Curriculum Map

Sandringham School
'Everybody can be Somebody'

Subject: CHEMISTRY syllabus lesson split 3:2 **Year group:KS5**

Time period	yr1 Autumn	yr1 spring	yr1 summer	yr2 autumn	yr2 spring	yr2 summer
Content *Declarative Knowledge – 'Know What'*	**3.1.2 AMOUNT OF SUBSTANCE** RAM/RFM the mole ideal gas eq EF/MF equations titration calcs **3.1.4 ENERGETICS** Enthalpy change calorimetry application of hess's law bond enthalpies **3.1 1 ATOMIC STRUCTURE** Fund.parts mass nos and isotopes-TOF electron config **3.1.3 BONDING** ionic/covalent/metallic bonding and properties shapes of molecules/ions bond polarity intermolecular forces **3.2 1 PERIODICITY** period 3 elements **3.1.7 REDOX** oxidation states half equations **3.2.2 GROUP 2** trends reactions solubilities	**3.1.8 THERMODYNAMICS** born -haber cycle Gibbs free energy **3.3.1 INTRO TO ORGANIC CHEM.** nomenclature reaction mech isomerism **3.3.2 ALKANES** fract. distillation cracking combustion chlorination **3.3.4 ALKENES** structure, bonding ,reactivity addition reactions addition polymerisation **3.3.3 HALOGENOALKANES** nuc, subst elimination ozone depletion **3.3.5 ALCOHOLS** production oxidation elimination **3.2.3 THE HALOGENS** trends action as red and ox agents	**3.1.5 KINETICS** collision theory maxwell boltzman effect of temp /conc Pressure on rate catalysts **3.3.6 ORGANIC ANALYSIS** id of funct.groups mass spec IR **3.3.7 ISOMERISM OPTICAL** Concept of chirality, polarimeter and racemates **3.3.8 ALDEHYDES AND KETONES** naming them nuc addition reactions-HCN distinguishing aldehydes and ketones-tollens and fehlings tests oxidation of carbonyls reduction of carbonyls **3.3.9 CARBOXYLIC ACIDS AND DERIVATIVES** naming ester formation and hydroylsis uses of esters-biodiesel acylation reactions-acyllchlorides and acid	**3.1.6 CHEMICAL EQUILIBRIA** le Chats principal Kc **3.1.10 Kp EQUILIB CONST** describing equilibrium constant in terms of partial pressures **3.1.9. RATE EQUATIONS** rate expression and orders the rate equation rate determining step **3.1.11 ELECTROCHEMISTRY** redox reactions to generate voltage the electrochemical series **3.3.11 AMINES** preparation-red of nitriles phenyl amine amides **3.3.16 CHROMATOGRAPHY** TLC/column /gas calculating Rf values **3.3.12 POLYMERS** condensation polyamides/esters repeating units mpts related to IMF **3.3.13 AMINO ACIDS PROTEINS AND DNA**	**3.1.11 ELECTROCHEM** -cont predicting reaction feasibility using EMF batteries incl lead -acid Hydrogen cell **3.1.12 ACID -BASE EQUILIBRIA** B-L definitions conj acid base pairs pH SCALE calculations to obtain pH of strong acids, strong bases and weak acids Titration curves indicator theory Buffers definitions and calcs **3.2.5 TRANSITION METALS** definition of ™ characteristics complex ions coloured compounds variable ox state catalytic activity	**3.2.4 P3 AND THEIR OXIDES** reactions of p3 elements oxides of p3 elements acid base nature of P3 elements **3.2.6 REACTIONS OF IONS IN AQ SOLUTIONS** Reactions of aq ions with alkali, carbonate and ammonia- -ligand substitution reactions

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		uses of chlorine and chlorate identification of halides	anhydrides reacting with nucleophiles(amines, ammonia hydroxide water)	zwitter ions formation of polypeptides enzymes structure of DNA action of anti-cancer drugs 3.3.10 AROMATIC structure and stability of benzene ring electrophilic substitution reactions-nitration and acylation 3.3.14 ORGANIC SYNTHESIS using prior reactions to create synthetic routes 3.3.15 NMR Carbon 13 and H NMR interpretation of spectra		
Skills *Procedural Knowledge – 'Know How'*	3.1 1 ATOMIC STRUCTURE -Report calculations to an appropriate number of significant figures, given raw data quoted to varying numbers of significant figures. -Calculate weighted means e.g. calculation of an atomic mass based on supplied isotopic abundances.	3.1.8 THERMODYNAMICS -be able to perform calculations of an enthalpy change using these Born-Haber cycles. -Rearrange the equation $\Delta G = \Delta H - T\Delta S$ to find unknown values. -Determine ΔS and ΔH from a graph of ΔG versus T.	3.1.5 KINETICS --be able to use collision theory to describe how T,C,P and SA affect reaction rate define activation energy and draw energy level diagrams which incl Ea --know how to draw M-B distribution curve and use it to explain effect of T on rate	3.1.6 CHEMICAL EQUILIBRIA -Estimate the effect of changing experimental parameters on a measurable value eg how the value of Kc would change with temperature, given different specified conditions. -Report calculations to an appropriate number of significant figures, given raw	3.1.11 ELECTROCHEM -cont -to understand the role of the SHE -predict reactions using EMF/electrochemical series -understand how a electrochemical cells work-Zn/Cu, Zn/C	3.2.4 P3 AND THEIR OXIDES -to recall the trends in acid base nature of the oxides -to carry out experiments to support learning to understand amphoteric

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	-Interpret and analyse spectra. -Carry out calculations using numbers in standard and ordinary form e.g. using the Avogadro constant. -Carry out calculations using the Avogadro constant. **3.1.2 AMOUNT OF SUBSTANCE RAM/RFM** -Report calculations to an appropriate number of significant figures, given raw data quoted to varying numbers of significant figures. -Understand that calculated results can only be reported to the limits of the least accurate measurement. -Carry out calculations using numbers in standard and ordinary form e.g. using the Avogadro constant. -Carry out calculations using the Avogadro constant. -Find the Mr of a volatile liquid. -Understand that the correct units need to be in pV = nRT. -Carry out calculations with the ideal gas equation, including rearranging the ideal gas equation to find unknown quantities. -Find the empirical formula of a metal oxide. -Find the concentration of ethanoic acid in vinegar -Find the mass of calcium carbonate in an indigestion tablet -Find the Mr of $MHCO_3$ -Find the Mr of succinic acid -Find the mass of aspirin in an aspirin tablet	-Calculate entropy changes from absolute entropy value -Use the relationship $\Delta G = \Delta H - T\Delta S$ to determine how ΔG varies with temperature. -Use the relationship $\Delta G = \Delta H - T\Delta S$ to determine the temperature at which a reaction becomes feasible. **3.3.1 INTRO TO ORGANIC CHEM.** -Draw further isomers from a given structure of one isomer. -Identify isomers from various representations -Understand the origin of E–Z isomerism. -Draw different forms of isomers. **3.3.2 ALKANES** -Fractional distillation of a crude oil substitute. **3.3.3 HALOALKANES** -Follow instructions when carrying out test-tube hydrolysis of halogenoalkanes to show their relative rates of reaction. -Prepare a chloroalkane, purifying the product using a separating funnel and distillation. -Investigate the role of chemists in the introduction of legislation	- Know how catalysts work, examples and how to use reaction profiles for catalysed reactions. **3.3.6 ORGANIC ANALYSIS** -Carry out test-tube reactions in the specification to distinguish alcohols, aldehydes, alkenes and carboxylic acids. -Use precise atomic masses and the precise molecular mass to determine the molecular formula of a compound. -Use data in the Chemistry Data Sheet or Booklet to suggest possible structures for molecules. -Use infrared spectra and the Chemistry Data Sheet or Booklet to identify particular bonds, and therefore functional groups, and also to identify impurities. **3.3.7 ISOMERISM OPTICAL** -To recognise the presence of a chiral centre in a given structure in 2D or 3D forms. -To draw the 3D representation of chiral centres in various species. -draw the structural formulas and displayed formulas of enantiomers. -Passing polarised light through a solution of sucrose.	data quoted to varying numbers of significant figures. -Understand that calculated results can only be reported to the limits of the least accurate measurement. -Calculate the concentration of a reagent at equilibrium. -Calculate the value of an equilibrium constant Kc -Determine the equilibrium constant, Kc, for the reaction of ethanol with ethanoic acid in the presence of a strong acid catalyst to ethyl ethanoate. **3.1.10 Kp EQUILIB CONST** -be able to calc Kp from partial pressures -be able to calc partial pressues **3.1.9. RATE EQUATIONS** -know how to devise a rate expression -know how to calculate order of reaction from initial rate data -know how to determine rate const -know how to interpret graphs showing orders of reaction -know how to understand the mech of a reaction given rate data **3.1.11 ELECTROCHEMISTRY** -know what a half cell is and connect these together to create voltage	know electrode eqs for-Lead acid battery -give examples of prtable batteries -describe the hydrogen-oxygen fuel cell **3.1.12 ACID -BASE EQUILIBRIA** -understand and use log10 in pH calcs -do students know how to -Carry out pH CALCS for strong acids -calculate conc to pH and vice versa -state pH to 2 dp -understand standard form as applied to Kw -Calc Ph of strong base -Calc pH of WA by measuring pH at half neutralisation -plot pH curves -prepare and test a buffer soln **3.2.5 TRANSITION METALS** -carry out test tube reactions of complexes with variety of ligands to compare substitution rates -Carry out test tube reactions of metal aqa ions with ammonia or conc hydrochloric. -understand and draw shapes of complex ions -understand the origin of cis trans isomerism in sq planar complexes -draw cis trans complexes	nature of Al oxide **3.2.6 REACTIONS OF IONS IN AQ SOLUTIONS** -define lewis acids and bases -be able to write equations that represent ligand substitution reactions -carry out relevant test tube reactions

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	-Find the yield for the conversion of magnesium to magnesium oxide -Find the Mr of a hydrated salt (eg magnesium sulfate) by heating to constant mass. -Find the percentage conversion of a Group 2 carbonate to its oxide by heat. -Determine the number of moles of water of crystallisation in a hydrated salt by titration. -Construct and/or balance equations using ratios. -Calculate percentage yields and atom economies of reactions. -Select appropriate titration data (ie identify outliers) in order to calculate mean titres. -Determine uncertainty when two burette readings are used to calculate a titre value. 3.1.3 BONDING -Find the type of structure of unknowns by experiment (eg to test solubility, conductivity and ease of melting). -Deduce the shape according to valence shell electron pair repulsion (VSEPR) principle when given familiar and unfamiliar examples of species. -Deflect jets of various liquids from burettes to investigate the presence of different types and relative size of intermolecular forces. 3.2 1 PERIODICITY N/A	to ban the use of CFCs and in finding replacements. 3.3.4 ALKENES -be able to name them -be able to recognise geometric isomerism -use CIP rules to name isomers -be able to recall reactions of alkenes with HHal,hal,c H2SO4 -be able to write these mechanisms EA -Write equations for addition polymerisation and id repeating units. -recall issues wrt disposal and recycling 3.3.5 ALCOHOLS -be able to name them -be able to classify alcohols and recognise these classifications -know 2 ways to produce ethanol and to carry out fermentation -know and recall mech for dehydration of alcohols -Know the reactants, conditions and products for the oxidation of alcohols -be able to draw distillation and reflux apparatus. 3.2.3 THE HALOGENS -Carry out test-tube reactions of solutions of the halogens (Cl_2, Br_2, I_2) with solutions containing	3.3.8 ALDEHYDES AND KETONES -carry out test tube reactions to distinguish aldehydes and ketones 3.3.9 CARBOXYLIC ACIDS AND DERIVATIVES practical to observe reactions of ethanoyl chloride with variety of nucleophiles	3.3.11 AMINES describe the mechanism and reactions of amines as nucleophiles 3.3.16 CHROMATOGRAPHY -Use thin-layer chromatography to identify analgesics. -Calculate Rf values from a chromatogram. -Compare retention times and Rf values with standards to identify different substances. 3.3.12 POLYMERS -be able to devise repeating units -be able to recognise polyesters/amides --observe demo of nylon being made -be able to explain mpt wrt IMF between polymers 3.3.13 AMINO ACIDS PROTEINS AND DNA -be able to determine structures in different pH solns - determine repeat unit for polypeptides - know the structure of DNA -know how to join base pairs with the rest of DNA molecule	-perform colorimetry to determine conc of coloured ion and collect data for graph. -reduce Vanadate ion using zinc -perform redox titrations incl mass of iron ii in an iron tablet -perform autocatalysis reactions -	

	3.1.7 REDOX -Work out the oxidation state of an element in a compound or ion from the formula. -Write half-equations identifying the oxidation and reduction processes in redox reactions. -Combine half-equations to give an overall redox equation. **3.2.2 GROUP 2** -Test the reactions of Mg–Ba with water and Mg with steam and record their results. -Test the solubility of Group 2 hydroxides by mixing solutions of soluble Group 2 salts with sodium hydroxide and record their results. -Test the solubility of Group 2 sulfates by mixing solutions of soluble Group 2 salts with sulfuric acid and record their results. -Test for sulfate ions using acidified barium chloride and record their results. -Explain the trends in atomic radius and first ionisation energy. -Explain the melting point of the elements in terms of their structure and bonding. -Explain why $BaCl_2$ solution is used to test for sulfate ions and why it is acidified. **3.1.4 ENERGETICS**	their halide ions (eg KCl, KBr, KI). -Record observations from reactions of NaCl, NaBr and NaI with concentrated sulfuric acid. -Carry out tests for halide ions using acidified silver nitrate, including the use of ammonia to distinguish the silver halides formed. -Explain the trend in electronegativity -Explain the trend in the boiling point of the elements in terms of their structure and bonding. -explain why silver nitrate solution is used to identify halide ions, the silver nitrate solution is acidified and ammonia solution is added. -Carry out simple test-tube reactions to identify: cations – Group 2, NH_4^+ anions – Group 7 (halide ions), OH^-, CO_3^{2-}, SO_4^{2-}.		**3.3.10 AROMATIC** -use thermodynamic data to describe stability of benzene delocalised ring structure over kekule structure -describe the mechanism of electrophilic addition **3.3.14 ORGANIC SYNTHESIS** -know the reactants and conditions for organic reactions and put them together to make common synthetic routes **3.3.15 NMR** -to know how to interpret c 13 and H 1 NMR spectra using data sheet info -understand splitting patterns for H-1 spectra		

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	-describe exo and endo thermic reactions **-define enthalpy and carry out simple calorimetry PSA9** **-Use q=mcDT to calc enthalpy change** **-Define Hess's law** **-be able to use HL to calc DHf and DHc** **-Use bond enthalpies to calc energy changes**					
Key Questions	Have students completed summer work? What are the long term plans for students? How much do you know from GCSE? Where can you make connections to GCSE? Are students keeping up with consolidation work? which students are struggling?	Have students got the maths skills to carry out physical chem calculations ? Are practical skills being learnt and applied from RP's that students are performing? Are organic mechanisms being learnt? Are students keeping up with the increased pace of work?	Are students recapping last last terms work? Are practical skills being learnt and applied from RP's that students are performing? Are students planning for their threshold exams?	Which students need to be put into intervention? Have students completed any summer work? Are students planning for the Trial exam?	What areas need to be addressed by students in the light of the trial exams? Which students need to continue with intervention?	identify areas that need to be revised. which content areas need to be revisited?
Assessment	end of topic tests half term test weekly consolidation exercises RP 1	end of topic tests half term tests RP 2,5a, 5b, 6,	end of topic tests half term tests threshold exams RP 4,12	end of topic test half term test RP10, 6,3, 7,9	TRIAL EXAMS End of topic tests half term test RP	second mock paper A level summer terminal papers
Literacy/Numeracy/ SMSC/Character	algebra mathematical computation geometry handling data explaining trends in periodicity Cfc's and debating environmental issues resilience when attempting difficult amount of substance questions	algebra mathematical computation handling data issues relating to plastics and the environment confident contribution in practical group work	algebra mathematical computation handling data confident contribution in practical group work	graph drawing algebra mathematical computation handling data issues relating to cancer treatment confident contribution in practical group work	algebra mathematical computation handling data confident contribution in practical group work	