NOTTINGHAM BRITISH SCHOOL – CURRICULUM DEVELOPMENT 2019

Year 10

	October Assessment	December Assessment	March Assessment	June Assessment	Age-Related Expectation
CHEMISTRY IGCSE **O620** **(Core and Supplement)** **(All objectives outlined are subject to amendment, in line with the needs of the learners.)**	**1. Particulate Nature of Matter** State the distinguishing properties of solids, liquids and gases Describe the structure of solids, liquids and gases in terms of particle separation, arrangement and types of motion Describe changes of state in terms of melting, boiling, evaporation, freezing, condensation and sublimation Explain changes of state in terms of the kinetic theory Describe qualitatively the pressure and	**3. Atoms, Elements and Compounds** **3.1 Atomic structure and the Periodic Table** State the relative charges and approximate relative masses of protons, neutrons and electrons Define proton number (atomic number) as the number of protons in the nucleus of an atom Define nucleon number (mass number) as the total number of protons and neutrons in the nucleus of an atom Use proton number and the simple structure of atoms to explain the basis of the Periodic	**4. Stoichiometry** **4.1 Stoichiometry** Use the symbols of the elements and write the formulae of simple compounds Deduce the formula of a simple compound from the relative numbers of atoms present Deduce the formula of a simple compound from a model or a diagrammatic representation Construct word equations and simple balanced chemical equations Define relative atomic mass, Ar , as the average mass of naturally	**7. Chemical Reaction** **7.1 Physical and chemical changes** Identify physical and chemical changes, and understand the differences between them **7.2 Rate (speed) of reaction** Describe and explain the effect of concentration, particle size, catalysts (including enzymes) and temperature on the rate of reactions Describe the application of the above factors to the danger of explosive combustion with fine powders (e.g. flour mills)	**AO1 Knowledge and Understanding** Candidates should be able to demonstrate knowledge and understanding of: 1. scientific phenomena, facts, laws, definitions, concepts and theories 2. scientific vocabulary, terminology and conventions (including symbols, quantities and units) 3. scientific instruments and apparatus, including techniques of operation and aspects of safety 4. scientific and technological applications with their

	temperature of a gas in terms of the motion of its particles Show an understanding of the random motion of particles in a suspension (sometimes known as Brownian motion) as evidence for the kinetic particle (atoms, molecules or ions) model of matter Describe and explain Brownian motion in terms of random molecular bombardment State evidence for Brownian motion Describe and explain dependence of rate of diffusion on molecular mass **2. Experimental Techniques** **2.1 Measurement**	Table (see topic 9), with special reference to the elements of proton number 1 to 20 Define isotopes as atoms of the same element which have the same proton number but a different nucleon number State the two types of isotopes as being radioactive and non-radioactive State one medical and one industrial use of radioactive isotopes Understand that isotopes have the same properties because they have the same number of electrons in their outer shell Describe the build-up of electrons in 'shells' and understand the significance of the noble gas electronic structures	occurring atoms of an element on a scale where the 12C atom has a mass of exactly 12 units Define relative molecular mass, Mr, as the sum of the relative atomic masses (Relative formula mass or Mr will be used for ionic compounds.) Determine the formula of an ionic compound from the charges on the ions present Construct equations with state symbols, including ionic equations Deduce the balanced equation for a chemical reaction, given relevant information **4.2 The mole concept** Define the mole and the Avogadro constant Use the molar gas volume, taken as 24 dm3	and gases (e.g. methane in mines) Demonstrate knowledge and understanding of a practical method for investigating the rate of a reaction involving gas evolution Interpret data obtained from experiments concerned with rate of reaction Try to use the term rate rather than speed. Devise and evaluate a suitable method for investigating the effect of a given variable on the rate of a reaction Describe and explain the effects of temperature and concentration in terms of collisions between reacting particles, e.g. an increase in temperature causes an increase in collision rate and more of the colliding	social, economic and environmental implications. **AO2 Handling Information and Problem Solving.** Candidates should be able, in words or using other written forms of presentation (i.e. symbolic, graphical and numerical), to: 1. locate, select, organise and present information from a variety of sources 2. translate information from one form to another 3. manipulate numerical and other data 4. use information to identify patterns, report trends and draw inferences

	Name appropriate apparatus for the measurement of time, temperature, mass and volume, including burettes, pipettes and measuring cylinders **2.2.1 Criteria of purity** Demonstrate knowledge and understanding of paper chromatography Interpret simple chromatograms Identify substances and assess their purity from melting point and boiling point information Understand the importance of purity in substances in everyday life, e.g. foodstuffs and drugs	and of the outer shell electrons **3.2.1 Bonding: the structure of matter** Describe the differences between elements, mixtures and compounds, and between metals and non-metals Describe an alloy, such as brass, as a mixture of a metal with other elements **3.2.2 Ions and ionic bonds** Describe the formation of ions by electron loss or gain Describe the formation of ionic bonds between elements from Groups I and VII Describe the formation of ionic bonds between	at room temperature and pressure Calculate stoichiometric reacting masses, volumes of gases and solutions, and concentrations of solutions expressed in g / dm3 and mol / dm3 Calculations involving the idea of limiting reactants Calculate empirical formulae and molecular formulae Calculate percentage yield and percentage purity **5. Electricity and Chemistry** Define electrolysis as the breakdown of an ionic compound, molten or in aqueous solution, by the passage of electricity Describe the electrode products and the	molecules have sufficient energy (activation energy) to react whereas an increase in concentration only causes an increase in collision rate Describe and explain the role of light in photochemical reactions and the effect of light on the rate of these reactions Describe the use of silver salts in photography as a process of reduction of silver ions to silver; and photosynthesis as the reaction between carbon dioxide and water in the presence of chlorophyll and sunlight (energy) to produce glucose and oxygen **7.3 Reversible reactions** Understand that some chemical reactions can be reversed by changing	5. present reasoned explanations for phenomena, patterns and relationships 6. make predictions and hypotheses 7. solve problems, including some of a quantitative nature. **AO3 Experimental Skills and Investigation** Candidates should be able to: 1. demonstrate knowledge of how to safely use techniques, apparatus and materials (including following a sequence of instructions where appropriate) 2. plan experiments and investigations 3. make and record observations,

	Interpret simple chromatograms, including the use of Rf values Outline how chromatography techniques can be applied to colourless substances by exposing chromatograms to substances called locating agents (Knowledge of specific locating agents is not required.) **2.2.2 Methods of purification** Describe and explain methods of purification by the use of a suitable solvent, filtration, crystallisation and distillation (including use of fractionating column).(See fractional distillation of petroleum in sub-topic 14.2 and products of	metallic and nonmetallic elements Describe the lattice structure of ionic compounds as a regular arrangement of alternating positive and negative ions **3.2.3 Molecules and covalent bonds** Describe the formation of single covalent bonds in H2, Cl2, H2O, CH4, NH3 and HCl as the sharing of pairs of electrons leading to the noble gas configuration Describe the differences in volatility, solubility and electrical conductivity between ionic and covalent compounds Describe the electron arrangement in more complex covalent	observations made during the electrolysis of: • molten lead(II) bromide • concentrated hydrochloric acid • concentrated aqueous sodium chloride • dilute sulfuric acid between inert electrodes (platinum or carbon) State the general principle that metals or hydrogen are formed at the negative electrode (cathode), and that non-metals (other than hydrogen) are formed at the positive electrode (anode) Predict the products of the electrolysis of a specified binary compound in the molten state Describe the electroplating of metals Relate the products of electrolysis to the	the reaction conditions (For example, the effects of heat and water on hydrated and anhydrous copper(II) sulfate and cobalt(II) chloride.) Predict the effect of changing the conditions (concentration, temperature and pressure) on other reversible reactions Demonstrate knowledge and understanding of the concept of equilibrium **7.4 Redox** Define oxidation and reduction in terms of oxygen loss/gain. Oxidation state in terms of its use to name ions, e.g. iron(II), iron(III), copper(II), manganate(VII).) Define redox in terms of electron transfer Identify redox reactions by	measurements and estimates 4. interpret and evaluate experimental observations and data 5. evaluate methods and suggest possible improvements.

	fermentation in sub-topic 14.6.) Suggest suitable purification techniques, given information about the substances involved	molecules such as N2, C2H4, CH3OH and CO2 Explain the differences in melting point and boiling point of ionic and covalent compounds in terms of attractive forces **3.2.4 Macromolecules** Describe the giant covalent structures of graphite and diamond Relate their structures to their uses, e.g. graphite as a lubricant and a conductor, and diamond in cutting tools Describe the macromolecular structure of silicon(IV) oxide (silicon dioxide) Describe the similarity in properties between diamond and silicon(IV) oxide, related to their structures	electrolyte and electrodes used, exemplified by the specific examples in the Core together with aqueous copper(II) sulphate using carbon electrodes and using copper electrodes (as used in the refining of copper) Describe electrolysis in terms of the ions present and reactions at the electrodes in the examples given Predict the products of electrolysis of a specified halide in dilute or concentrated aqueous solution Construct ionic half-equations for reactions at the cathode Outline the uses of electroplating Describe the reasons for the use of copper and	changes in oxidation state and by the colour changes involved when using acidified potassium manganate(VII), and potassium iodide. Define oxidising agent as a substance which oxidises another substance during a redox reaction. Define reducing agent as a substance which reduces another substance during a redox reaction. Identify oxidising agents and reducing agents from simple equations **8. Acids, Bases and Salts** **8.1 The characteristic properties of acids and bases** Describe the characteristic properties	

		3.2.5 Metallic bonding Describe metallic bonding as a lattice of positive ions in a 'sea of electrons' and use this to describe the electrical conductivity and malleability of metals	(steel-cored) aluminium in cables, and why plastics and ceramics are used as insulators Describe the transfer of charge during electrolysis to include: • the movement of electrons in the metallic conductor • the removal or addition of electrons from the external circuit at the electrodes • the movement of ions in the electrolyte Describe the production of electrical energy from simple cells, i.e. two electrodes in an electrolyte (This is linked with the reactivity series in sub-topic 10.2 and redox in sub-topic 7.4.) Describe, in outline, the manufacture of: • aluminium from pure aluminium oxide in molten cryolite (see sub-topic 10.3)	of acids as reactions with metals, bases, carbonates and effect on litmus and methyl orange Describe the characteristic properties of bases as reactions with acids and with ammonium salts and effect on litmus and methyl orange Describe neutrality and relative acidity and alkalinity in terms of pH measured using Universal Indicator paper (whole numbers only) Describe and explain the importance of controlling acidity in soil Define acids and bases in terms of proton transfer, limited to aqueous solutions Describe the meaning of weak and strong acids and bases	

			• chlorine, hydrogen and sodium hydroxide from concentrated aqueous sodium chloride (You should give starting materials and essential conditions but you do not need to give the technical details or diagrams.) **6. Chemical Energetics** **6.1 Energetics of a reaction** Describe the meaning of exothermic and endothermic reactions Interpret energy level diagrams showing exothermic and endothermic reactions Describe bond breaking as an endothermic process and bond forming as an exothermic process	**8.2 Types of oxides** Classify oxides as either acidic or basic, related to metallic and nonmetallic character Classify more oxides as neutral or amphoteric **8.3 Preparation of salts** Demonstrate knowledge and understanding of preparation, separation and purification of salts as examples of some of the techniques specified in sub-topic 2.2.2 and the reactions specified in sub-topic 8.1. Demonstrate knowledge and understanding of the preparation of insoluble salts by precipitation Suggest a method of making a given salt from a suitable starting	

			Draw and label energy level diagrams for exothermic and endothermic reactions using data provided Calculate the energy of a reaction using bond energies **6.2 Energy transfer** Describe the release of heat energy by burning fuels State the use of hydrogen as a fuel Describe radioactive isotopes, such as 235U, as a source of energy Describe the use of hydrogen as a fuel reacting with oxygen to generate electricity in a fuel cell (You do not need details of the construction and operation of a fuel cell.)	material, given appropriate information **8.4 Identification of ions and gases** Describe the following tests to identify: aqueous cations: aluminium, ammonium, calcium, chromium(III), copper(II), iron(II), iron(III) and zinc (using aqueous sodium hydroxide and aqueous ammonia as appropriate) (Formulae of complex ions are not required.) cations: use of the flame test to identify lithium, sodium, potassium and copper(II) anions: carbonate (by reaction with dilute acid and then limewater), chloride, bromide and iodide (by reaction under acidic conditions with aqueous silver nitrate), nitrate (by reduction with	

				aluminium), sulfate (by reaction under acidic conditions with aqueous barium ions) and sulfite (by reaction with dilute acids and then aqueouspotassium manganate(VII)) gases: ammonia (using damp red litmus paper), carbon dioxide (using limewater), chlorine (using damp litmus paper), hydrogen (using lighted splint), oxygen (using a glowing splint), and sulfur dioxide (using aqueous potassium manganate(VII)	

Assessment for Learning

Formative assessment to take place in daily lessons via class discussion and differentiated questioning to highlight and address specific needs.

Assessment of Learning

- Past Paper Questions
- Weekly Quiz (20 Mins)
- End of Topic Review (Every 6-8 lessons)
- Peer Assessment
- Self-Assessment
- End of half term examination.