Year: 13
Subject: Chemistry

Term	Week	Focus	Summary	Learning Outcomes	Learning skills
Term 1.1	1	General Introduction/ Thermodynamics	AS-Level Retrieval Practice AS-Level Energetics Revision	Evaluate knowledge of all content from the AS-Level course and apply it to different retrieval tasks. Review enthalpy of formation, enthalpy of combustion, ionisation energy and electron affinity.	Learners will have the opportunity to break down a task and decide on a suitable approach based on their knowledge of Hess's Law and thermodynamics (ACP Analysing). Learners will develop the ability to approach new learning experiences by actively connecting it to existing knowledge (exo and endothermic reactions) and hence determine an appropriate way to think about the work (ACP Metathinking). Learners will be able to conceive something entirely new (ACP Creating).
	2	Thermodynamics	AS-Level Energetics Revision Born-Haber Cycles (2 lessons) Lattice Enthalpies	Review Hess's Law and simple calculations performed during the energetics topic. Define enthalpy of formation, ionisation energy, enthalpy of atomisation, bond enthalpy, electron affinity and lattice enthalpy. Construct Born–Haber cycles to calculate lattice enthalpies using these enthalpy changes. Construct Born–Haber cycles to calculate one of the other enthalpy changes. Compare lattice enthalpies from Born–Haber cycles with those from calculations based on a perfect ionic	Learner will be able to see how Hess's Law works and extrapolate this idea to apply it to the Born-Haber cycle (ACP Linking). Learners will be able to deduct, hypothesise and reason whether reactions are spontaneous or not using Gibbs free energy (ACP Analysing). Learners will be able to perform thermodynamics calculations with speed and accuracy (ACP Realising).

				model to provide evidence for covalent character in ionic compounds. Define the term enthalpy of hydration. Perform calculations of an enthalpy change using these cycles. Understand the concept of increasing disorder (entropy change). Calculate entropy changes from absolute entropy values. Use the Gibbs Free Energy relationship to determine how G varies with temperature. Use the Gibbs Free Energy relationship to determine the temperature at which a reaction becomes feasible.	
	3	Thermodynamics	Thermodynamics Retrieval Practice Thermodynamics Assessment Thermodynamics Assessment Feedback	Evaluate knowledge of all content from the thermodynamics topic and apply it to different retrieval tasks.	Learners will have the opportunity to develop their ability to monitor, evaluate and self-correct their answers to exam questions (ACP Metathinking). Learners will develop their ability to train and prepare through working on past exam questions in order to become more proficient (VAA Hardworking).
	4	Electrochemical Cells	Electrolysis and Ions Revision (GCSE and AS-level, 2 lessons) Writing Half-Equations (2 lessons) Redox Reactions (2 lessons)	Review basic redox reactions and the electron transfer that takes place in simple cells. Use the IUPAC convention of writing half-equations for electrode reactions.	Learners will be able to develop their confidence and their belief in their own knowledge by reviewing redox reactions and writing half equations based on their past knowledge (VAA Empathetic). Learners will have the opportunity to develop their skill in writing half equations to a point where they can do this with such

				Review the movement of electrons in oxidising and reducing agents and apply the concept to electrochemical cells. Understand that standard electrode potential refers to certain conditions. Familiarise yourself with the electrochemical series.	ease they no longer require active thinking (ACP Realising). Learners will work with a holistic concept of redox reactions and how these are related to the function of a fuel cell (ACP Linking).
	5	Electrochemical Cells	Electrode Potentials (2 lessons) Required Practical 6 (2 lessons) Lithium Cell and Fuel Cells (2 lessons)	Use Eq values to predict the direction of simple redox reactions. Calculate the EMF of a cell. Write and apply the conventional representation of a cell. Measure the EMF of an electrochemical cell practically. Explain the electrode reactions in a simple lithium cell and an alkaline hydrogen-oxygen fuel cell. Understand the benefits and risks to society associated with using these fuel cells. Use given electrode data to deduce the reactions occurring in non-rechargeable and rechargeable cells. Deduce the EMF of a cell. Explain how the electrode reactions can be used to generate an electric current.	Learners will have the opportunity to deduct, hypothesis, reason and seek supporting evidence to deduce the EMF of a call (ACP Analysing). Learners will work with a holistic concept of redox reactions and how these are related to the function of a fuel cell (ACP Linking). Learners will be able to be curious, willing to work alone, be proactive, keen to learn and think independently in the required practical (VAA Agile).
	6	Electrochemical Cells	Electrochemical Cells Retrieval Practice Electrochemical Cells Assessment	Evaluate knowledge of all content from the electrochemical cells topic and apply it to different retrieval tasks.	Learners will have the opportunity to develop their ability to monitor, evaluate and self-correct their answers to exam questions (ACP Metathinking). Learners will develop their ability to train and prepare through working on past exam

			Electrochemical Cells Assessment Feedback		questions in order to become more proficient (VAA Hardworking).
	7	Acids and Bases	Bronsted-Lowry Acids and Bases Definition and Determination of pH Ionic Product of Water (Kw) Weak Acids and Bases (2 lessons) Titration Calculations	Define an acid as a proton donor and a base as a proton acceptor. Understand that acid-base equilibria involve the transfer of protons. The pH scale, is used as a measure of hydrogen ion concentration. Convert concentration of hydrogen ions into pH and vice versa. Calculate the pH of a solution of a strong acid from its concentration. Water is slightly dissociated - Kw is derived from the equilibrium constant for this dissociation. The value of Kw varies with temperature. Use Kw to calculate the pH of a strong base from its concentration. Weak acids and weak bases dissociate only slightly in aqueous solution - Ka is the dissociation constant for a weak acid. Construct an expression for Ka. Perform calculations relating the pH of a weak acid to the concentration of the acid and the dissociation constant, Ka. Convert Ka into pKa and vice versa. Perform calculations of acid-base titrations based on experimental results.	Learners will have the opportunity to demonstrate confident when experimenting with novel ideas and work in unfamiliar contexts such as pH curves and the dissociation of water (VAA Agile). Learners will be able to use their GCSE knowledge of acids and bases to make connections to the new content (ACP Linking). Learners will be facing obstacles such as more difficult titration calculations and will be encouraged to not give up and persist in effort (VAA Hardworking).

Term 1.2	**1**	Acids and Bases	pH Curves and Indicators Required Practical 7 (3 lessons) Buffers (2 lessons)	Typical pH curves for acid–base titrations in all combinations of weak and strong monoprotic acids and bases. Sketch and explain the shapes of typical pH curves. Use pH curves to select an appropriate indicator. Investigate how pH changes when a weak acid reacts with a strong base and when a strong acid reacts with a weak base. A buffer solution maintains an approximately constant pH, despite dilution or addition of small amounts of acid or base. Acidic buffer solutions contain a weak acid and the salt of that weak acid. Basic buffer solutions contain a weak base and the salt of that weak base. Applications of buffer solutions. Explain qualitatively the action of acidic and basic buffers Calculate the pH of acidic buffer solutions.	Learners will have the opportunity to work in teams and take a variety of roles when completing the required practical on titrations (VAA Empathetic). Learners will be able to conceive the entirely new concept of buffers (ACP Creating).
	2	Acids and Bases	Acids and Bases Retrieval Practice Acids and Bases Assessment Acids and Bases Assessment Feedback	Evaluate knowledge of all content from the acids and bases topic and apply it to different retrieval tasks.	Learners will have the opportunity to develop their ability to monitor, evaluate and self-correct their answers to exam questions (ACP Metathinking). Learners will develop their ability to train and prepare through working on past exam questions in order to become more proficient (VAA Hardworking).

	3	Rate Equations	Rate Equations (AS-level Revision) Arrhenius Equation (3 lessons) Determination of Rate Equation (2 lessons)	Review the different factors such as temperature, concentration and pressure and how they affect the rate of reaction. Define the terms order of reaction and rate constant. Perform calculations using the rate equation. Explain the qualitative effect of changes in temperature on the rate constant k. Perform calculations using the equation $k = Ae^{-Ea/RT}$. Understand that the equation $k = Ae^{-Ea/RT}$ can be rearranged into the form $\ln k = -Ea/RT + \ln A$ and know how to use this rearranged equation with experimental data to plot a straight line graph with slope $-Ea/R$. Use concentration–time graphs to deduce the rate of a reaction. Use initial concentration–time data to deduce the initial rate of a reaction. Use rate–concentration data or graphs to deduce the order (0, 1 or 2) with respect to a reactant.	Learners will be able to use a wide range of thinking approaches and transfer their mathematical knowledge to the use and re-arranging of the Arrhenius equations (ACP Metathinking). Learners will be able to determine rate equations and analyse rate graphs with speed and accuracy (ACP Realising).
	4	Rate Equations	Determination of Rate Equation (2 lessons) Required Practical 8 (2 lessons) Rate Equations Retrieval Practice	Derive the rate equation for a reaction from the orders with respect to each of the reactants. Use the orders with respect to reactants to provide information about the rate determining/limiting step of a reaction.	Learners will have the opportunity to develop their ability to monitor, evaluate and self-correct their answers to exam questions (ACP Metathinking). Learners will develop their ability to train and prepare through working on past exam questions in order to become more proficient (VAA Hardworking).

				Measure the rate of reaction by an initial rate method and a continuous monitoring method. Evaluate knowledge of all content from the rate equations topic and apply it to different retrieval tasks.	
	5	Equilibrium Constant	Equilibria (AS-level Revision, 3 lessons) Equilibrium Constant Kp (3 lessons)	Review the affect of temperature, concentration and pressure on the equilibrium. Perform simple equilibrium concentration calculations. Derive partial pressure from mole fraction and total pressure. Construct an expression for Kp for a homogeneous system in equilibrium. Perform calculations involving Kp. Predict the qualitative effects of changes in temperature and pressure on the position of equilibrium. Predict the qualitative effects of changes in temperature on the value of Kp. Understand that, whilst a catalyst can affect the rate of attainment of an equilibrium, it does not affect the value of the equilibrium constant.	Learners will be able to break down a task on equilibrium concentrations and decide on a suitable approach (ACP Analysing). Learners will be able to approach new learning experiences by actively attempting to connect it to existing knowledge or concept and determine an appropriate way to think about the equilibrium constant (ACP Metathinking).

	6	Physical Chemistry Review	Physical Chemistry Retrieval Practice	Evaluate knowledge of all content from the physical chemistry topics and apply it to different retrieval tasks.	Learners will have the opportunity to develop their ability to monitor, evaluate and self-correct their answers to exam questions (ACP Metathinking). Learners will develop their ability to train and prepare through working on past exam questions in order to become more proficient (VAA Hardworking).
	7	Physical Chemistry Review	Physical Chemistry Retrieval Practice Physical Chemistry Mock Paper	Evaluate knowledge of all content from the physical chemistry topics and apply it to different retrieval tasks.	Learners will have the opportunity to develop their ability to monitor, evaluate and self-correct their answers to exam questions (ACP Metathinking). Learners will develop their ability to train and prepare through working on past exam questions in order to become more proficient (VAA Hardworking).