GCSE – Chemistry –Year 10

BROOK 6TH FORM & ACADEMY

A UNIVERSITY TECHNOLOGY COLLEGE

AQA

Autumn Term:

Atomic structure and periodic table

4.1.1 A simple model of the atom, symbols, relative atomic mass, electronic charge and isotopes

4.1.1.3 The development of the model of the atom

4.1.1.4 Relative electrical charges of subatomic particles

4.1.1.5 Size and mass of atoms

4.1.1.6 Relative atomic mass

4.1.1.7 Electronic structure

4.1.2 The periodic table

4.1.2.1 The periodic table

4.1.2.2 Development of the periodic table

4.1.2.3 Metals and non-metals

4.1.2.4 Group 0

4.1.2.6 Group 7

4.1.3 Properties of transition metals (chemistry only)

4.1.3.1 Comparison with Group 1 elements

4.1.3.2 Typical properties

Half term

Bonding and structure

4.2.1 Chemical bonds, ionic, covalent and metallic

4.2.1.1 Chemical bonds

4.2.1.2 Ionic bonding

4.2.1.3 Ionic compounds

4.2.1.4 Covalent bonding

4.2.1.5 Metallic bonding

4.2.2 How bonding and structure are related to the properties of substances

4.2.2.1 The three states of matter

4.2.2.2 State symbols

4.2.2.3 Properties of ionic compounds

4.2.2.4 Properties of small molecules

4.2.2.5 Polymers

4.2.2.6 Giant covalent structures

4.2.2.7 Properties of metals and alloys

4.2.2.8 Metals as conductors

4.2.3 Structure and bonding of carbon

4.2.3.2 Graphite

4.2.3.1 Diamond

4.2.3.3 Graphene and fullerenes

4.2.4 Bulk and surface properties of matter including nanoparticles (chemistry only)

4.2.4.1 Sizes of particles and their properties

4.2.4.2 Uses of nanoparticles

Christmas

Spring Term: 2025

4.4 Chemical Change

4.4.1 Reactivity of metals

4.4.2 Reactions of acids

4.4.3 Electrolysis

4.3 Quantitative Chemistry

4.3.1 Chemical measurements, conservation of mass and the quantitative interpretation of chemical equations

4.3.2 Use of amount of substance in relation to masses of pure substances

4.3.3 Yield and atom economy of chemical reactions (chemistry only)

4.3.4 Using concentrations of solutions in mol/dm 3 (chemistry only) (HT only)

4.3.5 Use of amount of substance in relation to volumes of gases (chemistry only) (HT only)

Summer Term: 2025

4.5 Energy changes

4.5.1 Exothermic and endothermic reactions

4.5.1.1 Energy transfer during exothermic and endothermic reactions

4.5.1.2 Reaction profiles

4.5.1.3 The energy change of reactions (HT only

4.5.2 Chemical cells and fuel cells (chemistry only)

4.5.2.1 Cells and batteries

4.5.2.2 Fuel cells

4.6 The rate and extent of chemical change

4.6.1 Rate of reaction

4.6.1.1 Calculating rates of reactions

4.6.1.2 Factors which affect the rates of chemical reactions

4.6.1.3 Collision theory and activation energy

4.6.1.4 Catalysts

4.6.2 Reversible reactions and dynamic equilibrium

4.6.2.1 Reversible reactions

4.6.2.2 Energy changes and reversible reactions

4.6.2.3 Equilibrium

4.6.2.4 The effect of changing conditions on equilibrium (HT only)

4.6.2.5 The effect of changing concentration (HT only)

4.6.2.6 The effect of temperature changes on equilibrium (HT only)

4.6.2.7 The effect of pressure changes on equilibrium (HT only)

Curriculum Intent and Implementation

Vision:

Our vision here in the Chemistry department is to inspire and equip students with the knowledge, skills, and enthusiasm necessary to understand and apply chemical principles through hands-on experiments, fostering a deeper appreciation of the scientific method and its impact on the world around us.

Mission:

Our mission is to provide a stimulating and supportive learning environment where students can develop their practical chemistry skills, critical thinking, and scientific literacy. We aim to cultivate curiosity, innovation, and a lifelong passion for science through engaging and meaningful laboratory experiences. Through our practical chemistry curriculum, we aim to nurture inquisitive minds, develop competent and confident individuals, and inspire the next generation of scientists.

Goals:

Develop Scientific skills:
We work hard to ensure that all students are helped to develop the following scientific Skills:

- Acquire essential laboratory techniques and safety practices.
- Promote precision, accuracy, and attention to detail in experimental work.
- Develop independent and collaborative problem-solving abilities.

Enhance Scientific Understanding

- All students are helped to reinforce their theoretical knowledge through practical application.
- Teachers must foster an understanding of the scientific method, including hypothesis formulation, experimental design, data collection, and analysis.
- Students are helped to see the relevance of chemistry in everyday life and its applications in various fields such as medicine, industry, and environmental science.

Promote Inquiry and Critical Thinking:

Teachers at Brook sixth form stimulate curiosity and questioning, encourage students to analyse and interpret data, draw conclusions, and communicate findings effectively. Through class discussions, students are helped to develop the ability to critically evaluate scientific information and experimental outcomes.

Cultivate a Safe and Supportive Learning Environment:

Here in the chemistry department, we understand the importance of safety and we take on the challenge to ensure all students understand and adhere to safety protocols. The science team provides equal opportunities for all students to participate and succeed in laboratory activities. We celebrate and welcome the diversity of our students, hence foster a collaborative and respectful atmosphere that supports diverse learning needs and styles.

Prepare our students for Future Endeavours:

Here in the Chemistry department, we know that transferable skills are critical for science students as they equip them with versatile abilities that are valuable across various professional and academic fields. Whatever, endeavours our students may pursue in their future careers, we equip them with the skills and confidence needed for higher education and careers in science and related fields.

As a team, we aim at developing them into lifelong learners with the ability to adapt in an ever-changing scientific landscape. In addition, we encourage ethical and responsible conduct in scientific practice.

Implementation:

Constructive learning:

We understand the need to place the learner in the centre of their learning journey. Therefore, the department adopt and implement the constructive learning approach in our lessons, enabling learners actively construct their own understanding and knowledge through experiences and reflecting on those experiences. We therefore emphasise of hands-on activities, critical thinking, and collaboration, allowing students to connect new information to prior knowledge and apply it in meaningful ways and ultimately take responsibility for their learning.

Structured Curriculum:

A well-organized sequence of practical activities aligned with theoretical lessons, progressing from fundamental techniques to more complex experiments. We work collaboratively at helping our learner link ideas across different areas of the curriculum.

Resources and Support:

We adapt learning to the very needs of individual students in order to help them reach their potential. In addition, we provide appropriate materials, equipment, and guidance to facilitate effective learning experiences.

Assessment and Feedback:

We aim at developing our students into reflective learners, through regular formative and summative assessments to monitor progress, identify areas for improvement, and provide constructive feedback.

4.1 Atomic structure and the periodic table		
Afl strategies:	**Retrieval :**	**Inclusivity and Differentiations:**
Low/high stake Quizzes, Targeted Questioning, Peer Talk and responses Peer Assessment & Self-Assessment, Thumb signs pose-pause –pounce, exit and self-peer assessment etc.	<u>Retrieval:</u> Starter- Retrieval at the start of each lesson/ Quizzes to retrieve previous knowledge/ opportunities in the lesson to link new knowledge to previous knowledge. <u>Strategies:</u> o Spaced retrieval (to combats the forgetting curve) o Retrieval mats/grids o Draw it !..label it! o Free recall Concept mapping o Peer teaching	<u>Inclusivity and Differentiations:</u> To ensure we provide a supportive environment and meet the individual learning needs of our SEND students we adopt the following strategies in our science lessons: o Chunk information into manageable bite sized tasks o Provide Visual /multisensory aids to help students develop understanding o Provide tiered activities/HW that allows all learners to make progress at their own pace o Flexible groupings to provide effective collaboration o Provide text that caters to the reading ages of individual learners *SEND support (K) and EHCP (E= statemented) – for pupils with IEPs targets in their pupil past-ports are used to inform planning*
<u>Prior learning:</u> o Particle theory o States of matter o Atoms elements and compounds o Chemical symbols o Maths - algebra		
Literacy in Chemistry:	**Reflection:**	**Numeracy and practical Skills:**
1. **Response to six markers (two-week cycle)** o Teacher provide detailed feedback to a six marker response with focus on; **content**, use of **key terms,** SPAG, **presentation**, **command words** and **coherence**, **logical reasoning** o Student respond and improve their work 2. **Frayers model** 3. Writing descriptions/observation during experiments 4. Lesson **key terms** provided during lessons 5. Claim –Evidence –Reasoning 6. **Read** and **translate** information into other formats	Students are encouraged to reflect and to evaluate their own and others' which work fosters reflective learning and helps them understand how to improve. The following strategies are employed: o Peer on peer/self-assessment during lesson o Teacher feedback and student respond to improve o End of unit/end of topic assessments are used to help student reflect and improve	Practical sessions are used to develop the following skills: o Choosing appropropriate graph, identifying variables and controls o Collecting and Recording data, interpreting, evaluating and describing trends and drawing conclusions o Observing safety protocols and setting up apparatus safely o Carrying out repeats, testing reliability of test data and identifying anomalous data o Drawing conclusions o Calculating averages/mean

Week	Learning Outcome	Teaching strategies	Skill Development	Required Practical
Week 1 3/9/24 6/9/24	<u>Lesson 1: Basic Concepts of Atomic Structure</u> <u>Learning Objectives:</u> ○ Understand the basic structure of the atom (protons, neutrons, electrons). ○ Define atomic number, mass number, and their significance. ○ Calculate the number of protons, neutrons, and electrons in an atom or ion. ○ Understand the concept of atomic and mass numbers in calculations.	○ Introduce atomic particles (location, charge, and mass). ○ Label the structure of an atom diagram. ○ Group activity: Compare the atomic numbers and mass numbers of different elements. ○ Interactive quiz: Find the numbers of protons, neutrons, and electrons in various elements and ions. ○ Worked examples of atomic number, mass number, and charge. **Homework:** Worksheet on labelling and defining atomic structure.		
	<u>Lesson 2: Isotopes:</u> <u>Learning Objectives:</u> ○ Define isotopes and understand that they have the same number of protons but different numbers of neutrons. ○ Calculate the relative atomic mass using isotopic abundance.	○ Explanation of isotopes using common examples (e.g., carbon isotopes). ○ Group activity: Explore isotopes using models. **Homework:** Calculation questions based on relative atomic mass.		
Week 2 9/9/24 to 13/9/24	<u>Lesson 3 - History of Atomic Models</u> <u>Learning Objectives:</u> - Describe how a scientific model can be developed -Describe the plum pudding model of the atom -Describe how Rutherford and Marsden's experiments led to the nuclear model of the atom, and the ideas the Bohr contributed to the model	○ Timeline activity: Match atomic models to scientists. ○ Video or interactive presentation on key experiments (e.g., Rutherford's gold foil experiment). **Homework:** Short research task on an atomic scientist and their contribution.	**Evaluative** and **critical thinking** skills developed as students analyse the strengths and limitations of various models. They develop skills to question assumptions and test different hypotheses.	
	<u>Lesson 4 - Bohr Model and Electron shells</u> ○ Draw the electronic structure of the first 20 elements on the periodic table ○ Use numbers to represent the electronic structure of the first 20 elements on the periodic table ○ Link atomic structure (number of protons and electrons) to the position of elements in the periodic table. ○ Explain trends in reactivity based on atomic structure.	○ Demonstration of electron configuration using diagrams. ○ Classroom activity: Draw electron shells for elements (e.g., sodium, oxygen). ○ Discussion on how electron configurations influence chemical properties. ○ Group task: Predict properties of elements based on their atomic structure.		

		Homework: Research on how atomic structure determines the properties of alkali metals. **Homework:** Worksheet on electron configurations		
Week 3 16/9/24 to 20/9/24	**Lesson 5: Ions and Ion Formation** ○ Describe what ions are and how they are formed. ○ Describe the difference between atoms and ions (cations and anions).	○ Explanation of how atoms gain or lose electrons to form ions. ○ Group task: Predict ion formation for different elements. **Homework:** Questions on ion formation and their charges		
	Lesson 6: Atoms –Elements and Compounds ○ Explain that all substance is made from atoms ○ Explain that that periodic table shows the range of elements that are known to exist ○ Interpret the symbols on the periodic table and use them to identify elements ○ Define the term compound	**Homework**: Practice questions on atomic structure and ions		**RP1 -Mixtures**
	Lesson 7: Word and Symbol Equations ○ Represent a reaction using a word equation ○ I can represent a reaction using a balanced symbol equation			
Week 4 23/9/24 to 27/9/24	**Lesson 7: Introduction to the Periodic Table** ○ Understand the layout of the periodic table and the meaning of groups and periods. ○ Explain how the periodic table is arranged based on atomic number.	○ Interactive periodic table exploration (e.g., trends across groups and periods). ○ Classroom task: Match elements to their positions in the periodic table. **Homework:** Periodic table questions focusing on group and period trends.	Analytical thinking and pattern recognition	

Week 5 30/10/24 to 4/10/24	**Lesson 8:** Group 1 Describe the reactions of the first three alkali metals with oxygen, chlorine and water. Explain how properties of the elements in Group 1 depend on the outer shell of electrons of the atoms.			

	Predict properties from given trends down the group. Lesson 9: Group 0 o -I can describe the properties of the noble gasses (in group -0) o -I can recall that the boiling points of noble gases increase as you go down the periodic table o -I can describe the properties of group 1 metals o -I can describe the reactions of group 1 metals o -I can recall that the reactivity of group 1 metals increases as you go down the group.			
Week 6 4/10/24 to 11/10/24	Lesson 10: Group 7 o Describe the nature of the compounds formed when chlorine, bromine and iodine react with metals and non-metals. o Explain how properties of the elements in Group 7 depend on the outer shell of electrons of the atoms. o Predict properties from given trends down the group.		Data interpretation: Students develop ability describe and provide scientific explanation to trends	
	Lesson 11: Transition metals o Describe the difference compared with Group 1 in melting points, densities, strength, hardness and reactivity with oxygen, water and halogens. o Exemplify these general properties by reference to Cr, Mn, Fe, Co, Ni, Cu.			
Week 7 14/10/24 to 18/10/24	Lesson 9: Unit Review and Exam Preparation Learning Objectives: Recap key concepts of atomic structure (particles, isotopes, ions, periodic table). Apply knowledge to GCSE-style questions.	Activities: o Group work: Solve past GCSE exam questions on atomic structure. o Teacher-led review of challenging topics. Homework: Revision questions on atomic structure.		
Week 8 21/10/24 to 24/10/24	Lesson 10: End of Unit Test Assessment: 45-minute test covering: o Atomic structure (protons, neutrons, electrons).			

	○ Electron configuration. ○ Isotopes and ions. ○ Trends in the periodic table. **Feedback:** Go over common errors and areas for improvement in the next lesson			

4.2 Bonding, structure and the properties of matter

Afl strategies:

Low/high stake Quizzes, Targeted Questioning, Peer Talk and responses Peer Assessment & Self-Assessment, Thumb signs pose-pause –pounce, exit and self-peer assessment etc.

Retrieval :

Retrieval:

Starter- Retrieval at the start of each lesson/ Quizzes to retrieve previous knowledge/ opportunities in the lesson to link new knowledge to previous knowledge.

Strategies:

- Spaced retrieval (to combats the forgetting curve)
- Retrieval mats/grids
- Draw it !..label it!
- Free recall Concept mapping
- Peer teaching

Prior learning:

- Basic knowledge of atoms
- Electron configuration
- Knowledge of Periodic table
- State of matter
- Knowledge of compounds, elements and compounds
- Simple chemical equations

Inclusivity and Differentiations:

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To ensure we provide a supportive environment and meet the individual learning needs of our SEND students we adopt the following strategies in our science lessons:

- Chunk information into manageable bite sized tasks
- Provide Visual /multisensory aids to help students develop understanding
- Provide tiered activities/HW that allows all learners to make progress at their own pace
- Flexible groupings to provide effective collaboration
- Provide text that caters to the reading ages of individual learners

SEND support (K) and EHCP (E= statemented) – for pupils with IEPs targets in their pupil past-ports are used to inform planning

Literacy in Chemistry:

7. **Response to six markers (two-week cycle)**
   - Teacher provide detailed feedback to a six marker response with focus on; **content**, use of **key terms,** SPAG, **presentation**, **command words** and **coherence**, **logical reasoning**
   - Student respond and improve their work
   - Extended writing
8. **Frayers model**
9. Writing descriptions/observation during experiments
10. Lesson **key terms** provided during lessons
11. Claim –Evidence –Reasoning
12. **Read** and **translate** information into other formats

Reflection:

Students are encouraged to reflect and to evaluate their own and others' which work fosters reflective learning and helps them understand how to improve. The following strategies are employed:

- Peer on peer/self-assessment during lesson
- Teacher feedback and student respond to improve
- End of unit/end of topic assessments are used to help student reflect and improve

Numeracy and practical Skills:

Practical sessions are used to develop the following skills:

- Choosing appropropriate graph, identifying variables and controls
- Collecting and Recording data, interpreting, evaluating and describing trends and drawing conclusions
- Observing safety protocols and setting up apparatus safely
- Carrying out repeats, testing reliability of test data and identifying anomalous data
- Drawing conclusions
- Calculating averages/mean

4.2.1 Chemical bonds, ionic, covalent and metallic

Spec ref. Week	Learning outcomes	Teaching strategies	Skills developed	Practical and Required Practical
4.2.1.1 Week 9 11/11/24 to 18/11/24	Lesson 1: **Introduction to ionic bonding** Students should be able to explain chemical bonding in terms of electrostatic forces and the transfer or sharing of electrons.	Define 'electrostatic forces of attraction'. **Extended writing**: describe why atoms bond in order to obtain a noble gas configuration/full outer level of electrons. Describe/draw the structure of common atoms and suggest how they could bond to obtain a full outer level of electrons.		Demo the formation of sodium chloride in a fume cupboard.
4.2.1.2	Lesson 2**: Ionic bonding and writing chemical formulae of ionic comlounds** Students should be able to: • draw dot and cross diagrams for ionic compounds formed by metals in Groups 1 and 2 with non-metals in Groups 6 and 7 • work out the charge on the ions of metals and non-metals from the group number of the element, limited to the metals in Groups 1 and 2, and non-metals in Groups 6 and 7.	Tabulate common atoms and state the charges of the ions formed. Grade 9: explain an example of ionic bonding including detail on electron transfer, group numbers of the atoms involved and the use of correct terms, eg cation and anion.	**Modelling scientific ideas:** Draw the dot and cross diagram for this reaction **Data analysis:** Students should be able to translate data between diagrammatic and numeric forms	Use magnesium ribbon to produce magnesium oxide. .

Spec ref. Week	Learning outcomes	Teaching strategies	Skills developed	Practical and Required Practical
4.2.1.3 Week 10 18/11/24 to 24/11/24	Students should be familiar with the structure of sodium chloride but do **not** need to know the structures of other ionic compounds. Lesson 3: **Modelling giant ionic structures and empirical formulae** Students should be able to: • deduce that a compound is ionic from a diagram of its structure in one of the specified forms • describe the limitations of using dot and cross, ball and stick, two and three dimensional diagrams to represent a giant ionic structure • work out the empirical formula of an ionic compound from a given model or diagram that shows the ions in the structure.	Students use ideas on 'making ions' to help them develop their understanding of how ionic compounds are formed **Extended writing:** describe the bonding in the sodium chloride lattice using the correct terms, eg electrostatic forces of attraction.	**Modelling scientific ideas:** Students should be able to visualise and represent 2D and 3D forms including two dimensional representations of 3D objects. **Developing critical thinking skills** Be able to identify strengths and limitations of the dot cross diagrams	Model the sodium chloride lattice using molecular model kits.
4.2.1.4	Lesson 4: **Comparing giant and simple covant compounds** Students should be able to: • recognise substances as small molecules, polymers or giant structures from diagrams showing their bonding • recognise common substances that consist of small molecules from their chemical formula. • draw dot and cross diagrams for the molecules of hydrogen, chlorine, oxygen, nitrogen, hydrogen chloride, water, ammonia and methane	Extended writing: describe the difference between simple covalent substances and giant covalent substances. Grade 9: explain an example of covalent bonding including detail on electron transfer, group numbers of the atoms involved and the use of correct terminology. Students compare simple and giant covalent structures		Demo the formation of hydrogen chloride. Draw the dot and cross diagram for this reaction. Model simple covalent substance using molecular model kits.

Spec ref. Week	Learning outcomes	Teaching strategies	Skills developed	Practical and Required Practical
Week 11 25/11/24 to 29/11/24	**Lesson 5: simple, giant and polymer covalent structures** • represent the covalent bonds in small molecules, in the repeating units of polymers and in part of giant covalent structures, using a line to represent a single bond • describe the limitations of using dot and cross, ball and stick, two and three dimensional diagrams to represent molecules or giant structures • deduce the molecular formula of a substance from a given model or diagram in these forms showing the atoms and bonds in the molecule.		Logical thinking, analytical and problem solving skills **Modelling and abstract thinking** Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects.	Demo giant covalent structures using molecular model kits.
4.2.1.5	**Lesson 6 : Giant metallic structures** Students should be able to: • recognise substances as giant metallic structures from diagrams showing their bonding Topic test –Revision – reflections and GAP analysis	Define 'delocalised electrons'.	visualise and represent 2D and 3D forms including two dimensional representations of 3D objects.	Visualise and represent 2D and 3D forms including two dimensional representations

4.2.2 How bonding and structure are related to the properties of substances

Spec ref. Week	Learning outcomes	Teaching strategies	Developing scientific skills	Practical/Required Practical
4.2.2.1 Week 12 2/12/24 to 8/12/24	**Lesson 7: Properties of Covalent and ionic** Students should be able to: • predict the states of substances at different temperatures given appropriate data • explain the different temperatures at which changes of state occur in terms of energy transfers and types of bonding • recognise that atoms themselves do not have the bulk properties of materials • (Higher Tier only) explain the limitations of the particle theory in relation to changes of state when particles are represented by solid spheres which have no forces between them.	Extended writing: describe the properties of matter in a solid, liquid and gas. Students predict the state of substance at using their melting and boiling point data Define melting point and boiling point. Grade 9: explain the differences in changes of state in terms of intermolecular forces of attraction between a short molecule i.e. methane and a longer molecule i.e. pentane.	Communication skills Communicate scientific ideas coherently and logically Predictive skills	Visualise and represent 2D and 3D forms including two dimensional representations
4.2.2.2	**Lesson 8: Balancing Chemical Equation** Include appropriate state symbols in chemical equations for the reactions in this specification.	Describe balanced symbol equations including the states of matter. Students balance a range chemical symbol equations	Mathematical skills: In the area of ratios	
4.2.2.3	Knowledge of the structures of specific ionic compounds other than sodium chloride is not required.	**Extended writing**: describe the electrical conductivity of ionic substances. Extended writing: explain why solid ionic substances do not conduct electricity but dissolved or molten ionic substances do conduct electricity. Grade 9: explain how ionic substances dissolve in water. Extended writing: explain why sodium chloride is difficult to melt.	Communication and research skills .	Practically test the conductivity of ionic compounds, eg sodium chloride and potassium chloride.

Spec ref. Week	Learning outcomes	Teaching strategies	Developing scientific skills	Practical/Required Practical
		Extension: make links between the uses of ionic substances, their properties and structure		
4.2.2.4 Week 13 9/12/24 to 15/12/24	**Lesson 9: Intermolecular force and covalent bond** Students should be able to use the idea that intermolecular forces are weak compared with covalent bonds to explain the bulk properties of molecular substances.	Using diagrams, students, identify intermolecular forces between molecules Extended writing: describe melting points and boiling points of covalent substances. Extended writing: explain why the melting point and boiling point increases as the size of the molecule does in terms of intermolecular forces. Extended writing: explain why covalent substances do not conduct electricity. Grade 9: explain why pure water does not conduct electricity but tap water does conduct electricity. Extension: make links between the uses of covalent substances, their properties and structure.	Making links Pattern recognition Communicating skills Inference skills Communications skills	Practically test the conductivity of simple covalent substances using ethanol and solid wax pieces.
Christmas Break				
4.2.2.5 Week 14 06/01/25 to 12/01/25	**Lesson 11 : Polymers** Students should be able to recognise polymers from diagrams showing their bonding.	Given polymers, students identify, monomers, repeating units etc. Extended writing: explain how ethene polymerises.	Research skills Investigate the properties of plastic bags.	Model polymers. Make a polymer from corn-starch.
4.2.2.6			Research skills Research some uses of covalent substances.	

Spec ref. Week	Learning outcomes	Teaching strategies	Developing scientific skills	Practical/Required Practical
	Students should be able to recognise giant covalent structures from diagrams showing their bonding and structure.	Given diagrams of giant structures, students identify features giant structures and compare these to those of simple molecules Extended writing: describe the structure of diamond, silicon dioxide and graphite. Extended writing: explain how covalent substances boil. Extension: make links between the uses of covalent substances, their properties and structure.		
4.2.2.7	**Lesson 12: Properties of alloys and pure metals** Explain why alloys are harder than pure metals in terms of distortion of the layers of atoms in the structure of a pure metal.	Teacher use particle diagrams of pure metals and those of an alloy to model the difference in their structure Students identify the difference and link this to their properties Teacher provide data on physical properties of metals and corresponding allows. Students compare and explain the pattern observed Extended writing: describe melting points and boiling points of metallic substances. Extended writing: explain why the melting point and boiling point of metallic substances are high. Extended writing: describe the structure of metal alloys. Extension: make links between the uses of metal substances, their properties and structure. Extension: make links between the uses of metal alloys, their properties and structure.	Research skills Research some uses of metallic substances. Research some uses of metal alloys.	

Spec ref. Week	Learning outcomes	Teaching strategies	Developing scientific skills	Practical/Required Practical
4.2.2.8	Explain why metals conduct electricity	Student use knowledge of delocalised electron to explain why metals conduct electricity Extended writing: explain why metallic substances conduct electricity.		

4.2.3 Structure and bonding of carbon

Spec ref.	Learning outcomes	Teaching strategies	Skills developed	Practical/Required Practical
4.2.3.1 Week 15 13/01/25 to 19/01/25	**Lesson 13: Properties of giant covalent compounds:** Explain the properties of diamond in terms of its structure and bonding.	**Extended writing:** link the properties of diamond to the structure.	Research the properties of diamond.	Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects. Model the structure of diamond using model kits.
4.2.3.2	Explain the properties of graphite in terms of its structure and bonding. Know that graphite is similar to metals in that it has delocalised electrons.	Extended writing: link the properties of graphite to the structure. Extended writing: explain why graphite conducts electricity.	Research the properties of graphite. Model the structure of graphite using model kits.	
4.2.3.3	Recognise graphene and fullerenes from diagrams and descriptions of their bonding and structure. Give examples of the uses of fullerenes, including carbon nanotubes.	Extended writing: link the properties of graphene to the structure. Extended writing: describe the history of fullerenes.	Research the properties of graphene. Research uses of fullerenes.	Visualise and represent 2D and 3D forms including two-dimensional representations of 3D objects.

4.2.4 Bulk and surface properties of matter including nanoparticles

Spec ref.	Learning outcomes	Teaching strategies	Skills developed	Practical/ Required Practical
4.2.4.1 Week 16 20/01/25 to 26/01/25	<u>Lesson 14: Nano particles</u> Students should be able to compare 'nano' dimensions to typical dimensions of atoms and molecules.	Teacher define the scale of Nano particles putting concept into context Provide particle problems and comparison Visual representation: how visuals or models that scale down objects from the macro level (like a human hair, which is 100,000 nanometres thick) to the nano level, making the comparison more intuitive. **Extended writing:** describe the history of nanoscience.	Maths skills Unit conversions	
4.2.4.2	Consider some of the applications of these Nano particulate materials. Students do **not** need to know specific examples or properties other than those specified. Given appropriate information, evaluate the use of nanoparticles for a specified purpose Explain that there are possible risks associated with the use of nanoparticles.	Extended writing: link the uses of nanoparticles to their properties. Extended writing: evaluate the use of nanoparticles in applications, eg sun cream.	Research skills Research uses and properties of nanoparticles.	
Lesson 15: Revision – Assessments- reflection – GAP analysis				

4.4.1 Chemical Change

Week	Lesson Objectives	Activities	Assessment opportunities (Afl)	Links to Previous Learning	Skill development	Required Practical Other practical
Week 1: Reactivity and REDOX						
Week 16 20/01/25 to 26/01/25 **Lesson 1** The reactivity Series 4.4.1.2	-I can describe the reaction between metal and oxygen -I can recall the order of the reactivity series -I can describe when a displacement reaction might take place -I can use experimental data to work out the order of reactivity Explain the order of the reactivity series based on observations	**Activity**: A teacher-led demonstration comparing how different metals react with water, acid, and oxygen. Student Investigate the reactions of metals with acids. Students write word and symbol chemical equations predicting products of reactions using reactivity series (**MA** –create and write balanced symbol equation) Card Sort Activity: Metal Reactivity Series	Quizzes, peer/self-assessment	Knowledge of periodic table, atomic structure and stoichiometry	Observations and recording data	
Lesson 2 – Oxidation and Reduction 4.4.1.1	- I can describe oxidation as the loss of electrons -I can describe reductions a gain of electrons -I can write balanced ionic half equations -I can determine which element in a reaction is oxidised or reduced from the equation	Students are provided with equations and they identify oxidation in terms of loss and gain of oxygen **Teacher lead** – explanation the rules for writing half equation Students write half equations and identify oxidised and reduced species in terms of electrons loss/gain **Homework**: Complete exam-style questions on redox reactions.	Targeted questioning Peer assessment	Knowledge of Bonding and Making ions	Math skills: Stoichiometry Rations/	

Week 2: Metal extraction						
Week 17 27/01/25 to 01/02/25 Lesson 3 – Extraction of Metals 4.4.1.4 (HT only)	-I can describe how unreactive metals are found in the Earth -I can describe reduction -I can describe the process of extracting aluminium by electrolysis - Understand how metals are extracted from ores (e.g., reduction of ores with carbon). - Explain why some metals are found uncombined in nature.	Practical demonstration: Carbon reduction of copper oxide. Watch video: How modern methods extract metals (e.g., electrolysis for aluminium). Given reactivity series, students predict with reasoning how the metals could be extracted from their ores Homework: Write a report on the environmental impact of metal extraction.	Quizzes Targeted questions Peer/self-assessment	Reactivity series Knowledge of how group 1 metals react	Describing trend	
Lesson 4 – Introduction to acids, Alkali and bases 4.4.2.1	Understand the difference between acids and alkalis. Learn how to use **indicators**, such as litmus paper and the pH scale, to classify substances as acidic, neutral, or alkaline.	○ Practical: Testing household substances with indicators. ○ Given key terms, students write their definition of acids and alkali ○ Group discussion on real-world examples of acids and alkalis. ○ Evaluate the use of different indicators	Quizzes Targeted questions Peer/self-assessment	Knowledge of pH scale from Ks3	Recording observing observations Literacy – use of keytems Evaluative skills	
Week 3 – How acids react						
Week 18 03/02/25 to 09/02/25 Lesson 5 – Reactions with Acids	-I can use the general equation to predict the products from a reaction -I can determine the formula of a salt from common ions	Teacher present rule on how to write the names of salts Students complete word equations predicting the products of chemical reaction		Stoichiometry		

Lesson 6 – Neutralisation 4.4.2.2	I can describe the ions that lead to acidic and alkaline conditions -I can use the pH scale to describe how acidic or alkaline a solution is -I can use an equation to show neutralisation					
	Making soluble salt 4.4.2.3					
Week 19 10/02/25 to 16/02/25 **Lesson 7** - The Concentration of a Solution	I can calculate the **concentration** of a solution in mol/dm3 -I can carry out titration calculations				Numeracy	
Lesson 8 (RP) – Titration 4.4.2.5	-I can carry out a titration -I can calculate a concentration from titration data				○ Error analysis ○ Attention to detail ○ Precision and accuracy	RP titration
Lesson 9 (RP) – Making soluble salt Week 20 17/02/25 to 23/02/25	-I can describe how to make a pure salt				Organisational skill Safety and risk management	RP – making salt
– Types of acids and Electrolysis -						
Lesson 8 – pH scale - Strong and weak acids 4.4.2.4 4.4.3.4	-I can give examples of strong and weak acids -I can describe how concentration relates to pH -I can use the terms strong, weak, concentrated and dilute in term of acids Required practical – Electrolysis	Demonstration: Diluting acids and observing their reactions. Graph interpretation of pH changes. Homework: Worksheet on identifying strong and weak acids.			Pattern recognition Interpreting trends	

		Activities: Practical: Metal + acid reactions (magnesium, zinc, copper, etc.). Video analysis: The reactivity series.				
Lesson 9 – Electrolysis 4.4.3.1	-I can explain why compounds need to be **molten** or dissolved to conduct -I can describe the movement of ions during electrolysis - I can predict the products of electrolysis -I can write **balanced half equations** to describe what happens at each electrode					
Required practical and revision						
Week 21 24/02/25 to 02/03/25 Lesson 10 (RP)– Electrolysis 4.4.3.2 Lesson 11:	-I can describe how to test for the production of **chlorine gas** -I can describe how to test for the production of **hydrogen gas** -I can describe how to test for the production of **oxygen gas** -I can describe what happens to aqueous solutions that are electrolysed I can write **half equations** of what happens at the **cathode** and a**node** **Fuel Cells and Batteries**	Activities: Practical: Electrolysis of CuSO4 solution Group discussion on industrial electrolysis (e.g., aluminium extraction). Homework: Case study: The role of electrolysis in the production of metals.				RP – Electrolysis
Week 22 03/03/25 to 09/03/25 Week 7: Lesson 11: Revision – Retrieval Lesson 12: Buffer						

Week 8: 21/10/24 to 24/10/24 Lesson 13: End of Unit Test	Assess students' understanding of the entire unit. Activities: End-of-unit test covering acids, metal reactions, electrolysis, and redox reactions. Homework: Review test results and self-assess.					
Lesson 14: Feedback and Revision	Identify areas of weakness and clarify misunderstandings. Review key points for improvement. Activities: Individual feedback sessions. Group revision activities based on common errors in the test.					

4.3 Quantitative chemistry

Spec ref.	Lesson Title	Learning Outcomes	Practical/ Required Practical
4.3.1.1 Week 22 10/03/25 to 16/03/25	Lesson 1: Conservation of mass and balanced chemical equations		
4.3.1.2	**Lesson 2:** Relative formula mass		
4.3.1.3 Week 23 17/03/25 to 23/03/25	**Lesson 3:** Mass changes when a reactant or product is a gas		
4.3.1.4	**Lesson 4 –** Chemical measurements		
4.3.2.1 Week 24 24/03/25 to 30/03/25	Lesson 5 Moles (HT only)		
4.3.2.2	Lesson 6 Amounts of substances in equations (HT only)		
4.3.2.3	**Lesson 7:** Using moles to balance equations (HT only)		

Spec ref.	Lesson Title	Learning Outcomes	Practical/ Required Practical
Half term			
Week 25 21/04/25 to 27/04/25	**Lesson 8:** Limiting reactants (HT only)		
4.3.3.1 4.3.3.2	**Lesson 9:** Percentage yield Atom economy		
4.3.4 Week 26 28/04/25 to 04/05/25	**Lesson 10:** Using concentrations of solutions in mol/dm3 (chemistry only) (HT only)		
4.3.5	**Lesson 11:** Use of amount of substance in relation to volumes of gases (chemistry only) (HT only)		
End of unit test			

4.5 Energy changes

Spec ref.	Lesson Title	Learning Outcomes	Practical/ Required Practical
4.5.1.1 Week 27 05/04/25 to 11/05/25	Lesson 1: Energy transfer during exothermic and endothermic reactions		**Required practical 4:** investigate the variables that affect temperature changes in reacting solutions such as, eg acid plus metals, acid plus carbonates, neutralisations, displacement of metals.
4.5.1.2	Lesson 2: Reaction profiles		
4.5.1.3 Week 28 12/05/25 to 18/05/25	Lesson 3: The energy change of reactions (HT only)		
4.5.2.1	Lesson 4: Cells and batteries		
4.5.2.2 Week 29 12/04/25 to 18/05/25	Lesson 5: Fuel cells		
End of unit test			

4.6 – Rate and extent of reaction

Spec ref.	Lesson Title	Learning Outcomes	Practical/ Required Practical
4.6.1.1 Week 30 02/06/25 to 08/06/25	Lesson 1: Calculating rates of reactions	Students should be able to: • calculate the mean rate of a reaction from given information about the quantity of a reactant used or the quantity of a product formed and the time taken • draw, and interpret, graphs showing the quantity of product formed or quantity of reactant used up against time • draw tangents to the curves on these graphs and use the slope of the tangent as a measure of the rate of reaction • (HT only) calculate the gradient of a tangent to the curve on these graphs as a measure of rate of reaction at a specific time. For the Higher Tier, students are also required to use quantity of reactants in terms of moles and units for rate of reaction in mol/s.	
4.6.1.2	Lesson 2: Factors affecting rates of reaction	Students should be able to explain how: concentrations of reactants in solution, the pressure of reacting gases, the surface area of solid reactants, the temperature and the presence of catalysts affect rates of reaction	investigate how changes in concentration affect the rates of reactions by a method involving measuring the volume of a gas produced and a method involving a change in colour or turbidity.
4.6.1.3 Week 30 09/06/25 to 15/06/25 4.6.1.4	Lesson 2: Collision theory and activation energy Lesson 3: Catalysts	Students should be able to: • predict and explain using collision theory the effects of changing conditions of concentration, pressure and temperature on the rate of a reaction predict and explain the effects of changes in the size of pieces of a reacting solid in terms of surface area to volume ratio • use simple ideas about proportionality when using collision theory to explain the effect of a factor on the rate of a reaction. Students should be able to identify catalysts in reactions from their effect on the rate of reaction and because they are not included in the chemical equation for the reaction. Students should be able to explain catalytic action in terms of activation energy. Students do not need to know the names of catalysts other than those specified in the subject content.	
4.6.2.1	Lesson 4: Reversible reactions	Students should be able to interpret appropriate given data to predict the effect of a change in concentration of a reactant or	

Spec ref.	Lesson Title	Learning Outcomes	Practical/ Required Practical
4.6.2.2 Week 30 16/06/25 To 22/06/25	Energy changes and reversible reactions	product on given reactions at equilibrium	
4.6.2.4 4.6.2.6 4.6.2.7 Week 30 23/06/25 to 29/06/25	Lesson 5: The effect of changing conditions on equilibrium (HT only)	The effect of temperature changes on equilibrium (HT only) Students should be able to interpret appropriate given data to predict the effect of a change in temperature on given reactions at equilibrium. The effect of pressure changes on equilibrium (HT only) Le Chetaliers principle	
Practical and Buffer zones Exams etc. 30/07/25 to 06/06/25 07/07/25 to 13/07/25 14/07/25 to 18/07/25			