OCR Chemistry B Separate Science Revision Checklist

*Statements in **bold** are for higher tier only.*

Specification Statement	Learning Outcome	✓
C1.1.1	recall and explain the main features of the particle model in terms of the states of matter and change of state, distinguishing between physical and chemical changes and recognise that the particles themselves do not have the same properties as the bulk substances	☐
C1.1.2	**explain the limitations of the particle model in relation to changes of state when particles are represented by inelastic spheres**	☐
C1.1.3	use ideas about energy transfers and the relative strength of forces between particles to explain the different temperatures at which changes of state occur	☐
C1.1.4	use data to predict states of substances under given conditions	☐
C1.1.5	interpret evidence for how it is thought the atmosphere was originally formed	☐
C1.1.6	describe how it is thought an oxygen-rich atmosphere developed over time	☐
C1.1.7	describe the major sources of carbon monoxide and particulates (incomplete combustion), sulfur dioxide (combustion of sulfur impurities in fuels), oxides of nitrogen (oxidation of nitrogen at high temperatures and further oxidation in the air)	☐
C1.1.8	explain the problems caused by increased amounts of these substances and describe approaches to decreasing the emissions of these substances into the atmosphere including the use of catalytic converters, low sulfur petrol and gas scrubbers to decrease emissions	☐
C1.1.9	use chemical symbols to write the formulae of elements and simple covalent compounds	☐
C1.1.10	use the names and symbols of common elements and compounds and the principle of conservation of mass to write formulae and balanced chemical equations	☐
C1.1.11	use arithmetic computations and ratios when balancing equations	☐
C1.1.12	describe tests to identify oxygen, hydrogen and carbon dioxide	☐
C1.1.13	explain oxidation in terms of gain of oxygen	☐
C1.2.1	distinguish between endothermic and exothermic reactions on the basis of the temperature change of the surroundings	☐
C1.2.2	draw and label a reaction profile for an exothermic and an endothermic reaction, identifying activation energy	☐
C1.2.3	explain activation energy as the energy needed for a reaction to occur	☐
C1.2.4	interpret charts and graphs when dealing with reaction profiles	☐
C1.2.5	**calculate energy changes in a chemical reaction by considering bond breaking and bond making energies**	☐
C1.2.6	carry out arithmetic computations when calculating energy changes	☐
C1.2.7	describe how you would investigate a chemical reaction to determine whether it is endothermic or exothermic	☐
C1.2.8	call that a chemical cell produces a potential difference until the reactants are used up	☐
C1.2.9	evaluate the advantages and disadvantages of hydrogen/oxygen and other fuel cells for given uses	☐
C1.3.1	describe the greenhouse effect in terms of the interaction of radiation with matter	☐
C1.3.2	evaluate the evidence for additional anthropogenic causes of climate change, including the correlation between change in atmospheric carbon dioxide concentration and the consumption of fossil fuels, and describe the uncertainties in the evidence base	☐
C1.3.3	describe the potential effects of increased levels of carbon dioxide and methane on the	☐

	Earth's climate, including where crops can be grown, extreme weather patterns, melting of polar ice and flooding of low land	
C1.3.4	describe how the effects of increased levels of carbon dioxide and methane may be mitigated, including consideration of scale, risk and environmental implications	☐
C1.3.5	extract and interpret information from charts, graphs and tables	☐
C1.3.6	use orders of magnitude to evaluate the significance of data	☐
C1.4.1	describe the principal methods for increasing the availability of potable water, in terms of the separation techniques used, including the ease of treating waste, ground and salt water including filtration and membrane filtration; aeration, use of bacteria; chlorination and distillation (for salt water)	☐
C1.4.2	describe a test to identify chlorine (using blue litmus paper)	☐
C2.1.1	describe how and why the atomic model has changed over time to include the main ideas of Dalton, Thomson, Rutherford and Bohr	☐
C2.1.2	describe the atom as a positively charged nucleus surrounded by negatively charged electrons, with the nuclear radius much smaller than that of the atom and with most of the mass in the nucleus	☐
C2.1.3	recall relative charges and approximate relative masses of protons, neutrons and electrons	☐
C2.1.4	estimate the size and scale of atoms relative to other particles	☐
C2.1.5	recall the typical size (order of magnitude) of atoms and small molecules	☐
C2.1.6	relate size and scale of atoms to objects in the physical world	☐
C2.1.7	calculate numbers of protons, neutrons and electrons in atoms, given atomic number and mass number of isotopes or by extracting data from the Periodic Table	☐
C2.2.1	explain how the position of an element in the Periodic Table is related to the arrangement of electrons in its atoms and hence to its atomic number	☐
C2.2.2	describe how Mendeleev organised the elements based on their properties and relative atomic masses	☐
C2.2.3	describe how discovery of new elements and the ordering elements by atomic number supports Mendeleev's decisions to leave gaps and reorder some elements	☐
C2.2.4	describe metals and non-metals and explain the differences between them on the basis of their characteristic physical and chemical properties, including melting point, boiling point, state and appearance, density, formulae of compounds, relative reactivity and electrical conductivity	☐
C2.2.5	recall the simple properties of Group 1 elements including their reaction with moist air, water and chlorine	☐
C2.2.6	recall the simple properties of Group 7 elements including their states and colours at room temperature and pressure, their colours as gases, their reactions with Group 1 elements and their displacement reactions with other metal halides	☐
C2.2.7	predict possible reactions and probable reactivity of elements from their positions in the Periodic Table	☐
C2.2.8	describe experiments to identify the reactivity pattern of Group 7 elements including displacement reactions	☐
C2.2.9	describe experiments to identify the reactivity pattern of Group 1 elements	☐
C2.3.1	recall the simple properties of Group 0 including their low melting and boiling points, their state at room temperature and pressure and their lack of chemical reactivity	☐
C2.3.2	explain how observed simple properties of Groups 1, 7 and 0 depend on the outer shell of electrons of the atoms and predict properties from given trends down the groups	☐
C2.3.3	explain how the reactions of elements are related to the arrangement of electrons in their atoms and hence to their atomic number	☐
C2.3.4	explain how the atomic structure of metals and non-metals relates to their position in the Periodic Table	☐
C2.3.5	describe the nature and arrangement of chemical bonds in ionic compounds	☐
C2.3.6	explain ionic bonding in terms of electrostatic forces and transfer of electrons	☐

C2.3.7	calculate numbers of protons, neutrons and electrons in atoms and ions, given atomic number and mass number or by using the Periodic Table	☐
C2.3.8	construct dot and cross diagrams for simple ionic substances	☐
C2.3.9	explain how the bulk properties of ionic materials are related to the type of bonds they contain	☐
C2.3.10	use ideas about energy transfers and the relative strength of attraction between ions to explain the melting points of ionic compounds compared to substances with other types of bonding	☐
C2.3.11	describe the limitations of particular representations and models of ions and ionically bonded compounds, including dot and cross diagrams, and 3-D representations	☐
C2.3.12	translate information between diagrammatic and numerical forms and represent three dimensional shapes in two dimensions and vice versa when looking at chemical structures for ionic compounds	☐
C2.4.1	use chemical symbols to write the formulae of elements and simple covalent and ionic compounds	☐
C2.4.2	use the formulae of common ions to deduce the formula of Group 1 and Group 7 compounds	☐
C2.4.3	use the names and symbols of the first 20 elements, Groups 1, 7 and 0 and other common elements from a supplied Periodic Table to write formulae and balanced chemical equations where appropriate	☐
C2.5.1	call the general properties of transition metals (melting point, density, reactivity, formation of coloured ions with different charges and uses as catalysts) and exemplify these by reference to copper, iron, chromium, silver and gold	☐
C3.1.1	describe the nature and arrangement of chemical bonds in metals	☐
C3.1.2	explain how the bulk properties of metals are related to the type of bonds they contain	☐
C3.2.1	deduce an order of reactivity of metals based on experimental results including reactions with water, dilute acid and displacement reactions with other metals	☐
C3.2.2	explain how the reactivity of metals with water or dilute acids is related to the tendency of the metal to form its positive ion to include potassium, sodium, calcium, aluminium, magnesium, zinc, iron, lead, [hydrogen], copper, silver	☐
C3.2.3	use the names and symbols of common elements and compounds and the principle of conservation of mass to write formulae and balanced chemical equations **and ionic equations**	☐
C3.2.4	explain, using the position of carbon in the reactivity series, the principles of industrial processes used to extract metals, including the extraction of zinc	☐
C3.2.5	explain why electrolysis is used to extract some metals from their ores	☐
C3.2.6	**evaluate alternative biological methods of metal extraction (bacterial and phytoextraction)**	☐
C3.3.1	describe electrolysis in terms of the ions present and reactions at the electrodes	☐
C3.3.2	predict the products of electrolysis of binary ionic compounds in the molten state	☐
C3.3.3	recall that metals (or hydrogen) are formed at the cathode and non-metals are formed at the anode in electrolysis using inert electrodes	☐
C3.3.4	**use the names and symbols of common elements and compounds and the principle of conservation of mass to write half equations**	☐
C3.3.5	**explain reduction and oxidation in terms of gain or loss of electrons, identifying which species are oxidised and which are reduced**	☐
C3.3.6	explain how electrolysis is used to extract some metals from their ores including the extraction of aluminium	☐
C3.3.7	describe competing reactions in the electrolysis of aqueous solutions of ionic compounds in terms of the different species present, including the formation of oxygen, chlorine and the discharge of metals or hydrogen linked to their relative reactivity	☐
C3.3.8	describe the technique of electrolysis of an aqueous solution of a salt	☐
C3.4.1	recall that crude oil is a main source of hydrocarbons and is a feedstock for the	☐

	petrochemical industry	
C3.4.2	explain how modern life is crucially dependent upon hydrocarbons and recognise that crude oil is a finite resource	☐
C3.4.3	describe and explain the separation of crude oil by fractional distillation	☐
C3.4.4	describe the fractions of crude oil as largely a mixture of compounds of formula C_nH_{2n+2} which are members of the alkane homologous series	☐
C3.4.5	use ideas about energy transfers and the relative strength of chemical bonds and intermolecular forces to explain the different temperatures at which changes of state occur	☐
C3.4.6	deduce the empirical formula of a compound from the relative numbers of atoms present or from a model or diagram and vice versa	☐
C3.4.7	use arithmetic computation and ratio when determining empirical formulae	☐
C3.4.8	describe the arrangement of chemical bonds in simple molecules	☐
C3.4.9	explain covalent bonding in terms of the sharing of electrons	☐
C3.4.10	construct dot and cross diagrams for simple covalent substances	☐
C3.4.11	represent three dimensional shapes in two dimensions and vice versa when looking at chemical structures for simple molecules	☐
C3.4.12	describe the limitations of dot and cross diagrams, ball and stick models and two and three dimensional representations when used to represent simple molecules	☐
C3.4.13	translate information between diagrammatic and numerical forms	☐
C3.4.14	explain how the bulk properties of simple molecules are related to the covalent bonds they contain and their bond strengths in relation to intermolecular forces	☐
C3.4.15	describe the production of materials that are more useful by cracking	☐
C3.4.16	recognise functional groups and identify members of the same homologous series	☐
C3.4.17	name and draw the structural formulae, using fully displayed formulae, of the first four members of the straight chain alkanes and alkenes, alcohols and carboxylic acids	☐
C3.4.18	predict the formulae and structures of products of reactions (combustion, addition across a double bond and oxidation of alcohols to carboxylic acids) of the first four and other given members of these homologous series	☐
C3.4.19	recall that it is the generality of reactions of functional groups that determine the reactions of organic compounds	☐
C4.1.1	compare quantitatively the physical properties of glass and clay ceramics, polymers, composites and metals, including melting point, softening temperature (for polymers), electrical conductivity, strength (in tension or compression), stiffness, flexibility, brittleness, hardness, density, ease of reshaping	☐
C4.1.2	explain how the properties of materials are related to their uses and select appropriate materials given details of the usage required	☐
C4.1.3	describe the composition of some important alloys in relation to their properties and uses, including steel	☐
C4.2.1	recall the basic principles of addition polymerisation by reference to the functional group in the monomer and the repeating units in the polymer	☐
C4.2.2	deduce the structure of an addition polymer from a simple monomer with a double bond and vice versa	☐
C4.2.3	**explain the basic principles of condensation polymerisation by reference to the functional groups of the monomers, the minimum number of functional groups within a monomer, the number of repeating units in the polymer, and simultaneous formation of a small molecule.**	☐
C4.2.4	recall that DNA is a polymer made from four different monomers called nucleotides and that other important naturally-occurring polymers are based on sugars and amino- acids	☐
C4.3.1	explain how the bulk properties of materials (including strength, melting point, electrical and thermal conductivity, brittleness, flexibility, hardness and ease of reshaping) are related to the different types of bonds they contain, their bond strengths in relation to intermolecular forces and the ways in which their bonds are arranged, recognising that	☐

	the atoms themselves do not have these properties	
C4.3.2	recall that carbon can form four covalent bonds	☐
C4.3.3	explain that the vast array of natural and synthetic organic compounds occurs due to the ability of carbon to form families of similar compounds, chains and rings	☐
C4.3.4	describe the nature and arrangement of chemical bonds in polymers with reference to their properties including strength, flexibility or stiffness, hardness and melting point of the solid	☐
C4.3.5	describe the nature and arrangement of chemical bonds in giant covalent structures	☐
C4.3.6	explain the properties of diamond and graphite in terms of their structures and bonding, include melting point, hardness and (for graphite) conductivity and lubricating action	☐
C4.3.7	represent three dimensional shapes in two dimensions and vice versa when looking at chemical structures e.g. allotropes of carbon	☐
C4.3.8	describe and compare the nature and arrangement of chemical bonds in ionic compounds, simple molecules, giant covalent structures, polymers and metals	☐
C4.4.1	compare 'nano' dimensions to typical dimensions of atoms and molecules	☐
C4.4.2	describe the surface area to volume relationship for different-sized particles and describe how this affects properties	☐
C4.4.3	describe how the properties of nanoparticulate materials are related to their uses including properties which arise from their size, surface area and arrangement of atoms in tubes or rings	☐
C4.4.4	explain the properties fullerenes and graphene in terms of their structures	☐
C4.4.5	explain the possible risks associated with some nanoparticulate materials including: a) possible effects on health due to their size and surface area b) reasons that there is more data about uses of nanoparticles than about possible health effects c) the relative risks and benefits of using nanoparticles for different purposes	☐
C4.4.6	estimate size and scale of atoms and nanoparticles including the ideas that: a) nanotechnology is the use and control of structures that are very small (1 to 100 nanometres in size)	☐
C4.4.6	estimate size and scale of atoms and nanoparticles including the ideas that: b) data expressed in nanometres is used to compare the sizes of nanoparticles, atoms and molecules	☐
C4.4.7	interpret, order and calculate with numbers written in standard form when dealing with nanoparticles	☐
C4.4.8	use ratios when considering relative sizes and surface area to volume comparisons	☐
C4.4.9	calculate surface areas and volumes of cubes	☐
C4.5.1	describe the conditions which cause corrosion and the process of corrosion and explain how mitigation is achieved by creating a physical barrier to oxygen and water and by sacrificial protection	☐
C4.5.2	explain reduction and oxidation in terms of loss or gain of oxygen, identifying which species are oxidised and which are reduced	☐
C4.5.3	**explain reduction and oxidation in terms of gain or loss of electrons, identifying which species are oxidised and which are reduced**	☐
C4.5.4	describe the basic principles in carrying out a life-cycle assessment of a material or product including: a) the use of water, energy and the environmental impact of each stage in a life cycle, including its manufacture, transport and disposal b) incineration, landfill and electricity generation schemes c) biodegradable and non-biodegradable materials	☐
C4.5.5	interpret data from a life-cycle assessment of a material or product	☐
C4.5.6	describe the process where PET drinks bottles are reused and recycled for different uses and explain why this is viable	☐
C4.5.7	evaluate factors that affect decisions on recycling with reference to products made from crude oil and metal ores	☐
C5.1.1	explain that many useful materials are formulations of mixtures	☐

C5.1.2	explain what is meant by the purity of a substance, distinguishing between the scientific and everyday use of the term 'pure'	☐
C5.1.3	use melting point data to distinguish pure from impure substances	☐
C5.1.4	recall that chromatography involves a stationary and a mobile phase and that separation depends on the distribution between the phases	☐
C5.1.5	interpret chromatograms, including calculating Rf values	☐
C5.1.6	suggest chromatographic methods for distinguishing pure from impure substances including the use of: paper chromatography aqueous and non-aqueous solvents locating agents	☐
C5.1.7	describe, explain and exemplify the processes of filtration, crystallisation, simple distillation, and fractional distillation	☐
C5.1.8	suggest suitable purification techniques given information about the substances involved	☐
C5.2.1	describe the purpose of representative sampling in qualitative analysis	☐
C5.2.2	interpret flame tests to identify metal ions, including the ions of lithium, sodium, potassium, calcium and copper	☐
C5.2.3	describe the technique of using flame tests to identify metal ions	☐
C5.2.4	describe tests to identify aqueous cations and aqueous anions and identify species from test results including: tests and expected results for metal ions in solution by precipitation reactions using dilute sodium hydroxide (calcium, copper, iron(II), iron(III), zinc) tests and expected results for carbonate ions (using dilute acid), chloride, bromide and iodide ions (using acidified dilute silver nitrate) and sulfate ions (using acidified dilute barium chloride or acidified barium nitrate)	☐
C5.2.5	interpret an instrumental result for emission spectroscopy given appropriate data in chart or tabular form, when accompanied by a reference set in the same form	☐
C5.2.6	describe the advantages of instrumental methods of analysis (sensitivity, accuracy and speed)	☐
C5.2.7	interpret charts, particularly in spectroscopy	☐
C5.3.1	recall and use the law of conservation of mass	☐
C5.3.2	explain any observed changes in mass in non-enclosed systems during a chemical reaction and explain them using the particle model	☐
C5.3.3	calculate relative formula masses of species separately and in a balanced chemical equation	☐
C5.3.4	**recall and use the definitions of the Avogadro constant (in standard form) and of the mole**	☐
C5.3.5	**explain how the mass of a given substance is related to the amount of that substance in moles and vice versa and use the relationship: number of moles = mass of substance (g) ÷ relative formula mass (g)**	☐
C5.3.6	**deduce the stoichiometry of an equation from the masses of reactants and products and explain the effect of a limiting quantity of a reactant**	☐
C5.3.7	**use a balanced equation to calculate masses of reactants or products**	☐
C5.3.8	use arithmetic computation, ratio, percentage and multistep calculations throughout quantitative chemistry	☐
C5.3.9	**carry out calculations with numbers written in standard form when using the Avogadro constant**	☐
C5.3.10	change the subject of a mathematical equation	☐
C5.3.11	calculate the theoretical amount of a product from a given amount of reactant	☐
C5.3.12	calculate the percentage yield of a reaction product from the actual yield of a reaction	☐
C5.3.13	suggest reasons for low yields for a given procedure	☐
C5.3.14	**describe the relationship between molar amounts of gases and their volumes and vice versa, and calculate the volumes of gases involved in reactions, using the molar gas volume at room temperature and pressure (assumed to be 24dm^3)**	☐
C5.4.1	identify the difference between qualitative and quantitative analysis	☐

C5.4.2	**explain how the mass of a solute and the volume of the solution is related to the concentration of the solution and calculate concentration using the formula: concentration (g/dm^3) = mass of solute (g) ÷ volume (dm^3)**	☐
C5.4.3	**explain how the concentration of a solution in mol/dm^3 is related to the mass of the solute and the volume of the solution and calculate the molar concentration using the formula: concentration (mol/dm^3) = numbers of moles of solute ÷ volume (dm^3)**	☐
C5.4.4	describe neutralisation as acid reacting with alkali to form a salt plus water including the common laboratory acids hydrochloric acid, nitric acid and sulfuric acid and the common alkalis, the hydroxides of sodium, potassium and calcium	☐
C5.4.5	recall that acids form hydrogen ions when they dissolve in water and solutions of alkalis contain hydroxide ions	☐
C5.4.6	recognise that aqueous neutralisation reactions can be generalised to hydrogen ions reacting with hydroxide ions to form water	☐
C5.4.7	describe and explain the procedure for a titration to give precise, accurate, valid and repeatable results	☐
C5.4.8	evaluate the quality of data from titrations	☐
C5.4.9	**explain the relationship between the volume of a solution of known concentration of a substance and the volume or concentration of another substance that react completely together**	☐