Curriculum Plans: Year 10 (Chemistry)

	Topic	Knowledge: By the end of the unit students will know:	Skills: What skills will students have developed by the end of this unit?	Key terms: What new key terms and vocabulary will be learnt in this unit?	Summative Assessment: How will pupils be assessed in this unit?
Michaelmas 1	**Bonding, Structure and Properties of Matter**	**Different types of chemical bonding** **Ionic bonding and properties of ionic compounds** **Covalent bonding and properties of covalent molecules** **Metallic Bonding and properties of metal** **Particle model for states of matter and state symbols**	Draw dot-cross diagrams to represent ionic and covalent bonding Explain how properties such as melting point, electrical conductivity, and hardness depend on structure and bonding Explain different properties of solids, liquids, and gases using the particle model	**Ion:** a positive or negative charged particle formed when an atom loses or gains electrons **Electrostatic attraction:** attraction between positively and negatively charged particles **Ionic Bond:** electrostatic force of attraction between positively and negatively charged ions **Covalent Bond:** the strong attraction between two non-metal atoms that share one or more pairs of electrons **Delocalised Electrons:** electrons from an element's outer shell that is free to move through a structure **Metallic bond:** strong attraction between the nucleus of a metal atoms and delocalised electrons occurring in metal elements and alloys **Molecule:** particle made from atoms, joined together by covalent bonds	

Curriculum Plans: Year 10 (Chemistry)

				Intermolecular forces : the attraction between the individual molecules in a covalently bonded substance **Ionic lattice** : a giant 3D structure of alternating positive and negative ions, held together by strong electrostatic attraction	
Michaelmas 2	**Bonding, Structure and Properties of Matter** Continued **Chemical Changes**	Properties of polymers Examples and properties of giant covalent structures Structure and properties of diamond and graphite How alloying affects metals Structures and uses of fullerenes, nanotubes, (nanoparticles), and graphene Reactions of metals with oxygen(air), water and acids Reactivity of metals How extraction of metals depends on reactivity Definitions of Oxidation and Reduction Neutralisation reactions of acids	Explain how properties such as melting point, electrical conductivity, and hardness depend on structure and bonding Ability to recognise and work with numbers in standard form Write word, balanced symbol, and half-equations for reactions Predict when reactions will occur and identify the products of reaction Explain choice of extraction method for	**Polymer:** a very large molecules made up of many repeating units, with atoms linked by strong covalent bonds **Giant Covalent Structure:** covalently bonded structure where many atoms are joined together by many strong covalent bonds e.g. diamond or silicon dioxide **Fullerene**: a form of the element carbon that can exist as cage-like or tubular structures based on hexagonal rings of carbon atoms **Diamond**: a form of the element carbon where each	Written test using past exam questions, including those from previous topics

		How to prepare a pure salt sample from an acid	different metals using the reactivity series Identify reduction and oxidation Safely heating solutions using a water bath	carbon atom is covalently bonded to 4 others **Graphite**: a form of the element carbon where each carbon atom is covalently bonded to 3 others **Graphene**: a form of the element carbon where each atom is covalently bonded to 3 others AND is only one atom thick **Reactivity series:** An arrangement of metals in order of reactivity **Displacement reaction:** Reaction where a more reactive element takes the place of a less reactive element in a compound **Oxidation**: A reaction in which a substance loses electrons (gains oxygen) **Reduction**: Reaction in which a substance gains electrons (loses oxygen) **Ore**: A rock from which a metal can be extracted for profit **Electrolysis**: Decomposition of ionic compounds using electricity	

Curriculum Plans: Year 10 (Chemistry)

Lent 1	**Chemical Changes** ctd	Definitions of Acid and Alkali How indicators and pH can be used to identify acids and alkalis Differences between strong and weak acids Electrolysis of molten compounds and aqueous solutions Representing redox reactions using half-equations (ion-electron equations)	Classify solutions as acidic, alkaline of neutral using litmus, UI, or pH Predict effect of changes such as dilution on pH Predict and explain the products of electrolysis, at each electrode, of molten compounds and aqueous solutions Identify which of 2 unknown solutions is a strong/weak acid by comparing reactions and properties. Explain why weak acids have higher pH, react more slowly, and conduct less well than strong acids of the same concentration	**Acid:** Solution with a pH less than 7; produces H^+ ions in water **Alkali**: Solution with a pH more than 7; produces OH^- ions in water **Aqueous**: Dissolved in water **Strong acid**: Acid in which all the molecules break into ions in water **Weak acid**: Acid in which only a small fraction of the molecules break into ions in water **Dilute**: A solution in which there is a small amount of solute dissolved **Concentrated:** A solution in which there is a lot of solute dissolved **Neutralisation**: A reaction that uses up some or all of the H^+ ions from an acid **Electrolyte**: A liquid that conducts electricity **Discharge**: Gain or lose electrons to become electrically neutral **Exothermic reaction**: Reaction where thermal energy is transferred from the chemicals to the surroundings and so the temperature increases	Written test using past exam questions, including those from previous topics
	Energy Changes	Exothermic and endothermic reactions Energy diagrams Measuring energy changes Calculating energy changes How chemical reactions can be used to generate electricity Factors affecting voltage of a cell Fuel cells	Identify exothermic and endothermic reactions Draw, interpret and label energy diagrams Use bond energy values to calculate energy changes for reactions Explain why reactions are exothermic or endothermic referring to the bonds broken and formed Evaluate the use of different cells/batteries		Written test using past exam questions, including those from previous topics

Curriculum Plans: Year 10 (Chemistry)

				Endothermic reaction: Reaction where thermal energy is transferred from the surroundings to the chemicals and so the temperature decreases **Activation energy**: The minimum energy particles must have to react – measured on an energy diagram from the level of the reactants to the peak of the line **Reaction Profile**: A diagram that shows how the energy changes during a chemical reaction from reactants to products **Energy Change**: Always measured on the energy diagram from the level of the reactants to the level of the products	
Lent 2	**Quantitative Chemistry**	**Conservation of Mass** **What a mole is** **Avagadro's number** **How RFM is calculated** **How to calculate moles from mass** **How to interpret ratios in chemical equations** **How to calculate reacting masses**	Explain apparent mass losses in chemical reactions Define relative atomic mass Calculate relative atomic mass from relative	**Avogadro constant:** the number of atoms, molecules, or ions in a mole of any substance (i.e., 6.02×10^{-23} per mol) **Mole**:the amount of substance in the relative atomic or formula mass of a substance in	Written test using past exam questions, including those from previous topics. This may be completed at the start of Y11.

		Limiting Reactants	abundance and mass numbers of isotopes Calculate relative abundance from relative atomic mass Work out relative formula masses Define the mole Perform calculations using Avagadro's number (standard form) Use mass and RFM to calculate moles Use moles and RFM to calculate mass Convert masses in kg, tonnes, mg to grams. Use mole ratios from chemical equations Calculate reacting masses Identify limiting reactants	gram The symbol for the unit mole is mol **Concentration**:the amount of a substance dissolved in a given volume of liquid **Limiting reactant** :the reactant in a chemical reaction that when used up causes the reaction to stop **Relative formula mass RFM** :the total of the relative atomic masses, added up in the ratio shown in the chemical formula, of a substance **Relative atomic mass A_r**: the average mass of the atoms of an element compared with carbon-12 (which is given a mass of exactly 12). (**Found on the periodic table)** **Thermal decomposition**: Reaction where high temperature causes a substance to break down into simpler substances. **Excess**: When the amount of a reactant is greater than the mount that can react. **Limiting reactant**: The reactant in a reaction that determines the amount of products formed. Any other reagents are all in excess and will not react.	Appropriate quantitative chemistry questions will also be assessed in the EoY exam.

Curriculum Plans: Year 10 (Chemistry)

Trinity 1	**Quantitative Chemistry** ctd	**Concentration** **How to calculate moles in solutions** **Percentage Yield** **Percentage Atom Economy** **How to carry out a titration** **Titration calculations** **Molar volume of a gas at RTP**	Calculate concentrations in moles per litre and grams per litre Calculate moles in solution using n = cv Safely and accurately use a burette (and volumetric pipette) Carry out titration calculations Calculate percentage yield Explain why percentage yields obtained are <100% Calculate percentage atom economy Explain how to improve atom economy Calculate moles of gas in a given volume	**Concentration:** the amount of a substance dissolved in a given volume of liquid **Titration:** A process used to accurately calculate the volume of one substance needed to fully react with another. **Titre:** The volume added from the burette in a titration **Burette:** Used to accurately measure variable volumes of liquids **Pipette:** Used to measure a set volume of a liquid **Indicator:** Changes colour with one drop of reactant when the reaction is at its endpoint **End point:** The point at which an acid has exactly neutralised and alkali and NEITHER is in excess. **Molar volume:** The volume that 1 mole of any gas occupies at room temperature and pressure = 24dm^3	
Trinity 2	**Rate of Reaction and**	How to measure and calculate rates of chemical reaction	Describe how to carry out simple practical investigations to	**Rate of reaction**: The speed at which a reaction takes place.	Written test using past exam questions, including those from previous topics. This

Curriculum Plans: Year 10 (Chemistry)

	Equilibria (Completed in Y11)	How changes in surface area, concentration, pressure, and temperature affect rate of reaction Collision Theory What a catalyst is How catalysts work <u>Probable Y11 Work</u> Reversible Reactions Equilibrium Effect of changing concentration, pressure, and temperature on equilibrium position Le Chatelier's principle Effect of a catalyst on equilibrium position	investigate rate of reaction. Safely carry out required practical investigating the effect of concentration on rate. Calculate average rate of reaction over a time period. Draw a tangent to a curve and use it to find the gradient (and therefore rate of reaction) at a point in time. Predict and explain the effect of changing surface area, concentration, pressure and temperature on rate of reaction and equilibrium yield.	This can be worked out in two ways: Mean rate of reaction = quantity of reactant used ÷ time Mean rate of reaction = quantity of product formed ÷ time **Activation energy**: The minimum energy particles must have to react **Catalyst**: A substance that speeds up a chemical reaction by lowering the activation energy **Enzymes**: Molecules that act as catalysts in biological systems **Closed system**: A system where no substances can get in or out **Dynamic equilibrium**: System where both the forward and reverse reactions are taking place simultaneously and at the same rate **equilibrium**: In chemical reactions, a situation where the forward and backward reactions happen at the same rate, and the concentrations	may be completed in Y11 when the topic has been completed.

				of the substances stay the same. **equilibrium position**: A measure of the relative concentrations of substances in an equilibrium, showing if there are more reactants or products at equilibrium. **reversible reaction**: A chemical reaction which can go both ways. **Le Chatelier's Principle**: "if a system is at equilibrium and a change is made to any of the conditions, then the system responds to counteract that change." **Exothermic**: Reaction in which energy is given out to the surroundings. The surroundings then have more energy than they started with so the temperature increases **Endothermic**: Reaction in which energy is taken in. The surroundings then have less energy so the temperature decreases	