Curriculum Map Year 10 - Chemistry

Topic Name	Term	Content / skills developed with link to NC / exam board subject content (if applicable)	Reflection on previous learning	Progress to future learning	Global Citizenship links	Qatar National Identity links
Section 1: Principles of chemistry **(a) States of matter**	**1**	**1.1 understand the three states of matter in terms of the arrangement, movement, and energy of the particles** **1.2 understand the interconversions between the three states of matter in terms of:** ● **the names of the interconversions** ● **how they are achieved** ● **the changes in arrangement, movement, and energy of the particles** **1.3 understand how the results of experiments involving the dilution of coloured solutions and diffusion of gases can be explained.** **1.4 know what is meant by the terms:** ● **solvent** ● **solute** ● **solution** ● **saturated solution** **1.5C know what is meant by the term solubility in the units g per 100 g of solvent**	**KS3 states of matter: Solids, liquid, and gases** **KS3 Solutions and mixtures**	**Builds a foundation of understanding to be able to describe and explain physical and chemical properties of a range of substances**	**Independence and dedication**	○ **Sustainability: self-esteem and participation** ○ **Conscious thinking about my Future**

		1.6C understand how to plot and interpret solubility curves				
Section 1: Principles of chemistry **(b) Elements, compounds, and mixtures**		**1.14 know what is meant by the terms atom and molecule** **1.8 understand how to classify a substance as an element, a compound, or a mixture** **1.9 understand that a pure substance has a fixed melting and boiling point, but that a mixture may melt or boil over a range of temperatures** **1.10 describe these experimental techniques for the separation of mixtures:** ● **simple distillation** ● **fractional distillation** ● **filtration** **crystallisation.**	**KS3 Atoms, elements, compounds, and mixture**	**Builds a foundation of understanding to be able to describe and explain physical and chemical properties of a range of substances**	**Perseverance and engagement**	○ **Sustainability: self-esteem and participation** ○ **Conscious thinking about my Future**
Section 1: Principles of chemistry **(c) Atomic structure**		**1.17 be able to calculate the relative atomic mass of an element (A_r) from isotopic abundances.**		**Provides a platform to explain bonding and structure of different substances**	**Resilience**	
Section 1: Principles of chemistry **(f) Ionic bonding**		**1.37 understand how ions are formed by electron loss or gain** **1.38 know the charges of these ions:** ● **metals in Groups 1, 2 and 3**	**Links to Section 1c) atomic structure**	**Provides a platform to explain bonding and structure of different substances**	**Resilience**	○ **Sustainability: self-esteem and participation** ○ **Conscious thinking about my Future**

		• non-metals in Groups 5, 6 and 7 • Ag+, Cu2+, Fe2+, Fe3+, Pb2+, Zn2+ • hydrogen (H+), hydroxide (OH–), ammonium (NH4+), carbonate (CO32–), nitrate (NO3-), sulfate (SO42–) **1.39 write formulae for compounds formed between the ions listed above** **1.40 draw dot-and-cross diagrams to show the formation of ionic compounds by electron transfer, limited to combinations of elements from Groups 1, 2, 3 and 5, 6, 7** ***only outer electrons need be shown.*** **1.41 understand ionic bonding in terms of electrostatic attractions** **1.42 understand why compounds with giant ionic lattices have high melting and boiling points** **1.43 know that ionic compounds do not conduct electricity when solid but do conduct electricity when molten and in aqueous solution.**				
Section 1: Principles of chemistry		**1.44 know that a covalent bond is formed between atoms by the sharing of a pair of electrons**	**Links to Section 1c) atomic structure**	**Provides a platform to explain bonding and structure of**	**Perserverance**	○ **Sustainability: self-esteem and participation**

(g) Covalent bonding		**1.45 understand covalent bonds in terms of electrostatic attractions** **1.46 understand how to use dot-and-cross diagrams to represent covalent bonds in:** ● **diatomic molecules, including hydrogen, oxygen, nitrogen, halogens, and hydrogen halides** ● **inorganic molecules including water, ammonia, and carbon dioxide** ● **organic molecules containing up to two carbon atoms, including methane, ethane, ethene and those containing halogen atoms.** **1.47 explain why substances with simple molecular structures are gases or liquids, or solids with low melting and boiling points** ***the term intermolecular forces of attraction can be used to represent all forces between molecules*** **1.48 explain why the melting and boiling points of substances with simple molecular structures increase, in general, with increasing relative molecular mass**		**different substances**		○ **Conscious thinking about my Future**

		1.49 explain why substances with giant covalent structures are solids with high melting and boiling points **1.50 explain how the structures of diamond, graphite and C_{60} fullerene influence their physical properties, including electrical conductivity and hardness.**				
Section 2: Inorganic chemistry **(a) Group 1 (alkali metals)**		**1.25 write word equations and balanced chemical equations (including state symbols):** ● **for reactions studied in this specification** ● **for unfamiliar reactions where suitable information is provided** **2.1 understand how the similarities in the reactions of these elements with water provide evidence for their recognition as a family of elements** **2.2 understand how the differences between the reactions of these elements with air and water provide evidence for the trend in reactivity in Group 1** **2.3 use knowledge of trends in Group 1 to predict the properties of other alkali metals**	**KS3 periodic table**	**Intrinsic skill required across all aspects of IGCSE chemistry to supporting the understanding of a range chemical reactions.**	**Independance**	○ **Sustainability: responsibility**

		2.4C explain the trend in reactivity in Group 1 in terms of electronic configurations.				
Section 2: Inorganic chemistry **(b) Group 7 (halogens)**		**2.5 know the colours, physical states (at room temperature) and trends in physical properties of these elements** **2.6 use knowledge of trends in Group 7 to predict the properties of other halogens** **2.7 understand how displacement reactions involving halogens and halides provide evidence for the trend in reactivity in Group 7** **2.8C explain the trend in reactivity in Group 7 in terms of electronic configurations.**	**KS3 Periodic table**	**Builds a foundation of understanding to be able to describe and explain physical and chemical properties of a range of substances**	**Engagement**	○ **Conscious thinking about my Environment**
Section 2: Inorganic chemistry **(c) Gases in the atmosphere**		**2.9 know the approximate percentages by volume of the four most abundant gases in dry air** **2.10 understand how to determine the percentage by volume of oxygen in air using experiments involving the reactions of metals (e.g. iron) and non-metals (e.g. phosphorus) with air** **2.11 describe the combustion of elements in oxygen, including magnesium, hydrogen, and sulphur**	**KS3 types of chemical reactions: Burning and hazards**		**Dedication and engagement**	○ **Conscious thinking about my Environment**

		2.14 *practical: determine the approximate percentage by volume of oxygen in air using a metal or a non-metal.* **2.12 describe the formation of carbon dioxide from the thermal decomposition of metal carbonates, including copper (II) carbonate** **2.13 know that carbon dioxide is a greenhouse gas and that increasing amounts in the atmosphere may contribute to climate change.**				
Section 2: Inorganic chemistry **(d) Reactivity series**		**2.15 understand how metals can be arranged in a reactivity series based on their reactions with:** ● **water** ● **dilute hydrochloric or sulfuric acid** **2.16 understand how metals can be arranged in a reactivity series based on their displacement reactions between:** ● **metals and metal oxides** ● **metals and aqueous solutions of metal salts** **2.17 know the order of reactivity of these metals: potassium, sodium, lithium, calcium, magnesium, aluminium, zinc, iron, copper, silver, gold**	**KS3 reactions of metals and making salts**	**Builds a foundation of understanding to be able to describe and explain physical and chemical properties of metals**	**Resilience**	○ **Conscious thinking about my Environment**

		2.21 ***practical: investigate reactions between dilute hydrochloric and sulfuric acids and metals (e.g. magnesium, zinc, and iron).*** **2.18 know the conditions under which iron rusts** **2.19 understand how the rusting of iron may be prevented by:** ● **barrier methods** ● **galvanising** ● **sacrificial protection** **2.20 in terms of gain or loss of oxygen and loss or gain of electrons, understand the terms:** ● **oxidation** ● **reduction** ● **redox** ● **oxidising agent**				
Section 2: Inorganic chemistry **(e) Extraction and uses of metals**	**2**	**2.22C know that most metals are extracted from ores found in the Earth's crust and that unreactive metals are often found as the uncombined element** **2.23C explain how the method of extraction of a metal is related to its position in the reactivity series, illustrated by carbon extraction for iron and electrolysis for aluminium**	**New learning for KS4 links to atomic structure and periodic table**	**Makes links to the concept of redox which is revisited in Y11: Electrolysis**	**Resilience and perseverance**	○ **Conscious thinking about my Environment**

		2.24C be able to comment on a metal extraction process, given appropriate information ***detailed knowledge of the processes used in the extraction of a specific metal is not required.***				
Section 1: Principles of chemistry **(h) Metallic bonding** **Section 2: Inorganic chemistry** **(e) Extraction and uses of metals**		**1.52C know how to represent a metallic lattice by a 2-D diagram** **1.53C understand metallic bonding in terms of electrostatic attractions** **1.54C explain typical physical properties of metals, including electrical conductivity and malleability** **2.25C explain the uses of aluminium, copper, iron, and steel in terms of their properties** ***the types of steel will be limited to low-carbon (mild), high-carbon and stainless*** **2.26C know that an alloy is a mixture of a metal and one or more elements, usually other metals, or carbon** **2.27C explain why alloys are harder than pure metals.**	**New learning for KS4 – builds on KS3 understanding of metals and their physical properties**		**Resilience and perseverance**	○ **Conscious thinking about my Environment** ○ **Sustainability: responsibility**

Section 2: Inorganic chemistry **(f) Acids, alkalis, and titrations**		**2.28 describe the use of litmus, phenolphthalein, and methyl orange to distinguish between acidic and alkaline solutions** **2.29 understand how to use the pH scale, from 0–14, can be used to classify solutions as strongly acidic (0–3), weakly acidic (4–6), neutral (7), weakly alkaline (8–10) and strongly alkaline (11–14)** **2.30 describe the use of universal indicator to measure the approximate pH value of an aqueous solution** **2.31 know that acids in aqueous solution are a source of hydrogen ions and alkalis in aqueous solution are a source of hydroxide ions** **2.32 know that alkalis can neutralise acids** **2.33C describe how to carry out an acid-alkali titration**	**KS3 acids and alkalis**	**Supports understanding of practical techniques for making salts**	**Independence and dedication**	○ **Conscious thinking about my Environment**
Section 2: Inorganic chemistry **(g) Acids, bases, and salt preparations**		**2.34 know the general rules for predicting the solubility of ionic compounds in water:** ● **common sodium, potassium and ammonium compounds are soluble** ● **all nitrates are soluble**	**New concept for KS4 that builds on general chemical reactions of acids from KS3**	**Required to understand how to select a method for making a specific salt**	**Independence and perseverance**	○ **Conscious thinking about my Environment**

		• **common chlorides are soluble, except those of silver and lead (II)** • **common sulfates are soluble, except for those of barium, calcium, and lead (II)** • **common carbonates are insoluble, except for those of sodium, potassium, and ammonium** • **common hydroxides are insoluble except for those of sodium, potassium, and calcium (calcium hydroxide is slightly soluble)** **2.35 understand acids and bases in terms of proton transfer** **2.36 understand that an acid is a proton donor, and a base is a proton acceptor** **2.37 describe the reactions of hydrochloric acid, sulfuric acid and nitric acid with metals, bases, and metal carbonates (excluding the reactions between nitric acid and metals) to form salts** **2.38 know that metal oxides, metal hydroxides and ammonia can act as bases, and that alkalis are bases that are soluble in water** **2.39 describe an experiment to prepare a pure, dry sample of a**				

		soluble salt, starting from an insoluble reactant **2.40C describe an experiment to prepare a pure, dry sample of a soluble salt, starting from an acid and alkali** **2.42 *practical: prepare a sample of pure, dry hydrated copper (II) sulfate crystals starting from copper (II) oxide*** **2.41C describe an experiment to prepare a pure, dry sample of an insoluble salt, starting from two soluble reactants** **2.43C *practical: prepare a sample of pure, dry lead (II) sulfate.***				
Section 2: Inorganic chemistry **(h) Chemical tests**		**2.44 describe tests for these gases:** ● **hydrogen** ● **oxygen** ● **carbon dioxide** ● **ammonia** ● **chlorine** **2.45 describe how to carry out a flame test** **2.46 know the colours formed in flame tests for these cations:** ● **Li+ is red** ● **Na+ is yellow** ● **K+ is lilac**	**Expands gas test already learned from KS3**	**Fundamental concept that feeds through a variety of questions by using observations of chemical reactions to identify unknown substances**	**Engagement**	○ **Sustainability: self-esteem and participation** ○ **Conscious thinking about my Future**

		• **Ca2+ is orange red** • **Cu2+ is blue green** **2.47 describe tests for these cations:** • **NH_4^+ using sodium hydroxide solution and identifying the gas evolved** • **Cu^{2+}, Fe^{2+} and Fe^{3+} using sodium hydroxide solution** **2.48 describe tests for these anions:** • **Cl^-, Br^- and I^- using acidified silver nitrate solution** • **SO_4^{2-} using acidified barium chloride solution** • **CO_3^{2-} using hydrochloric acid and identifying the gas evolved** **2.49 describe a test for the presence of water using anhydrous copper (II) sulphate** **2.50 describe a physical test to show whether a sample of water is pure.**				
Section 1: Principles of chemistry **(e) Chemical formulae, equations, and calculations**	**3**	**Review the concept of a mole, Mr and RAM/RFM from Y9** **1.29 calculate reacting masses using experimental data and chemical equations**	**Makes use of KS3 understanding of information on the periodic table**	**Fundamental skills that can be incorporated into all areas of the syllabus**	**Resilience and perseverance**	○ **Sustainability: self-esteem and participation** ○ **Conscious thinking about my Future**

		1.30 calculate percentage yield **1.31 understand how the formulae of simple compounds can be obtained experimentally, including metal oxides, water and salts containing water of crystallisation.** **1.32 know what is meant by the term's empirical formula and molecular formula** **1.33 calculate empirical and molecular formulae from experimental data** **1.36 *practical: know how to determine the formula of a metal oxide by combustion (e.g. magnesium oxide) or by reduction (e.g. copper (II) oxide).*** **1.34C understand how to carry out calculations involving amount of substance, volume, and concentration (in mol/dm^3) of solution.** **1.35C understand how to carry out calculations involving gas volumes and the molar volume of a gas (24 dm^3 and 24 000 cm^3 at room temperature and pressure (rtp)).**				

Section 3: Physical chemistry **(a) Energetics**		**3.5C draw and explain energy level diagrams to represent exothermic and endothermic reactions** **3.6C know that bond-breaking is an endothermic process, and that bond-making is an exothermic process** **3.7C use bond energies to calculate the enthalpy change during a chemical reaction.** ***3.8 practical: investigate temperature changes accompanying some of the following types of change:*** • ***salts dissolving in water*** • ***neutralisation reactions*** • ***displacement reactions*** • ***Combustion reactions***	**KS3 chemical reactions**	**Provides an explanation as to why some chemical reactions happen spontaneously.**	**Resilience and engagement**	