نظام إدارة الجودة
Quality Management System

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نمضي بثقة
Moving Forward with Confidence

Syllabus	الإطار المنهجي
Chemistry	مادة الكيمياء
Bilingual Program	برنامج ثنائي اللغة
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Contents

Introduction

Science plays a major role in the evolution of knowledge. It empowers us to use creative and independent approaches to problem solving. It arouses our natural curiosity and enables us to meet diverse and ever expanding challenges. It enhances our ability to inquire, seek answers, research and interpret data. These skills lead to the construction of theories and laws that help us to explain natural phenomena and exercise control over our environment. Science is, thus, an integral component of a balanced education.

This syllabus focus on the content essential for preparing students to be engaged and productive citizens. A good foundation in the sciences will help citizens to respond to the challenges of a rapidly changing world using the scientific approach. It addresses, in addition to a specific knowledge base, the development of related skills and attitudes. Critical thinking, enquiry and reasoning are emphasized to ensure that students develop the ability to work creatively, think analytically and solve problems. The syllabus also ensure that students become aware of their moral, social, and ethical responsibilities, as well as, the benefits intrinsic to the practical application of scientific knowledge to careers in the scientific field. Teaching these standards requires teaching methods that are varied and experiential. Effective lessons will concert and incorporate with: Practical work and the science standards, the place of information and communications technology in the science standards, teaching about science, technology and society, the mathematical requirements of the science standards.

The overall aims of science standards are that students should:

1. develop and sustain an interest in science and its applications.
2. have a sound and systematic knowledge of important scientific facts, concepts and principles, and possess the skills needed to apply these in new and changing situations in a range of personal, domestic, industrial and environmental contexts.
3. recognize the importance of the application of scientific knowledge in the modern world and be aware of the moral, ethical, social and environmental implications.
4. develop relevant attitudes, such as a concern for accuracy and precision, objectivity, integrity, enquiry, initiative and inventiveness.
5. develop an understanding of the scientific skills essential for both further study and everyday life.
6. plan, design and perform experiments to test theories and hypotheses.
7. be proficient in the use of a range of scientific methods and techniques and in handling apparatus.
8. develop the ability to work independently and collaboratively with others when necessary.
9. integrate Information and Communication Technology (ICT) tools and skills.

Important Skills:

- Scientific enquiry skills: Scientific enquiry, which ensures the development of scientific skills, intellectual and practical, should be integrated in the learning of the scientific content across all the science branches. Scientific enquiry skills include the following:

1. Carry out the practical experiments to developed the practical skills which will be mentioned in details below.
2. Find secondary information sources such as the resources available in the public libraries and on the Internet and use these after validation and making sure of the suitability of the subject.
3. Apply Scientific knowledge and procedures to the situations of the reality Life.
4. Recognizes the importance of cooperative teamwork, put work plans, distributes responsibilities and regulates and sets specific targets for work.

- Know how scientists are working:

1. Realize that with science we can bring great benefits to humanity also if it is abused can cause serious damage to the environment.
2. know how scientists are carrying out their work, such as environmental monitoring and control of industrial processes.
3. Know how scientists publish and present their ideas and results in order to encourage debate and development.
4. know that science could lead to the emergence of ethical considerations, and discuss them.
5. know that there are many questions and considerations that cannot be answered by Science.
6. trace the historical development of some key scientific models and knows what contributions Scientists presented in this development.

- Processing and delivery of information

1. present qualitative and quantitative data using a variety of methods, such as descriptive texts, graphics, images, tables, and maps with the use of technology methods and computer when it is appropriate, then analyse and explain these date to extract conclusions from them.
2. use mathematical relationships routinely to calculate the quantities.
3. do calculations based on data taken from the graphs, and distinguishes between Independent and dependent variables.
4. handle data and writes reports about the results.
5. use symbolic equations to represent chemical reactions and simple physical relationships.
6. use the appropriate methods to deliver scientific information.

- ICT application:

This syllabus provides students with a wide range of opportunities to use ICT in their study of science in order to play a full part in modern society, students need to be confident and effective users of ICT. Opportunities for ICT include:

1. gathering information from the internet, DVDs and CD-ROMs.
2. using spreadsheets and other software to process data.
3. using animations and simulations to visualize scientific ideas.
4. using software to present ideas and information on paper and on screen.

Skills and abilities to be assessed:

The skills students are expected to develop on completion of this syllabus, have been grouped under three main headings:

1. knowledge and understanding.
2. application of knowledge and understanding, analysis and evaluation of information.
3. scientific enquiry skills and procedures.

1. Knowledge and understanding

Assessment Objectives	Skills: The ability to
Knowledge	• identify, remember and grasp the meaning of basic facts, concepts and principles.
Understanding	• select appropriate ideas, match, compare and cite examples of facts, concepts and principles in familiar situations; • explain familiar phenomena in terms of theories, models, laws and principles.

Questions testing these skills will often begin with one of the following words: define, state, describe, explain.

2. Application of knowledge and understanding, analysis and evaluation of information

Assessment Objectives	Skills: The ability to
Application	• use facts, concepts, principles and procedures in unfamiliar situations. • transform data accurately and appropriately • use common characteristics as a basis for classification • use information to identify patterns, report trends and draw inferences. • use formulae accurately
Analysis and Interpretation	• identify and recognize the component parts of a whole and interpret the relationships between those parts; • identify causal factors and show how they interact with each other; • infer, predict and draw conclusions; • make necessary and accurate calculations and recognize the limitations and assumptions of data. • present reasoned explanations for phenomena, patterns and relationships
Synthesis	• combine component parts to form a new meaningful whole; • make predictions and solve problems. • locate, select, organize and present information from a variety of sources.
Evaluation	• make reasoned judgments and recommendations based on the value of ideas and information and their implications.

Questions testing these skills will often begin with one of the following words: predict, suggest, calculate or determine.

3. Scientific enquiry skills and investigations.

Assessment Objectives	Skills: The ability to
Planning and designing a practical procedure	• identify problems, make predictions, and design a practical procedure to answer a question, solve a problem or test a hypothesis. • select and use suitable apparatus for carrying out experiments accurately and safely. • take into account possible sources of errors and danger in the design of an experiment; • evaluating experimental procedures and identifying weaknesses and develop realistic strategies for improvement • Work in a way that is committed to ethical and moral standards such as honesty and authenticity of his results and writing of the used references.
Control	• use experimental controls where appropriate; • Appreciate that, unless certain variables are controlled, experimental results may not be valid • Recognize the need to choose appropriate sample sizes, and study control groups where necessary.
Risk assessment	• Identify possible hazards in practical situations, the risks associated with these hazards, and methods of minimizing the risks.
Manipulation and measurement	• follow a detailed set or sequence of instructions; • make measurements with due regard for precision and accuracy; • handle chemicals and living organisms with care; • assemble and use simple apparatus and measuring instruments.
Observation, recording and reporting	• select observations relevant to the particular activity; • make accurate observations and minimise experimental errors • record observations, measurements, methods and techniques with due regard for precision, accuracy and units; • record and report unexpected results; • select and use appropriate models of recording data or observations, for example, graphs, tables, diagrams and drawings; • organize and present information, ideas, descriptions and arguments clearly and logically in a complete report, using spelling, punctuation, grammar and scientific terminology with an acceptable degree of accuracy;

Assessment Objectives	Skills: The ability to
Analyzing and interpreting data	• Appreciate when it is appropriate to calculate a mean, calculate a mean from a set of at least three results and recognize when it is appropriate to ignore anomalous results in calculating a mean. • Recognize patterns in data, form hypotheses and deduce relationships. • Use and interpret tabular and graphical representations of data. • Evaluate data, considering its repeatability, reproducibility and validity in presenting and justifying conclusions.
Making conclusions	• Draw conclusions that are consistent with the evidence obtained and support them with scientific explanations
Drawing	• make clear, accurate line representations of specimens, with no shading or unnecessary details; and with clean continuous lines. • label drawings accurately and use label lines which do not cross each other or carry arrowheads or dots • make drawings which are large enough to display specific details • calculate the magnification of the drawings.

Chemistry Syllabus

The chemistry syllabus allow students to work individually and with others in practical, field and interactive activities that are related to theoretical concepts. It is expected that students will apply investigative and problem-solving skills, effectively communicate scientific information and appreciate the contribution that a study of chemistry makes to their understanding of the world. The syllabus places greater emphasis on the understanding and application of chemical concepts and principles and different learning styles and needs, so that students will develop skills that will be of long term value in an increasingly technological world, rather than focusing on large quantities of factual information. Through the principles of chemistry, students will understand everyday life, nature and technology, and the significance of the well-being of man and the environment.

Aims: Chemistry syllabus enables students to:

1. appreciate and understand natural phenomena and the ways in which materials behave.
2. be aware of the power, impact and influence which Chemistry has in a modern scientific world and to emphasize that there is a responsibility that Chemistry be used for the good of the society and for the preservation of the environment.
4. appreciate, understand and use methods of science.
5. see the relevance of Chemistry to everyday life.
6. appreciate and understand the role of Chemistry in enabling materials to be used in the service of mankind.
7. understand basic chemical concepts in sufficient depth to provide an adequate foundation for specialization.
8. develop the spirit of inquiry and to continue the search for new ways in which materials may be used in the service of mankind.
9. make use of chemical data, concepts, principles and terminology in communicating chemical information.

How to use this syllabus

This syllabus is arranged according to the following manner:

Outcomes:

Indicate the scope of the content, including practical work which will be examined as well. However, practical work should not necessarily be limited to these objectives.

1- The numbering key :[Unit – Topic –Learning outcome]
2- (S) skill objective.

Practical experiments and activities:

Show some examples of active Learning activities and do not represent Full -scale activities can be done. It is recommended that approximately 70 % of suggested laboratory-related activities, such as conducting experiments, making field trips and viewing audio-visual materials, must be done. Take into account the sufficient time to carry out practical experiments in the student text book and the wok book and training students in practical skills related to them. The teachers should get benefit from the work book and laboratory practical book that are recommended by MOE in the approved books list.

Grade 9 (Bilingual) Chemistry- Learning outcomes Semester 1						
Subtopic	**Learning Outcomes**		**Pages**			**Suggested teaching and learning activities + Practical work**
			Cambridge	**Oxford**	**Hodder**	
1. The particulate nature of matter.						
1. The particulate nature of matter.	1.1.1	State the distinguishing properties of solids, liquids and gases.	22	4	2	
	1.1.2 (S)	Describe the structure of solids, liquids and gases in terms of particle separation, arrangement and types of motion.		6 , 7	2,3	
	1.1.3 (S)	Describe changes of state in terms of melting, boiling, evaporation, freezing, condensation and sublimation.	22-23	6 , 7	4,5,6	
	1.1.4	Explain changes of state in terms of the kinetic theory.	36-40	6 , 7	2,3	
	1.1.5 (S)	Describe qualitatively the pressure and temperature of a gas in terms of the motion of its particles.	36-40	8	4,5,6	
	1.1.6	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.	36-40	3	7	
	1.1.7	Explain diffusion.	38-39	3	6,7	Adding drop of ink in cold water and hot water
	1.1.8 (S)	Explain dependence of rate of diffusion on molecular mass.	6	9	6,7	Mixing HCl gas and NH_3 gas in glass tube ,observe the ring formed inside the tube (page9, Oxford book).

Grade 9 (Bilingual) Chemistry- Learning outcomes Semester 1						
Subtopic	**Learning Outcomes**		**Pages**			**Suggested teaching and learning activities + Practical work**
			Cambridge	**Oxford**	**Hodder**	
2. The Periodic Table						
1.The Periodic Table	2.1.1	Describe the Periodic Table as a method of classifying elements and its use to predict properties of elements.	56	162	135-137	
	2.1.2	Describe the change from metallic to non-metallic character across a period.	60,63 and 64	162,163	138	
	2.1.3	Explain the relationship between Group number, number of outer shell electrons and metallic/nonmetallic Character.	59-60	162,163	137,138	
2. Group properties	2.2.1	Describe lithium, sodium and potassium in Group I as a collection of relatively soft metals showing a trend in melting point, density and reaction with water.	60,207-208	60-62	138-140	Show the students demo video for the reaction of sodium and potassium with water to see which is more reactive
	2.2.2	Identify trends in Groups, given information about the elements concerned	60-63	60-62	138-140	
	2.2.3	Predict the properties of other elements in Group I, given data, where appropriate.	60	60-62	138-140	
	2.2.4	Describe the halogens, chlorine, bromine and iodine in Group VII, as a collection of diatomic non-metals showing a trend in colour and density and state their reaction with other halide ions.	60-62		141,142	
	2.2.5	Predict the properties of other elements in Group VII, given data where appropriate.	60-62		141,142	

Grade 9 (Bilingual) Chemistry- Learning outcomes Semester 1						
Subtopic	**Learning Outcomes**		**Pages**			**Suggested teaching and learning activities + Practical work**
			Cambridge	**Oxford**	**Hodder**	
3. Transition elements	2.3.1	Describe the transition elements as a collection of metals having high densities, high melting points and forming colored compounds, and which, as elements and compounds, often act as catalysts.	64 212-214	170,171	144,145	
	2.3.2	Know that transition elements have variable oxidation states.	64,213		145	
4. Noble gases	2.4.1	Describe the noble gases, in Group VIII or 0, as being uncreative, monatomic gases and explain this in terms of electronic structure.	62-63	168,169	143,144	
	2.4.2	State the uses of the noble gases in providing an inert atmosphere, i.e. argon in lamps, helium for filling balloons	62-63		144,176	
3.Metal						
1.Properties of metals	3.1.1	List the general physical properties of metals.	56-57		55	
	3.1.2	Describe the general chemical properties of metals e.g. reaction with dilute acids and reaction with oxygen.		178,179	150,151	- Reaction of iron and zinc with dilute HCl - Burning Mg ribbon
	3.1.3	Explain in terms of their properties why alloys are used instead of pure metals.	80-81	198,199	165-167	
	3.1.4 (s)	Identify representations of alloys from diagrams of structure.	81		167	

Grade 9 (Bilingual) Chemistry- Learning outcomes Semester 1						
Subtopic	**Learning Outcomes**		**Pages**			**Suggested teaching and learning activities + Practical work**
			Cambridge	**Oxford**	**Hodder**	
4. Atoms, elements and compounds						
1. Atomic structure	4.1.1	State the relative charges and approximate relative masses of protons, neutrons and electrons.	41-43	26	34	Discovering the structure of the atom
	4.1.2	Define *proton number* (atomic number) as the number of protons in the nucleus of an atom	41-43	28 , 29	34	
	4.1.3	Define *nucleon number* (mass number) as the total number of protons and neutrons in the nucleus of an atom.	41-43	28 , 29	34	
	4.1.4 (S)	Use proton number and the simple structure of atoms to explain the basis of the Periodic Table with special reference to the elements of proton number 1 to 20.	47-49	32 , 33	37,38	
	4.1.5	Define *isotopes* as atoms of the same element, which have the same proton number but a different nucleon number.	43-46	30 , 31	35	
1.Atomic structure	4.1.6	Understand that isotopes have the same properties because they have the same number of electrons in their outer shell	43-46	30 , 31	35,36	
	4.1.7	State the two types of isotopes as being radioactive and non-radioactive.	43-46	30	35	
	4.1.8	State one medical and one industrial use of radioactive isotopes.	43-46	31	35,36	
	4.1.9	Describe the build-up of electrons in ‘shells’ and understand the significance of the noble gas electronic structures and of the outer shell electrons. (The ideas of the distribution of electrons in s and p orbitals and in d block elements are not required.)	47-49	32 , 33	37,38	

Grade 9 (Bilingual) Chemistry- Learning outcomes Semester 1						
Subtopic	**Learning Outcomes**		**Pages**			**Suggested teaching and learning activities + Practical work**
			Cambridge	**Oxford**	**Hodder**	
2. Bonding the structure of matter	4.2.1	Describe the differences between elements, mixtures and compounds, and between metals and non-metals.	57	42	10-17	Testing metals and non-metals.
	4.2.2	Describe an alloy, such as brass, as a mixture of a metal with other elements.	80-81	198 , 199	167	
3. Ions and ionic bonds	4.3.1	Describe the formation of ions by electron loss or gain.	71	44-49	38-40	
	4.3.2	Describe the formation of ionic bonds between metallic and non-metallic elements.	71		38-41	
	4.3.3	Describe the formation of ionic bonds between elements from Groups I and VII.	71-72		40,41	
	4.3.4	Describe the lattice structure of ionic compounds as a regular arrangement of alternating positive and negative ions.	72,82		42	
4. Molecules and covalent bonds	4.4.1	Describe the formation of single covalent bonds in H_2, Cl_2, H_2O, CH_4, NH_3 and HCl as the sharing of pairs of electrons leading to the noble gas configuration.	67-70	50-53	45-49	Modelling the bonding in covalent substances.
	4.4.2	Describe the electron arrangement in more complex covalent molecules such as N_2, C_2H_4, CH_3OH and CO_2.	67-70		45-49	
4. Molecules and covalent bonds	4.4.3	Describe the differences in volatility, solubility and electrical conductivity between ionic and covalent compounds.	67-70		42,50	
	4.4.4	Explain the differences in melting point and boiling point of ionic and covalent compounds in terms of attractive forces.			42,50	

Grade 9 (Bilingual) Chemistry- Learning outcomes Semester 1						
Subtopic	**Learning Outcomes**		**Pages**			**Suggested teaching and learning activities + Practical work**
			Cambridge	**Oxford**	**Hodder**	
5.Macro molecules	4.5.1	Describe the giant covalent structures of graphite and diamond.	83-84	56-57	51	
	4.5.2	Describe the macromolecular structure of silicon(IV) oxide (silicon dioxide).	83-84		54	
	4.5.3	Relate their structures to their uses, e.g. graphite as a lubricant and a conductor, and diamond in cutting tools.	83-84		50,51	
	4.5.4	Describe the similarity in properties between diamond and silicon(IV) oxide ,related to their structures.	83-84		51-54	
6. Metallic bonding	4.6.1	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.	79-80	58 , 59	55	Modelling metallic crystal structure.

Grade 9 (Bilingual) Chemistry- Learning outcomes Semester 2						
Subtopic	**Learning Outcomes**		**Pages**			**Suggested teaching and learning activities + Practical work**
			Cambridge	**Oxford**	**Hodder**	
5. Experimental techniques						
1. Criteria of Purity	5.1.1	Demonstrate knowledge and understanding of paper Chromatography.	31-33	19	23	Investigation of food dyes by chromatography.
	5.1.2	Interpret simple chromatograms.(Rf is not required)	31-33	20 , 21	23	
	5.1.3	Identify substances and assess their purity from melting point and boiling point information.	24-26	5 , 14 , 15	24	Measuring the b.p of pure ethanol or other substance
	5.1.4	Understand the importance of purity in substances in everyday life, e.g. foodstuffs and drugs.	32-33		24	
2.Methods of purification	5.2.1	Describe and explain methods of purification by the use of suitable solvent , filtration , crystallization , and distillation	24-33	16-19 20, 21	17-22	For crystallization make supersaturation of $CuSO_4$ solution with heating then leave it cooled Distillation of $CuSO_4$ Filtrate AgCl from the mixture
	5.2.2	Suggest suitable purification techniques, given information about the substances involved.	27-33		17-22	Separating common salt and sand.
6. Stoichiometry						
1. Stoichiometry	6.1.1	Use the symbols of the elements and write the formulae of simple compounds	75-76		43	
	6.1.2 (S)	Determine the formula of an ionic compound from the charges on the ions present.	75-76	63	43,44	
	6.1.3	Deduce the formula of a simple compound from the relative numbers of atoms present.	75-76	62	43-45	
	6.1.4 (S)	Construct word equations and simple balanced chemical equations.	91-94	64,65		

Grade 9 (Bilingual) Chemistry- Learning outcomes Semester 2						
Subtopic	**Learning Outcomes**		**Pages**			**Suggested teaching and learning activities + Practical work**
			Cambridge	**Oxford**	**Hodder**	
	6.1.5	Define *relative atomic mass*, Ar , as the average mass of naturally occurring atoms of an element on a scale where the 12C atom has a mass of exactly 12 units.	152-153	66	37	
	6.1.6	Define *relative molecular mass*, Mr , as the sum of the relative atomic masses	153-156	66 , 67 , 72 , 73	59	Reacting marble chips with acid.
7. The mole concept						
1. The mole concept	7.1.1	Define the *mole* and the *Avogadro Constant.*	158	72	60	
	7.1.2	Use the molar gas volume, taken as 24 dm^3 at room temperature and pressure.	166	76 , 77	63	
	7.1.3 (S)	Calculate stoichiometric reacting masses, volumes of gases and solutions, and concentrations of solutions expressed in mol / dm^3.	166-168	78 , 79	61-64	Determining the concentration of a hydrochloric acid solution.
	7.1.4(S)	Calculate empirical formulae.	160	80 , 83	64,65	
	7.1.5 (S)	Calculate molecular formulae.	160	80 , 83	65,66	
	7.1.6 (S)	Calculate percentage yield.(simple questions)	163-165	84, 85	68	
	7.1.7 (S)	Calculate percentage purity (simple questions) . Note : All question related to balance equation are not included.	163-165	84, 85	68,69	
8. Acid, base and salts						
1. The characteristic properties of acids and bases.	8.1.1	Describe the characteristic properties of acids as reactions with metals, bases, carbonates and effect on litmus and methyl orange	120-121	144-151	123,124	
	8.1.2	Define *acids* and *bases* in terms of proton transfer, limited to aqueous solutions	124		119	
	8.1.3	Describe the characteristic properties of bases as reactions with acids and with ammonium salts and effect on litmus and methyl orange.	129-131			
	8.1.4	Define weak and strong acids and bases.	143-146		120	

Grade 9 (Bilingual) Chemistry- Learning outcomes Semester 2						
Subtopic	**Learning Outcomes**		**Pages**			**Suggested teaching and learning activities + Practical work**
			Cambridge	**Oxford**	**Hodder**	
2. Types of oxides	8.2.1 (S)	Describe neutrality and relative acidity and alkalinity in terms of pH measured using Universal Indicator paper(whole numbers only)	122-123,127-129		117,118	Testing the pH of everyday substances. Measuring the pH for solutions like juice,Milk ,detergent , tooth paste solution , Vinegar …. etc
	8.2.2	Explain the importance of controlling acidity in soil.	128		120	
	8.2.3	Classify oxides as either acidic or basic, related to metallic and non-metallic character	125-126	152-153		
	8.2.4	Further, classify other oxides as neutral or amphoteric.	126-127	153	156	
3. Preparation of salts	8.3.1(s)	Demonstrate the preparation, separation and purification of salts.	138-143	154-157	122-126	Quick and easy copper (II) sulfate crystals.
	8.3.2(s)	Understanding of the preparation of insoluble salts by precipitation.	141-143		125	
	8.3.3	Suggest a method of making a given salt from a suitable starting material, given appropriate information	141-143		265	

Grade 9 (Bilingual) Chemistry- Learning outcomes Semester 2						
Subtopic	**Learning Outcomes**		**Pages**			**Suggested teaching and learning activities + Practical work**
			Cambridge	**Oxford**	**Hodder**	
9. Identification of ions and gases						
1. Identification of ions and gases	9.1.1	Describe the following tests to identify: aqueous cations: aluminium, calcium, copper(II), iron(II), iron(III) and zinc (using aqueous sodium hydroxide and aqueous ammonia as appropriate) (Formulae of complex ions are not required.	137-138	280,281	262	Chemical tests for cations
		anions: carbonate (by reaction with dilute acid and then limewater), chloride, bromide and iodide (by reaction with acidic aqueous silver nitrate), sulfate (by reaction with acidic aqueous barium chloride)	298-300	282,283	126,127, 262	Chemical tests for anions.
		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).		278-279	263	Chemicals test for gases.

Grade 10 (Bilingual) Chemistry- Learning outcomes Semester 1						
Subtopics		**Learning Outcomes**	**Pages**			**Suggested teaching and learning activities + Practical work**
			Cambridge	**Oxford**	**Hodder**	
1.Chemical energetic						
1. Energetic of a reaction	1.1.1	Describe the meaning of exothermic and endothermic reactions.	175-179	110-115	88	Exothermic and endothermic reactions.
	1.1.2	Describe bond breaking as an endothermic process and bond forming as an exothermic process.			95-97	
	1.1.3	Interpret energy level diagrams showing exothermic an endothermic reactions.				
	1.1.4 (S)	Draw and label energy level diagrams for exothermic and endothermic reactions using data provided.				
	1.1.5 (S)	Calculate the energy of a reaction using bond energies			96	
2. Energy transfer	1.2.1	Describe the release of heat energy by burning fuels	16 -18	114, 115	92	
	1.2.2	State the use of hydrogen as a fuel		117	95	Hydrogen power- communicating the benefits.
	1.2.3	Describe the use of hydrogen as a fuel reacting with oxygen to generate electricity in a fuel cell (Details of the construction and operation of a fuel cell are not required.)		117	95	
	1.2.4	Describe radioactive isotopes, such as ^{235}U, as a source of energy		115	93	

Subtopics		Learning Outcomes	Pages			Suggested teaching and learning activities + Practical work
			Cambridge	Oxford	Hodder	
2. Reactivity series						
1. Reactivity series	2.1.1	Place in order of reactivity : potassium, sodium, calcium, magnesium, zinc, iron, (hydrogen) and copper, by reference to the reactions, if any, of the metals with: – water or steam – dilute hydrochloric acid and the reduction of their oxides with carbon	215	180-185	150	
	2.1.2	Describe the reactivity series as related to the tendency of a metal to form its positive ion, illustrated by its reaction,if any, with: – the aqueous ions – the oxides of the other listed metals	217		154,155	Displacement reactions of metals.
	2.1.3	Explain the action of heat on the hydroxides, carbonates and nitrates of the listed metals	220		152,153	
	2.1.4	Account for the apparent unreactivity of aluminum in terms of the oxide layer which adheres to the metal	210	187		
2. Extraction of metals	2.2.1	Describe the ease in obtaining metals from their ores by relating the elements to the reactivity series	216	192	157,158	Extracting metals with charcoal.
	2.2.2	Describe the essential reactions in the extraction of iron from hematite	227	194 , 195	158,159	
	2.2.3	Describe in outline, the extraction of zinc from zinc blend	232	193	160	
	2.2.4	Describe the conversion of iron into steel using basic oxides and oxygen	228,229	200,201	165-167	
	2.2.5	Describe in outline, the extraction of aluminum from bauxite including the role of cryolite and the reactions at the electrodes.	234,235	196, 197	74,75	
3. Uses of metals	2.3.1	Name the uses of aluminium: – in the manufacture of aircraft because of its strength and low density – in food containers	210	39,198, 199	76	
	2.3.2	Name the uses of mild steel (car bodies and machinery) and stainless steel (chemical plant and cutlery	229	200	165-167	
	2.3.3	Describe the idea of changing the properties of iron by the controlled use of additives to form steel alloys	229	200,201		

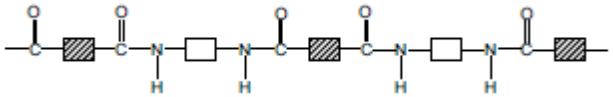
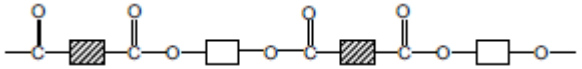
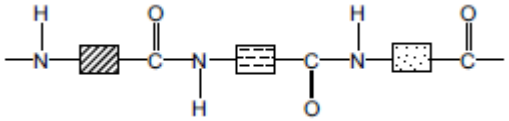
Subtopics	Learning Outcomes		Pages			Suggested teaching and learning activities + Practical work
			Cambridge	Oxford	Hodder	
3. Electrolysis						
1. Electrolysis	3.1.1	Define electrolysis as the breakdown of an ionic compound, molten or in aqueous solution, by the passage of electricity.	102	100 - 105	72	The conductivity of liquids and aqueous solutions.
	3.1.2	Describe the electrode products and the observation made during the electrolysis of : - molten lead (ii) bromide - concentrated hydrochloric acid - concentrated aqueous sodium chloride - Dilute sulfuric acid Between inert electrode platinum or carbon.	105 105 109 110		72-80	The electrolysis of concentrated sodium chloride solution.
	3.1.3	State the general principle that metal or hydrogen are formed at the negative electrode (cathode) and that nonmetal (other than hydrogen) are formed at the positive electrode (anode).	109			
	3.1.4	Predict the products of the electrolysis of a special binary compound in the molten state.	108			
	3.1.5	Outline the uses of electroplating.	111	107	83	Electroplating copper with nickel.
	3.1.6	Describe the electrolysis of metal (refining copper)	113,114	106	81,82	Electrolysis of copper (II) sulfate solution.
	3.7	Describe the reason for the use of copper and (steel-cored) aluminum in cables	103	196,198	81	

Subtopics	Learning Outcomes		Pages			Suggested teaching and learning activities + Practical work
			Cambridge	Oxford	Hodder	
4. Chemical reactions						
1. Reversible reactions	4.1.1(S)	Understand that some chemical reactions can be reversed by changing the reaction conditions (Limited to the effects of heat and water on hydrated and anhydrous copper(II) sulfate and cobalt(II) chloride.)	194-195	120-123	128	- Prepare a mixture of chromate and dichromate ,divide into 3 test tubes add to one acid to the 2nd one base ,observe the changes in color - Copper sulfate anhydrous white with water turns blue this on heat turns white
	4.1.2	Predict the effect of changing the conditions (concentration, temperature and pressure) on other reversible reactions.	197-198		177,200	Cobalt chloride in hot water and in cold water
5. Redox						
1. Redox	5.1.1	Define *oxidation* and *reduction* in terms of oxygen loss/gain.	101	88		Burning Mg ribbon
	5.1.2	Define *redox* in terms of electron transfer.	101	90		Zn metal with $CuSO_4$ solution
	5.1.3	Identify redox reactions by changes in oxidation state and by the color changes involved when using acidified potassium manganate (VII), and potassium iodide. (Recall of equations involving KMnO4 is not required)	101-102	92-95		$FeCl_2$ with $KMnO_4$ solution
	5.1.4	Define *oxidizing agent* as a substance, which oxidizes another substance during a redox reaction. And *reducing agent* as a substance which reduces another substance during a redox reaction	102			
	5.1.5	Identify oxidizing agents and reducing agents from simple equations	102	92-95		

Grade 10 (Bilingual) Chemistry- Learning outcomes
Semester 2

Subtopics		Learning Outcomes	Pages			Suggested teaching and learning activities + Practical work
			Cambridge	Oxford	Hodder	
6. Organic Chemistry						
1. Homologous series	6.1.1	Describe the concept of homologous series as 'family' of similar compounds with similar chemical properties due to the presence of the same functional group.	256	246-248	218,219	
	6.1.2	Describe the general characteristics of an homologous series.	257	247		
	6.1.3	Recall that the compounds in a homologous series have the same general formula.	256-257			
	6.1.4	Describe and identify structural isomerism.	260		220	
2. Alkanes	6.2.1	Describe the properties of alkanes (exemplified by methane) as being generally uncreative, except in terms of burning.	254-256		218,220	
	6.2.2S	Describe substitution reactions of alkanes with chlorine.	263		221	
	6.2.3	Describe the bonding in alkanes.	256	248,249	219,220	
3. Alkenes	6.3.1	Describe the manufacture of alkenes and of hydrogen by cracking.	2278-280	250,251	222,223	
	6.3.2	Describe the properties of alkenes in terms of addition reactions with bromine, hydrogen and steam.	263-264	251	224,225	
	6.3.3	Distinguish between saturated and unsaturated hydrocarbons: – from molecular structures – by reaction with aqueous bromine	288	251	225	Alkene with Bromine water or with $KMnO_4$
4. Fuels	6.4.1	Name the fuel coal , natural gas and petroleum	276	240	90-92	
	6.4.2	Name methane as the main constituent of natural gas	276	240		
	6.4.3	Describe petroleum as a mixture of hydrocarbons and its separation into useful fractions by fractional distillation	276	242,243		
	6.4.4	Describe the properties of molecules within a fraction	277	243		

Subtopics	Learning Outcomes		Pages			Suggested teaching and learning activities + Practical work
			Cambridge	Oxford	Hodder	
4. Fuels	6.4.5	Name the uses of the fractions as : Refinery gas for bottled gas for heating and cooking Gasoline for fuel in car - naphtha for making chemicals - kerosene /paraffin for jet fuel - diesel oil/gas in diesel engine - fuel oil for ships and home heating system - lubricating for lubricants , waxes and polishes - bitumen for making roads	277	243		
	6.4.6	Understand cracking of the long hydrocarbon	278	244-245		
5 .Alcohols	6.5.1	Describe the manufacture of ethanol by fermentation and by the catalytic addition of steam to ethane.	265-266	252,253	225, 236	
	6.5.2	Outline the advantages and disadvantages of these two methods of manufacturing ethanol.	266-267			
	6.5.3	Describe the properties of ethanol in terms of burning.	267		235	
	6.5.4	Name the uses of ethanol as a solvent and as a fuel.	267-268		234	
6. Carboxylic acids	6.6.1	Describe the properties of aqueous ethanoic acid.	269	254,255	237	
	6.6.2	Describe the formation of ethanoic acid by the oxidation of ethanol by fermentation and with acidified potassium manganite (VII).	268		235	
	6.6.3	Describe ethanoic acid as a typical weak acid.	269		237	
	6.6.4	Describe the reaction of a carboxylic acid with an alcohol in the presence of a catalyst to give an ester.	270-271		237,238	
7. Polymers	6.7.1	Define polymers as large molecules built up from small units (monomers).	284	258-265	241	
7.1 Synthetic polymers	6.7.1.1	• Name some typical uses of plastics and of man-made fibers such as nylon and *Terylene*	287-288		242	
	6.7.1.2	Explain the differences between condensation and Addition polymerization	284-288		226,241	
	6.7.1.3	Deduce the structure of the polymer product from a given alkene and *vice versa*	285-286		226 –228	
	6.7.1.4	Describe the pollution problems caused by non-biodegradable Plastics.	289		229	

Subtopics	Learning Outcomes		Pages			Suggested teaching and learning activities + Practical work
			Cambridge	Oxford	Hodder	
7.1 Synthetic polymers	6.7.1.5	Describe the formation of nylon (a polyamide) and *Terylene* (a polyester) by condensation polymerization, the structure of nylon being represented as:  and the structure of *Terylene* as:  Details of manufacture and mechanisms of these polymerizations are not required.)	287-288	258-265	241 242	
7.2 Natural polymers	6.7.2.1	Name proteins and carbohydrates as constituents of food.	290	270,271	243	
	6.7.2.2	Describe proteins as possessing the same (amide) linkages as nylon but with different units.	290-291			
	6.7.2.3	Describe the structure of proteins as: 	290-291			
	6.7.2.4	Describe the hydrolysis of proteins to amino acids (Structures and names are not required.)	290-291			
	6.7.2.5	Describe complex carbohydrates in terms of a large number of sugar units, considered as $HO\text{-}CH_2CH_2\text{-}OH$, joined together by condensation polymerization,	291			
	6.7.2.6	Describe the hydrolysis of complex carbohydrates (e.g. starch), by acids or enzymes to give simple sugars.	291			

Subtopics		Learning Outcomes	Pages			Suggested teaching and learning activities + Practical work
			Cambridge	Oxford	Hodder	
7. Air and Water						
1. Water	7.1.1	Describe chemical tests for water using cobalt(II) chloride and copper(II) sulfate	302,303	120	128	An observation exercise.
	7.1.2	Describe, in outline, the treatment of the water supply in terms of filtration and chlorination	11-13	215	190-192	
	7.1.3	Name some of the uses of water in industry and in the home	13	214	185	
2. Air	7.2.1	State the composition of clean, dry air as being approximately 78% nitrogen, 21% oxygen and the remainder as being a mixture of noble gases and carbon dioxide	5	206	173	
	7.2.2	Describe the separation of oxygen and nitrogen from liquid air by fractional distillation	6,7	208	175	
	7.2.3	Name the common pollutants in the air as being carbon monoxide, sulfur dioxide, oxides of nitrogen and lead compounds	7,8	210,211	182-184	
	7.2.4	State the source of each of these pollutants: – carbon monoxide from the incomplete combustion of carbon-containing substances – sulfur dioxide from the combustion of fossil fuels which contain sulfur compounds (leading to ‘acid rain’) – oxides of nitrogen from car engines – lead compounds from leaded petrol	7,8	210	182-184 182-184	
	7.2.5	Explain the presence of oxides of nitrogen in car engines and their catalytic removal	8,9	211	110,11	
	7.2.6	State the adverse effect of these common pollutants on buildings and on health and discuss why these pollutants are of global concern	9,10	210		
	7.2.7	State the conditions required for the rusting of iron	230	212		
	7.2.8	Describe and explain methods of rust prevention, specifically paint and other coatings to exclude oxygen	230,231	213		

Subtopics	Learning Outcomes		Pages			Suggested teaching and learning activities + Practical work
			Cambridge	Oxford	Hodder	
	7.2.9	Describe and explain sacrificial protection in terms of the reactivity series of metals and galvanizing as a method of rust prevention	231	213		
3. Nitrogen and fertilizers	7.3.1	Describe the need for nitrogen-, phosphorus- and potassium-containing fertilizers	235-238	224	180-182	
	7.3.2	Describe and explain the essential conditions for the manufacture of ammonia by the Haber process including the sources of the hydrogen and nitrogen, i.e. hydrocarbons or steam and air.	236 , 245	221-223 221-223	177-178	
4. Carbon dioxide and methane	7.4.1	State that carbon dioxide and methane are greenhouse gases .	9,10	232-234	212,213	
	7.4.2	explain how they may contribute to climate change	3-10 96-98 132,133 96	230,231	214	
	7.4.3	State the formation of carbon dioxide: – as a product of complete combustion of carbon containing substances – as a product of respiration – as a product of the reaction between an acid and a carbonate – from the thermal decomposition of a carbonate	9,10	232-234	212,213	
	7.4.4	Describe the carbon cycle, in simple terms, to include the processes of combustion, respiration and photosynthesis	2,3	230,231	212	
	7.4.5	State the sources of methane, including decomposition of vegetation and waste gases from digestion in animals	10,283	233		
8. Sulfur						
1. Sulfur	8.1.1	Name some sources of sulfur	238	226	197	
	8.1.2	Name the use of sulfur in the manufacture of sulfuric acid	238	228		
	8.1.3	Describe the manufacture of sulfuric acid by the Contact process, including essential conditions and reactions	240	228	199,200	
	8.1.4	State the uses of sulfur dioxide as a bleach in the manufacture of wood pulp for paper and as a food preservative (by killing bacteria).	239	227	197	
	8.1.5	Describe the properties and uses of dilute and concentrated sulfuric acid.	240	229	200-203	

Subtopics		Learning Outcomes	Pages			Suggested teaching and learning activities + Practical work
			Cambridge	Oxford	Hodder	
9.Carbonates						
1. Carbonates	9.1.1	Describe the manufacture of lime (calcium oxide) from calcium carbonate (limestone) in terms of thermal decomposition	243	236	209	
	9.1.2	Name some uses of lime and slaked lime such as in treating acidic soil and neutralizing acidic industrial waste products, e.g. flue gas desulfurization	243	236,237 237,194, 195	208	
	9.1.3	Name the uses of calcium carbonate in the manufacture of iron and cement	227,242		208	

Yearly plan

Semester 1 (YEAR 9)	Semester 2 (YEAR 9)	Semester 1 (YEAR 10)	Semester 2 (YEAR 10)
1. The particulate nature of matter. **2.** The Periodic Table **3.** Metal **4.** Atoms, elements and compounds	**5.** Experimental techniques **6.** Stoichiometry **7.** The mole concept **8.** Acid, base and salts **9.** Identification of ions and gases	1. Chemical energetic 2. Reactivity series 3. Electrolysis 4. Chemical reactions 5. Redox	6. Organic Chemistry 7. Air and Water 8. Sulfur 9. Carbonates

Resources for teachers to upgrade their knowledge and skills

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www.xtremepapers.com
www.fuseedu.org
www.nclark.net > chemistry
www.ocr.org.uk
www.rsc.org
www.chemcollective.org

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5. Chemistry Syllabus, Caribbean Examinations Council, Caenwood Centre, Jamaica, 2013. www.cxc.org
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