Crewe Engineering & Design UTC

Curriculum Summary – Chemistry (Year 10)

Autumn

C1: Atomic structure

In this chapter, students will develop their understanding of atoms as fundamental chemical building blocks. They will see how to interpret chemical formulae and extend their KS3 knowledge of the law of the conservation of mass, leading them to balance chemical equations. It is important that they understand that when balancing an equation, the formula of the substance must not change. Students will also develop their understanding of the differences between compounds and mixtures, and how mixtures can be separated using techniques such as filtration, crystallisation, distillation, and chromatography. Finally, students will learn about the development of the atomic model, providing ample opportunity to foster their 'Working scientifically' skills – specifically around the development and use of models within science. Students will be able to describe the evidence that led to each new stage in the development of the atomic model. Studying the development of the atomic model will lead into the model currently accepted for GCSE, and students will be able to use this to write and draw electronic structures up to element 20.

C2: The periodic table

In this chapter, students will learn about the development of the periodic table, including the work of Dalton, Newlands, and Mendeleev. Within this, students will build upon their understanding of the development of scientific models from *C1 Atomic structure*. Students will understand how each stage in the development of the periodic table was facilitated by new evidence becoming available. They will also be able to identify the importance of an inherent pattern to the elements and how this guided Mendeleev's thinking.

Students will develop their understanding of electronic structures from *C1 Atomic structure and* apply this to the arrangement of the periodic table and the chemical properties of Group 0, Group 1, and Group 7 elements. They will also be able to identify trends in properties and reactivity, and higher-tier students will be able to explain these in terms of the electronic structure of the elements.

C3: Structure and bonding

In this chapter, students will develop their understanding of the states of matter from KS3. They will build upon their understanding of the particle model using this to explain the energy transfers involved when substances change state.

Students will learn about the different types of bonding in substances. They will learn that covalent bonding is the sharing of one or more pairs of electrons between non-metal atoms; ionic bonding involves a metal and non-metal atom, with the metal atom losing one or more electrons and the non-metal atom gaining one or more electron; and metallic bonding involves a delocalised sea of electrons surrounding the positive metal ions.

Students will learn how the bonding of a substance affects its bulk properties. They will be able to describe the difference in bonding and properties of giant ionic structures, simple covalent molecules, and giant covalent structures (including different arrangements of carbon). Students will understand that covalent, metallic, and ionic bonding is strong, but that it is how the particles interact (intermolecular forces) that determines properties such as melting point, boiling point, and electrical conductivity.

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Curriculum Summary – Chemistry (Year 10)
Spring
C5: Chemical changes In this chapter, students will revise and develop their understanding of the reactivity series from KS3. They will study the reactions of the metals potassium, sodium, lithium, calcium, magnesium, zinc, iron, and copper with water and acids and should be able to recall and describe these reactions. They will apply their understanding of the reactivity series to displacement reactions and the extraction of metals, as well as introducing higher-tier students to the concepts of oxidation and reduction as the loss and gain of electrons respectively. Students will also learn about salts and how they are prepared, including from metals and acids, acids and bases, and acids and carbonates. Students should be able to prepare a pure, dry sample of a salt from an insoluble metal oxide or carbonate as part of the required practical. Finally, students will learn about the pH scale. Higher-tier students will be able to explain how pH relates to H+(aq) ion concentration and the difference between strong and weak acids. **C6: Electrolysis** In this chapter, students are introduced to electrolysis. They will build upon their knowledge from *Chapter C3* to explain why ionic compounds can undergo electrolysis when molten or in solution. They will also be able to explain the movement of particles during electrolysis, and the reactions that occur at the electrodes. Students will then apply their understanding of electrolysis to the extraction of aluminium, and learn how to investigate the electrolysis of a solution. They will be able to predict the products of electrolysis and higher-tier students will be able to write balanced half equations.

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Curriculum Summary – Chemistry (Year 10)
Summer
C7: Energy changes In this chapter, students will learn about the energy transfers that occur during chemical reactions. They will understand that an exothermic reaction transfers energy from the system to the surroundings, and an endothermic reaction transfers energy from the surroundings to the system. Students will be able to interpret experimental data to identify if a reaction is exothermic or endothermic and should be able to describe some uses of exothermic and endothermic reactions. Students will further develop their qualitative understanding of the energy transfers in a reaction into a quantitative understanding. They will be confident with sketching and interpreting reaction profile diagrams and higher-tier students will be able to use bond energies to calculate overall energy changes for a reaction, identifying if it is exothermic or endothermic. **C4: Chemical calculations** In this chapter, students will build upon their understanding of the structure of atoms and sub-atomic particles to understand relative atomic mass and relative formula mass. Students will be able to use relative atomic masses to calculate relative formula masses of compounds. For higher-tier students, this will then be related to the mole and Avogadro's constant, and the relevant calculations introduced. Students will be able to use the equation number of moles = mass (g) / A_r and use moles to balance symbol equations and calculate reacting masses. Students will apply their understanding of relative atomic mass, relative formula mass, and moles to concentrations. All students will be able to carry out calculations with concentrations in g/dm^3.