Personalised Learning Checklist
WJEC (Triple Award) Chemistry 2
Unit 2: Topics 2.1 -2.6

Topic	Student Checklist	R	A	G
Topic 2.1 BONDING, STRUCTURE AND PROPERTIES	Describe the properties of metals, ionic compounds, simple molecular covalent substances and giant covalent substances.			
	Apply the knowledge of the 'sea' of electrons/lattice of positive ions structural model for metals in explaining their physical properties.			
	Demonstrate the knowledge of electronic structure in explaining how ionic bonding takes place (and how this is represented using dot and cross diagrams).			
	Apply the knowledge of the accepted structural model for giant ionic structures in explaining the physical properties of ionic compounds.			
	Show understanding of electronic structure, and be able to explain how covalent bonds are formed (and how this is represented using dot and cross diagrams).			
	Show understanding of the intermolecular bonding structural model for simple molecular structures, and be able to explain the physical properties of simple molecular substances.			
	Demonstrate knowledge of the properties of diamond, graphite, fullerenes, carbon nano-tubes and graphene and how these are explained in terms of structure and bonding.			
	Apply knowledge of individual atoms not having the same properties as bulk materials as demonstrated by diamond, graphite, fullerenes, carbon nano-tubes and graphene.			
	Apply knowledge of nano-scale silver particles exhibiting properties not seen in bulk silver.			
	Show understanding of the properties and uses of nano-scale particles of silver and titanium dioxide.			
	Describe the possible risks associated with the use of nano-scale particles of silver and titanium dioxide, and of potential future developments in nanoscience .			
	Describe the properties and uses of smart materials including thermochromic pigments, photochromic pigments, polymer gels, shape memory alloys and shape memory polymers.			
Topic 2.2 ACIDS, BASES AND SALTS	Demonstrate an understanding of substances as acidic, alkaline or neutral in terms of the pH scale, including acid/alkali strength			
	Apply knowledge of solutions of acids containing hydrogen ions and alkalis containing hydroxide ions			
	Apply knowledge of the reactions of dilute acids with metals and how these relate to the metals' position in the reactivity series			
	Describe the neutralisation of dilute acids with bases (including alkalis) and carbonates			
	HT: Explain neutralisation as the reaction of hydrogen ions with hydroxide ions to form water **$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$**			
	Describe the acid/carbonate reaction as a test for acidic substances and CO_3^{2-} ion			

	Have knowledge of the preparation of crystals of soluble salts, such as copper(II) sulfate, from insoluble bases and carbonates			
	Understand the names of the salts formed by hydrochloric acid, nitric acid and sulfuric acid			
	Describe the test used to identify SO_4^{2-} ions			
	Understand and apply knowledge of titration as a method to prepare solutions of soluble salts and to determine relative concentrations of solutions of acids/alkalis			
	HT: Describe the concentration of a solution in mol dm^{-3}			
	HT: Apply calculations involving neutralisation reactions in solution, using a balanced chemical equation			
	Explain the distinction between the description of acids as dilute or concentrated (amount of substance) and strong or weak (degree of ionisation)			
	Describe the similarities and differences in the reactions of strong and weak acids e.g. hydrochloric acid and ethanoic acid			
	Describe the process of the preparation of insoluble salts by precipitation reactions			
Topic 2.3 METALS AND THEIR EXTRACTION	Describe ores found in the Earth's crust as the source of most metals and that these metals can be extracted using chemical reactions			
	Understand some unreactive metals (e.g. gold) being found in their native form and that the difficulty involved in extracting metals increases as their reactivity increases			
	Describe the relative reactivities of metals as demonstrated by displacement (e.g. iron nail in copper(II) chloride solution) and competition reactions (e.g. thermit reaction)			
	Describe reduction and oxidation in terms of removal or gain of oxygen			
	Describe the industrial extraction of iron in the blast furnace, including the combustion, reduction, decomposition and neutralisation reactions			
	Describe electrolysis of molten ionic compounds e.g. lead(II) bromide (including electrode equations)			
	Explain reduction and oxidation in terms of gain or loss of electrons			
	Describe the industrial extraction of aluminium using electrolysis, including the use of cryolite to dissolve alumina			
	Describe and apply knowledge of the properties and uses of iron (steel), aluminium, copper and titanium			
	Describe the general properties of transition metals, including their ability to form ions with different charges			
	Apply knowledge of an alloy being a mixture made by mixing molten metals, whose properties can be modified by changing its composition			
	Describe factors affecting economic viability and sustainability of extraction processes e.g. siting of plants, fuel and energy costs, greenhouse emissions and recycling			
	Apply knowledge of electrolysis of molten ionic compounds e.g. lead(II) bromide (including electrode equations)			
	Explain the identification of Cu2+, Fe2+ and Fe3+ ions by their precipitation reactions with aqueous OH–			
	Apply knowledge of an alloy being a mixture made by mixing molten metals, whose properties can be modified by changing its composition			
	Understand the electrolysis of water (including electrode equations)			
	Apply knowledge of electrolysis of aqueous solutions such as copper(II) chloride (including electrode equations)			

	Describe factors affecting economic viability and sustainability of extraction processes e.g. siting of plants, fuel and energy costs, greenhouse emissions and recycling			
	HT : **Explain electrolysis of aqueous solutions involving competing ions such as sodium chloride (including electrode equations**			
	Describe the use of electrolysis in electroplating, **purification of copper and the manufacture of sodium hydroxide (and hydrogen gas and chlorine gas)**			
Topic 2.4 CHEMICAL REACTIONS AND ENERGY	Explain exothermic and endothermic reactions in terms of temperature change and energy transfer to or from the surroundings			
	Describe and apply knowledge of energy profiles for exothermic and endothermic reactions			
	Explain the activation energy as the energy needed for a reaction to occur			
	Explain the use of bond energy data to calculate overall energy change for a reaction and to identify whether it is exothermic or endothermic			
Topic 2.5 CRUDE OIL, FUELS AND ORGANIC CHEMISTRY	Describe crude oil as a complex mixture of hydrocarbons that was formed over millions of years from the remains of simple marine organisms			
	Describe the fractional distillation of crude oil			
	Apply knowledge of fractions as containing mixtures of hydrocarbons (alkanes) with similar boiling points			
	Apply knowledge of the trends in properties of fractions with increasing chain length and the effect on their usefulness as fuels			
	Apply knowledge of the global economic and political importance and social and environmental impact of the oil industry			
	Describe the combustion reactions of hydrocarbons and other fuels			
	Explain how to determine experimentally the energy per gram released by a burning fuel			
	Describe the combustion reaction of hydrogen and its use as an energy source including its advantages and disadvantages as a fuel			
	Apply knowledge of the fire triangle in fire-fighting and fire prevention			
	Describe the cracking of some fractions to produce smaller and more useful hydrocarbon molecules, including monomers (alkenes) which can be used to make plastics			
	Apply the general formula C_nH_{2n+2} for alkanes and C_nH_{2n} for alkenes			
	Understand and apply the names and molecular and structural formulae for simple alkanes and alkenes			
	HT Explain isomerism in more complex alkanes and alkenes			
	Describe the addition reactions of alkenes with hydrogen and bromine and the use of bromine water in testing for alkenes			
	Describe the addition polymerisation of ethene and other monomers to produce polythene, poly(propene), poly(vinylchloride) and poly(tetrafluoroethene)			

	Describe the general properties of plastics and the uses of polythene, poly(propene), poly(vinylchloride) and poly(tetrafluoroethene)			
	Apply knowledge of the environmental issues relating to the disposal of plastics, in terms of their non-biodegradability, increasing pressure on landfill for waste disposal, and how recycling addresses these issues as well as the need to carefully manage the use of finite natural resources such as crude oil			
	Explain how ethanol (an alcohol) is made from sugars by fermentation using yeast			
	Describe the use of potassium dichromate(VI) in testing for alcohols			
	Apply knowledge on the use of ethanol in alcoholic drinks and the social and economic impact of these drinks			
	Describe the uses of ethanol as a solvent and as a fuel and the social, economic and environmental factors that affect the development of bioethanol fuel			
	Apply knowledge of the names and molecular and structural formulae for alcohols, **including positional isomers**			
	Describe the microbial oxidation of ethanol to ethanoic acid (a carboxylic acid)			
	Apply knowledge of the use of infrared spectroscopy to identify the presence of certain bonds in organic molecules thereby indicating whether they may be alkanes, alkenes, alcohols or carboxylic acids			
Topic 2.6 REVERSIBLE REACTIONS, INDUSTRIAL PROCESSES AND IMPORTANT CHEMICALS	Explain what is meant by a reversible reaction			
	Describe the production of ammonia by the reversible reaction of nitrogen and ammonia in the Haber process			
	Explain the factors involved in choosing conditions to ensure the most economical production of ammonia (Le Chatelier's principle not required)			
	Describe the test used to identify ammonia gas			
	Describe the production of sulfuric acid by the contact process; a three-stage process including the reversible formation of sulfur trioxide			
	Apply knowledge of the broad range of uses of sulfuric acid, including in the production of fertilisers, paints, dyes, fibres, plastics and detergent			
	Describe concentrated sulfuric acid as a dehydrating agent in its reaction with sugar and hydrated copper(II) sulfate			
	Describe the production of nitrogenous fertilisers such as ammonium sulfate and ammonium nitrate by neutralisation of ammonia solution			
	Describe the identification of NH^{4+} ions by addition of aqueous OH			
	Explain the benefits of nitrogenous fertilisers for crop growth and the problems that arise when they are washed into waterways			