



Year 10 Learning Journey - Autumn Term 1

Structures, Bonding and the Properties of Matter

Core knowledge				
1. Describe what an ion is and how it is formed.				
2. Explain how ionic bonding occurs between oppositely charged ions.				
3. Explain ionic bonding in terms of electrostatic forces and loss and gain of electrons using dot and cross diagrams.				
4. Describe the properties of ionic compounds and explain why they conduct electricity when molten or dissolved.				
5. Describe what a covalent bond is and use diagrams to show how covalent bonds form between non-metal elements.				
6. Draw diagrams to represent the bonding in the simple molecules of hydrogen, chlorine, hydrogen chloride, methane, water, oxygen & nitrogen.				
7. Explain in terms of intermolecular forces why simple molecular substance have poor electrical conductivity, low melting and boiling points and are usually gases or liquids at room temperature.				
8. Recall that silicon dioxide, graphite and diamond are all giant covalent substances and explain why they have high melting and boiling points.				
9. Describe and explain the structure and properties of diamond, graphite and graphene.				
10. State what is meant by the term fullerene and give examples of these structures.				
11. Explain how the properties of nanotubes makes them suitable for their uses.				
12. Be able to draw diagrams of the bonding in a metal and explain how the structure gives it useful properties.				
13. State what an alloy is and use understanding of their structure to explain why they are harder than pure metals.				
14. Use diagrams and state symbols to represent the 3 states of matter and explain the limitations of each model.				
15. Recall that the bulk properties of a material aren't possessed by the particles of that material.				
16. Use the particle model to explain changes of state and describe the relationship between both melting and freezing (melting point) and boiling and condensing (boiling point).				
17. Explain the relationship between the strength of forces between particles and how much energy it takes for a substance to melt or boil and predict using data the state of a substance at a particular temperature.				
Learning Checkpoint Title	Attempt 1		Attempt 2 / Extend	
	Mark	RAG	Mark	RAG
LC1				
LC2				

Key Vocabulary
Tier 2 Attract, Repulsive, Possess, Model, Oppose
Tier 3 Ion, Ionic Bond, Covalent Bond, Giant Covalent Structure, States of Matter



Year 10 Learning Journey - Autumn Term 2

The Periodic Table

Core knowledge
1. Describe how scientists contributed to the development of the periodic table.
2. Identify what 'Mendeleev did to solve some of the problems of the early periodic table.
3. Define how elements are arranged in the modern periodic table.
4. Explain where metals and non-metals are found in the periodic table.
5. Explain how the electronic structure of metals and non-metals affects their properties and how they react.
6. State the name and properties of the group 1 elements and explain the trend in reactivity down the group.
7. State the name and properties of the group 7 elements and explain the trend in reactivity down the group.
8. State the name and properties of the group 0 elements and explain the trend in properties within the group.
9. Describe how positive and negative ions form and explain the charge formed using electronic structure.

Learning Checkpoints

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

Key Vocabulary
Tier 2 Deduce, Ordered, Trend, Predict, Prove
Tier 3 Atomic Weight, Atomic Number, Metal, Non-metal, Electronic Structure



Year 10 Learning Journey

Autumn Term 2

Energy Changes

Core knowledge
1. Recall that during a chemical reaction the total amount of energy in the universe stays the same.
2. Describe and explain what is meant by an exothermic and endothermic reactions in terms of temperature change of the surroundings.
3. Give examples of exothermic and endothermic reactions.
4. Required practical 10: investigate how different variables affect the temperature change of a reaction in solution.
5. Key practical skill: measure temperature changes when substances react or dissolve in water.
6. Describe what the 'activation energy' of a reaction is in terms of particles and collisions.
7. Interpret reaction profiles (energy level diagrams) to identify the relative energies of reactants and products, the activation energy and the overall energy change.
8. Determine if a reaction is exothermic or endothermic using a reaction profile.
9. Draw simple reaction profiles for exothermic and endothermic reactions.
10. Higher - Calculate using bond energies if a reaction is exothermic or endothermic and explain this using the terms 'bond making' and 'bond breaking'.

Learning Checkpoints

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

Key Vocabulary
Tier 2 Difference, Compare, Calculate, Axes, Suggest
Tier 3 Endothermic, Exothermic, Activation Energy, Collisions, Bond Energy, Surroundings



Year 10 Learning Journey

Spring Term 1

Quantitative Chemistry – Part 1

Core knowledge
1. Calculate the relative formula mass (M_r) of a compound, using relative atomic masses (A_r).
2. Make use of relative formula masses (M_r) in chemical calculations.
3. Higher - Recall that amounts of chemical substances are measured in moles and that 1 mole contains 6.02×10^{23} particles.
4. Higher - Describe the relationship between the mass of 1 mole and relative formula mass of a substance.
5. Describe and explain what is meant by the law of conservation of mass and use this principle to balance chemical equations.
6. Higher - Calculate the mass of substances in a reaction when given the mass of 1 of the products or reactants and a symbol equation.
7. Higher - State the meaning of the terms limiting reactant and excess.
8. Describe the meaning of the term concentration and state the relationship between mass (g), volume (dm^3) and concentration (g/dm^3).
9. Describe the meaning of the term uncertainty and be able to calculate the uncertainty of a measurement from a range.

Learning Checkpoints

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

Key Vocabulary
Tier 2 Economy, Concentration, Reversible, Factor, Volume
Tier 3 Relative Formula Mass, Moles, Limiting Reactant, Excess, Concentration, Volume, Mass



Year 10 Learning Journey - Spring Term 2

Chemical Changes

Core knowledge	
1.	Describe how the pH scale is used to determine how acidic or alkaline a solution is based on a scale from 0 to 14, solutions formed with pH of less than 7 being acidic, more than 7 alkaline and exactly
2.	Describe how to use universal indicator or a pH probe to measure the pH of a solution.
3.	Recall that H^+ ions make solutions acidic and OH^- ions alkaline.
4.	Explain why water is always a product of a neutralisation reaction.
5.	Higher - Explain what makes strong and weak acids in terms of ionisation and dissociation, give examples of these acids and describe the difference between a concentrated acid and a strong acid.
6.	State that a change in H^+ ion concentration by a factor of 10 will only result in a change of 1 on the pH scale.
7.	Describe the reactions of acids with bases such as metal oxides and metal hydroxides.
8.	Recall that the salts formed depends upon the positive ion in the base and the acid it reacts with.
9.	Describe the reactions of acids with metal carbonates.
10.	Required Practical 8 - Describe and explain how to make a pure dry sample of a soluble salt from the reaction of an acid with an insoluble oxide or carbonate.
11.	Describe how the pH scale is used to determine how acidic or alkaline a solution is based on a scale from 0 to 14, solutions formed with pH of less than 7 being acidic, more than 7 alkaline and exactly
12.	Describe how experimental results can be used to work out an order of reactivity and recall that an order of reactivity of metals is called the reactivity series.
13.	State that more reactive metals are able to displace less reactive metals from their compounds.
14.	Higher - Identify in a given reaction, symbol equation, or half equation which species are oxidised and which are reduced, in terms of electron transfer.
15.	Describe what is meant by the term 'REDOX reaction' and explain why most metals require extraction.
16.	Describe how metals lower than carbon in the reactivity series are extracted from their ore.
17.	Describe how metals higher than carbon in the reactivity series are extracted from their ore.
18.	Describe REDOX reactions in terms of loss and gain of electrons.

Learning Checkpoints

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

Key Vocabulary

Tier 2

Displace, Reduce, Neutralise, Concentrate

Tier 3

pH, Universal Indicator, Strong, Weak, Acid, Base, Redox, Reactivity



Year 10 Learning Journey

Summer 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, PbBr_2 , Al_2O_3 , 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. Higher - Be able to write half equations for the reactions at the electrodes during electrolysis of aqueous solutions.
5. Required practical 9 - 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 10 Learning Journey

Summer 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 ³ /s.
5. Draw and interpret graphs of the rate of a reaction showing product formed or reactant used up against time.
6. Required practical 11 - 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