time because of the discovery of subatomic particles ☐ Describe the structure of an atom as a nucleus containing protons and neutrons, surrounded by electrons in shells ☐ Recall the relative charge and relative mass of: a proton, a neutron and an electron ☐ Explain why atoms contain equal numbers of protons and electrons ☐ Describe the nucleus of an atom as very small compared to the overall size of the atom ☐ Recall that most of the mass of an atom is concentrated in the nucleus ☐ Recall the meaning of the term mass number of an atom ☐ Describe atoms of a given element as having the same number of protons in the nucleus and that this number is unique ☐ Describe what isotopes are ☐ Calculate the numbers of protons, neutrons and electrons in atoms given the atomic number and mass number ☐ Explain how the existence of isotopes results in relative atomic masses of some elements not being whole numbers ☐ HT ONLY: Calculate the relative atomic mass of an element from the relative masses and abundances of its isotopes

Key learning questions	Edexcel Chemistry Year 9 Assessment Phase 1 The Periodic Table and Ionic Bonding
☐ Describe how Mendeleev arranged the elements in his version of the periodic table ☐ Explain why Mendeleev left gaps in his version of the periodic table ☐ Describe the differences between Mendeleev's periodic table and the modern periodic table ☐ What does an elements period tell us about its electronic configuration? ☐ What does an elements group tell us about its electronic configuration? ☐ Where are the metals located on the periodic table? ☐ Draw the electronic configuration of potassium ☐ What is an ion? ☐ How is an ion formed? ☐ If the name on an ion end in –ide, what does this tell you about it? ☐ If the name on an ion end in –ate, what does this tell you about it? ☐ What is the difference between a cation and an anion? ☐ What is ionic bonding? ☐ What type of structure do ionic compounds have? ☐ Give an advantage and disadvantage of using the following two models to represent ionic bonding: dot and cross diagrams, ball and stick models ☐ Explain why ionic compounds have high melting and boiling points ☐ State when ionic compounds conduct electricity ☐ State when ionic compounds do not conduct electricity ☐ Explain why ionic compounds can conduct electricity in some states.	☐ Describe how Mendeleev arranged the elements known at that time, in a periodic table by using properties of these elements and their compounds ☐ Describe how Mendeleev used his table to predict the existence and properties of some elements not discovered by then ☐ Explain that Mendeleev thought he had arranged elements in order of increasing relative atomic mass but this was not always true ☐ Explain the meaning of atomic number of an element in terms of position in the periodic table and number of protons in the nucleus ☐ Describe how elements are arranged in the groups and periods of the periodic table ☐ Identify elements as metals or non-metals according to their position in the periodic table, explaining this division in terms of atomic structure ☐ Predict the electronic configurations of the first 20 elements in the periodic table as diagrams and in the form 2.8.1 etc. ☐ Explain how the electronic configuration of an element is related to its position in the periodic table ☐ Explain how ionic bonds are formed to produce cations and anions, including the use of dot and cross diagrams ☐ Recall that an ion is an atom or group of atoms with a positive or negative charge ☐ Calculate the numbers of protons, neutrons and electrons in simple ions given the atomic number and mass number ☐ Explain the formation of ions in ionic compounds from their atoms, limited to compounds of elements in groups 1, 2, 6 and 7 ☐ Explain the use of the endings –ide and –ate in the names of compounds ☐ Deduce the formulae of ionic compounds given the formulae of the constituent ions ☐ 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
☐ What is the definition of a covalent bond? ☐ Why do atoms share electrons with each other in covalent bonding? ☐ How many extra electrons does a single covalent bond provide to an atom? ☐ What is a simple molecule? ☐ Draw a dot and cross diagram to represent the following molecules: hydrogen, methane, carbon dioxide ☐ Simple molecules have low melting points, explain why ☐ Do simple molecules conduct electricity? Explain your answer ☐ Give the definition of a polymer ☐ Name the polymer that is made by joining lots of ethane molecules ☐ Describe the similarities and differences between: diamond, graphite, graphene and fullerene ☐ Name two uses of fullerenes ☐ Explain why diamond has a high melting point ☐ Describe the structure of a metal ☐ What type of forces hold the particles in a metal together? ☐ Explain why metals conduct electricity ☐ Explain why metals are malleable	☐ Explain how a covalent bond is formed when a pair of electrons is shared between two atoms ☐ Recall that covalent bonding results in the formation of molecules ☐ Recall the typical size (order of magnitude) of atoms and small molecules ☐ Explain the formation of simple molecular, covalent substances, using dot and cross diagrams, including: H, HCl, H_20, CH_4, O_2, CO_2 ☐ Explain why elements and compounds can be classified as: ionic, simple molecular (covalent), giant covalent and metallic ☐ Explain how the structure and bonding of substances results in different physical properties ☐ Explain the properties of ionic compounds including: melting/boiling points, forces between ions and conductivity ☐ Explain the properties of typical covalent, simple molecular compounds including: melting/boiling points, forces between ions and conductivity ☐ Recall that graphite and diamond are different forms of carbon and that they are examples of giant covalent substances ☐ Describe the structures of graphite and diamond ☐ Explain, in terms of structure and bonding, why graphite and diamond have different uses ☐ Explain the properties of fullerenes including C_{60} and graphene in terms of their structures and bonding ☐ Describe, using poly(ethene) as the example, that simple polymers consist of large molecules containing chains of carbon atoms ☐ Explain the properties of metals, including malleability and the ability to conduct electricity ☐ Describe the limitations of particular representations and models, to include dot & cross, ball & stick models & 2/3D ☐ Describe the properties of most metals

Key learning questions	Edexcel Chemistry Year 9 Assessment Phase 2 Acids
☐ What is pH a measure of? ☐ If a solution is neutral, what pH will it have? ☐ What type of ions are released when an acid dissolves in water? ☐ Describe the relationship between the concentration of these ions and the pH of a solution ☐ What range of pHs show that a substance is a base ☐ What is an alkali? ☐ What ions are present in an alkali? ☐ State the products that are formed during a neutralisation reaction ☐ Write an equation to show the reaction of a hydrogen ion with a hydroxide ion, include state symbols ☐ Give the definition of a strong and weak acid ☐ Describe the difference between the strength and the concentration of an acid ☐ Describe the chemical test for hydrogen gas ☐ Describe the chemical test for carbon dioxide gas ☐ State whether the following salts will be soluble or insoluble in water – sodium hydroxide, silver nitrate, barium chloride, potassium iodide ☐ What type of reaction is used to make insoluble salts? ☐ What is the name of the process used to make a soluble salt? ☐ Give the name of three indicators ☐ Explain why universal indicator is not used during a titration ☐ State which chemical goes into the burette during a titration ☐ Describe how to put a chemical into the conical flask during a titration	☐ Recall that acids in solution are sources of hydrogen ions and alkalis in solution are sources of hydroxide ions ☐ Recall that the pH values of acids, alkalis and neutral ☐ Recall the effect of acids and alkalis on indicators, including litmus, methyl orange and phenolphthalein ☐ HT ONLY: Recall what the higher the concentration of hydrogen ions and hydroxide ions in a solution does to the pH of a solution ☐ 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 ☐ Core Practical: Investigate the change in pH on adding powdered calcium hydroxide or calcium oxide to a dilute hydrochloric acid ☐ HT ONLY: Explain the terms dilute and concentrated, with respect to amount of substances in solution ☐ HT ONLY: Explain the terms weak and strong acids, with respect to the degree of dissociation into ions ☐ Recall what is formed when a base of any substance reacts with an acid ☐ Recall what alkalis and bases are ☐ Explain the general reactions of aqueous solutions of acids with: metals, metal oxides, metal hydroxides and metal carbonates ☐ Describe the chemical test for: hydrogen and carbon dioxide (using limewater) ☐ Describe a neutralisation reaction as a reaction between an acid and a base ☐ Explain an acid-alkali neutralisation as a reaction in which hydrogen ions react with hydroxide ions ☐ Explain why, when soluble salts are prepared from an acid and an insoluble reactant: excess reactant is added and excess insoluble reactant is removed ☐ 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 ☐ Core Practical: Investigate the preparation of pure, dry hydrated copper sulfate crystals starting from copper oxide including the use of a water bath ☐ Describe how to carry out an acid-alkali titration, using burette, pipette and a suitable indicator, to prepare a pure, dry salt ☐ Recall the general rules which describe the solubility of all common types of substance in water ☐ 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 ☐ Describe the method used to prepare a pure, dry sample of an insoluble salt

Edexcel Chemistry Year 9 Assessment Phase 2

Key learning questions	Calculation Involving Masses
☐ Describe how you would work out the relative formula mass of a compound ☐ Define the term empirical formula ☐ State the law of conservation of mass ☐ Explain how to work out the empirical formula of magnesium oxide, using heat and a crucible ☐ What is concentration? ☐ State the equation to calculate concentration using mass of solute and volume of solution ☐ HT – What is a limiting reagent? ☐ HT – What is the value of the Avogadro constant? Give your answer in standard form ☐ HT - What is a mole? ☐ HT - What equation can you use to convert between moles and grams? ☐ HT - What is the mole triangle?	☐ Calculate relative formula mass given relative atomic masses ☐ Calculate the formulae of simple compounds from reacting masses and understand that these are empirical formulae ☐ Deduce: empirical formula of a compound from the formula of its molecule ☐ Deduce: molecular formula of a compound from its empirical formula and its relative molecular mass ☐ Describe an experiment to determine the empirical formula of a simple compound such as magnesium oxide ☐ Explain the law of conservation of mass applied to: a closed system and a non-enclosed system ☐ Calculate masses of reactants and products from balanced equations, given the mass of one substance ☐ Calculate the concentration of solutions in g dm–3 ☐ HT ONLY: Recall what one mole of particles of a substance is defined as ☐ HT ONLY: Calculate the number of: moles of particles of a substance in a given mass of that substance and vice versa ☐ HT ONLY: Calculate the number of: particles of a substance in a given number of moles of that substance and vice versa ☐ HT ONLY: Calculate the number of: particles of a substance in a given mass of that substance and vice versa ☐ HT ONLY: Explain why, in a reaction, the mass of product formed is controlled by the mass of the reactant which is not in excess ☐ HT ONLY: Deduce the stoichiometry of a reaction from the masses of the reactants and products
Key learning questions	**Electrolytic Processes, Obtaining and Using Metals**
☐ Why are dissolved ionic substances able to conduct electricity? ☐ What type of ions are attracted to the negative electrode? ☐ What two states can the electrolyte be in? ☐ What determines the products of electrolysis of an aqueous solution using inert electrodes? ☐ If a metal is more reactive than hydrogen what will be produced at the cathode when carrying out electrolysis on an aqueous solution? ☐ Describe the electrodes used for the purification of copper sulfate ☐ Define oxidation in terms of the loss or gain of oxygen ☐ Define reduction in terms of the loss or gain of oxygen ☐ HT - Define oxidation and reduction in terms of the loss or gain of electrons	☐ Recall that electrolytes are ionic compounds in the molten state or dissolved in water ☐ Describe electrolysis as a process in which electrical energy, from a direct current supply, decomposes electrolytes ☐ Explain the movement of ions during electrolysis ☐ Explain the formation of the products in the electrolysis, using inert electrodes, for copper & sodium chloride solution, sodium sulfate, acidified water & molten lead bromide ☐ Predict the products of electrolysis of other binary, ionic compounds in the molten state ☐ HT ONLY: Write half equations for reactions occurring at the anode and cathode in electrolysis ☐ HT ONLY: Explain oxidation and reduction in terms of loss or gain of electrons ☐ HT ONLY: Recall that reduction occurs at the cathode and that oxidation occurs at the anode in electrolysis reactions ☐ Explain the formation of the products in the electrolysis of copper sulfate solution, using copper electrodes, and how this can be used to purify copper ☐ Core Practical: Investigate the electrolysis of copper sulfate solution with inert electrodes and copper electrodes ☐ Deduce the relative reactivity of some metals, by their reactions with water, acids and salt solutions ☐ HT ONLY: Explain displacement reactions as redox reactions, in terms of gain or loss of electrons ☐ Explain the reactivity series of metals in terms of the reactivity of the metals with water and dilute acids (relative to carbon) ☐ Recall what ores and native metals are

□ What does a reactivity series show? □ Why does iron displace copper in a solution of copper sulfate? □ Write the general word equation for the reaction of a metal with acid □ What is a metal ore? □ Name a metal which is found in the Earth as the metal itself (native) □ True or false? Sodium can be extracted from its ore by reduction with carbon □ Give two benefits of recycling materials □ State the four stages that are assessed in a life cycle assessment	□ Describe what oxidation and reduction are □ Explain why the method used to extract a metal from its ore is related to its position in the reactivity series and the cost of the extraction process (electrolysis and smelting) □ HT ONLY: Evaluate alternative biological methods of metal extraction (bacterial and phytoextraction) □ Explain how a metal's relative resistance to oxidation is related to its position in the reactivity series □ Evaluate the advantages of recycling metals □ Describe what a life time assessment for a product involves and what it needs to consider □ Evaluate data from a life cycle assessment of a product

Key learning questions	Edexcel Chemistry Year 9 Assessment Phase 3 Reversible Reactions and Equilibria and Groups In The Periodic Table
☐ What is a reversible reaction? ☐ Define the term dynamic equilibrium State the conditions of the Haber process ☐ Which groups in the periodic able do the alkali metals, halogens and noble gases belong to? ☐ State the trend in reactivity as you go down group 1 ☐ State what you would observe when lithium, sodium and potassium are placed in water ☐ Explain the trend in reactivity seen in group 1 ☐ State the trend in melting points down group 7 ☐ Describe the appearance of chlorine, bromine and iodine at room temperature ☐ Where are the most reactive halogens found – at the top or bottom of group 7? ☐ What is the charge of a halide ion? ☐ Explain the trend in reactivity down group 7 ☐ What is a halogen displacement reaction? ☐ Name the halide ions formed by: fluorine, chlorine, iodine and bromine ☐ What would happen if you added a less reactive halogen to solution of a more reactive halide salt? ☐ What are the elements in group 0 of the periodic table known as? ☐ Give one example of a use of noble gas ☐ Explain why noble gases are called inert	☐ Recall that chemical reactions are reversible, the use of the symbol ⇌ in equations and how the direction of some reversible reactions can be altered ☐ Explain what is meant by dynamic equilibrium ☐ Describe the formation of ammonia as a reversible reaction in the Haber process ☐ Recall the conditions for the Haber process ☐ HT ONLY: Predict how the position of a dynamic equilibrium is affected by changes in temperature, pressure and concentration ☐ Explain why some elements can be classified as alkali metals, halogens or noble gases, based on their position in the periodic table ☐ Recall the physical properties of alkali metals ☐ Describe the reactions of lithium, sodium and potassium with water ☐ Describe the pattern in reactivity of the alkali metals, lithium, sodium and potassium, with water; and use this pattern to predict the reactivity of other alkali metals ☐ Explain this pattern in reactivity in terms of electronic configurations ☐ Recall the colours and physical states of chlorine, bromine and iodine at room temperature ☐ Describe the pattern in the physical properties of the halogens, chlorine, bromine and iodine, and use this pattern to predict the physical properties of other halogens ☐ Describe the chemical test for chlorine ☐ Describe the reactions of the halogens, chlorine, bromine and iodine, with metals to form metal halides, and use this pattern to predict the reactions of other halogens ☐ Recall that the halogens, chlorine, bromine and iodine, form hydrogen halides which dissolve in water to form acidic solutions, and use this pattern to predict the reactions of other halogens ☐ Describe the relative reactivity of the halogens chlorine, bromine and iodine, as shown by their displacement reactions with halide ions and use this to predict the reactions of astatine ☐ HT ONLY: Explain why these displacement reactions are redox reactions in terms of gain and loss of electrons, identifying which of these are oxidised and which are reduced ☐ Explain the relative reactivity of the halogens in terms of electronic configurations ☐ Explain why the noble gases are chemically inert, compared with the other elements, in terms of their electronic configurations ☐ Explain how the uses of noble gases depend on their inertness, low density and/or non-flammability ☐ Describe the pattern in the physical properties of some noble gases and use this pattern to predict the physical properties of other noble gases

Key learning questions	Rates of Reactions and Energy Changes
☐ What is the formula for calculating the rate of reaction? ☐ Describe how you could measure the rate of reaction between two transparent solutions where one of the products was a precipitate ☐ Suggest another way of measuring the rate of reaction where a gas is given off as oppose to using a gas syringe ☐ Describe how you would carry out an experiment to investigate the effect of concentration on the rate of the reaction between marble chips and hydrochloric acid ☐ Describe one way that you could measure how the temperature affects the rate of the reaction between sodium thiosulfate and hydrochloric acid ☐ What must happen for a reaction to occur between two particles ☐ Give two reasons why increasing the temperature increases the rate of reaction ☐ Explain why increasing the concentration of the reactants increases the rate of a reaction ☐ Describe what is meant by the term activation energy ☐ List the ways to increase the rate of reaction – explain how each of them increases the rate of reaction ☐ What is the definition of a catalyst? ☐ What is an enzyme? ☐ Give one example of an industrial process that uses enzymes	☐ Core Practical: Investigate the effects of changing the conditions of a reaction on the rates of chemical reactions by: measuring the production of a gas/observing a colour change ☐ Suggest practical methods for determining the rate of a given reaction ☐ Explain how reactions occur by discussing the collision theory ☐ Explain the effects on rates of reaction of changes in temperature, concentration, surface area to volume ratio and pressure in terms of frequency and energy of collisions ☐ Interpret graphs of mass, volume or concentration of reactant or product against time ☐ Describe what a catalyst is ☐ Explain how the addition of a catalyst increases the rate of a reaction in terms of activation energy ☐ Recall that enzymes are biological catalysts and that enzymes are used in the production of alcoholic drinks ☐ Recall when chemical changes occur that they cause changes in heat energy ☐ Describe the differences between endothermic and exothermic in terms of energy taken in or given out ☐ Recall if bonds are broken or made for each of the following reactions: endothermic and exothermic ☐ Describe why the overall heat energy change for a reaction is exothermic or endothermic in terms of bonds being made or broken ☐ HT ONLY: Calculate the energy change in a reaction given the energies of bonds (in kJ mol–1) ☐ Explain the term activation energy ☐ Draw and label reaction profiles for endothermic and exothermic reactions, identifying activation energy