AQA GCSE **– Chemistry** – Paper 1 Learning Pathway

Learning objectives for paper 1:

C1	Atomic Structure		Revised	Understood
C1.1	Atoms	Know the difference between an atom, element and compound		
C1.2	Chemical equations	Know and identify reactants and products when given an equation Write word and symbol equations when given reactants and products Balance symbol equations, including state symbols, and relate this to the law of the conservation of mass		
C1.3	Separating mixtures	Identify the states of matter of substances in mixtures Describe the correct method for separating the substances		
C1.4	Fractional distillation and paper chromatography	Explain how fractional distillation works Explain how paper chromatography works and be able to interpret results from a chromatogram		
C1.5	History of the atom	Understand and describe the different theories about the atom and the evidence that led to each theory Be able to predict what would happen in light of new evidence		
C1.6	Structure of the atom	Describe the structure of the atom, including the location, charge and mass of each subatomic particle Explain why atoms have no overall charge		
C1.7	Ions, atoms and Isotopes	Know how to work out the number of protons, neutrons and electrons in an ion Know how to estimate the size of atoms using SI units and the prefix "nano" Be able to explain what an isotope is		
C1.8	Electronic structure	Be able to draw electronic structures for atoms and ions using the Periodic Table for the first 20 elements		
C2	**The Periodic table**			
C2.1	Development of the periodic table	Know how the elements in the periodic table are arranged, key groups are and why they are grouped Understand and describe what Mendeleev and other scientists did to develop the periodic table		
C2.2	Electronic structures and the periodic table	Explain how the position of an element in the periodic table is related to the arrangement of its electrons Explain why the noble gases are so unreactive		
C2.3	Group 1 – the alkali metals	Be able to describe properties and reactions of elements in group 1		
C2.4	Group 7 – the halogens	Write word and symbol equations for halogen displacement reactions		
C2.5	Explaining trends	Be able to explain trends in properties of elements in group 1 and group 7		
C2.6	**TRIPLE ONLY** Transition elements	Know the properties of the transition elements Know how the transition elements compare with the alkali metals		

C3	**Structure and Bonding**			
C3.1	States of matter	Be able to draw particle diagrams for the three states of matter Interpret data to predict the state of matter of a material at given temperatures Discuss the limitations of the particle model		
C3.2	Atoms into ions	Know what a chemical compound is Know how elements form compounds Know how atoms can form positive or negative ions		

		Know how the elements in Gp1 bond with those in Gp7		
C3.3	Ionic bonding	Know how ionic compounds are held together Know which elements form ions Know how the charges on ions are related to group numbers in the periodic table.		
C3.4	Giant Ionic Structures	Explain why ionic compounds have a high melting point. Describe, in terms of ions, how an ionic compound can conduct electricity. Explain the movement of ions in solutions or when molten.		
C3.5	Covalent bonding	Explain how a covalent bond forms in terms of electronic structure. Draw dot and cross diagrams and ball and stick diagrams for H2, Cl2, O2, N2, HCl, H2O, NH3, and CH4. Describe a double bond in a diatomic molecule.		
C3.6	Structure of simple molecules	Explain how the size of molecules affects melting and boiling points Explain why small molecules and polymers do not conduct electricity. Identify substances that would have weak intermolecular forces.		
C3.7	Giant covalent structures	Recognise the structure of diamond and graphite from information provided in written or diagrammatic form. Explain the properties of diamond in terms of its bonding. Explain the properties of graphite in terms of its bonding.		
C3.8	Fullerenes and graphene	Recognise the structure of a fullerene or nanotube in diagrams and prose. Explain the structure of fullerenes List the properties and consequent uses of fullerenes and carbon nanotubes.		
C3.9	Bonding in metals	Describe metallic bonding. Recognise and represent metallic bonding diagrammatically.		
C3.10	Giant metallic structures	Explain key physical properties of metals using the model of metallic bonding. Describe why metals are alloyed.		
C3.11	**TRIPLE ONLY** Nanoparticles	Describe the size of nanoparticles. Explain why surface area to volume ratio increases as particle size decrease. Convert lengths into standard form.		
C3.12	**TRIPLE ONLY** Applications of nanoparticles	List the advantages and disadvantages of using nanoparticles. Explain why nanoparticles can have new applications.		
C4	Chemical Calculations			
C4.1	Relative masses and moles	Describe relative atomic mass Calculate relative atomic mass of an element		
C4.2	Equations and calculations (H)	Know what balanced symbol equations tell you about chemical reactions Use balanced symbol equations to calculate masses of reactants and products.		
C4.3	From masses to balanced equations (H)	Balance an equation, given the masses of reactants and products		
C4.4	**TRIPLE ONLY** Yield of a chemical reaction	Know what the yield of a chemical reaction is and what factors can affect it. Calculate the theoretical yield of a reaction. Calculate the % yield of a chemical reaction.		
C4.5	**TRIPLE ONLY** Atom economy	Calculate the atom economy of a reaction to form a desired product from the balanced equation. Know why atom economy is important in industrial processes		
C4.6	Expressing concentrations	Know how to express the concentrations of solutions. Know how the mass of a solute and the volume of a solution is related to the concentration of the solution.		
C4.7	**TRIPLE ONLY** Titrations	Know how to accurately measure the amount of acid and alkali that react together completely. Know how to determine when the reaction is complete.		
C4.8	**TRIPLE ONLY** Titration calculations (H)	Know how to calc. the number of moles or the mass of solute in a given volume of solution of known concentration. Calc. the amount of acid or alkali needed in a neutralisation reaction. Calc. an unknown concentration from reacting volumes of two solutions, where one concentration is known.		
C4.9	**TRIPLE ONLY** Volumes of gases (H)	Calc. the volume of a gas at room temp and pressure from its mass and relative formula mass. Calc. volumes of gaseous reactants and products from a balanced equation and a given volume of a gaseous reactant or product.		
C5	**Chemical Changes**			

C5.1	The Reactivity Series	Be able to write word and symbol equations for the reaction between a metal and an acid Predict the reactions of unfamiliar metals given information about their reactivity Explain oxidation and reduction in terms of loss or gain of oxygen		
C5.2	Displacement reactions	Know the position of carbon and hydrogen in the reactivity series and how to predict displacement reactions		
C5.3	Extracting metals	Evaluate extraction methods for different metals Identify species which are oxidised or reduced in terms of gain or loss of oxygen		
C5.4	Salts from metals	Write word equations for the reaction of metals with hydrochloric and sulphuric acids Understand why these reactions are classed as redox reactions Suggest a method to make a sample of salt crystals from metals and acids		
C5.5	Salts from insoluble bases	Write word equations for the reaction between an acid and a base Suggest a method to make a sample of salt crystals from metal oxides and acids Use the formulae of common ions to deduce the formulae of salts		
C5.6	Making more salts	Write word equations for the reaction of acids and alkalis Write word equations for the reaction of acids and carbonates Suggest a method to make a sample of salt crystals from acids and alkalis Suggest a method to make a sample of salt crystals from acids and carbonates		
C5.7	Neutralisation and the pH scale	Know the method for carrying out a titration and what it can tell us		
C5.8	Strong and Weak Acids (H)	Know how to use the terms “strong” and “concentrated” and recognise that these words do not mean the same Link the concentration of hydrogen ions to pH		
C6	**Electrolysis**			
C6.1	Introduction to electrolysis	Be able to describe what happens in electrolysis Identify products of electrolysis of different compounds Explain why compounds must be molten or in solution to be electrolysed		
C6.2	Changes at the electrodes	Explain what happens to each ion in a given electrolyte during electrolysis Explain how water affects electrolysis Write half equations for the reactions at each electrode for a given electrolyte		
C6.3	The extraction of aluminium	Explain why aluminium cannot be extracted from its ore using reduction with Carbon Describe the process of extracting aluminium from its ore Write half equations for the reaction at each electrode during electrolysis of aluminium oxide (H)		
C6.4	Electrolysis of aqueous solutions	Predict the products of electrolysis of an aqueous solution Plan an investigation to identify products of electrolysis of different aqueous solutions Write half equations for the reaction at each electrode during electrolysis of different solutions (H)		
C7	Energy Changes			
C7.1	Exothermic and Endothermic reactions	Appreciate that energy cannot be created or destroyed in a reaction Discuss energy transfer to and from the surroundings for exothermic and endothermic reactions Plan an investigation into exothermic and endothermic reactions		
C7.2	Using energy transfers from reactions	Evaluate the uses of exothermic and endothermic reactions, including some common applications		
C7.3	Reaction profiles	Draw and label simple reaction profiles for exothermic and endothermic reactions Use reaction profiles to describe whether a reaction is exothermic or endothermic Define activation energy Describe how bond making and bond breaking can affect the overall enthalpy change in a reaction (H)		
C7.4	Bond enthalpy calculations (H)	Calculate the energy changes when bonds are broken and made (H)		
C7.5	**TRIPLE ONLY** Chemical Cells and Batteries	Explain how potential difference can be changed in a cell. Interpret data from an electrochemical cell to determine the reactivity of the metals involved. Explain why non-rechargeable batteries stop working.		
C7.6	**TRIPLE ONLY**	Explain how a hydrogen fuel cell produces electricity.		

	Fuel cells	List the advantages and disadvantages of hydrogen fuel cells. Explain why hydrogen fuel cells are an alternative to rechargeable cells and batteries.		

Topic:	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**
Recall score (%) :							
Test score (%):							