Year 12 Chemistry 9

Term	1	2	3	4	5	6
Topic Title	Module 2 Foundations in Chemistry		Module 3 Perioidic Table and Energy (Teacher 1): Module 4 Core Organic Chemistry (Teacher 2)			Revision for examination: Module 5 Physical Chemistry and the Transition elements
Rationale	Atoms, ions and compounds looks at some of the essential language of chemistry. It consolidates learning about atomic masses, formulae and equations. Amount of subsatnce and the mole provides knowledge and skills to convert betweem mass, concnetration and volume to predict how much product is made in a chemical reaction. Acids and redox is centrally connected to calculations and analysis of solutions via titrations, which is a technique which is the basis of quality testing in chemistry, Electrons and bonding look at the role of electrons in atoms and in chemical bonding, which is an essential foundation in future topics. Shapes of molecules and intermolecular forces is all about the molecule. How electrons determine shape and polarity in molecules and how intermolecular forces explain many properties of molecular compounds.		Periodic table looks at physical trends and extends understanding of structure and bonding. Reactivity trends looks at group properties usign Group 2 as a typical metals group and Group 7 as a non-metal group. Enthalpy focuses energy changes and their determination from data provided. Reaction rates and equilibrium focuses on rates and positions of equilibrium,	Organic chemistry is the study of carbon based compounds. This module introduces the various types of formula and structures used in organic chemistry. Students must have a prior knowledge of some organic systems from KS4 and the extraction methods for these species. Students must also have already completed the Foundations of Chemistry module - skils in drawing structures and and understanding of structural properties,spectroscopy and formulae are required to study this module		This is further development and extension of many topics studied earlier in the course. The study of chemical equilibrium and reaction rates enables the students to use a more quantitative approach of temperature, pressure, and concentration on reactions including the control of industrial processes. The students will learn how an understanding of reaction rates enables predictions of mechansims covered in the previous term.
Prior knowledge	Recall relative charges.Calculate protons, neutrons and electrons given atomic and mass numbers. Write formulae and balanced equations. Calculate relative formula masses of species separately and in a balanced equation. Use a balanced equation to calculate masses of reactants or products. Recall that acids react with some metals and with carbonates and write equations of these reactions. Describe neutralisation as an acid reacting with an alkali to form a salt amd water. Explain reduction and oxidation in terms of gain and loss of electrons, identifying which species is oxidised and wjhich is reduced. Construct dot and cross diagrams for simple ionic and covalent substances and predict their properties.		Use of oxidation numbers and identify redox reactions. Prior knowledge of structure, properties and intermolecular forces in systems. Factor affecting rate and position of equilibrium from KS4. Simple energetic terms and calculations from KS4. Explain simple properties of Group 1,7 and 0. Distinguish between exothemric and endothermic reactions and calculate energhy changes. Interpret reaction rate graphs.	Recall that crude oil is a main source of hydrocarbons and is a feedstock to the petrochemical industry. Modern life is dependent of finite resources such as crude oil. Describe how to separate alkanes via fractional distillation. Describe the production of more useful products by cracking.		Calculate reactio rates from measurement of gradients. Know how to investifgate reaction rates by gas collection of mass loss over time. Write expressions for Kc and calculate Kc for equilibrium reactions. Apply Le Chateliers principle for changes in temperature, pressure and concentration.
Key knowledge/skills development	1. Atoms ions and compounds. 2. Amount of Substance. 3. Acids and Redox 4. Electrons and Bonding. 5. Shapes of molecules and Intermolecular forces. Development of mathematical skills in methodology / problem solving strategies. Shape determination: PAG 1 Moles determination: PAG 2 Acid- Base Titration		1. The perioidic table, 2, Recativity trends, 3. Enthalpy 4. Equlibrium and reaction rates. PAG3 Enthalpy determination PAG4 Qualitative determination of ions	1. Basic concepts of organic chemistry 2. Alkanes 3. Alkenes 4. Alcohols 5. Halogenoalkanes 6. Organic synthesis 7. Spectroscopy PAG5 Synthesis of an Organic liquid		1. Rates of reaction 2. Equilibrium PAG 9 Rates of reaction - continuous monitoring method PAG10 Rates of reaction - initial rates method
National Curriculum/specification links	PAG 1: 2.1.3d; 2.1.3h, PAG 2: 2.14d	Module 2: 2.1.1-2.1.4, 2.2.1, 2.2.2	PAG3: 3.2.1e, PAG4: 3.1.4a, 5.3.2a Module 3: 3.1.1 - 3.1.3. 3.2.1 - 3.2.3	PAG 5 4.2.3a Module 4: 4.1.1-4.1.3; 4.2.1-4.2.4		5.1.1/5.1.2
Literacy	Literacy task: Silly Putty	Research task on intermolecular forces	Research Fritz Haber, World War one and the Haber process	Molecular orbital theory research task		Research and produce biography of Henri - Louis Le Chatelier
Numeracy	Amount of substance module is numeracy	Molar calculations and application	Energetic calculations and reaction rate calculations	Yield calculations		Rate calculations and Kc
STEM	PAG 1 and 2	PAG 1 and 2	PAG 3	PAG 5	PAG 4	PAG 9 and PAG10
Cross curricular links	Mathematical skills: Working with standard form and significant figures and using appropriate units. Changing the subject of and equation Y9 T2. Using ratios, fractions and percentages for molar calculations. Y9T4,5 Finding arithmetic means for calculating weighted means for atomic masses and titrations Y9 T4. Using angles and shapes in regular 2D and 3D structures. Y9 T3		Mathematical skills: Changing the subject of and equation Y9 T2. Substituting number into algebraic equations and solving Y9 T2. Plotting variable from sets of data and drawing gradients and tangents to curves to measure rate Y10 T1,2,4. History - Extraction of chemicals (Y8 T2, Y10 T4. Haber process - Y9 T1/2 Geography - rocks and ores. Technology Y8 T4	Using Angles and shapes in regular 2D and 3D structures. Translating information between graphical, numerical and algebraic forms. Visualising and representeuing 2D and 3D forms including 2D representations of 3D objects. Understand symmetry of 2D and 3D shapes Y9 T3, Y10 T6 Geography - climate change. Y9 T4/5, Y11 T1/3: Atmosphere Y8 T3,4		Changing the subject of, substituting numbers into, and solving algebraic equations Y9 T2. Plotting variables from experimental data. Drawing and using the gradient of a tangent to a curve as a measure of rate of reaction Y10 T4. Finding logarithms amd their inverse.Y10: T1,2,4 Finding arithmetic means. Using Angles and shapes in regular 2D and 3D structures. Visualising and representeuing 2D and 3D forms including 2D representations of 3D objects. Understand symmetry of 2D and 3D shapes Y9 T3, Y10 T6
Key vocabulary	Atom, isotope, atomic number, mass number, relative atomic and isotopic mass, mass spectrometer, simple ion, polyatomic ion, molar mass, avogadro constant, relative formula mass, hydrated, anhydrous, moles, standard solution, molar gas volume, ideal gas, stoichiometry, percentage yield, atom economy, limiting reagent, strong and weak acid, base, alkali, neutralisation, titration, standard solution, redox, oxidation, reduction, oxidation number, shell, orbital, sub-shell, electron configuration, ionic bonding, covalent bonding, bond enthalpy, lone pair, repulsion, electron pair, bond angle, electronegativity, polar, non-polar, intermolecular force, London force, Van der waals force, Hydrogen Bond, Perment dipole-dipole interaction		Redox, oxidation, reduction, acid, alkali, pH, neutralisation, titration, weak acid, strong acid, dilute, concentrated, Le Chatelier principle, dynamic equilibrium, equilibrium constant,	Homologous series, alkanes, functional group,hydrocarbon, aliphatic, alicyclic, aromatic, alkyl group, alkene, Molecular formula, Empirical formula, General formula, structural isomer,nucleophile, electrophile, radical, addition, substitution, fractional distillation, combustion, saturated, unsaturated, polymerisation, alcohol, oxidation, halogenoalkane, mechanism		Order of reaction, rate of reaction, rate equation, rate constant, half life, rate determining step, reaction mechanism, equilibrium constant, partial pressure, mole fraction,
Catch up Plan / Closing the gaps	No content missed – new topics start of new course How are you identifying gaps in your subject? Retrieval starters; SENECA; Students completed pre A Level booklets as part of preparation for Year 12 We review learning from previous topics as much as possible and refer to Y7 materials. Most of these topics are re-taught in Y9/10 at a higher standard, but will include basic information now as well, from Y7 & 8. How are you and your team capturing evidence so that you as HOF can be confident we are aware of all pupils gaps? Faculty Tracker (detailed) SENECA – topic specific assessments , Q&A sessions, Starters, H/W					

Why are you deliverin

What have pupils alre

What other curriculum areas/skills does the topic link with? When are these taught?

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Topic Title	Module 5 Physical Chemistry and the Transition elements (Teacher 1) : Module 6 Organic Chemistry and analysis (Teacher 2)		Module 5 Physical Chemistry and the Transition elements (Teacher 1) : Module 6 Organic Chemistry and analysis (Teacher 2)		Revision for examination	
Rationale	Acids and bases and pH are important in many biological and chemcial processes, such as the role of buffers in maintaining blood pH. Students will cover this work after gaining an understanding of equilibrium calculations and use of equilibrium equations. The study of enthalpic quantities and entropy require an understanding of Year 12 calculations, such as using Hess Law and Cycles.	This module builds on knowledge and understanding gained during the first year of study in organic chemistry.It considers the physical and chemical properties of molecules with more complex functional groups and how they can linked synthetically. They will also learn about more advanced spectroscopic techniques used for structural analysis.	Study of redox potentials requires knowledge and understanding of redox reactions and formation of electrolytic cells (KS4) and half equations. It is required that there is knowledge of perfroming titrations and applying relevant analytical techniques.Studying the transition metals requires an understanding of constructing ionic formulae, structures of 3D ions, electton transtions and reoc theory. Students study the colours, shapes and reactions the transition metals undergo and the types of isomeriem transition metal complex ions exhibit.	This module builds on knowledge and understanding gained during the first year of study in organic chemistry.It considers the physical and chemical properties of molecules with more complex functional groups and how they can linked synthetically. They will also learn about more advanced spectroscopic techniques used for structural analysis.	After completion of the course - focused revision lessons as exmainations approach	
Prior knowledge	Writing neutralisation equations of acids with bases. Have knowledge of the key reactions and concepts which govern how acid and bases react. Calculate enthalpy changes from formation and combustion using Hess Cycles.	Prior knowledge of key functional groups and their chemical reactions is required. Students should be able to use IUPAC rules for organic compunds. Interpret and use general, structural, displayed and skeletal formulae. Recognise alkanes, alkenes, alcohols, halogenoalkanes, aldehydes, ketones and carboxylic acids. Understand the terms electrophile, nucleophile, addition, substitution, and elimination. Use curly arrows to write mechanisms for electrophilic substitution and nuclephilic addition. Describe the oxidation of primary secondary and tertiary alcohols.	Use of oxidation numbers and identify redox reactions with descriptions in terms of electrons and oxidation numbers. Recognise tetrahedral and octahedral complexes. Know how to prepare a standard solution, to carry out a titration and solve calculations. Identify anions and ammonium ions by qualitative analysis.	Prior knowledge of key functional groups and their chemical reactions is required. Students should be able to use IUPAC rules for organic compunds. Interpret and use general, structural, displayed and skeletal formulae. Recognise alkanes, alkenes, alcohols, halogenoalkanes, aldehydes, ketones and carboxylic acids. Understand the terms electrophile, nucleophile, addition, substitution, and elimination. Use curly arrows to write mechanisms for electrophilic subsitution and nuclephilic addition. Describe the oxidation of primary secondary and tertiary alcohols.	Review of course completed	
Key knowledge/skills development	1. Acids, Bases and pH a) Bronsted Lowry Aciids and Bases b) pH Scale c) Acid Dissociation constant d) pH of weak acids e) pH and strong bases f) 2. Buffers and neutralisation 3. Enthalpy and entropy. PAG 11 pH Measurement	1. Aromatic Compounds a) Introducing Benzene b) Electrophilic Substitution c) The chemistry of Phenol d) Directing Groups 2. Carbonyls and Carboxylic acids a) Carbonyl Compounds b) Identifying Aldehydes and Ketones c) Carboxylic Acids d) Carboxylic Acids and Derivatives PAG 6 Synthesis of an organic solid PAG7 Qualitative analysis of organic functional groups.	1. Redox and electrode potentials a) Redox reactions b) Redox titrations c) Electrode potentials d) Predictions from electrode potentials e) Storage and fuel cells 2. Transition elements a) oxidation states b) Colour c) Complex ions d) Stereoisomerism in complex ions e) Ligand substitution f) Redox and qualitative analysis PAG 12 Research Skills. PAG 8 Eelctrochemical cells	1.) Amines, amino acids and polymers a) Amines b) Amino acids, amides and polymers c) Condensation Polymers 2. Organic synthesis a) Carbo-Carbon bond formation b) Further Practical techniques c) Further synthetic routes 5. Chromatography and spectroscopy a) Chromatography and functional group analysis b) Nuclear magnetic resonance spectroscopy c) Carbon-13 NMR spectroscopy d) Proton NMR Spectroscopy e) Interpreting NMR spectra f) Combined techniques PAG 12 research Skills	n/a	
National Curriculum/specification links	PAG 11 5.1.3o ; 5.1.3, 5.2.1, 5.2.2	PAG 6 6.2.5a, 6.3.1a; PAG7 6.3.1a; 6.1.1 and 6.1.2	PAG 8 5.2.3g; 5.2.3, 5.3.1	6.2.1 - 6.2.3, 6.3.1 and 6.3.2	N/A	
Literacy	The contributions of Carlsberg and Arhennius to acids	The manufacture of phenol P.442	Create a written document based on research og Lithium ion and lithium ion polymer cells / Hydrogen cells	Pharmocology and optical isomerism - research and construct a written account of how stereospecificity is used in development of drugs and medecines.		
Numeracy	Graphical analysis and calculations in kinetics, pH calculations, buffer analysis	Calculating atom economies and yields	Redox titration calculations and electrode potentials	Structural determination when applying combined techniques		
STEM	PAG 6, 8	PAG 11	PAG 7	PAG 12		
What other curriculum areas/skills does the topic link with? When are these taught? Cross curricular links	Changing the subject of, substituting numbers into, and solving algebraic equations Y9 T2. Plotting variables from experimental data. Drawing and using the gradient of a tangent to a curve as a measure of rate of reaction Y10 T4. Finding logarithms amd their inverse.Y10: T1,2,4 Finding arithmetic means. Using Angles and shapes in regular 2D and 3D structures. Visualising and representing 2D and 3D forms including 2D representations of 3D objects. Understand symmetry of 2D and 3D shapes Y9 T3, Y10 T6 Blood - Biology A Level	Working with standard form, significant figure and appropriate units Y10 T2,5. Changing the subject of an equation Y9 T2. Using ratios, fractions and percentages Y9 T5. Using Angles and shapes in regular 2D and 3D structures. Visualising and representing 2D and 3D forms including 2D representations of 3D objects. Understand symmetry of 2D and 3D shapes Y9 T3, Y10 T6 Translating inofrmation between graphical, numerical and algebraic forms. Y10 T4	Changing the subject of, substituting numbers into, and solving algebraic equations Y9 T2. Plotting variables from experimental data. Drawing and using the gradient of a tangent to a curve as a measure of rate of reaction Y10 T4. Finding logarithms amd their inverse.Y10: T1,2,4 Finding arithmetic means. Using Angles and shapes in regular 2D and 3D structures. Visualising and representeuing 2D and 3D forms including 2D representations of 3D objects. Understand symmetry of 2D and 3D shapes Y9 T3, Y10 T6.	Working with standard form, significant figure and appropriate units Y10 T2,5. Changing the subject of an equation Y9 T2. Using ratios, fractions and percentages Y9 T5. Using Angles and shapes in regular 2D and 3D structures. Visualising and representing 2D and 3D forms including 2D representations of 3D objects. Understand symmetry of 2D and 3D shapes Y9 T3, Y10 T6 Translating inofrmation between graphical, numerical and algebraic forms. Y10 T4	n/a	
Key vocabulary	Acid. Base, hydronium ion, mono di or tribasic acid, pH scale, strong acid or base, weak acid or base, equilibrium constant, ionic product of water, buffer, neutralisation, blood buffer, titration curve, lattice enthalpy, Born-Haber cycle, electron affinity, enthalpy of solution, hydration, entropy, free energy	Benzene, aromatic, electrophilic substitution, halogenation, alkylation, acylation, phenol, directing group, aldehyde, ketone, carboxylic acid, acyl chloride, acid anhydride, carbonyl group, carboxyl group, nucleophiloc addition, neutralisation, esterification, hydrolysis	Redox, oxidation, reduction, redox titration, electrode potentials, fuel cells, storage cells, d-block elements, catalysts, complex ions, coordinate bonds, ligands, stereoisomer, ligand substitution, precipitation, qualitative.	Amine, amide, amino acid, base, zwitterion, optical isomerism, chiral, polyester, polyamide, hydrolysis, chromatography, mobile phase, stationary phase, retention time, NMR, chemical shift, TMS, deuterate, spin-spin coupling, n+1 rule, proton exchange,	n/a	
Catch up Plan / Closing the gaps	No content missed – new topics start of new course Year 13: Year 12 content had been completed and preparation was being made for end of year exams - catch up need for required practicals. Students returned to school and covered the first two topics of the Year 13 course at the end of the school year. Practicals resumed and PAGS missed to be completed and reviewed once course content complete How are you identifying gaps in your subject? Retrieval starters; SENECA; Students completed pre A Level booklets as part of preparation for Year 12 We review learning from previous topics as much as possible and refer to Y7 materials. Most of these topics are re-taught in Y9/10 at a higher standard, but will include basic information now as well, from Y7 & 8. How are you and your team capturing evidence so that you as HOF can be confident we are aware of all pupils gaps? Faculty Tracker (detailed) SENECA – topic specific assessments , Q&A sessions, Starters, H/W						

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