COURSE OUTLINE
YEAR 11 CHEMISTRY ATAR: 2022
UNIT 1

Term	Week	Topic and key teaching points	Syllabus content	Assessment
1	1 - 2	**Properties and structure of materials**	**SU** materials are pure substances with distinct measurable properties, including melting and boiling points, reactivity, hardness and density; or mixtures with properties dependent on the identity and relative amounts of the substances that make up the mixture **SU** pure substances may be elements or compounds which consist of atoms of two or more elements chemically combined; the formulae of compounds indicate the relative numbers of atoms of each element in the compound **SU** nano materials are substances that contain particles in the size range 1–100 nm andhave specific properties relating to the size of these particles which may differ from those of the bulk material	
			HE Matter at the nanoscale can be manipulated to create new materials, composites and devices; the different characteristics of nanomaterials can be used to provide commercially available products. As products are designed on the basis of properties which are different from the bulk material, their use can be associated with potential risks to health, safety and the environment and this has led to regulations being developed to address new and existing nanoform materials **SU** differences in the physical properties of substances in a mixture, including particle size, solubility, density, and boiling point, can be used to separate them	

	2	**Properties and structure of atoms**	**SU** isotopes are atoms of an element with the same number of protons but different numbers of neutrons and are represented in the form ^{A}X (IUPAC) or X-A **SU** isotopes of an element have the same electron configuration and possess similar chemical properties but have different physical properties **SU** atoms can be modelled as a nucleus, surrounded by electrons in distinct energy levels, held together by electrostatic forces of attraction between the nucleus and electrons; the location of electrons within atoms can be represented using electron configurations **SU** elements are represented by symbols **HE** Findings from a range of scientific experiments contributed to the understanding of the atom, enabling scientists, including Dalton, Thomson, Rutherford, Bohr and Chadwick to develop models of atomic structure and make reliable predictions about the mass, charge and location of the sub-atomic particles. **SU** the relative atomic mass (atomic weight), Ar is the ratio of the average mass of the atom to $^{1}/_{12}$ the mass of an atom of C-12; relative atomic masses of the elements are calculated from their isotopic composition	**TASK 2- Hand out – History of the Atomic Model**

	3		**SU** mass spectrometry involves the ionisation of substances and the separation and detection of the resulting ions; the spectra which are generated can be analysed to determine the isotopic composition of elements and interpreted to determine relative atomic mass **SU** flame tests and atomic absorption spectroscopy (AAS) are analytical techniques that can be used to identify elements; these methods rely on electron transfer between atomic energy levels and are shown by line spectra	**TASK 1 – Separation techniques**
	4	**The Periodic Table**	**SU** the elements of the periodic table show trends across periods and down main groups, including in atomic radii, valencies, 1st ionisation energy and electronegativity as exemplified by groups 1, 2, 13–18 and period 3	**Hand out extended response on Atomic Theory and Models**
	5	**Bonding** **Metallic bonding** **Ionic bonding**	**SU** metallic bonding can be modelled as a regular arrangement of atoms with electrostatic forces of attraction between the nuclei of these atoms and their delocalised electrons that are able to move within the three dimensional lattice **SU** the metallic bonding model can be used to explain the properties of metals, including malleability, thermal conductivity, generally high melting point and electrical conductivity; covalent bonding can be modelled as the sharing of pairs of electrons resulting in electrostatic forces of attraction between the shared electrons and the nuclei of adjacent atoms	**TASK 2 – Periodic table/Separating Technique Topic Test**

			SU the type of bonding within ionic, metallic and covalent substances explains their physical properties, including melting and boiling points, conductivity of both electricity and heat and hardness **SU** ionic bonding can be modelled as a regular arrangement of positively and negatively charged ions in a crystalline lattice with electrostatic forces of attraction between oppositely charged ions	
	6	**Ions and Ionic Bonding**	**SU** the ionic bonding model can be used to explain the properties of ionic compounds, including high melting point, brittleness and non-conductivity in the solid state; the ability of ionic compounds to conduct electricity when molten or in aqueous solution can be explained by the breaking of the bonds in the lattice to give mobile ions **SU** chemical bonds are caused by electrostatic attractions that arise because of the sharing or transfer of electrons between participating atoms; the valency is a measure of the bonding capacity of an atom **SU** ions are atoms or groups of atoms that are electrically charged due to a loss or gain of electrons; **SU** formulae which include the number of constituent atoms and the charge of the ion (for example, O^{2-}, SO_4^{2-}) **SU** the formulae of ionic compounds can be determined from the charges on the relevant ions-refer to syllabus Appendix 2	

	7	**Covalent molecular substances and Covalent Bonding**	**SU** the properties of covalent molecular substances, including low melting point, can be explained by their structure and the weak intermolecular forces between molecules; their non-conductivity in the solid and liquid/molten states can be explained by the absence of mobile charged particles in their molecular structure	
	8-9	**Covalent network substances and Covalent Bonding**	**SU** the properties of covalent network substances, including high melting point, hardness and electrical conductivity, are explained by modelling covalent networks as three-dimensional structures that comprise covalently bonded atoms **SU** nanomaterials are substances that contain particles in the **size range 1–100 nm** and have specific properties relating to the size of these particles which may differ from those of the bulk material	**TASK 3 – Atomic theory Validated test**

	10	**Organic Chemistry**	**SU** hydrocarbons, including alkanes, alkenes and benzene, have different chemical properties that are determined by the nature of the bonding within the molecules **SU** molecular structural formulae (condensed or showing bonds) can be used to show the arrangement of atoms and bonding in covalent molecular substances	
Term 2	1	**Organic Chemistry - reactions**	**SU** IUPAC nomenclature is used to name straight and simple branched alkanes and alkenes from C1- C8 (including structural and simple geometric isomers) **SU** alkanes, alkenes and benzene undergo characteristic reactions such as combustion, addition reactions for alkenes and substitution reactions for alkanes and benzene	**TASK 4 – Test 2 Bonding, Structure and Carbon Chemistry**
Term 2	2	**The Law of Conservation of Mass**	**SU** the mole concept relates mass, moles and molar mass and, with the Law of Conservation of Mass; can be used to calculate the masses of reactants and products in a chemical reaction **SU** molecular formulae represent the number and type of atoms present in the molecules. (refer to Appendix 2)	
	2	**Percentage composition**	**SU** percentage composition of a compound can be calculated from the relative atomic masses of the elements in the compound and the formula of the compound	

	3	**Chemical reactions can be represented by chemical equations**	**SU** chemical reactions and phase changes involve enthalpy changes, commonly observable as changes in the temperature of the surroundings and/or the emission of light	**TASK 5 – Percentage composition of Plaster of Paris**
	4-5	**Fossil fuels and Biofuels**	**SU** fossil fuels (including coal, oil, petroleum and natural gas) and biofuels (including biogas, biodiesel and bioethanol) can be compared in terms of their energy output, suitability for purpose, and the nature of products of combustion **HE** There are differences in the energy output and carbon emissions of fossil fuels (including coal, oil, petroleum and natural gas) and biofuels (including biogas, biodiesel and bioethanol). These differences, together with social, economic, cultural and political values, determine how widely these fuels are used.	**TASK 6 – Test 3 Moles, Enthalpy and Biofuels**
	6		**Semester One Examination Revision**	

Term 2	7-8		**SEMESTER ONE EXAM**	**TASK 7**