Academic Year (2011 – 2012) HomelinkChemistry IGCSE

Students studying IGCSE Chemistry are expected to complete a minimum of 2 hours homework per week rising to 3 depending on the difficulty of the work being covered.

Equipment required:Pencil, pen, ruler, rubber, protractor, compass, scientific calculator, access to a computer and Internet connection.

Note: Failure to bring said equipment will result in deduction of marks from internal assessment.

Year 10 CHEMISTRY Term 1

Topic	Learning outcomes	Assessment (50%)
1. Particle theory (Weeks 1& 2)	Describe the states of matter and how they are changed into each other: the difference between solids liquids and gases, how the movement and closeness of the particles differs in solids, liquids and gases Describe and explain diffusion: as the spreading out and intermingling of liquids and gases; caused by the random movement of particles Describe the evidence for the movement of particles in liquids and gases: in terms of diffusion Describe what affects the rate of diffusion : the larger the molecular mass the greater the rate of diffusion	Homework and Classwork Project End of topic test
2.1 Experimentaltechniques Measurement (Weeks 3 & 4)	Name apparatus: stop clock, thermometer, (weighing) balance, burette, pipette, measuring cylinders	Homework and Classwork Project End of topic test
2.2 (a) Criteria of purity (Weeks 5&6)	Understand the idea of purity: describe paper chromatograph, interpret simple chromatograms, substance can be identified from their specific melting and boiling points know that impurities alter melting and boiling points purity is important in everyday life e.g. food and drugs	Homework and Classwork Project End of topic test
2.2 (b) Methods of purification (Weeks 7&8)	Describe methods of purification: using a suitable solvent e.g. water for dissolving water soluble substances • filtration • crystallisation • simple distillation (including distillation of alcohol from fermentation) • fractionation (as in oil refining) • suggesting how to purify a substance when given suitable	Homework and Classwork Project End of topic test

	information Outline the use of locating agents to show the position of colourless substances on chromatograms	
3.1 Atoms, elements and compounds (Weeks 9&10)	Describe atomic structure: a proton has a positive charge, an electron has a negative charge and a neutron is uncharged protons and neutrons have approximately the same mass electrons have a mass about 1/2000 that of a proton define proton number and nucleon number elements are ordered in the Periodic Table in order of increasing proton number the number of electrons in the outer shell of an element is the same as the group number define isotopes isotopes can be radioactive or non-radioactive	Homework and Classwork Project End of topic test
3.1 Atomic Structure and the Periodic Table (Week 11)	describe how electrons are built up in shells understand that a 'full' outer shell of electrons makes a structure stable understand the term valency electrons Understand the main types of structure: the differences between elements, compounds and Mixtures, how the properties of metals differ from those of non-metal, an alloy (e.g. brass, steel) is a mixture of a metal with other elements	Homework and Classwork Project End of topic test
3.2 Bonding (Weeks 12 & 13)	Understand ions and ionic bonding: • ions are formed by the gain or loss of electrons • ionic compounds are formed when group I and group VII elements combine Describe molecules and covalent bonding: • the difference between ions, atoms and molecules • describe the electronic structure and formation of covalent bonds in H_2, Cl_2, H_2O, CH_4 and HCl • describe how the sharing of pairs of electrons in these molecules leads to the noble gas structure round each atom • ionic substances have high melting and boiling points and simple molecular substances have low boiling points • ionic substances are soluble in water whereas covalent compounds may or may not be soluble in water • the electrical conductivity of ionic and covalent compounds Understand the structure and properties of giant molecules (macromolecules) • graphite and diamond are giant covalent structures • relate the structures of graphite and diamond to their use as a lubricant (graphite) and in cutting tools (diamond) describe the formation of ionic bonds which can be formedbetween metallic and non-metallic elements • ionic compounds have aregular 3-dimensional structure (lattice) ofalternating positive andnegative ions • describe the electron arrangement in more complex molecules e.g. N_2, C_2H_4,CH_3OH, and CO_2 describe the structure of silicon(IV) oxide (silicon dioxide)	Homework and Classwork Project End of topic test

	• the similarity between the structures of silicon(IV) oxide and diamond Describe metallic bonding: • as a lattice of positive ions in a sea of electrons • use this model to explain the electrical conductivity and malleability of metals	
Week 14	First Term Examination	50%

ATTAINMENT (Internal Assessment & Examination Mark)		
	Description	**% of term mark**
Homework and Classwork	Homework sheets, exercises etc	20%
Project	Science project on curriculum theme	5%
End of topic test	Past papers or coursework test	20%
Attendance	Punctuality	5%
Examination week	End of term exam	50%

Year 10 CHEMISTRYTerm 2

Topic	Learning outcomes	Assessment (50%)
5. Electricityandchemistry (Weeks 1& 2)	Describe some general ideas used in electrolysis: • the cathode is the negative electrode • the anode is the positive electrode • inert electrodes such as platinum or carbon are used in electrolysis Describe the products formed at the electrodes in the electrolysis: • molten lead(II) bromide • concentrated hydrochloric acid • concentrated aqueous sodium chloride • metals or hydrogen are formed at the negative electrode • non-metals (other than hydrogen) are formed at the positive electrode) • predict the products when a molten simple salt (e.g. sodium bromide, lead iodide) is electrolysed Describe the products formed at the electrodes: • when the electrolyte is molten • when the electrolyte is a solution in water • when the electrolyte is a dilute or concentrated solution of a halide in water • when a solution of copper sulphate in water is electrolysed using carbon electrodes • when a solution of copper sulphate in water is electrolysed using copper electrodes (For the examples given in this section), describe electrolysis in terms of: • the ions present • the reactions at the electrodes	Homework and Classwork Project End of topic test
Week 3	Describe in outline: • the manufacture of aluminium from aluminium oxide in molten cryolite • the manufacture of chlorine and sodium hydroxide from a concentrated solution of sodium chloride • the electroplating of metals • the uses of electroplating • why copper is used in electrical cables • why aluminium with a steel core is used in electrical cables • why plastics and ceramics are used as insulators	Homework and Classwork Project End of topic test
6. Energetic of a reaction (week 4)	Understand that: • exothermic reactions are those releasing energy • endothermic reactions are those requiring energy • heat is released when fuels are burnt • hydrogen can be used as a fuel • radioactive isotopes such as ^{235}U are a source of energy Understand that: • energy is released when bonds are formed (exothermic) • energy is absorbed when bonds are broken • batteries are a source of convenient, portable energy • a cell consists of 2 electrodes in an electrolyte	Homework and Classwork Project End of topic test

	• in a cell, the further the electrodes are apart in the reactivity series, the greater the voltage (and energy). • redox reactions occur at the electrodes in a cell	
7.1 Chemical reactions (weeks 5, 6 & 7)	Understand that speed of a reaction: • is also called rate of reaction • can be calculated by measuring the volume of gas in a gas syringe over a period of time • can be calculated by measuring the volume of gas in an upturned measuring cylinder full of water over a period of time Understand that various factors affect the speed of a chemical reaction: • increasing the temperature increases the speed • increasing the concentration of one or more of the reactants increases the speed • decreasing the particle size of a solid reactant increases the speed • a catalyst is a substance that speeds up a chemical reaction (and is not chemically changed at the end) • enzymes are biological catalysts Describe some effects related to the speed of reaction include: • explosions in flour mills due to fine particles of readily combustible flour in the air • explosions in mines due to explosive combinations of gases Understand that reversible reactions: • can be reversed by changing the reaction conditions • water is removed when a hydrated salt is gently heated • a hydrated salt is formed when water is added back to a dehydrated salt Understand speed of reaction in more detail: •devise a way to measure the speed of a reaction when given information about theexperiment e.g. mass loss of areactant • interpret data obtained from speed of reaction experiments understand that: • light affects the speed of a few reactions e.g. the darkening of silver halides • increasing the temperature increases the speed of a reaction because of increased rate of collision of the particles • increasing the concentration of a reactant increases thespeed of a reaction because of the increased rate of collision of the particles Describe more effects related tospeed of reaction: • silver salts are used in photography • in the presence of light, some silver salts are reduced tosilver • photosynthesis is the reactionbetween carbon dioxide and water to produce glucose • light energy is needed for photosynthesis • chlorophyll absorbs the lightenergy photosynthesis Understand more about reversible reactions: • the concept of equilibrium • increase in pressure on a reversible reaction pushes the equilibrium in favour of thesideof the equation with the lower volume of gas	Homework and Classwork Project End of topic test

	• for an endothermic reaction, increase in temperatureincreases the products • for an exothermic reaction, increase in temperatureincreases the reactants	
7.3 Redox (Weeks 8, 9 & 10)	Understand redox reactions: • oxidation is gain of oxygen • reduction is loss of oxygen • the oxidation state of an ion in a compound is given by roman numbers e.g. iron(II), manganate(VII) Understand redox reactions: • oxidation is loss of electrons • reduction is gain of electrons • oxidation is increase in oxidationnumber • reduction is decrease inoxidation number • when potassium manganate(VII) oxidises a substance, it changes in colour from deep pink to colourless • when (acidified) potassium iodide reduces a substance, it changes in colour fromcolourless to brown	Homework and Classwork Project End of topic test
Week 11	Second Term Examination	50%

ATTAINMENT (Internal Assessment & Examination Mark)		
	Description	**% of term mark**
Homework and Classwork	Homework sheets, exercises etc	20%
Project	Science project on curriculum theme	5%
End of topic test	Past papers or coursework test	20%
Attendance	Punctuality	5%
Examination week	End of term exam	50%

Year 10 CHEMISTRY Term 3

Topic	Learning outcomes	Assessment (50%)
8. Acids, bases and salts	Describe the properties of acids and bases: • acids react with metals to form a salt and hydrogen • acids react with hydroxides and basic oxides to form a salt and water • acids react with carbonates to form a salt, carbon dioxide and water • pH can be measured using universal indicator • how the numbers on the pH scale describe the degree of acidity or alkalinity. • pH 7 is neutral (neither acid nor alkaline) • the importance of controlling soil acidity Describe oxides: • oxides of many non-metals are acidic • oxides of many metals are basic Describe the preparation of salts: • by reaction of acids with metals, metal oxides, hydroxides and carbonates • filtration and crystallization are used to separate and purify salts Describe tests to identify the following cations (positive ions) inqueous solution using sodium hydroxide or ammonia: • aluminium • ammonium • calcium • copper(II) • iron (II) and iron(III) • zinc Describe tests to identify the following anions (negative ions) in aqueous solution: • carbonate (by reaction with dilute acid then testing the gas given off with limewater) • chloride (by reaction with silver nitrate solution under acid conditions) • iodide (by reaction with lead(II) nitrate solution under acid conditions) • nitrate (by reduction with aluminium under alkaline conditions) • sulphate (by reaction with a solution of barium ions under acid conditions) Describe tests to identify the following gases: • ammonia (with damp red litmus) • carbon dioxide (with limewater) • chlorine (with damp litmus) • hydrogen (with a lighted splint) • oxygen (with a glowing splint) Describe the properties of acids and bases: • an acid gives off protons (towater) when it reacts • a base accepts protons • when dissolved in water, strongacids are completely ionised • when dissolved in water, weak acids are only slightly ionised Describe oxides: • as amphoteric if they react with both acids and bases • neutral if they do not reactwith acids or bases Describe the preparation of salts: • by precipitation	Homework and Classwork Project End of topic test

	• suggest a way of making a salt when given suitable information	
10. Metals	Describe the general properties of metals: • physical properties e.g. shiny, malleable, ductile etc • some chemical reactions which are common to many metals e.g. many metals react with oxygen to form oxides and many react with acids • alloys (mixtures of metals with other elements) may alter the physical properties of the metal e.g. make the metal stronger, more malleable or more resistant to corrosion • you can tell if a metal is an alloy from a diagram of its structure Describe the reactivity series: • as an order of reactivity of the metals potassium, calcium, sodium, magnesium, zinc, iron (hydrogen) and copper You can get the order of reactivity by observing the reaction of the metals with: • water or steam • dilute hydrochloric acid • reduction of the metal oxide with carbon • work out an order of reactivity from experimental results Describe how we get metals from their ores: • metals above carbon in the reactivity series are easily obtained from their ores by reduction with carbon • metals near the top of the reactivity series are usually extracted by electrolysis • the main reactions in the extraction of iron from haematite (reduction with carbon and carbon monoxide) • steel is made from iron by reaction with oxygen and basic oxides Describe the uses of metals: • aluminium for aircraft bodies because of its strength and low density • aluminium for food containers because it resists corrosion • mild steel for car bodies and machinery • stainless steel for chemical plant and cutlery (knives, forks, spoons) • the properties of iron can be changed by adding small amounts of other elements to make steels with special properties Describe the reactivity series : • as a list of the ease of formation of positive ions (the metals most easily forming positive ions being at the top) You can get this order of reactivity by observing the reaction of the metals with • ionic solutions such as sodium chloride solution (the more reactive metal displaces the less reactive one) • by the reaction of the metals with metal oxides (the more reactive metal displaces the less reactive one) • aluminium appears to be unreactive because it forms a protective oxide layer on its surface Describe the action of heat (if any) on: • hydroxides of Ca, Cu, Fe, Mg, K, Na and Zn • nitrates of Ca, Cu, Fe, Mg, K, Na and Zn Describe how we get metals from their ores: • the main reactions in the extraction of zinc from zinc blends • the main ore of aluminium is bauxite Describe further uses of metals: • zinc for galvanizing and making brass • copper for electrical wires because of its good electrical conductivity • copper for saucepans because it is a good conductor of heat.	Homework and Classwork Project End of topic test

11. Air and water	Understand the importance of water: • know a chemical test for water • describe how water is purified by filtration and chlorination • name some uses of water in the home • name some uses of water in industry Understand the importance of clean air: • clean air is a mixture containing approximately 79% nitrogen and 20% oxygen • oxygen is used in oxygen tents in hospitals and (with the hydrocarbon acetylene) in welding • there are small amounts of noble gases, carbon dioxide and water vapour in the air • carbon dioxide is formed by the complete combustion of carbon compounds • carbon dioxide is a product of respiration • carbon dioxide is given off when an acid reacts with a carbonate • pollutants in the air include carbon monoxide, sulphur dioxide, oxides of nitrogen and lead compounds • the carbon monoxide is formed by incomplete combustion of carbon compounds • carbon monoxide is poisonous • the sulphur dioxide is formed from the combustion of fossil fuels containing sulphur • sulphur dioxide contributes to acid rain which corrodes buildings and damages fish and plants • the lead compounds and nitrogen oxides are found in car exhausts • nitrogen oxides contribute to acid rain and irritate the nose and throat • lead compounds damage the nervous system Describe methods of rust prevention: • paints and other coatings prevent rust by stopping oxygen getting to the iron Describe the importance of ammonia and ammonium compounds: • ammonia is released when ammonium salts are heated with sodium hydroxide • fertilizers add nitrogen back to the soil which has been removed by plants • fertilizers often contain nitrogen, phosphorus and potassium • Describe how nitrogen and oxygen are separated from liquid air by fractional distillation Explain: • how nitrogen oxides are formed in the car engine • how nitrogen oxides are removed by a catalytic converter Describe further methods of rust prevention: • sacrificial protection (by placing a metal higher in the reactivity series in contact with the iron) • galvanizing iron with a layer of zinc Describe the manufacture of ammonia by the Haber Process: • the hydrogen comes from petroleum hydrocarbons or steam • the nitrogen comes from the air • the essential conditions for the process	Homework and Classwork Project End of topic test

ATTAINMENT (Internal Assessment & Examination Mark)		
	Description	**% of term mark**
Homework and Classwork	Homework sheets, exercises etc	20%
Project	Science project on curriculum theme	5%
End of topic test	Past papers or coursework test	20%
Attendance	Punctuality	5%
Examination week	End of term exam	50%

Year 11 CHEMISTRY Term 1

Topic	Learning outcomes	Assessment (50%)
4. Quantities and equations (Weeks 1 & 2)	• use the symbols of the elements • write formulas of simple compounds • work out the formula of a compound by comparing the number of different atoms • work out the formula of a compound from a diagram	Homework and Classwork Project End of topic test
(Weeks 3&4)	• write word equations • write simple balanced chemical equations • work out the formula of an ionic compound form the charges on the ions • write more complex balanced equations and include state symbols • write ionic equations • work out a balanced equation given relevant information	Homework and Classwork Project End of topic test
(Weeks 5, 6 & 7)	• define relative atomic mass, A_r • relative molecular mass, M_r is the sum of the relative atomic masses • the symbol M_r also used for the relative formula mass of ionic compounds Use the mole concept: • define the mole • define the Avogadro constant • do calculations using the molar gas volume • the units of solution concentration are either g/dm^{3}or mol/dm^3 • calculate empirical formula • calculate molecular formula • calculate % yield and % purity	Homework and Classwork Project End of topic test
(Weeks 8&9)	• do basic calculations involving simple proportion in order to work out the amounts of substances which react of grams • from a given equation, calculate reacting masses, and volumes of gases and solutions • calculate amounts of products/ reactants when one reactant in the equation is limiting (not in excess)	Homework and Classwork Project End of topic test
12. Sulphur (Weeks 10&11)	Describe some aspects of the chemistry of sulphur: • name some sources of sulphur • sulphur is used to make sulphuric acid • the conditions used in the Contact process for making sulphuric acid (catalyst, temperature and (normal) pressure) • dilute sulphuric acid has the properties of a typical acid • sulphur dioxide is used to bleach wood pulp • sulphur dioxide is a food preservative because it kills bacteria	Homework and Classwork Project End of topic test
13. Carbonates (Weeks	Describe the reactions and uses of calcium carbonate: • how lime (calcium oxide) is made from calcium carbonate by heating • the chemical reaction involved in making lime is thermal decomposition • lime is used to neutralise acidic soils	Homework and Classwork

12&13)	• slaked lime is used to neutralise acidic industrial waste • calcium carbonate is used in the manufacture of iron and of cement	Project End of topic test
Week 14	First Term Examination	50%

ATTAINMENT (Internal Assessment & Examination Mark)		
	Description	**% of term mark**
Homework and Classwork	Homework sheets, exercises etc	20%
Project	Science project on curriculum theme	5%
End of topic test	Past papers or coursework test	20%
Attendance	Punctuality	5%
Examination week	End of term exam	50%

Year 11 CHEMISTRY Term 2

Topic	Learning outcomes	Assessment (50%)
14. Organic chemistry Week 1	Understand about fuels: • that coal, natural gas and petroleum are fuels • that natural gas is largely methane • that petroleum is a mixture of hydrocarbons • how petroleum is separated into useful fractions by fractional distillation • the names of the petroleum fractions • petrol is used as a fuel in cars • paraffin is used for oil stoves and aircraft fuel • diesel is used for fuel in diesel engines • lubricating oil is used for lubricants and for making waxes and polishes • bitumen is used for making roads	Homework and Classwork Project End of topic test
(Weeks 2 & 3)	Describe an homologous series of compounds as: • having the same functional group • having similar properties Describe an homologous series in more detail: • e.g. they can be represented by a general formula e.g. alkenes C_nH_{2n}	Homework and Classwork Project End of topic test
Week 4	Name and draw the structures of: • methane • ethene • ethanol • ethanoic acid • 1,2-dibromoethane • poly(ethene) Recognise by name, compounds ending in: • -ane are alkanes • -ene are alkenes • -ol are alcohols • -oic acid are carboxylic acids Recognise from diagrams, the structures of: • alkanes • alkenes • alcohols • carboxylic acids	Homework and Classwork Project End of topic test
Week 5	Understand that alkanes: • are saturated hydrocarbons • are generally unreactive • can be burnt in excess air to form carbon dioxide and water Name and draw further structures: • unbranched alkanes • describe and identify structural isomers Describe further reactions of alkanes: • they react with chlorine (in the presence of light to substitute one or more hydrogen atoms)	Homework and Classwork Project End of topic test
Week 6	Understand about alkenes: • that they are unsaturated hydrocarbons	Homework and

	• they decolourise bromine water (or acidified potassium manganate(VII)) • ethene undergoes addition polymerisation to form poly(ethene) • in addition polymerisation, the simple units (ethene) which join together are called monomers • that unsaturated hydrocarbons differ from saturated hydrocarbons in structure and reaction with bromine water Name and draw further structures: • alkenes • describe and identify structural isomers Describe the reaction of alkenes: • with bromine • with steam • with hydrogen	Classwork Project End of topic test
Week 7	Understand that ethanol: • forms carbon dioxide and water on complete combustion • can be made by fermentation • can be made by addition of steam to ethene in the presence of a catalyst • is used as a solvent • is used as a fuel Name and draw further structures: • alcohols with up to 4 carbon atoms • describe and identify structural isomers • ethanol and carbon dioxide are formed when simple sugars are fermented	Homework and Classwork Project End of topic test
Week 8	Understand that ethanoic acid: • it is formed when ethanol is oxidised by oxygen from the air • it can be made by oxidising ethanol with acidified potassium dichromate (VI). • it is a weak acid • it reacts with ethanol to make the ester, ethyl ethanoate Name and draw further structures: • carboxylic acids with up to 4 carbon atoms	Homework and Classwork Project End of topic test
Week 9	Understand some aspects of the chemistry of macromolecules: • they are large molecules built up from small units called monomers • different macromolecules have different units and/ or different linkages between the units Understand some of the chemistry of synthetic polymers: • plastics and man-made fibres have particular uses • the pollution problems that are caused by non-biodegradable plastics • know how to work out the structure of a polymer from a given alkene • know how to work out the structure of an alkene monomer when given the structure of the polymer • nylon is formed by a condensation polymerisation. • the structure of terylene (a polyester) • terylene is formed by a condensation reaction	Homework and Classwork Project End of topic test
Week 10	Understand some of the chemistry of natural macromolecules: • proteins, carbohydrates and fats form the main part of our food	Homework and

	• proteins have the same linkages (amide) as in nylon • proteins have different monomer units to nylon • proteins are hydrolysed to amino acids • fats have the same linkage (ester) as terylene • fats have different units to terylene • fats are hydrolysed to make soap • complex carbohydrates contain a large number of (polymerised) sugar units • in a sugar units are joined by condensation polymerisation when a sugar polymer is formed • complex carbohydrates such as starch can be hydrolysed to simple sugars • amino acids (from the hydrolysis of proteins) and simple sugars (from the hydrolysis of complex carbohydrates) can be separated and identified using chromatography	Classwork Project End of topic test
Week 11	2nd Term Examination	50%

ATTAINMENT (Internal Assessment & Examination Mark)		
	Description	**% of term mark**
Homework and Classwork	Homework sheets, exercises etc	20%
Project	Science project on curriculum theme	5%
End of topic test	Past papers or coursework test	20%
Attendance	Punctuality	5%
Examination week	End of term exam	50%