ANNUAL LESSON PLAN FOR CHEMISTRY, KEY STAGE 4, year 10 (2021-22)

		Key Concepts	
Term 1: September – December	<u>Unit 1: PRINCIPLES OF CHEMISTRY</u> 1. States of matter	• States of matter: arrangement, movement and energy of the particles • Interconversions between the three states of matter	
	2. Elements, compounds and mixtures	• Element, compound or mixture • Experimental techniques for the separation of mixtures	
	3. Atomic Structure	• Positions, relative masses and charges of sub-atomic particles • Atomic number, mass number, isotopes and relative atomic mass (Ar)	
	4. The Periodic Table	• The Periodic Table: groups and periods • Electronic configurations of the first 20 elements • Metals and non-metals in the Periodic table • Elements in the same group of the Periodic Table have similar chemical properties	
	5. Chemical formulae, equations and calculations Part 1 6. Chemical formulae, equations and calculations Part 2	• Word equations and balanced chemical equations • Relative formula/molecular masses (Mr) • The mole (mol) is the unit for the amount of a substance • Reacting masses using experimental data and chemical equations • Percentage yield • Empirical formula and molecular formula	60
	7. Ionic bonding	• Ions are formed by electron loss or gain • Formulae for compounds formed between the ions • Giant ionic lattices have high melting and boiling points • Ionic compounds do not conduct electricity when solid, but do conduct electricity when molten and in aqueous solution	
	8. Covalent bonding	• Covalent bond is formed between atoms by the sharing of a pair of electrons • Dot-and-cross diagrams to represent covalent bonds • Substances with a simple molecular structures are gases or liquids, or solids with low melting and boiling points • Substances with giant covalent structures are solids with high melting and boiling points	
	9. Metallic bonding	• Metallic lattice by a 2-D diagram • Typical physical properties of metals	
	10. Electrolysis	• Anion and cation • Electrolysis, using inert electrodes, of molten compounds and aqueous solutions • Ionic half-equations representing the reactions at the electrodes during electrolysis	

Term 2: January – March	Unit 2: INORGANIC CHEMISTRY 11. The alkali metals 12. The halogens 13. Gases in the atmosphere 14. Reactivity series 15. Extraction and uses of metals 16. Acids, alkalis and titrations 17. Acids, bases and salt preparations 18. Chemical tests	• Reactions of alkali metals with water and air • The trend in reactivity in Group 1 in terms of electronic configurations • The colours, physical states (at room temperature) and trends in physical properties of halogens • Trend in reactivity in Group 7 in terms of electronic configurations • Approximate percentages by volume of the four most abundant gases in dry air • Carbon dioxide as a greenhouse gas • Order of reactivity of these metals: potassium, sodium, lithium, calcium, magnesium, aluminium, zinc, iron, copper, silver, gold • The rusting of iron: conditions and prevention • Oxidation • reduction • redox • oxidising agent • reducing agent • Method of extraction of a metal is related to its position in the reactivity series • Uses of aluminium, copper, iron and steel in terms of their properties • Alloy is a mixture of a metal and one or more elements • Litmus, phenolphthalein, methyl orange and universal indicators • Acids in aqueous solution are a source of hydrogen ions and alkalis in a aqueous solution are a source of hydroxide ions • Acid-alkali titration • Solubility of ionic compounds in water • Reactions of acids with metals, bases and metal carbonates • Preparation of a pure, dry sample of a soluble and insoluble salts • Tests for these gases: • hydrogen • oxygen • carbon dioxide • ammonia • chlorine • Flame tests: Li^+ is red • Na^+ is yellow • K^+ is lilac • Ca^{2+} is orange-red • Cu^{2+} is blue-green • Tests for these cations: • NH_4^+ • Cu^{2+}, Fe^{2+} and Fe^{3+} • Tests for these anions: • Cl^-, Br^- and I^- • SO_4^{2-} • CO_3^{2-} • Test for the presence of water using anhydrous copper(II) sulfate	44
Term 3: April – June	Unit 3: PHYSICAL CHEMISTRY 19. Energetics 20. Rates of reaction 21. Reversible reactions and equilibria	• Exothermic and endothermic reactions • Heat energy change calculation using the expression $Q = mc\Delta T$ • Molar enthalpy change (ΔH) • Energy level diagrams • Bond-breaking process and bond-making process, bond energies • Effects of changes in surface area of a solid, concentration of a solution, pressure of a gas, temperature and the use of a catalyst on the rate of a reaction • Reaction profile diagrams showing ΔH and activation energy • Reversible reactions are indicated by the symbol $\rightleftharpoons$ in equation • Dynamic equilibrium characteristics • Effect of changing either temperature or pressure on the position of equilibrium in a reversible reaction	52
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