Medium Term Planning - Topic: Electrolysis

Curriculum Intent	**In addition to working further on objectives from Year __, pupils will be taught, following National Curriculum guidelines, the following this topic:**
Skills/National Curriculum Links	Exothermic and endothermic reactions: Aiming for Grade 4 LOs: • Define exothermic and endothermic reactions. • State that energy is conserved in a chemical reaction. • Safely complete a calorimetry experiment for a reaction that takes place in solution. Aiming for Grade 6 LOs: • Describe examples of exothermic and endothermic reactions. • Explain, using observations from calorimetry, how to classify a reaction as exothermic or endothermic. • Explain in detail how to carry out a calorimetry experiment. Aiming for Grade 8 LOs: • Explain a chemical reaction in terms of energy transfer. • Plan, carry out, and evaluate the errors in a calorimetry investigation. Using energy transfer from reactions: Aiming for Grade 4 LOs: • State a use of an exothermic reaction and an endothermic reaction. • Write word equations for familiar reactions. Aiming for Grade 6 LOs: • Explain how an energy change from a chemical reaction can be used. • Write balanced symbol equations for familiar reactions. Aiming for Grade 8 LOs: • Suggest a chemical reaction for a specific purpose based on the energy change for the reaction. • Evaluate in detail the uses of exothermic and endothermic reactions. Reaction profiles: Aiming for Grade 4 LOs: • Define activation energy. • Sketch a generic reaction profile diagram for an exothermic or endothermic reaction. Aiming for Grade 6 LOs: • Label activation energy on a reaction profile diagram. • Generate a specific reaction profile diagram for a given chemical reaction when its energy change is also supplied. • Identify bonds broken in reactants and new bonds made in products of a reaction. Aiming for Grade 8 LOs: • Explain why chemical reactions need activation energy to start them. • Use the particle model to explain how a chemical reaction occurs. • Explain energy change in terms of the balance between bond making and bond breaking. Bond energy calculations: Aiming for Grade 6 LOs: • Explain, using the particle model, how reactants become products in a chemical reaction. • Explain why bond breaking is endothermic and bond making is exothermic. • Define bond energy and identify all the bonds that break and are made in a chemical reaction. Cells and batteries: Aiming for Grade 4 LOs: • Describe a simple cell. • Describe a battery • Give an example of a nonrechargeable battery. Aiming for Grade 6 LOs: • Explain how potential difference can be changed in a cell. • Interpret data from an electrochemical cell to determine the reactivity of the metals involved. • Explain why non-rechargeable batteries stop working.

	Aiming for Grade 8 LOs: • Describe an electrochemical cell with half equations and ionic equations. • Explain why the reactions in an electrochemical cell are redox reactions and determine which species is oxidised or reduced in an electrochemical cell. • Evaluate the use of non-rechargeable cells. Fuel cells: Aiming for Grade 4 LOs: • Describe a hydrogen fuel cell. • State some uses for hydrogen fuel cells. • State that hydrogen fuel cells could be an alternative to rechargeable cells and batteries. Aiming for Grade 6 LOs: • Explain how a hydrogen fuel cell produces electricity. • List the advantages and disadvantages of hydrogen fuel cells. • Explain why hydrogen fuel cells are an alternative to rechargeable cells and batteries. Aiming for Grade 8 LOs: • Describe the reactions in fuel cells using balanced symbol and half equations. • Evaluate the use of hydrogen fuel cells instead of rechargeable cells and batteries. • Determine and explain which species is oxidised and which is reduced in a hydrogen fuel cell.
Spiritual, moral, social, and cultural development	**SMSC:** group work from practical activities in this section. Also pupils can work in groups to produce a timeline for the development of the periodic table. **PSHE/British Values:** The history of the is important development of the atom when learning about british values and world values. Students will complete teamwork, leadership and put science into everyday situations. They will show mutual respect during classwork. **Skills Builder:**Listening (Receiving, retaining and processing info), Speaking (The oral transmission of info and ideas), Problem solving (Find a solution to a situation or challenge), Creativity (imagination and generation of new ideas), Staying positive (The ability to use tactics and strategies to overcome setbacks), aiming high (Set clear and tangible goals), Leadership and teamwork
Numeracy	
Literacy	**Vocabulary Tier 2:** surroundings, combustion, expressed, particles, external, collide, displacement, tendency, pollutants. **Vocabulary Tier 3:** activation energy, bond energy, endothermic, exothermic, fuel cells. **Reading:** Following a written method and read risk assessments. Students may be directed to the textbook; this could be in lesson or at home on Kerboodle. **Writing:** Describing and explaining scientific phenomenon, free response writing for describing precautions taken, use of word mat to promote sentence formation. **Oracy:** inclusion of BEST resources which are research evidence on common misunderstandings in science, effective diagnostic questioning and formative assessment, constructivist approaches to building understanding, and effective sequencing of key concepts that promote metacognitive talk and dialogue.
Becoming future ready	**Careers/Employability:** Scientist Chemist Drug development Teacher Post-doctoral researcher
Adaptation **QFT/SEND Provision**	Throughout this topic, quality first teaching will provide differentiation: **By product:** Linear assessments and differentiated practical work. **By resource:** Lessons are differentiated per class and students, worksheets are available if support and assessments are linear. **By Intervention**: by providing different levels of supervision and support **By Progressive Questioning:** exploring pupils' understanding through interactive dialogue. **By Grouping:** according to prior attainment, gender, social preference, preferred learning style. **By Offering Optional Activities:** In class or as homework, to extend learning. This QFT/SEND provision will be explicit within the lesson-by-lesson schemes of work.
Implementation Curriculum Delivery Learning Outcomes **(Core Knowledge)**	To be able to: 5.1.1 Energy is conserved in chemical reactions. The amount of energy in the universe at the end of a chemical reaction is the same as before the reaction takes place. If a reaction transfers energy to the surroundings the product molecules must have less energy than the reactants, by the amount transferred. An exothermic reaction is one that transfers energy to the surroundings so the temperature of the surroundings increases. Exothermic reactions include combustion, many oxidation reactions and neutralisation. An endothermic reaction is one that takes in energy from the surroundings so the temperature of the surroundings decreases. Endothermic reactions include thermal decompositions and the reaction of citric acid and sodium hydrogen carbonate. Students should be able to: • distinguish between exothermic and endothermic reactions on the basis of the temperature change of the surroundings. Limited to measurement of temperature change. Calculation of energy changes or ΔH is not

	required. Required practical: Investigate the variables that affect temperature changes in reacting solutions, for example, acid plus metals, acid plus carbonates, neutralisations. 5.1.1 An exothermic reaction is one that transfers energy to the surroundings so the temperature of the surroundings increases. Everyday uses of exothermic reactions include self-heating cans and hand warmers. An endothermic reaction is one that takes in energy from the surroundings so the temperature of the surroundings decreases. Some sports injury packs are based on endothermic reactions. Students should be able to: • evaluate uses and applications of exothermic and endothermic reactions given appropriate information. 5.1.2 Chemical reactions can occur only when reacting particles collide with each other and with sufficient energy. The minimum amount of energy that particles must have to react is called the activation energy. Reaction profiles can be used to show the relative energies of reactants and products, the activation energy, and the overall energy change of a reaction. Students should be able to: • draw simple reaction profiles (energy level diagrams) for exothermic and endothermic reactions showing the relative energies of reactants and products, the activation energy, and the overall energy change, with a curved line to show the energy as the reaction proceeds • use reaction profiles to identify reactions as exothermic or endothermic • explain that the activation energy is the energy needed for a reaction to occur • calculate energy changes. 5.1.3 H During a chemical reaction: • energy must be supplied to break bonds in the reactants • energy is released when bonds in the products are formed. 5.1.3 During a chemical reaction: • energy must be supplied to break bonds in the reactants • energy is released when bonds in the products are formed. The energy needed to break bonds and the energy released when bonds are formed can be calculated from bond energies. The difference between the sum of the energy needed to break bonds in the reactants and the sum of the energy released when bonds in the products are formed is the overall energy change of the reaction. In an exothermic reaction, the energy released from forming new bonds is greater than the energy needed to break existing bonds. In an endothermic reaction, the energy needed to break existing bonds is greater than the energy released from forming new bonds. Students should be able to calculate the energy transferred in chemical reactions using bond energies supplied. 5.2.1 Cells contain chemicals which react to produce electricity. The voltage produced by a cell is dependent upon a number of factors including the type of electrode and electrolyte. A simple cell can be made by connecting two different metals in contact with an electrolyte. Batteries consist of two or more cells connected together in series to provide a greater voltage. In non-rechargeable cells and batteries the chemical reactions stop when one of the reactants has been used up. Alkaline batteries are non-rechargeable. Rechargeable cells and batteries can be recharged because the chemical reactions are reversed when an external electrical current is supplied. Students should be able to interpret data for relative reactivity of different metals and evaluate the use of cells. Students do not need to know details of cells and batteries other than those specified. 5.2.2 Fuel cells are supplied by an external source of fuel (e.g., hydrogen) and oxygen or air. The fuel is oxidised electrochemically within the fuel cell to produce a potential difference. The overall reaction in a hydrogen fuel cell involves the oxidation of hydrogen to produce water. Hydrogen fuel cells offer a potential alternative to rechargeable cells and batteries. Students should be able to: • evaluate the use of hydrogen fuel cells in comparison with rechargeable cells and batteries • H write the half equations for the electrode reactions in the hydrogen fuel cell.
Current learning to be developed in the future within:	A level chemistry students will again cover all greater depth, with the topic of electrochemistry.
Assessment	Refer to assessment maps for formative and summative assessment opportunities.
Impact	Attainment and Progress – Refer to assessment results / data review documentation.