



## Year 11 Learning Journey

### Autumn Term 1

#### Electrolysis

Core knowledge
1. State and describe the process of electrolysis in terms of electrolytes, free ions, redox and electrodes.
2. Predict and identify the products of electrolysis of various ionic compounds including NaCl solution, $\text{PbBr}_2$ , $\text{Al}_2\text{O}_3$ , $\text{CuSO}_4$ solution.
3. Describe and explain the products of electrolysis when metals are more or less reactive than hydrogen and if halide ions are present.
4. <b>Higher</b> - Be able to write half equations for the reactions at the electrodes during electrolysis of aqueous solutions.
5. <b>Required practical 9</b> - Describe how to setup an electrolysis experiment using inert electrodes and make clear identification of the products.

#### Learning Checkpoints

Learning Checkpoint Title	Attempt 1		Attempt 2 / Extend	
	Mark	RAG	Mark	RAG
LC1				
LC2				

Key Vocabulary
Tier 2 – Separate, Predict, Formed, Balance, Maximum
Tier 3 - Electrolysis, Electrolyte, Ion, Redox, Electrode, Cathode, Anode, Cation, Anion, Aqueous, Molten



## Year 11 Learning Journey

### Autumn Term 2

#### Rates of Reaction

Core knowledge
1. Describe and explain what 'collision theory' is and how the rate of a reaction is affected by temperature, concentration, pressure and surface area to volume ratio.
2. Describe what a catalyst is and explain how it speeds up the rate of a reaction without being changed or used up.
3. Identify and interpret reaction profiles to show reactions both with and without catalysts.
4. Determine the rate of reaction using the amount of reactant used up or the amount of product formed over a period of time and state it in units g/s or cm <sup>3</sup> /s.
5. Draw and interpret graphs of the rate of a reaction showing product formed or reactant used up against time.
6. <b>Required practical 11</b> - Describe and explain how to investigate the effect of concentration on the rate of reaction by observing a precipitate formed or volume of gas produced.
7. Calculate the rate of a reaction using the slope of a graph.
8. Calculate the rate of a reaction at a specific time using a tangent of a graph.
9. Recall what is a reversible reaction in terms of products and reactants and recognise the how it is represented in a chemical equation.
10. Describe what is meant by the term equilibrium in terms of forward and reverse reaction rates.
11. Recall that if a reversible reaction is exothermic in one direction it is endothermic in the other direction and that energy absorbed in one direction will be released in the other.
12. Describe Le Chatelier's principle and explain that if the conditions are altered for a reversible reaction at equilibrium the position of equilibrium will alter to counteract those changes.
13. Predict how changing the temperature, pressure and concentration would alter the position of equilibrium.

#### Learning Checkpoints

Learning Checkpoint Title	Attempt 1		Attempt 2 / Extend	
	Mark	RAG	Mark	RAG
LC1				
LC2				

#### Key Vocabulary

Tier 2 – Rate, Frequently, Volume, Effect, Dynamic

Tier 3 – Gradient, Reactant, Product, Catalyst, Concentration, Surface Area, Reversible, Equilibrium, pressure, collision



## Year 11 Learning Journey

### Summer Term 1

#### Organic chemistry

Core knowledge
1. Recall that hydrocarbons contain hydrogen and carbon only.
2. State the names of the first 6 alkanes and recognise them from their molecular and displayed formulas and know they can be represented with the general formula $C_nH_{2n+2}$ .
3. Recall that hydrocarbons containing a double bond are referred to as alkenes and they are more reactive than alkanes.
4. Describe how alkenes can be used as the starting material for many chemicals and give examples of these substances such as polymers.
5. Describe the relationship between the size of hydrocarbon molecule and their viscosity, flammability, and boiling points.
6. Describe the products of complete combustion of a hydrocarbon and be able to represent this as balanced chemical equations.
7. Describe and explain how bromine water can be used to identify the presence of an alkene and know they can be represented with the general formula $C_nH_{2n}$ .
8. Describe how the petrochemical industry separates fractions of crude oil to make fuels or starting materials for new compounds including lubricants, solvents, polymers and detergents.
9. Describe the properties and uses of crude oil fractions such as diesel oil, petrol, kerosene, heavy fuel oil and LPG in modern life.
10. Describe the process of cracking large hydrocarbon molecules into smaller more useful ones, of which one is an alkane and the other an alkene, which can be used as fuels.
11. Describe the process of catalytic cracking and steam cracking and be able to balance the chemical equation that represents the process.
12. State that carbon compounds can form a wide variety of homologous series.

#### Learning Checkpoints

Learning Checkpoint Title	Attempt 1		Attempt 2 / Extend	
	Mark	RAG	Mark	RAG
LC1				
LC2				

#### Key Vocabulary

Tier 2 – Properties, Flammable, Explain, Incomplete, Complete

Tier 3 - Hydrocarbon, Alkene, Alkane, Polymer, Cracking, Combustion, Saturated, Unsaturated, Distillation, Volatile



## Year 11 Learning Journey

### Summer Term 2

#### Chemical analysis

Core knowledge
1. Define the meaning of 'pure' in chemistry and how this differs from pure in everyday language.
2. State that pure substances melt and boil at specific temperatures, and that impure substances melt and boil over a range of temperatures.
3. Recall that a formulation is a mixture with exact amounts of components made for a specific function, that include paints, cleaning agents, medicines, alloys, fertilizers, fuels and foods.
4. Identify a substance as a formulation from given information.
5. Describe the process of chromatography in terms of the mobile and stationary phase and that a pure substance will only ever produce 1 spot during paper chromatography regardless of the solvent.
6. Calculate $R_f$ values using a ratio between the distance travelled by the substance and the distance travelled by the solvent.
7. <b>Required practical 12</b> - Describe how to carry out paper chromatography and use given chromatograms to calculate $R_f$ values to an appropriate number of significant figures.
8. Use $R_f$ values to identify the components of a mixture by comparing them with a reference compounds.
9. Describe and explain how to carry out tests for chlorine, oxygen, hydrogen and carbon dioxide and be able to identify positive results.

#### Learning Checkpoints

Learning Checkpoint Title	Attempt 1		Attempt 2 / Extend	
	Mark	RAG	Mark	RAG
LC1				
LC2				

#### Key Vocabulary

Tier 2 – analysing, identifying, comparing, value, observation

Tier 3 - Pure, Melting Point, Boiling Point, Chromatography,  $R_f$ , formulation, solvent, cation, halide, sulphate, carbonate



## Year 11 Learning Journey - Summer Term 2 - Using resources

Core knowledge
1. Recall what natural resources are used for and that some have been replaced by synthetic alternatives or enhanced by agriculture.
2. Describe what is meant by the terms renewable and finite and determine which category a material falls into.
3. Describe what sustainable development is and how chemistry can improve sustainability.
4. Describe the impacts of extracting and processing finite resources.
5. Describe the amount of energy required to extract and process raw materials is high and this energy comes from finite resources.
6. <b>Higher</b> - Describe and explain how bioleaching and phytomining can be used to extract metals such as copper from low grade ores due to limited supply of copper-rich ores.
7. Describe what is meant by recycling or reusing a product and suggest advantages of doing so.
8. Describe how materials such as glass or metals can be reused or recycled.
9. Analyse methods of reducing use of resources from given information.
10. Describe what a life cycle assessment (LCA) involves and what stages of a products life need to be considered.
11. Using an LCA interpret information about the environmental impact of a product.
12. Explain why LCAs are not completely objective in regards to some impacts not being quantifiable and requiring judgements instead.
13. Compare simple LCAs for bags made of paper and plastic and explain why some LCAs may be misleading.
14. Describe the difference between potable water and pure water and that how potable water is produced varies depending on location.
15. Describe that the water in the UK generally comes from freshwater sources which are supplied by rainfall.
16. Describe the process of treating freshwater to turn it into potable water.
17. Describe the process of making potable water in dry environments using desalination through reverse osmosis and detail the energy requirement to do so.
18. <b>Required practical 13</b> - Analyse and purify water samples from different sources, including pH, dissolved solids and distillation.
19. Describe the process used to treat domestic and agricultural waste water to remove organic matter and harmful microbes before being released into the environment.
20. Describe the need for industrial waste water to have organic matter and harmful chemicals removed during treatment.
21. Describe how the stages of screening, sedimentation, aerobic digestion and anaerobic digestion are used in sewage treatment and how this can be used to recycle water in areas where water is scarce.

### Learning Checkpoints

Learning Checkpoint Title	Attempt 1		Attempt 2 / Extend	
	Mark	RAG	Mark	RAG
LC1				
LC2				

### Key Vocabulary

Tier 2 – Natural, Describe, Compare, Social, Economic

Tier 3 - Finite, Renewable, Sustainable, Recycling, Potable, Reverse Osmosis, Anaerobic, Phytomining, purify, bioleaching