

# GCSE Chemistry

## Y10 End of Year Exam 2020

### Personal Learning Checklist (PLC)

All highlighted content will be assessed in your end of year exam.

Content highlighted yellow was covered before the lockdown period.

Content highlighted blue was covered after the lockdown period.

Any content not highlighted has not yet been covered and so will not be assessed.

## 1. Atomic Structure and the Periodic Table (Paper 1+2)

		Confidence		
<b>Learning Objectives:</b>				
<b>Elements, Compounds and Mixtures (Chapter 1)</b>	Describe what elements, compounds and mixtures are.			
	Name compounds from their formulae.			
	Write word and balanced symbol equations for the reactions you have studied.			
	Write balanced half equations and ionic equations. <b>(HT only)</b>			
	Describe how mixtures are separated by filtration, crystallisation, simple distillation, fractional distillation and chromatography.			
	Explain how these separation methods work and why they are physical processes rather than chemical reactions.			
	Suggest suitable separation and purification techniques for a given mixture.			
<b>Atomic Structure (Chapter 1)</b>	Describe the differences between the plum pudding model and the nuclear model for the atom (as for Physics).			
	Describe why the new evidence from the scattering experiment led to a change in the atomic model (as for Physics).			
	Describe the structure of an atom.			
	Recall the masses and charges of protons, neutrons and electrons.			
	Identify the number of protons, neutrons and electrons in an atom using the periodic table.			
	Explain why atoms are electrically neutral.			
	Explain what an isotope is.			
	Calculate the relative atomic mass of an element.			
Give the approximate size of an atom and a nucleus.				

<b>Electronic Structure</b> (Chapter 2)	Draw 'dot and cross' diagrams for the electronic structures for the first 20 elements of the periodic table.			
	Write electronic structures in numbers for the first 20 elements of the periodic table.			
	Explain why elements in the same group of the periodic table have similar chemical properties.			
	Explain why elements in group 0 are unreactive.			
<b>Periodic Table and Patterns in Reactivity</b> (Chapter 2)	Describe how elements are arranged on the periodic table in terms of their electron structure.			
	Describe how the periodic table was developed (early periodic table and Mendeleev).			
	Describe where metals and non-metals are found on the periodic table and explain why.			
	Describe the properties of metals and non-metals.			
	Explain why elements in the same group do similar chemical reactions.			
	Identify and predict trends in the physical properties of group 0 elements.			
	Describe trends in physical properties and reactivity of group 1 and use it to predict the properties of a given element.			
	Describe and write equations for the reactions of the first three group 1 elements with oxygen, chlorine and water.			
	Describe trends in physical properties and reactivity of group 7 and use it to predict the properties of a given element.			
Explain and write equations to show what happens when a halogen is mixed with a salt of a different halogen.				
<b>Transition Metals</b> (Chapter 2)	State where transition metals are found on the periodic table.			
	Describe the difference between transition metals and group 1 metals (melting point, density, strength, hardness, reactivity with water, oxygen and halogens).			
	Recall that many transition elements form ions with different charges, coloured compounds and are useful as catalysts.			
	Use Cr, Mn, Fe, Co, Ni and Cu as examples when describing properties of transition metals.			

## 2. Bonding, Structure and Properties of Matter (Paper 1+2)

Chemical Bonding (Chapter 3)	Name the three types of chemical bond and state whether they are between metals only, non-metals only or a metal and a non-metal.			
	Explain why atoms form chemical bonds.			
	Describe how atoms bond together in ionic bonding.			
	Draw dot-and-cross diagrams to represent ionic bonding.			
	Deduce the formulae of ionic compounds.			
	Describe how atoms bond together in covalent bonding.			
	Draw dot-and-cross diagrams to represent covalent bonding.			
States of Matter (Chapter 3)	Predict the states of substances (solid, liquid or gas) at different temperatures.			
	Explain the different temperatures at which changes of state occur in terms of energy transfers and types of bonding.			
	Recognise that atoms themselves do not have the bulk properties of materials.			
	Explain the limitations of the particle theory in relation to changes of state when particles are represented by solid inelastic spheres which have no forces between them.			
	Use state symbols - (s), (l), (g) and (aq).			
Structures and their Properties (Chapter 3)	Describe the two types of covalent structure.			
	Describe the structure of ionic compounds.			
	Describe the structure of metals.			
	Describe graphene, fullerenes and carbon nanotubes.			
	List the properties of each type of structure.			
	Explain each property in terms of the structure and bonding.			
	Relate the properties of substances to their uses.			
	Identify the type of structure from its properties.			
	Evaluate the different ways of representing structures.			
Nanoparticles (Chapter 3)	Compare 'nano' dimensions to typical dimensions of atoms and molecules.			
	Explain why nanoparticles have different properties to the same material in bulk and why this may mean that smaller quantities are needed.			
	Evaluate the use of nanoparticles from given information.			
	Explain why there are possible risks associated with use of nanoparticles.			

### 3. Quantitative Chemistry (Paper 1+2)

Conservation of mass and balanced chemical equations (Chapter 1)	Recall the law of conservation of mass.			
	Balance chemical equations.			
	Explain what the multipliers (big numbers before a symbol/formula) mean and what the subscript (small) numbers within a formula mean.			
	Explain why a reaction in a non-enclosed system may appear to involve a change in mass, e.g. oxidation and thermal decomposition.			
	Describe what a limiting reactant is and explain the effect on the amount of product that can be obtained (in moles or grams). (HT only)			
Relative formula mass (Chapter 4)	Calculate the relative formula mass ( $M_r$ ) of a compound.			
	Show that the sum of the relative formula masses of the reactants equals the sum of the relative formula masses of the products in the quantities shown if an equation is balanced.			
Moles (HT only) (Chapter 4)	Define the term 'mole'. (HT only)			
	Give the mass of one mole of a substance from its $A_r$ or $M_r$ . (HT only)			
	Calculate the number of moles of a substance from its mass and vice versa. (HT only)			
% Yield and Atom Economy (Chapter 4)	Calculate the % yield of a reaction.			
	Calculate the theoretical mass of a product from given mass of reactant and balanced equation (reacting mass calculation as above). (HT only)			
	Explain why it is not usually possible to obtain a yield of 100%.			
	Calculate the atom economy of a reaction from a balanced equation.			
	Explain why a particular reaction pathway is chosen based on atom economy, yield, rate, equilibrium position and usefulness of by-products. (HT only)			

### 4. Chemical Changes (Paper 1)

Oxidation and Reduction (Chapter 5)	Name the reaction between metals and oxygen and name the product formed.			
	Explain oxidation and reduction in terms of loss or gain of oxygen.			
	Explain oxidation and reduction in terms of gain or loss of electrons (HT only).			
	Identify which species are oxidised and which are reduced from given symbol equations or half equations (HT only).			

## 5. Energy Changes (Paper 1)

Energy Changes (Chapter 7)	Describe what exothermic and endothermic reactions are.			
	Identify exothermic and endothermic reactions from temperature changes.			
	Identify exothermic and endothermic reactions from energy profiles.			
	Evaluate uses of exothermic and endothermic reactions.			
	Describe the energy changes in a reversible reaction.			
	Calculate the energy transferred in a chemical reaction using bond energies.			
	<b>Required Practical</b> – Investigate the variables that affect temperature changes in reacting solutions, such as acid plus metal, neutralisation and displacement reactions of metals.			

## 7. Organic Chemistry

		Confidence		
Learning Objectives:				
Crude Oil and Alkanes (Chapter 9)	Describe what crude oil is.			
	Define the terms mixture and hydrocarbon.			
	State the properties of hydrocarbons and describe the trends in these properties.			
	Describe how crude oil is separated.			
	Explain why crude oil is separated and how the technique works.			
	Name some of the useful products obtained from crude oil.			
	Describe what an alkane is.			
	Identify an alkane from its name, molecular formula or displayed formula.			
Fuels and Combustion (Ch 9)	Name the elements that fuels contain.			
	List the products of combustion (complete and incomplete) and identify the problems associated with these products.			
	State what type of chemical reaction combustion is and explain why.			
	Write and balance symbol equations for combustion reactions.			
Cracking (Chapter 9)	Explain what cracking is and why it is carried out.			
	Describe how steam and catalytic cracking are carried out, name the products and identify some uses of these products.			
	Balance symbol equations for cracking.			

<b>Alkenes (Chapter 10)</b>	Describe what an alkene is.			
	Identify an alkene from its name, molecular formula or displayed formula.			
	Name and draw the structures of the first four alkenes.			
	State the general formula of an alkene.			
	State the functional group of an alkene and explain what a functional group is.			
	Describe the reactions and conditions for the addition of hydrogen, water and halogens to alkenes.			
	Explain what an addition reaction is.			
	Draw displayed formulae for the products of the reactions of hydrogen, water, chlorine, bromine and iodine with the first four alkenes.			
	Describe the test for an alkene and the result of this test.			
	Write balanced equations for the combustion of alkenes.			
	Explain why alkenes tend to burn with a smoky flame.			

## 8. Chemical Analysis

	<b>Learning Objectives:</b>	<b>Confidence</b>		
<b>Chemical Analysis (Chapter 12)</b>	Describe what is meant by the term 'pure' in chemistry and in everyday language.			
	Use melting and boiling point data to distinguish between pure and impure substances.			
	Describe what a formulation is and identify formulations from given information.			
	Describe how to test for the following gases (and the results of the tests): hydrogen, oxygen, carbon dioxide and chlorine.			

# 9. Chemistry of the Atmosphere

		Confidence		
<b>Learning Objectives:</b>				
Chemistry of the Atmosphere (Chapter 13)	Recall the proportions of the gases that currently make up the Earth's atmosphere.			
	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.			
	Explain why evidence for this is limited.			
	Interpret evidence that is provided to evaluate different theories about the Earth's early atmosphere.			
	Explain how oxygen increased in the atmosphere (including an equation).			
	Explain how carbon dioxide decreased.			
	Describe and explain the formation of deposits of limestone, coal, crude oil and natural gas.			
	Describe the greenhouse effect in terms of the interaction of short and long wavelength radiation with matter.			
	Explain how the greenhouse effect enables the Earth to support life.			
	Name three greenhouse gases.			
	Recall two human activities that increase greenhouse gases in the atmosphere.			
	Evaluate the quality of evidence (from provided information) for global climate change.			
	Describe uncertainties in the evidence base.			
	Recognise the importance of peer review of results and of communicating results to a wide range of audiences.			
	Describe briefly four potential effects of global climate change.			
	Discuss the scale, risk and environmental implications of global climate change.			
	State what is meant by the term 'carbon footprint'.			
	Describe actions to reduce emissions of carbon dioxide and methane.			
Give reasons why actions may be limited.				

# 10. Using Resources

		Confidence		
<b>Learning Objectives:</b>				
Using Resources (Chapter 14)	State examples of natural products that are supplemented or replaced by agricultural and synthetic products.			
	Distinguish between finite and renewable resources given appropriate information.			
	Extract and interpret information about resources from charts, graphs and tables.			
	Use orders of magnitude to evaluate the significance of data.			
	State what is meant by the term 'potable water'.			
	Distinguish between potable water and pure water.			
	Describe the differences in treatment of ground water and salty water.			
	Give reasons for the steps used to produce potable water.			
	<b>Required Practical</b> – Analysis and purification of water samples from different sources, including pH, dissolved solids and distillation.			
	Describe some of the processes involved in sewage and waste water treatment.			
	Comment on the relative ease of obtaining potable water from waste, ground and salt water.			
	Describe how metals can be obtained by phytomining and bioleaching ( <b>HT only</b> ).			
	Explain why alternative methods of extracting metals are necessary ( <b>HT only</b> ).			
	Evaluate alternative biological methods of metal extraction, given appropriate information ( <b>HT only</b> ).			
	Describe what a life cycle assessment (LCA) is and state the four stages that are considered.			
	Explain why an LCA is not purely objective.			
	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.			
	Give three reasons why reducing the use of/reusing/recycling materials is important.			
	Give examples of materials that are produced from limited raw materials.			
	Describe how glass can be reused or recycled.			
Describe how metals can be recycled.				
Evaluate ways of reducing the use of limited resources, given appropriate information.				

Learning Objectives:		Confidence		
Corrosion (Chapter 15)	Describe what corrosion is.			
	Name the metal that rusts, state what rust is and give the conditions needed for rusting.			
	Describe experiments and interpret results to show that both air and water are necessary for rusting.			
	Describe how corrosion can be prevented by applying a coating barrier (grease, paint, electroplating).			
	Explain how aluminium is protected from further corrosion.			
	Explain how sacrificial protection works in terms of relative reactivity.			
Alloys (Chapter 15)	State what the alloys bronze, 'gold' in jewellery, low carbon steel, high carbon steel and stainless steel are made of.			
	Describe the properties of the alloys listed above and state a use of each one.			
	Interpret and evaluate the composition and uses of alloys from given information.			