GCSE Combined Science - Chemistry Paper 2 FT
Personal Learning Checklist (PLC)

6. The Rate and Extent of Chemical Change

		Learning Objectives:	Dates		
Rates of Reaction	6.1	Describe how the rate of reaction can be determined experimentally.			
	6.2	Calculate the mean rate of reaction.			
	6.3	Give units for the rate of a reaction.			
	6.4	Draw and interpret graphs showing the amount of product formed (or reactant used up) against time – describe how the rate of reaction changes with time and compare the rate of different reactions.			
	6.5	Draw tangents to curves on these graphs and use the slope to describe the rate of reaction.			
	6.6	Explain what happens to particles in a reaction using the collision theory.			
	6.7	Predict what happens to the rate of reaction if the temperature, concentration, pressure or surface area are changed and explain why this happens using ideas about particles and collision theory.			
	6.8	Describe what catalysts and enzymes are.			
	6.9	Identify when a catalyst has been used in a reaction.			
	6.10	State and explain the effect of using a catalyst on the rate of reaction and explain why catalysts are important in industry.			
Reversible Reactions and Equilibrium	6.11	Recall the symbol used to represent a reversible reaction.			
	6.12	Describe how the direction of a reversible reaction can be changed by changing the conditions, e.g. the thermal decomposition of ammonium chloride.			
	6.13	Explain how equilibrium is reached with a reversible reaction in a closed system.			

7. Organic Chemistry

		Learning Objectives:	Dates		
Crude Oil and Alkanes	7.1	Describe what crude oil is.			
	7.2	Define the terms mixture and hydrocarbon.			
	7.3	State the properties of hydrocarbons and describe the trends in these properties.			
	7.4	Describe how crude oil is separated.			
	7.5	Explain why crude oil is separated and how the technique works.			
	7.6	Name some of the useful products obtained from crude oil.			
	7.7	Describe what an alkane is.			
	7.8	Identify an alkane from its name, molecular formula or displayed formula.			
Fuels and Combustion	7.9	Name the elements that fuels contain.			
	7.10	List the products of combustion (complete and incomplete) and identify the problems associated with these products.			
	7.11	State what type of chemical reaction combustion is and explain why.			
	7.12	Write and balance symbol equations for combustion reactions.			
Cracking and Alkenes	7.13	Explain what cracking is and why it is carried out.			
	7.14	Describe how steam and catalytic cracking are carried out, name the products and identify some uses of these products.			
	7.15	Balance symbol equations for cracking.			
	7.16	Describe what an alkene is.			
	7.17	Identify an alkene from its name, molecular formula or displayed formula.			
	7.18	State the general formula of an alkene.			
	7.19	Describe how to test for an alkene using bromine water.			
	7.20	Explain why bromine reacts with alkenes but not alkanes in terms of reactivity.			
	7.21	Explain how modern life depends on the uses of hydrocarbons.			

8. Chemical Analysis

		Learning Objectives:	Dates		
Chemical Analysis	8.1	Describe what is meant by the term 'pure' in chemistry and in everyday language.			
	8.2	Use melting and boiling point data to distinguish between pure and impure substances.			
	8.3	Describe what a formulation is and identify formulations from given information.			
	8.4	Describe how to test for the following gases (and the results of the tests): hydrogen, oxygen, carbon dioxide and chlorine.			
Chromatography	8.5	Describe and explain how paper chromatography can be used to separate mixtures.			
	8.6	Explain how to identify pure and impure substances by chromatography.			
	8.7	Interpret chromatograms and calculate R_f values from chromatograms.			
	8.8	**Required Practical –** Investigate how paper chromatography can be used to separate and tell the difference between coloured substances. Calculate R_f values.			

9. Chemistry of the Atmosphere

		Learning Objectives:	Dates		
Chemistry of the Atmosphere	9.1	Recall the proportions of the gases that currently make up the Earth's atmosphere.			
	9.2	Describe the main changes to the Earth's atmosphere over the past 4.6 billion years and some of the likely causes of these changes.			
	9.3	Explain why evidence for this is limited.			
	9.4	Interpret evidence that is provided to evaluate different theories about the Earth's early atmosphere.			
	9.5	Explain how oxygen increased in the atmosphere (including an equation).			
	9.6	Explain how carbon dioxide decreased.			
	9.7	Describe and explain the formation of deposits of limestone, coal, crude oil and natural gas.			
	9.8	Describe the greenhouse effect in terms of the interaction of short and long wavelength radiation with matter.			
	9.9	Explain how the greenhouse effect enables the Earth to support life.			
	9.10	Name three greenhouse gases.			
	9.11	Recall two human activities that increase greenhouse gases in the atmosphere.			
	9.12	Evaluate the quality of evidence (from provided information) for global climate change.			
	9.13	Describe uncertainties in the evidence base.			
	9.14	Recognise the importance of peer review of results and of communicating results to a wide range of audiences.			
	9.15	Describe briefly four potential effects of global climate change.			
	9.16	Discuss the scale, risk and environmental implications of global climate change.			
	9.17	State what is meant by the term 'carbon footprint'.			
	9.18	Describe actions to reduce emissions of carbon dioxide and methane.			
	9.19	Give reasons why actions may be limited.			

10. Using Resources

		Learning Objectives:	Dates		
Using Resources	10.1	State examples of natural products that are supplemented or replaced by agricultural and synthetic products.			
	10.2	Distinguish between finite and renewable resources given appropriate information.			
	10.3	Extract and interpret information about resources from charts, graphs and tables.			
	10.4	Use orders of magnitude to evaluate the significance of data.			
	10.5	State what is meant by the term 'potable water'.			
	10.6	Distinguish between potable water and pure water.			
	10.7	Describe the differences in treatment of ground water and salty water.			
	10.8	Give reasons for the steps used to produce potable water.			
	10.9	**Required Practical –** Analysis and purification of water samples from different sources, including pH, dissolved solids and distillation.			
	10.10	Describe some of the processes involved in sewage and waste water treatment.			
	10.11	Comment on the relative ease of obtaining potable water from waste, ground and salt water.			
	10.12	Describe what a life cycle assessment (LCA) is and state the four stages that are considered.			
	10.13	Explain why an LCA is not purely objective.			
	10.14	Discuss how a LCA can be used to evaluate a product, but how it can also be misused, e.g. to support claims for advertising purposes.			
	10.15	Give three reasons why reducing the use of/reusing/recycling materials is important.			
	10.16	Give examples of materials that are produced from limited raw materials.			
	10.17	Describe how glass can be reused or recycled.			
	10.18	Describe how metals can be recycled.			
	10.19	Evaluate ways of reducing the use of limited resources, given appropriate information.			

Mathematical Skills (Paper 1+2)

Arithmetic and Numerical Computation	A.	Express numbers in decimal form.			
	B.	Express numbers in standard form.			
	C.	Use ratios, fractions and percentages.			
	D.	Make estimates of the results of simple calculations.			
Handling Data	E.	Use an appropriate number of significant figures.			
	F.	Calculate the mean.			
	G.	Understand the terms mean, mode and median.			
	H.	Make order of magnitude calculations.			
Algebra	I.	Understand and use the symbols: =, <, <<, >>, >, α, ~			
	J.	Change the subject of an equation.			
	K.	Substitute numerical values into equations using appropriate units.			
Graphs	L.	Understand that $y = mx+c$ represents a linear relationship.			
	M.	Plot a line graph from experimental data, including drawing a line of best fit.			
	N.	Determine the gradient and intercept of a linear graph.			
	O.	Draw a tangent to a curve and calculate its gradient as a measure of the rate of change.			
Geometry and Trigonometry	P.	Visualise and represent 2D and 3D forms.			
	Q.	Calculate areas of triangles and rectangles.			
	R.	Calculate surface areas and volumes of cubes.			