| Year Group: 12 | Subject: Chemistry | Term: Autumn 2021 |
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| **Topic** | **Key Learning points** | **Assessment** |
| **Formulae, Equations and Amounts of Substance** | *End Point: Know how to use the mole to calculate masses, volumes, concentrations and formulae.*<br>• Know what is meant by empirical formulae<br>• Calculate empirical formulae from experimental data<br>• Know what is meant by the term molecular formula and be able to calculate in from experimental data<br>• Know how to use the ideal gas equation pV=nRT<br>• Know that the mole is the unit for amount of substance and use the Avogadro constant in equations<br>• Write balanced full and ionic equations (including state symbols) for chemical reactions<br>• Calculate reacting masses and reacting volumes of gases from chemical equations<br>• Calculate concentration of solutions<br>• Be able to prepare a standard solution with an accurately known concentration<br>• Understand how to carry out a titration and use it to calculate solution concentration<br>• Understand what is meant by mistakes, errors, accuracy and precision and identify sources of error in experiments<br>• Understand what is meant by measurement uncertainty and calculate percentage measurement uncertainty<br>• Calculate percentage yield and atom economy | Students will be formatively assessed during each topic by past paper questions completed in lesson time.<br>• Students will complete homework assignments as ongoing assessment of understanding.<br>• Teachers will provide students with targeted feedback, based on their test performance. |
| **Atomic Structure and the Periodic Table** | *End Point: Know how the model of the atom has changed over time and understand the evidence for the existence of quantum shells, subshells and orbitals.*<br>• Understand the structure of an atom in terms of protons, electrons and neutrons and understand the term isotope<br>• Understand how mass spectrometry can be used to determine the relative atomic mass & relative molecular mass<br>• Know that an orbital is a region within an atom that can hold up to two electrons<br>• Be able to draw the shape of p & s orbitals and state the number of electrons that occupy s, p & d subshells<br>• Predict the electronic configuration of the first 36 elements<br>• Understand that electronic configuration determines the chemical properties of an element<br>• Know what is meant by ionisation energy and explain the trend across a period and down a group<br>• Understand periodicity in terms of a repeating pattern across different periods | |
| **Chemical Bonding and Structure** | *End Point: Understand the nature of metallic, ionic, covalent, polar covalent, dative covalent bonding and intermolecular interactions. Explain the physical properties of substances based on their bonding and structure.*<br>• Know that metallic bonding is the strong electrostatic interaction between the nuclei of metal cations and delocalised electrons<br>• Know that ionic bonding is the strong electrostatic interaction between oppositely charged ions<br>• Understand how ions are formed, the trends for ionic radii and the effect of ionic radii and charge on bond strength<br>• Know that a covalent bond is formed by the overlap of two atomic orbitals and is the strong electrostatic attraction between the nuclei of two atoms and the bonding pair of electrons<br>• Know that a dative covalent bond is when both of the electrons in the bond are supplied by only one of the atoms<br>• Understand the relationship between bond length and bond strength for covalent bonds<br>• Know that electronegativity is the ability of an atom to attract a bonding pair of electrons<br>• Understand what is meant by a polar covalent bond and the difference between polar and non-polar molecules<br>• Understand what is meant by a simple discrete molecule | |

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| | • Understand that the shape of a simple molecule or ion is determined by the repulsion between the electron pairs that surround the central atom and predict the shapes of and bond angles in simple molecules and ions<br>• Understand the nature of the following intermolecular interactions; London Forces, Permanent Dipoles, H bonds<br>• Understand the physical properties of molecules and choice of solvents in terms of intermolecular interactions<br>• Know about the different types of giant lattice (giant metallic, giant ionic, giant covalent)<br>• Predict the type of structure and bonding present in a substance and the physical properties of a substance | |
| **Reaction Kinetics** | *End Point: Understand the concept of activation energy and be able to draw reaction profiles for both catalysed and uncatalyzed reactions. Explain the Maxwell-Boltzmann model of distribution of molecular energies.*<br>• Know what is meant by the term 'Rate of Reaction'<br>• Know how to calculate rate of reaction from experimental data or determining the gradient of a graph<br>• Explain how changes in concentration of a solution, pressure of a gas and surface area of a solid can affect rate<br>• Explain how changes in temperature can affect rate of reaction & understand the Maxwell-Boltzmann distribution<br>• Explain how the addition of a catalyst can affect rate of reaction and understand economic benefits in industry<br>• Understand that a catalyst provides an alternative reaction route with a lower activation energy<br>• Draw the reaction profiles for uncatalyzed and catalysed reaction | |
| **Chemical Equilibrium** | *End Point: Understand the effects of concentration of a reactant on the position of equilibrium and describe the equilibrium constant in terms of concentration ($K_c$). Know about reversible reactions in industry.*<br>• Know that reversible reactions can reach a state of dynamic equilibrium<br>• Predict and justify the effect of a change in concentration, pressure, temperature, or the addition of a catalyst on the composition of an equilibrium mixture<br>• Deduce an expression for the equilibrium constant, $K_c$<br>• Evaluate data to explain the necessity, for many industrial processes, of reaching a compromise between the yield and the rate of reaction. | |
| **Organic Chemistry** | *End Point: Use different types of formulae to represent organic compounds and use reaction mechanisms to understand how organic reactions occur.*<br>• Represent organic molecules using displayed formulae, molecular formulae, skeletal formulae, empirical formulae and structural formulae<br>• Know what is meant by the terms 'homologous series' and 'functional group'<br>• Name compounds using the rules of IUPAC nomenclature<br>• Explain what isomerism is and how it arises<br>• Understand that alkane fuels are obtained from fractional distillation, cracking and reforming of crude oil<br>• Describe the pollutants formed through combustion of alkane fuels and the problems arising<br>• Understand how biofuels are used as an alternative to fossil fuels<br>• Know the general formula for and bonding in alkenes<br>• Understand the addition reactions of alkenes and how to qualitatively test for alkenes<br>• Understand how to draw mechanisms for electrophilic addition reactions of alkenes | |