Yr 7 Long Term Plan (Chemistry)

Year 7 Intent / End Point: Students will study part of each of the "Big Ideas" in Chemistry (as outlined on the Learning Journey). Beginning with a study of the properties of different substances and how this knowledge is used to devise separating techniques. This extends into the properties of acids and alkalis. Students then learn the particulate nature of matter and how this helps to *explain* different properties. Finally, they learn about different atoms and elements and how they are rearranged in chemical reactions - and their abundance in the Earth and the Atmosphere.

	Phase 1 - HT1 & HT2		Phase 2- HT3		Phase 3- HT5	
Unit title	**7E Mixtures and Separation**	**7F Acids and Alkalis**	**7G- The Particle Model**		**7H- Atoms, Elements and Molecules.**	
Subject Knowledge	• Recall the three states of matter and identify solids, liquids, gases. Classify Mixtures • Describe how factors affect how much of a substance dissolves. • Describe what happens during evaporating. • Describe how chromatography is used to separate mixtures. • Explain how distillation works.	• The meaning of hazard symbols. • Describing acids and alkalis in terms of pH. • Understanding & using the pH scale. • Understanding neutralisation and uses of it.	• Properties of states of matter in terms of the particle model including pressure • Similarities and differences, between solids, liquids and gases • Brownian motion in gases • Differences in arrangements, motion and closeness of particles explaining properties.		• Differences between atoms, elements and compounds • Chemical symbols and formulae for elements and compounds • Combustion, thermal decomposition, oxidation and displacement reactions • The composition of the Earth	
Working Scientifically	Students learn how to use a Bunsen burner. Identify risks to themselves and others and state the meaning of: risk, hazard. Recognise a range of risks and plan appropriate safety precautions.	Use appropriate techniques, apparatus and materials during fieldwork and laboratory work, paying attention to health and safety. Students conduct a full investigation into indigestion remedies	Describe how evidence and observations are used to develop a hypothesis into a theory. Explain how evidence and observations support or do not support a certain theory.		State the difference between quantitative and qualitative data. Interpret tables, bar charts, pie charts and scatter graphs. Identify the best way to present different types of data.	
Literacy and Numeracy	Students learn how to write a scientific method. Divide written information into: sections, groups, bullet points. Develop logical sequences of points in writing.	Identify key points in a text. Develop clear titles in order to present ideas and opinions.	LIT- Identify adjectives, comparatives and superlatives in sentences. NUM - calculating mean/ plotting scatter graph/ curve of best fit		Identify and explain the difference between fact (scientific evidence) and opinion. Identify where facts and opinions are used to persuade.	
Middle Stake Testing	End of Unit Test 7E Purposeful Practice (Try now)	End of Unit Test 7F Purposeful Practice (Try now)	End of Unit Test 7G	Purposeful Practice (Try now)	End of Unit Test 7H	Purposeful Practice (Try now)
High Stake Testing			Assessment 1			End of Year Assessment
Skills development	Students will learn how to work safely and assess risk during investigations. They will learn how to write a scientific method and how to present different forms of data for scientific evidence.					

Yr 8 Long Term Plan (Chemistry)

Year 8 Intent / End Point: Students continue their learning journey into the "Big Ideas" in Chemistry (as outlined on the Learning Journey). They recap on the idea of atoms and how they combine to make compounds. They learn how atoms are rearranged in combustion reactions. This is extended into a study of corrosion and displacement reactions. They begin to link properties of metals with their uses. They will be able to understand physical and chemical weathering of rocks in the Earth's crust and the minerals from which they are made.

	Phase 1- HT1		Phase 2- HT3		Phase 3- HT5	
Unit title	**8E/F Combustion/ Periodic Table**		**8G/9F- Metals and their Uses/Reactivity**		**8H- Rocks**	
Subject Knowledge	• Recap on Atoms and Dalton's Atomic Model. • Differences between Atoms, Elements and Compounds. • Chemical Symbols and Formulae. • Chemical reactions as the rearrangement of atoms. • Conservation of mass, changes of state and chemical reactions. • Combustion and Oxidation reactions. • Fire safety. How to stop combustion reactions. • How burning fuels produces pollution. • What catalysts do. • The Carbon Cycle. The composition of the Atmosphere. The production of carbon dioxide by human activity and the impact on climate change.		• Describe some common properties of metals and non-metals. • Model simple reactions of metals and non-metals using word equations. • Describe the corrosion of metals by reactions with oxygen. • Recall ways in which iron can be prevented from rusting. • Use information on the reactions of metals with water and acid to place them in an order of reactivity. • Explain why metals are often alloyed with other elements. • Classify changes as exothermic or endothermic from temperature changes. • Explain why a displacement reaction may or may not occur. • Recall that the extraction of some metals is more difficult than others, depending on the metal's reactivity.		• Recall what earthquakes and volcanoes are. • Recall why different rocks have different properties • Explain why certain rocks are porous and/or permeable. • Describe how igneous rocks are formed. • Describe how metamorphic rocks are formed • Explain the variation in crystal size in an igneous intrusion, in terms of cooling rate • Describe the effect of chemical weathering on rocks. • Describe the link between the size of rock fragments carried and the water speed • Describe how sedimentary rocks are formed. • Evaluate the environmental effects of quarrying and mining.	
Working Scientifically	Identify variables that need to be controlled in a given experiment. Plan ways in which to control a simple control variable.	Explain the need for a fair test. Plan ways in which to control more than one variable. Justify the choice of control variables.	Identify data that is repeatable, not repeatable, reproducible, not reproducible, reliable and not reliable.	Explain why repeatable, reproducible, reliable data are better quality. Suggest a simple way to improve an investigation.	Outline the basic scientific method and how it is modified for largely observational sciences such as Geology.	Identify hypotheses and some of the evidence that supports or refutes them.
Literacy and Numeracy	Lit: Distinguish between information and explanation texts. Use information and explanation texts to answer different types of question.	Num: Interpreting line graphs.	Lit - the use of adjectives to accurately describe substances in science.	Num - calculating mean values and percentages drawing and interpreting bar charts and line graphs. Calculate percentage change.	Lit - analysing the use of emotive language and evaluating media reports.	Num - interpreting more complex graphs substituting into formulae.
Middle Stake Testing	**End of Unit Test 8E/F**	Purposeful Practice (Try now)	**End of Unit Test 8G**	Purposeful Practice (Try now)	**End of Unit Test 8H**	Purposeful Practice (Try now)
High Stake Testing			Assessment 1			End of Year Assessment
Skills development	**Students will learn how to identify variables in a scientific investigation and to justify their choice of control variables. They will learn how to effectively communicate their observations in experiments and to interpret the results after presenting them in a graph.**					

Yr 9 Long Term Plan (Chemistry)

Year 9 Intent / End Point: Students will study part of each of the "Big Ideas" in Chemistry (as outlined on the Learning Journey). Beginning with a study of the properties of different substances and how this knowledge is used to devise separating techniques. They then learn about how the model of the atom has changed in the light of new evidence and how the elements were first arranged into a Periodic Table. They will be able to compare older versions of the Periodic Table to the modern version. This completes the coverage of the National Curriculum and overlaps with the Chemistry GCSE. Pupils will learn how to tackle 6 mark questions on a GCSE paper.

	Phase 1- HT1			Phase 2- HT4		
Unit title	**SC1/SC2 States of Matter/Methods of Separating Substances.**			**SC3/SC4 Atomic Structure/ Periodic Table**		
Subject Knowledge	• Describe the arrangement, movement and the relative energy of particles in each of the three states of matter: solid, liquid and gas • Explain the changes in arrangement, movement and energy of particles during interconversions. • Explain the differences between the use of 'pure' in chemistry compared with its everyday use and the differences in chemistry between a pure substance and a mixture • Explain the experimental techniques for separation of mixtures by: (c) filtration; and (d) crystallisation. • Explain how substances can be separated by chromatography. • Describe how to carry out, and explain what happens in, simple distillation. • Identify when fractional distillation should be used to separate a mixture. • Describe how a) waste and ground water can be made potable, including the need for sedimentation, filtration and chlorination. b) seawater can be made potable by using distillation. c) water used in analysis must not contain any dissolved salts.			• Describe how the Dalton model of an atom has changed because of the discovery of subatomic particles. • Describe the structure of an atom as a nucleus containing protons and neutrons, surrounded by electrons in shells. • Calculate the numbers of protons, neutrons and electrons in atoms given the atomic number and mass number. • Describe isotopes as different atoms of the same element containing the same number of protons but different numbers of neutrons in their nuclei. • Calculate the relative atomic mass of an element from the relative masses and abundances of its isotopes. • Describe how Mendeleev arranged the elements, known at that time, in a periodic table by using properties of these elements and their compounds. • Describe how Mendeleev used his table to predict the existence and properties of some elements not then discovered.		
Working Scientifically	Evaluate the risks in a practical procedure and suggest suitable precautions for a range of practicals.	Core Practical - Separating inks by distillation and chromatography.				
Literacy and Numeracy	Students learn how to write a scientific method. Divide written information into: sections, groups, bullet points. Develop logical sequences of points in writing.	Num - to identify substances by calculation and the use of Rf values Substitute numerical values into algebraic equations	Translate information between graphical and numeric forms. Plot two variables using experimental or other data.	Use ratios, fractions and percentages. Use an appropriate number of significant figures	Calculate arithmetic means.	
Middle Stake Testing	6 Mark Q - SC1 - CORE Practical End of Unit Test SC1/SC2	6 Mark Q - Structure Strip	6 Mark Q - Structure Strip	6 Mark Q - Structure Strip End of Unit Test Sc3/SC4	6 Mark Q - Structure Strip	6 Mark Q - Structure Strip
High Stake Testing			Assessment 1			End of Year Assessment
Skills development	Students will further develop their ability to conduct full investigations, identifying variables, and suggesting improvements to experimental methods. They will perform calculations from the data gathered in investigations and learn how to draw valid conclusions.					

Yr 10 Long Term Plan (Separate Chemistry)

Year 10 Intent / End Point: Students will study part of each of the "Big Ideas" in Chemistry (as outlined on the Learning Journey). They will be able to describe the different types of chemical bonding and structure and how this affects the properties of materials. They will extend their knowledge of acids and alkalis and be able to write balanced symbol equations for chemical reactions. They will carry out extraction methods of metals and be able to explain these processes. They will be able to perform quantitative calculations for chemical reactions. They will be able to describe the effects of changing reaction conditions on the position of an equilibrium reaction. They will be able to describe the main properties of transition metals and be able to relate these to their uses.

	HT1	HT2	HT3	HT4	HT5	HT6
Unit title	**SC5-7 Structure and Bonding SC8 - Acids and Alkalis**		**SC9 Calculations Involving Masses/SC 10 Electrolytic Processes/SC 11 Obtaining Metals/ Sc 12 Reversible Reactions**		**SC13 Transition Metals/ Sc14 Quantitative Analysis / Sc15 Dynamic Equilibria and calculations involving gases / SC16 Chemical Cells and Fuel Cells**	
Subject Knowledge	Explain how ionic bonds are formed. Describe the properties of ionic compounds. Explain the formation of simple molecular, covalent substances Explain the properties of typical covalent, simple molecular compounds Describe the structures of diamond, graphite, fullerenes and graphene. Explain the properties of metals, including malleability and the ability to conduct electricity Recall that acids in solution are sources of hydrogen ions and alkalis in solution are sources of hydroxide ions. Explain the terms weak and strong acids, with respect to the degree of dissociation into ions. Explain the general reactions of aqueous solutions of acids with metal oxides to produce salts. Write balanced chemical equations, including the use of the state symbols (s), (l), (g) and (aq). Explain an acid–alkali neutralisation as a reaction in which hydrogen ions (H+) from the acid react with hydroxide ions (OH–) Explain the general reaction between an acid and a metal carbonate to produce a salt, water and carbon dioxide. Recall the general rules which describe the solubility of common types of substances in water.		Calculate the formulae of simple compounds from reacting masses and understand that these are empirical formulae. Explain the law of conservation of mass. Calculate the number of: moles of particles of a substance in a given mass of that substance and vice versa. Describe electrolysis as a process in which electrical energy, from a direct current supply, decomposes electrolytes. Explain the formation of the products in the electrolysis, using inert electrodes, of some electrolytes. Explain the formation of the products in the electrolysis of copper sulfate solution. Deduce the relative reactivity of some metals, by their reactions with water, acids and salt solutions. Explain why the method used to extract a metal from its ore is related to its position in the reactivity series and the cost of the extraction process. Explain displacement reactions as redox reactions, in terms of gain or loss of electrons. Recall that chemical reactions are reversible, the use of the symbol ⇌ in equations and that the direction of some reversible reactions be altered by changing the reaction conditions.		Recall that most metals are transition metals and that their typical properties include: a high melting point, b high density, c the formation of coloured compounds, d catalytic activity of the metals and their compounds as exemplified by iron. Describe some general physical properties of transition metals. Explain how rusting can be prevented by excluding oxygen and/or water. Explain how electroplating can be used to improve the appearance and/or the resistance to corrosion of metal objects. Explain, using models, why converting pure metals into alloys often increases the strength of the product. Explain how the uses of metals are related to their properties (and vice versa), Calculate the percentage yield of a reaction from the actual yield and the theoretical yield. Calculate the atom economy of a reaction forming a desired product. Calculate the concentrations of solutions Carry out an accurate acid-alkali titration. Use the molar volume and balanced equations in calculations involving the masses of solids and volumes of gases. Evaluate the strengths and weaknesses of fuel cells for given uses.	
Working Scientifically	Core Practical - Preparing Copper Sulfate crystals. Core Practical - Investigating Neutralisation.		Core Practical - Electrolysis of copper sulfate solution.		Core Practical- Acid Alkali Titration	
Literacy and Numeracy	Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects.	Use ratios, fractions and percentages.	Use an appropriate number of significant figures.	Change the subject of an equation Recognise and use expressions in standard form		
Middle Stake Testing	6 Mark Q - Structure Strip	EOU Test - SP6 Core Practical	6 Mark Q - Structure Strip	EOU Test - SP6 Core Practical Supplement	6 Mark Q - Structure Strip	EOU Test - SP6
High Stake Testing		Assessment 1				End of Year Assessment
Skills development	Students will plan and conduct full investigations, and write balanced symbol equations or ionic half equations to help explain their observations of chemical reactions. They will learn how to calculate the yield in a reaction and the concentration of solutions.					

Yr 10 Long Term Plan (Combined Chemistry)

Year 10 Intent / End Point: : Students will study part of each of the "Big Ideas" in Chemistry (as outlined on the Learning Journey). They will be able to describe the different types of chemical bonding and structure and how this affects the properties of materials. They will extend their knowledge of acids and alkalis and be able to write balanced symbol equations for chemical reactions. They will carry out extraction methods of metals and be able to explain these processes. They will be able to perform quantitative calculations for chemical reactions. They will be able to describe the effects of changing reaction conditions on the position of an equilibrium reaction.

	HT1	HT2	HT3	HT4	HT5	HT6
Unit title	**CC5-7 Structure and Bonding CC8 - Acids and Alkalis**		**CC9 Calculations Involving Masses/CC 10 Electrolytic Processes/**		**CC 11 Obtaining Metals/ CC 12 Reversible Reactions**	
Subject Knowledge	Explain how ionic bonds are formed. Describe the properties of ionic compounds. Explain the formation of simple molecular, covalent substances Explain the properties of typical covalent, simple molecular compounds Describe the structures of diamond, graphite, fullerenes and graphene. Explain the properties of metals, including malleability and the ability to conduct electricity Recall that acids in solution are sources of hydrogen ions and alkalis in solution are sources of hydroxide ions. Explain the terms weak and strong acids, with respect to the degree of dissociation into ions. Explain the general reactions of aqueous solutions of acids with metal oxides to produce salts. Write balanced chemical equations, including the use of the state symbols (s), (l), (g) and (aq). Explain an acid–alkali neutralisation as a reaction in which hydrogen ions (H+) from the acid react with hydroxide ions (OH–) Explain the general reaction between an acid and a metal carbonate to produce a salt, water and carbon dioxide. Recall the general rules that describe the solubility of common types of substances in water.		Calculate the formulae of simple compounds from reacting masses and understand that these are empirical formulae. Explain the law of conservation of mass. Calculate the number of moles of particles of a substance in a given mass of that substance and vice versa. Describe electrolysis as a process in which electrical energy, from a direct current supply, decomposes electrolytes. Explain the formation of the products in the electrolysis, using inert electrodes, of some electrolytes. Explain the formation of the products in the electrolysis of copper sulfate solution.		Deduce the relative reactivity of some metals, by their reactions with water, acids and salt solutions. Explain why the method used to extract a metal from its ore is related to its position in the reactivity series and the cost of the extraction process. Explain displacement reactions as redox reactions, in terms of gain or loss of electrons. Recall that chemical reactions are reversible, the use of the symbol ⇌ in equations and that the direction of some reversible reactions be altered by changing the reaction conditions.	
Working Scientifically	Core Practical - Preparing copper sulfate crystals. Core Practical - Investigating Neutralisation.		Core Practical - Electrolysis of copper sulfate solution.			
Literacy and Numeracy	Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects.	Use ratios, fractions and percentages.	Use an appropriate number of significant figures.	Change the subject of an equation Recognise and use expressions in standard form		
Middle Stake Testing	6 Mark Q - Structure Strip	EOU Test - SP6 Core Practical Supplement	6 Mark Q - Structure Strip	EOU Test - SP6 Core Practical Supplement	6 Mark Q - Structure Strip	EOU Test - SP6
High Stake Testing		Assessment 1				End of Year Assessment
Skills development	Students will plan and conduct full investigations, and write balanced symbol equations or ionic half equations to help explain their observations of chemical reactions. They will learn how to calculate the yield in a reaction and the concentration of solutions.					

Yr 11 Long Term Plan (Separate Chemistry)

Year 11 Intent / End Point: Students will study part of each of the "Big Ideas" in Chemistry (as outlined on the Learning Journey). Students will be able to describe and explain the main trends in three of the groups in the Periodic Table. They will investigate and explain the factors that affect the rate of chemical reactions. They will be able to classify reactions as exothermic or endothermic and be able to calculate the overall energy transfer in a chemical reaction. They will then explore the reactions of hydrocarbons and how the combustion of fuels is affecting the Earth's atmosphere and the environment. This will extend into a deeper look at other organic chemicals. They will carry out qualitative analysis techniques and be able to identify different ions in compounds. They will then research the properties and uses of some common materials and some of the latest materials developed using nano technology.

	HT1	HT2	HT3	HT4	HT5	
Unit title	**SC17-19 Groups in the Periodic Table/ Rates of Reaction/ Heat Energy Changes in Reactions**		**SC20-21 Fuels/ Earth and Atmospheric Science**		**SC22-26 Hydrocarbons/Alcohols/Carboxylic Acids/Polymers/ Tests for Ions/ Nanotechnology**	
Subject Knowledge	Describe the pattern in reactivity of the alkali metals, lithium, sodium and potassium, with water. Explain this pattern in reactivity in terms of electronic configurations. Describe the reactions of the halogens. Describe the pattern in the physical properties of some noble gases and use this pattern to predict the physical properties of other noble gases. Suggest practical methods for determining the rate of a given reaction. Explain the effects on rates of reaction of changes in temperature, concentration, surface area to volume ratio of a solid and pressure (on reactions involving gases) in terms of frequency and/or energy of collisions between particles. Explain how the addition of a catalyst increases the rate of a reaction in terms of activation energy. Describe the differences between exothermic and endothermic changes. Calculate the energy change in a reaction given the energies of bonds (in kJ mol–1).		Recall the meaning of the term hydrocarbon. Describe and explain the separation of crude oil into simpler, more useful mixtures by the process of fractional distillation. Explain how hydrocarbons in different fractions […] are mostly members of the alkane homologous series. Explain why the incomplete combustion of hydrocarbons can produce carbon and carbon monoxide. Explain why oxides of nitrogen are produced when fuels are burned in engines Explain how cracking involves the breaking down of larger, saturated hydrocarbon molecules. Describe how the Earth's early atmosphere was formed. Explain how the amount of carbon dioxide in the atmosphere was decreased when carbon dioxide dissolved as the oceans formed. Evaluate the evidence for human activity causing climate change. Describe the projected effects of climate change.		Explain how bromine water is used to distinguish between alkanes and alkenes. Describe the production of ethanol by fermentation of carbohydrates in aqueous solution, using yeast to provide enzymes. Explain why alcohols have similar chemical properties. Recall the functional group present in all carboxylic acids. Describe some chemical properties of carboxylic acids. Describe how ethene molecules can combine together in a polymerisation reaction. Deduce the structure of a monomer from the structure of an addition polymer and vice versa. Explain what is meant by a condensation reaction. Describe some problems associated with polymers. Describe tests to identify positive and negative ions in solids. Compare, using data, the physical properties of glass and clay ceramics, polymers, composites and metals. Describe how the properties of nanoparticulate materials are related to their uses.	
Working Scientifically	Core Practical - Investigating Reaction Rates				Core Practical - The Combustion of Alcohols Core Practical - Identifying ions.	
Literacy and Numeracy	Interpret graphs of mass, volume or concentration of reactant or product against time.	Use ratios, fractions and percentages.	Use an appropriate number of significant figures.	Change the subject of an equation. Recognise and use expressions in standard form.		
Middle Stake Testing	6 Mark Q - Structure Strip	EOU Test Core Practical Supplement 3	6 Mark Q - Structure Strip	EOU Test Core Practical Supplement 4 Core Practicals	6 Mark Q - Structure Strip	EOU Test
High Stake Testing		Mock Exam 1		Mock Exam 2		
Skills development	Students will plan and carry out investigations that allow them to discover how the rates of chemical reactions can be altered. They will take accurate and precise measurements, analyse the data and identify anomalous results. They will then evaluate their method and suggest improvements. They will be able to judge if their results are repeatable, reproducible and accurate.					

Yr 11 Long Term Plan (Combined Chemistry)

Year 11 Intent / End Point: Students will study part of each of the "Big Ideas" in Chemistry (as outlined on the Learning Journey). Students will be able to describe and explain the main trends in three of the groups in the Periodic Table. They will investigate and explain the factors that affect the rate of chemical reactions. They will be able to classify reactions as exothermic or endothermic and be able to calculate the overall energy transfer in a chemical reaction. They will then explore the reactions of hydrocarbons and how the combustion of fuels is affecting the Earth's atmosphere and the environment.

	HT1	HT2	HT3	HT4	HT5
Unit title	**CC13-14 Groups in the Periodic Table/ Rates of Reaction/ Heat Energy Changes in Reactions**		**SC20-21 Fuels/ Earth and Atmospheric Science**		**Revision for Exam**
Subject Knowledge	Describe the pattern in reactivity of the alkali metals, lithium, sodium and potassium, with water. Explain this pattern in reactivity in terms of electronic configurations. Describe the reactions of the halogens. Describe the pattern in the physical properties of some noble gases and use this pattern to predict the physical properties of other noble gases. Suggest practical methods for determining the rate of a given reaction. Explain the effects on rates of reaction of changes in temperature, concentration, surface area to volume ratio of a solid and pressure (on reactions involving gases) in terms of frequency and/or energy of collisions between particles. Explain how the addition of a catalyst increases the rate of a reaction in terms of activation energy. Describe the differences between exothermic and endothermic changes. Calculate the energy change in a reaction given the energies of bonds (in kJ mol–1).		Recall the meaning of the term hydrocarbon. Describe and explain the separation of crude oil into simpler, more useful mixtures by the process of fractional distillation. Explain how hydrocarbons in different fractions […] are mostly members of the alkane homologous series. Explain why the incomplete combustion of hydrocarbons can produce carbon and carbon monoxide. Explain why oxides of nitrogen are produced when fuels are burned in engines Explain how cracking involves the breaking down of larger, saturated hydrocarbon molecules. Describe how the Earth's early atmosphere was formed. Explain how the amount of carbon dioxide in the atmosphere was decreased when carbon dioxide dissolved as the oceans formed. Evaluate the evidence for human activity causing climate change. Describe the projected effects of climate change.		
Working Scientifically	Core Practical - Investigating Reaction Rates				
Literacy and Numeracy	Interpret graphs of mass, volume or concentration of reactant or product against time.	Use ratios, fractions and percentages.	Use an appropriate number of significant figures.	Change the subject of an equation Recognise and use expressions in standard form	
Middle Stake Testing	6 Mark Q CORE Practical	6 Mark Q - Structure Strip End of Unit Test + Core Practical Supplement 3	6 Mark Q - Structure Strip	EOU Test - SP6 End of Unit Test + Core Practical Supplement 4	
High Stake Testing		Mock Exam 1		Mock Exam 2	
Skills development	Students will plan and carry out investigations that allow them to discover how the rates of chemical reactions can be altered. They will take accurate and precise measurements, analyse the data and identify anomalous results. They will then evaluate their method and suggest improvements. They will be able to judge if their results are repeatable, reproducible and accurate.				