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	

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Year 10 Combined Science 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 • Analyse and interpret information presented in a variety of forms including graphs, tables and writen text • 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 • Calculate the relative formula mass, empirical formula, number of moles, concentration in an element, compound or soltuion • Explain why elements are placed into certain groups of the periodic table • Explain the reactivity of the group 1, group 7 and group 0 elements • Construct a diagram for simple electrolysis, explaining why each piece of equipment is used • Explain how and why a substance will break down using electrolysis and state the products formed • Investigate the electrolysis of copper sulfate solution • Describe and explain the reactivity series, decsribing how metals can be extracted from their ores and why this process is done • Recall and explain that some chemical reactions are reversible • Explain how the rate of a reaction can be increased using temperature, surface area, concentration and a catalyst • Recall that some reactions are endothermic or exothermic, explain the differences between the two types of reaction and how they are identified • Recall the names and uses of fuels and explain how they are separated from crude oil • Explain the differences between the two types of combustion • Describe and explain how the Earths atmopshere has changed over time	**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 Combined Science Chemistry Year 10 Assessment Phase 1 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	**Groups In The Periodic Table**
☐ 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?	☐ 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

☐ 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	☐ 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	Edexcel Combined Science Chemistry Year 10 Assessment Phase 2 Electrolytic Processes, Obtaining and Using Metals, Reversible Reactions and Equilibria
☐ 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 ☐ 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 ☐ What is a reversible reaction? ☐ Define the term dynamic equilibrium ☐ State the conditions of the Haber process	☐ 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 ☐ 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 ☐ 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

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

Key learning questions	Edexcel Combined Science Chemistry Year 10 Assessment Phase 3 Fuels and Earth Science
☐ What is a finite resource? ☐ Give a use for the following: petrol, fuel oil, kerosene, fuel oil ☐ What is crude oil? ☐ How is crude oil formed? ☐ What is a hydrocarbon? ☐ Write down the general word equation for the complete combustion of a hydrocarbon in oxygen ☐ Explain when incomplete combustion occurs ☐ Give one health problem associated with the production of carbon monoxide during incomplete combustion ☐ Name a gas that can cause acid rain ☐ Give two ways in which acid rain can damage the environment ☐ What is cracking? ☐ Name two types of hydrocarbon produced by cracking ☐ Why is cracking a necessary process in the petrochemical industry? ☐ Describe the likely composition of the Earth's early atmosphere ☐ Describe how oceans were formed ☐ Describe why the formation of the oceans led to a decrease in the concentration of carbon dioxide in the atmosphere ☐ Explain how greenhouse gases help to keep the Earth warm ☐ State how human activity is leading to an increase to methane and carbon dioxide in the atmosphere	☐ Recall what a hydrocarbon is ☐ Describe and explain what crude oil is and why it is important ☐ Describe and explain the separation of crude oil into simpler, more useful mixtures by the process of fractional distillation ☐ Recall the names and uses of the following fractions: gases, petrol, kerosene, diesel oil, fuel oil and bitumen ☐ Explain how hydrocarbons in different fractions differ from each other in terms of boiling point, number of C & H's, flammability and viscosity ☐ Explain what a homologous series of hydrocarbon compounds is ☐ Describe the complete combustion of hydrocarbon fuels including energy changes and products ☐ Explain why the incomplete combustion of hydrocarbons can produce carbon and carbon monoxide ☐ Explain how carbon monoxide behaves as a toxic gas ☐ Describe the problems caused by incomplete combustion in appliances that use carbon compounds as fuels ☐ Explain how impurities in some hydrocarbon fuels result in the production of sulfur dioxide ☐ Explain some problems associated with acid rain ☐ Explain why, when fuels are burned in engines, oxides of nitrogen are formed and that they are pollutants ☐ Evaluate the advantages and disadvantages of using hydrogen, rather than petrol, as a fuel in cars ☐ Recall the names and sources of some renewable fossil fuels ☐ Explain what cracking is and why it is necessary ☐ Recall that the gases produced by volcanic activity formed the Earth's early atmosphere ☐ Describe what the Earth's early atmosphere was thought to contain ☐ Explain what the oceans were formed from ☐ Explain why the amount of carbon dioxide in the atmosphere decreases when the oceans were formed ☐ Explain how the growth of primitive plants changes the composition of gases in the atmosphere ☐ Describe the chemical test for oxygen ☐ Describe and explain the greenhouse effect and name the gases that contribute to it ☐ Evaluate the evidence for human activity causing climate change ☐ Describe the potential effects on the climate of increased levels of carbon dioxide and methane generated by human activity

□ What is global warming □ Explain why there are uncertainties in measuring the current carbon dioxide level □ Suggest one way that the effects of climate change can be mitigated	□ Describe how effects on the climate may be mitigated: consider scale, risk and environmental implications