Edexcel, a Pearson company, is the UK's largest awarding body, offering academic and vocational qualifications and testing to more than 25,000 schools, colleges, employers and other places of learning in the UK and in over 100 countries worldwide. Qualifications include GCSE, AS and A Level, NVQ and our BTEC suite of vocational qualifications from entry level to BTEC Higher National Diplomas, recognised by employers and higher education institutions worldwide.

We deliver 9.4 million exam scripts each year, with more than 90% of exam papers marked onscreen annually. As part of Pearson, Edexcel continues to invest in cutting-edge technology that has revolutionised the examinations and assessment system. This includes the ability to provide detailed performance data to teachers and students which help to raise attainment.

This specification is Issue 3. Key changes are sidelined. The latest issue can be found on the Edexcel website: www.edexcel.com

Acknowledgements

This specification has been produced by Edexcel on the basis of consultation with teachers, examiners, consultants and other interested parties. Edexcel would like to thank all those who contributed their time and expertise to its development.

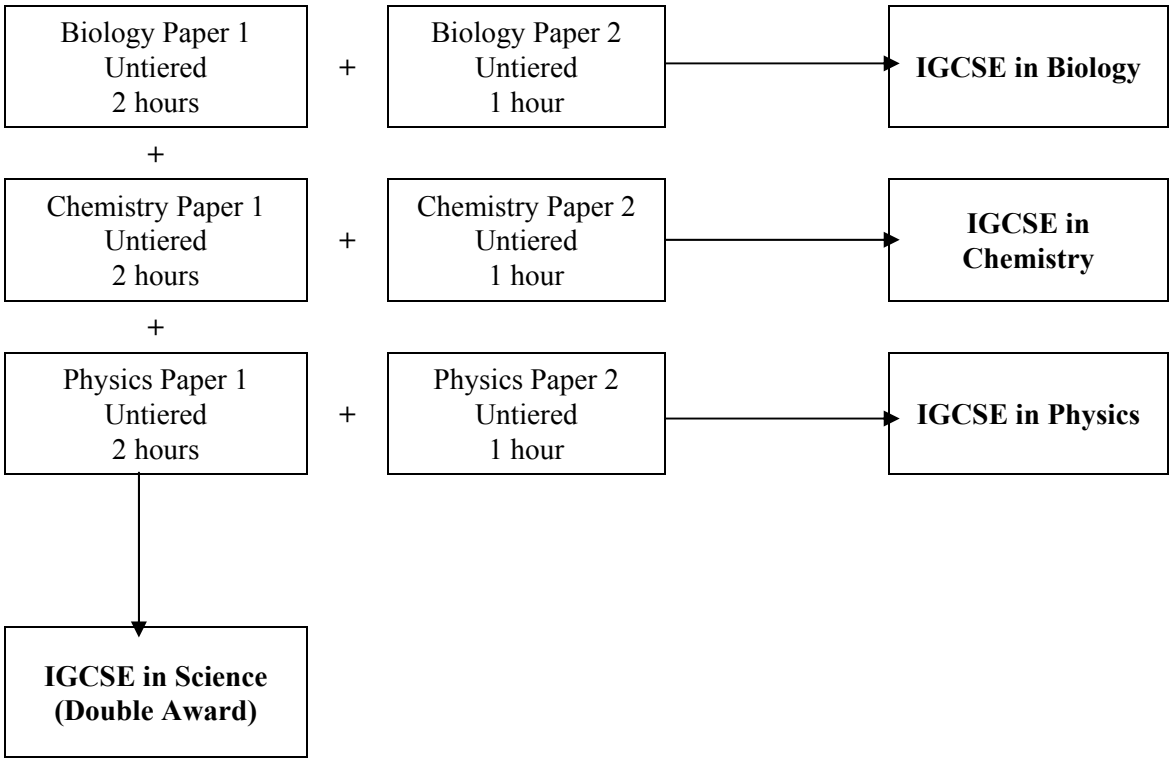
References to third-party material made in this specification are made in good faith. Edexcel does not endorse, approve or accept responsibility for the content of materials, which may be subject to change, or any opinions expressed therein. (Material may include textbooks, journals, magazines and other publications and websites.)

Authorised by Roger Beard
Prepared by Phil Myers

Introduction

The Edexcel International General Certificate of Secondary Education (IGCSE) in Chemistry is designed for use in schools and colleges. It is part of a suite of the IGCSE suite of science qualifications offered by Edexcel. The course offers opportunity for students to experience chemistry within the context of their general education. In terms of progression, the design of the course provides a basis of progression to further study in GCE Advanced Subsidiary and Advanced Level Chemistry.

The relationship of assessment to the qualifications available is shown below.



About this specification

Key features and benefits of the specification

Key features and benefits are:

- the specification includes aspects of science appropriate for the 21st century
- a straightforward linear assessment
- single tier assessment
- assessment of investigative skills through an examination paper
- provides a sound foundation for progression to Edexcel GCE Advanced Subsidiary and Advanced Level Chemistry, and other comparable post-16 qualifications.

Key subject aims

The Edexcel IGCSE in Chemistry qualification enables students to:

- learn about the unifying patterns and themes of chemistry
- appreciate the practical nature of chemistry, acquiring experimental and investigative skills based on correct and safe laboratory techniques
- appreciate the importance to scientific methods of accurate experimental work and reporting
- form hypotheses and design experiments to test them
- develop a logical approach to problem solving in a wider context
- understand the widespread importance of chemistry and the way materials are used in the world
- appreciate how the work of the chemist has social, industrial, technological, environmental and economic consequences for the community
- prepare for more advanced courses in chemistry and for courses which require them to have a knowledge of chemistry.

Contents

Specification at a glance

This Edexcel IGCSE in Chemistry qualification comprises TWO externally assessed papers.

- Chemistry Paper 1
- Chemistry Paper 2

Chemistry Paper 1	**Paper code: 4CH0/1C**
• Externally assessed • Availability: January and June series • First assessment: June 2011	**66.6% of the total IGCSE marks**
Overview of content: Assesses only the content not in bold • Section 1: Principles of chemistry • Section 2: Chemistry of the elements • Section 3: Organic chemistry • Section 4: Physical chemistry • Section 5: Chemistry in society	
Overview of assessment: • The paper is assessed through a two-hour examination paper set and marked by Edexcel. • The total number of marks is 120.	

Chemistry Paper 2	**Paper code: 4CH0/2C**
• Externally assessed • Availability: January and June series • First assessment: June 2011	**33.3% of the total IGCSE marks**
Overview of content: Assesses all content including content **in bold** • Section 1: Principles of chemistry • Section 2: Chemistry of the elements • Section 3: Organic chemistry • Section 4: Physical chemistry • Section 5: Chemistry in society	
Overview of assessment: • The paper is assessed through a one-hour examination paper set and marked by Edexcel. • The total number of marks is 60.	

Qualification content

Paper 1 will assess only the content which is not in bold.

Paper 2 will assess all content including content in bold.

Section 1: Principles of chemistry

a) States of matter

b) Atoms

c) Atomic structure

d) Relative formula masses and molar volumes of gases

e) Chemical formulae and chemical equations

f) Ionic compounds

g) Covalent substances

h) Metallic crystals

i) Electrolysis

a) States of matter

Students will be assessed on their ability to:

1.1 understand the arrangement, movement and energy of the particles in each of the three states of matter: solid, liquid and gas

1.2 describe how the interconversion of solids, liquids and gases are achieved and recall the names used for these interconversions

1.3 describe the changes in arrangement, movement and energy of particles during these interconversions.

b) Atoms

Students will be assessed on their ability to:

1.4 describe simple experiments leading to the idea of the small size of particles and their movement including:

- i dilution of coloured solutions
- ii diffusion experiments

1.5 understand the terms atom and molecule

1.6 understand the differences between elements, compounds and mixtures

1.7 describe techniques for the separation of mixtures, including simple distillation, fractional distillation, filtration, crystallisation and paper chromatography.

c) Atomic structure

Students will be assessed on their ability to:

1.8 recall that atoms consist of a central nucleus, composed of protons and neutrons, surrounded by electrons, orbiting in shells

1.9 recall the relative mass and relative charge of a proton, neutron and electron

1.10 understand the terms atomic number, mass number, isotopes and relative atomic mass (A_r)

1.11 calculate the relative atomic mass of an element from the relative abundances of its isotopes

1.12 understand that the Periodic Table is an arrangement of elements in order of atomic number

1.13 deduce the electronic configurations of the first twenty elements from their positions in the Periodic Table

1.14 deduce the number of outer electrons in a main group element from its position in the Periodic Table.

d) Relative formula masses and molar volumes of gases

Students will be assessed on their ability to:

1.15 calculate relative formula masses (M_r) from relative atomic masses (A_r)

1.16 understand the use of the term mole to represent the amount of substance

1.17 understand the term mole as the Avogadro number of particles (atoms, molecules, formulae, ions or electrons) in a substance

1.18 carry out mole calculations using relative atomic mass (A_r) and relative formula mass (M_r)

1.19 understand the term molar volume of a gas and use its values (24 dm^3 and 24,000 cm^3) at room temperature and pressure (rtp) in calculations.

e) Chemical formulae and chemical equations

Students will be assessed on their ability to:

1.20 write word equations and balanced chemical equations to represent the reactions studied in this specification

1.21 use the state symbols (s), (l), (g) and (aq) in chemical equations to represent solids, liquids, gases and aqueous solutions respectively

1.22 understand how the formulae of simple compounds can be obtained experimentally, including metal oxides, water and salts containing water of crystallisation

1.23 calculate empirical and molecular formulae from experimental data

1.24 calculate reacting masses using experimental data and chemical equations

1.25 calculate percentage yield

1.26 carry out mole calculations using volumes and molar concentrations.

f) Ionic compounds

Students will be assessed on their ability to:

1.27 describe the formation of ions by the gain or loss of electrons

1.28 understand oxidation as the loss of electrons and reduction as the gain of electrons

1.29 recall the charges of common ions in this specification

1.30 deduce the charge of an ion from the electronic configuration of the atom from which the ion is formed

1.31 explain, using dot and cross diagrams, the formation of ionic compounds by electron transfer, limited to combinations of elements from Groups 1, 2, 3, and 5, 6, 7

1.32 understand ionic bonding as a strong electrostatic attraction between oppositely charged ions

1.33 understand that ionic compounds have high melting and boiling points because of strong electrostatic forces between oppositely charged ions

1.34 understand the relationship between ionic charge and the melting point and boiling point of an ionic compound

1.35 describe an ionic crystal as a giant three-dimensional lattice structure held together by the attraction between oppositely charged ions

1.36 draw a simple diagram to represent the positions of the ions in a crystal of sodium chloride.

g) Covalent substances

Students will be assessed on their ability to:

1.37 describe the formation of a covalent bond by the sharing of a pair of electrons between two atoms

1.38 understand covalent bonding as a strong attraction between the bonding pair of electrons and the nuclei of the atoms involved in the bond

1.39 explain, using dot and cross diagrams, the formation of covalent compounds by electron sharing for the following substances:

i hydrogen

ii chlorine

iii hydrogen chloride

iv water

v methane

vi ammonia

vii oxygen

viii nitrogen

ix carbon dioxide

x ethane

xi ethene

1.40 recall that substances with simple molecular structures are gases or liquids, or solids with low melting points

1.41 explain why substances with simple molecular structures have low melting points in terms of the relatively weak forces between the molecules

1.42 explain the high melting points of substances with giant covalent structures in terms of the breaking of many strong covalent bonds

1.43 draw simple diagrams representing the positions of the atoms in diamond and graphite

1.44 explain how the uses of diamond and graphite depend on their structures, limited to graphite as a lubricant and diamond in cutting.

h) Metallic crystals

Students will be assessed on their ability to:

1.45 describe a metal as a giant structure of positive ions surrounded by a sea of delocalised electrons

1.46 explain the malleability and electrical conductivity of a metal in terms of its structure and bonding.

i) Electrolysis

Students will be assessed on their ability to:

1.47 understand an electric current as a flow of electrons or ions

1.48 understand why covalent compounds do not conduct electricity

1.49 understand why ionic compounds conduct electricity only when molten or in solution

1.50 describe simple experiments to distinguish between electrolytes and non-electrolytes

1.51 recall that electrolysis involves the formation of new substances when ionic compounds conduct electricity

1.52 describe simple experiments for the electrolysis, using inert electrodes, of molten salts such as lead(II) bromide

1.53 describe simple experiments for the electrolysis, using inert electrodes, of aqueous solutions of sodium chloride, copper(II) sulfate and dilute sulfuric acid and predict the products

1.54 write ionic half-equations representing the reactions at the electrodes during electrolysis

1.55 recall that one faraday represents one mole of electrons

1.56 calculate the amounts of the products of the electrolysis of molten salts and aqueous solutions.

Section 2: Chemistry of the elements

a) The Periodic Table

b) Group 1 elements – lithium, sodium and potassium

c) Group 7 elements – chlorine, bromine and iodine

d) Oxygen and oxides

e) Hydrogen and water

f) Reactivity series

g) Tests for ions and gases

a) The Periodic Table

Students will be assessed on their ability to:

2.1 understand the terms group and period

2.2 recall the positions of metals and non-metals in the Periodic Table

2.3 explain the classification of elements as metals or non-metals on the basis of their electrical conductivity and the acid-base character of their oxides

2.4 understand why elements in the same group of the Periodic Table have similar chemical properties

2.5 recall the noble gases (Group 0) as a family of inert gases and explain their lack of reactivity in terms of their electronic configurations.

b) Group 1 elements – lithium, sodium and potassium

Students will be assessed on their ability to:

2.6 describe the reactions of these elements with water and understand that the reactions provide a basis for their recognition as a family of elements

2.7 recall the relative reactivities of the elements in Group 1

2.8 explain the relative reactivities of the elements in Group 1 in terms of distance between the outer electrons and the nucleus.

c) Group 7 elements – chlorine, bromine and iodine

Students will be assessed on their ability to:

2.9 recall the colours and physical states of the elements at room temperature

2.10 make predictions about the properties of other halogens in this group

2.11 understand the difference between hydrogen chloride gas and hydrochloric acid

2.12 explain, in terms of dissociation, why hydrogen chloride is acidic in water but not in methylbenzene

2.13 recall the relative reactivities of the elements in Group 7

2.14 describe experiments to show that a more reactive halogen will displace a less reactive halogen from a solution of one of its salts

2.15 understand these displacement reactions as redox reactions.

d) Oxygen and oxides

Students will be assessed on their ability to:

2.16 recall the gases present in air and their approximate percentage by volume

2.17 describe how experiments involving the reactions of elements such as copper, iron and phosphorus with air can be used to determine the percentage by volume of oxygen in air

2.18 describe the laboratory preparation of oxygen from hydrogen peroxide

2.19 describe the reactions with oxygen in air of magnesium, carbon and sulfur, and the acid-base character of the oxides produced

2.20 describe the laboratory preparation of carbon dioxide from calcium carbonate and dilute hydrochloric acid

2.21 describe the formation of carbon dioxide from the thermal decomposition of metal carbonates such as copper(II) carbonate

2.22 recall the properties of carbon dioxide, limited to its solubility and density

2.23 explain the use of carbon dioxide in carbonating drinks and in fire extinguishers, in terms of its solubility and density

2.24 recall the reactions of carbon dioxide and sulfur dioxide with water to produce acidic solutions

2.25 recall that sulfur dioxide and nitrogen oxides are pollutant gases which contribute to acid rain, and describe the problems caused by acid rain.

e) Hydrogen and water

Students will be assessed on their ability to:

2.26 describe the reactions of dilute hydrochloric and dilute sulfuric acids with magnesium, aluminium, zinc and iron

2.27 describe the combustion of hydrogen

2.28 describe the use of anhydrous copper(II) sulfate in the chemical test for water

2.29 describe a physical test to show whether water is pure.

f) Reactivity series

Students will be assessed on their ability to:

2.30 recall that metals can be arranged in a reactivity series based on the reactions of the metals and their compounds: potassium, sodium, lithium, calcium, magnesium, aluminium, zinc, iron, copper, silver and gold

2.31 describe how reactions with water and dilute acids can be used to deduce the following order of reactivity: potassium, sodium, lithium, calcium, magnesium, zinc, iron, and copper

2.32 deduce the position of a metal within the reactivity series using displacement reactions between metals and their oxides, and between metals and their salts in aqueous solutions

2.33 understand oxidation and reduction as the addition and removal of oxygen respectively

2.34 understand the terms redox, oxidising agent and reducing agent

2.35 recall the conditions under which iron rusts

2.36 describe how the rusting of iron may be prevented by grease, oil, paint, plastic and galvanising

2.37 understand the sacrificial protection of iron in terms of the reactivity series.

g) Tests for ions and gases

Students will be assessed on their ability to:

2.38 describe simple tests for the cations:

- i Li^+, Na^+, K^+, Ca^{2+} using flame tests
- ii NH_4^+ using sodium hydroxide solution and identifying the ammonia evolved
- iii Cu^{2+}, Fe^{2+} and Fe^{3+} using sodium hydroxide solution

2.39 describe simple tests for the anions:

- i Cl^-, Br^- and I^-, using dilute nitric acid and silver nitrate solution
- ii SO_4^{2-}, using dilute hydrochloric acid and barium chloride solution
- iii CO_3^{2-}, using dilute hydrochloric acid and identifying the carbon dioxide evolved

2.40 describe simple tests for the gases:

- i hydrogen
- ii oxygen
- iii carbon dioxide
- iv ammonia
- v chlorine.

Section 3: Organic chemistry

a) Introduction

b) Alkanes

c) Alkenes

d) Ethanol

a) Introduction

Students will be assessed on their ability to:

3.1 explain the terms homologous series, hydrocarbon, saturated, unsaturated, general formula and isomerism.

b) Alkanes

Students will be assessed on their ability to:

3.2 recall that alkanes have the general formula C_nH_{2n+2}

3.3 draw displayed formulae for alkanes with up to five carbon atoms in a molecule, and name the straight-chain isomers

3.4 recall the products of the complete and incomplete combustion of alkanes

3.5 recall the reaction of methane with bromine to form bromomethane in the presence of UV light.

c) Alkenes

Students will be assessed on their ability to:

3.6 recall that alkenes have the general formula C_nH_{2n}

3.7 draw displayed formulae for alkenes with up to four carbon atoms in a molecule, and name the straight-chain isomers

3.8 describe the addition reaction of alkenes with bromine, including the decolourising of bromine water as a test for alkenes.

d) Ethanol

Students will be assessed on their ability to:

3.9 describe the manufacture of ethanol by passing ethene and steam over a phosphoric acid catalyst at a temperature of about 300°C and a pressure of about 60–70 atm

3.10 describe the manufacture of ethanol by the fermentation of sugars, for example glucose, at a temperature of about 30°C

3.11 evaluate the factors relevant to the choice of method used in the manufacture of ethanol, for example the relative availability of sugar cane and crude oil

3.12 describe the dehydration of ethanol to ethene, using aluminium oxide.

Section 4: Physical chemistry

a) Acids, alkalis and salts

b) Energetics

c) Rates of reaction

d) Equilibria

a) Acids, alkalis and salts

Students will be assessed on their ability to:

4.1 describe the use of the indicators litmus, phenolphthalein and methyl orange to distinguish between acidic and alkaline solutions

4.2 understand how the pH scale, from 0–14, can be used to classify solutions as strongly acidic, weakly acidic, neutral, weakly alkaline or strongly alkaline

4.3 describe the use of universal indicator to measure the approximate pH value of a solution

4.4 define acids as sources of hydrogen ions, H^+, and alkalis as sources of hydroxide ions, OH^-

4.5 predict the products of reactions between dilute hydrochloric, nitric and sulfuric acids; and metals, metal oxides and metal carbonates (excluding the reactions between nitric acid and metals)

4.6 recall the general rules for predicting the solubility of salts in water:

- i all common sodium, potassium and ammonium salts are soluble
- ii all nitrates are soluble
- iii common chlorides are soluble, except silver chloride
- iv common sulfates are soluble, except those of barium and calcium
- v common carbonates are insoluble, except those of sodium, potassium and ammonium

4.7 describe how to prepare soluble salts from acids

4.8 describe how to prepare insoluble salts using precipitation reactions

4.9 describe how to carry out acid-alkali titrations.

b) Energetics

Students will be assessed on their ability to:

4.10 recall that chemical reactions in which heat energy is given out are described as exothermic and those in which heat energy is taken in are endothermic

4.11 describe simple calorimetry experiments for reactions such as combustion, displacement, dissolving and neutralisation in which heat energy changes can be calculated from measured temperature changes

4.12 calculate molar enthalpy change from heat energy change

4.13 understand the use of ΔH to represent molar enthalpy change for exothermic and endothermic reactions

4.14 represent exothermic and endothermic reactions on a simple energy level diagram

4.15 recall that the breaking of bonds is endothermic and that the making of bonds is exothermic

4.16 use average bond energies to calculate the enthalpy change during a simple chemical reaction.

c) Rates of reaction

Students will be assessed on their ability to:

4.17 describe experiments to investigate the effects of changes in surface area of a solid, concentration of solutions, temperature and the use of a catalyst on the rate of a reaction

4.18 describe the effects of changes in surface area of a solid, concentration of solutions, pressure of gases, temperature and the use of a catalyst on the rate of a reaction

4.19 understand the term activation energy and represent it on a reaction profile

4.20 explain the effects of changes in surface area of a solid, concentration of solutions, pressure of gases and temperature on the rate of a reaction in terms of particle collision theory

4.21 understand that a catalyst speeds up a reaction by providing an alternative pathway with lower activation energy.

d) Equilibria

Students will be assessed on their ability to:

4.22 recall that some reactions are reversible and are indicated by the symbol ⇌ in equations

4.23 describe reversible reactions such as the dehydration of hydrated copper(II) sulfate and the effect of heat on ammonium chloride

4.24 understand the concept of dynamic equilibrium

4.25 predict the effects of changing the pressure and temperature on the equilibrium position in reversible reactions.

Section 5: Chemistry in society

a) Extraction and uses of metals

b) Crude oil

c) Synthetic polymers

d) The industrial manufacture of chemicals

a) Extraction and uses of metals

Students will be assessed on their ability to:

5.1 explain how the methods of extraction of the metals in this section are related to their positions in the reactivity series

5.2 describe and explain the extraction of aluminium from purified aluminium oxide by electrolysis, including:

- i the use of molten cryolite as a solvent and to decrease the required operating temperature
- ii the need to replace the positive electrodes
- iii the cost of the electricity as a major factor

5.3 write ionic half-equations for the reactions at the electrodes in aluminium extraction

5.4 describe and explain the main reactions involved in the extraction of iron from iron ore (haematite), using coke, limestone and air in a blast furnace

5.5 explain the uses of aluminium and iron, in terms of their properties.

b) Crude oil

Students will be assessed on their ability to:

5.6 recall that crude oil is a mixture of hydrocarbons

5.7 describe how the industrial process of fractional distillation separates crude oil into fractions

5.8 recall the names and uses of the main fractions obtained from crude oil: refinery gases, gasoline, kerosene, diesel, fuel oil and bitumen

5.9 describe the trend in boiling point and viscosity of the main fractions

5.10 recall that incomplete combustion of fuels may produce carbon monoxide and explain that carbon monoxide is poisonous because it reduces the capacity of the blood to carry oxygen

5.11 recall that, in car engines, the temperature reached is high enough to allow nitrogen and oxygen from air to react, forming nitrogen oxides

5.12 recall that fractional distillation of crude oil produces more long-chain hydrocarbons than can be used directly and fewer short-chain hydrocarbons than required

5.13 describe how long-chain alkanes are converted to alkenes and shorter-chain alkanes by catalytic cracking, using silica or alumina as the catalyst and a temperature in the range of 600–700°C.

c) Synthetic polymers

Students will be assessed on their ability to:

5.14 recall that an addition polymer is formed by joining up many small molecules called monomers

5.15 draw the repeat unit of addition polymers, including poly(ethene), poly(propene) and poly(chloroethene)

5.16 deduce the structure of a monomer from the repeat unit of an addition polymer

5.17 recall that nylon is a condensation polymer

5.18 understand that the formation of a condensation polymer is accompanied by the release of a small molecule such as water or hydrogen chloride

5.19 recall the types of monomers used in the manufacture of nylon

5.20 draw the structure of nylon in block diagram format.

d) The industrial manufacture of chemicals

Students will be assessed on their ability to:

5.21 recall that nitrogen from air, and hydrogen from natural gas or the cracking of hydrocarbons, are used in the manufacture of ammonia

5.22 describe the manufacture of ammonia by the Haber process, including the essential conditions:

- i a temperature of about 450°C
- ii a pressure of about 200 atmospheres
- iii an iron catalyst

5.23 understand how the cooling of the reaction mixture liquefies the ammonia produced and allows the unused hydrogen and nitrogen to be recirculated

5.24 recall the use of ammonia in the manufacture of nitric acid and fertilisers

5.25 recall the raw materials used in the manufacture of sulfuric acid

5.26 describe the manufacture of sulfuric acid by the contact process, including the essential conditions:

- **i a temperature of about 450 °C**
- **ii a pressure of about 2 atmospheres**
- **iii a vanadium(V) oxide catalyst**

5.27 recall the use of sulfuric acid in the manufacture of detergents, fertilisers and paints

5.28 describe the manufacture of sodium hydroxide and chlorine by the electrolysis of concentrated sodium chloride solution (brine) in a diaphragm cell

5.29 write ionic half-equations for the reactions at the electrodes in the diaphragm cell

5.30 recall important uses of sodium hydroxide, including the manufacture of bleach, paper and soap; and of chlorine, including sterilising water supplies and in the manufacture of bleach and hydrochloric acid.

Assessment

Assessment summary

Chemistry Paper 1

This paper will assess chemistry across all the Assessment Objectives. All the content in this specification which is not in bold will be assessed in Paper 1. The maximum mark for this paper is 120.

Chemistry Paper 2

This paper will assess chemistry across all the Assessment Objectives. All the content in this specification, whether bold or not, will be assessed in Paper 2. The maximum mark for this paper is 60.

There will be a range of compulsory, short-answer structured questions in both papers which are ramped to ensure accessibility for less able students, as well as to stretch more able students.

Students may be required to perform calculations, draw graphs and describe, explain and interpret chemical phenomena. Some of the question content will be unfamiliar to students; these questions are designed to assess data-handling skills and the ability to apply chemical principles to unfamiliar situations. Questions targeted at grades A* – B will include questions designed to test knowledge, understanding and skills at a higher level, including some questions requiring longer prose answers.

Summary of table of assessment

Chemistry Paper 1	**Paper code: 4CH0/1C**
• Externally assessed • Availability: January and June series • First assessment: June 2011	
Chemistry Paper 2	**Paper code: 4CH0/2C**
• Externally assessed • Availability: January and June series • First assessment: June 2011	

Assessment Objectives and weightings

AO1 Knowledge and understanding

In the examination, students will be tested on their ability to:

- recognise, recall and show understanding of specific chemical facts, terminology, principles, concepts and practical techniques including aspects of safety
- draw on existing knowledge to show understanding of the ethical, social, environmental, economic and technological applications and implications of chemistry
- select, organise and present relevant information clearly and logically, using appropriate vocabulary.

AO2 Application of knowledge and understanding, analysis and evaluation

In the examination, students will be tested on their ability to:

- describe, explain and interpret phenomena, effects and ideas in terms of chemical principles and concepts, presenting arguments and ideas clearly and logically
- interpret and translate data presented as continuous prose or in tables, diagrams, drawings and graphs, from one form to another
- carry out relevant calculations
- apply chemical principles and concepts in solving problems in unfamiliar situations, including those related to the ethical, social, economic and technological applications and implications of chemistry
- assess the validity of chemical information, experiments, inferences and statements and make informed judgements from them.

AO3 Investigative skills

In the assessment of these practical skills, students will be tested on their ability to:

- devise and plan investigations, drawing on chemical knowledge and understanding in selecting appropriate techniques
- demonstrate and describe appropriate experimental and investigative methods, including safe and skilful practical techniques
- make observations and measurements with appropriate precision, record these methodically, and present them in a suitable form
- analyse and interpret data to draw conclusions from experimental activities which are consistent with the evidence, using chemical knowledge and understanding, and to communicate these findings using appropriate specialist vocabulary, relevant calculations and graphs
- evaluate data and methods.

	% in IGCSE
AO1: Knowledge and understanding	45–55%
AO2: Application of knowledge and understanding, analysis and evaluation	25–35%
AO3: Investigative skills	20%
TOTAL	**100%**

Relationship of Assessment Objectives to Papers for IGCSE

Paper number	Assessment Objective			
	AO1	AO2	AO3	Total for AO1, AO2 and AO3
Paper 1	30–36%	17–23%	$13\frac{1}{3}$%	$66\frac{2}{3}$%
Paper 2	15–19%	8–12%	$6\frac{2}{3}$%	$33\frac{1}{3}$%
Total for IGCSE	45–55%	25–35%	20%	100%

Entering your students for assessment

Student entry

Details of how to enter students for this qualification can be found in Edexcel's *International Information Manual*, copies of which (in CD format) are sent to all active Edexcel centres. The information can also be found on Edexcel's website.

Combinations of entry

Students entering for this specification may not, in the same series of examinations, enter for the Edexcel IGCSE in Science (Double Award (4SC0). (First examination June 2011.)

Access arrangements and special requirements

Edexcel's policy on access arrangements and special considerations for GCE, GCSE, IGCSE, and Entry Level qualifications aims to enhance access to the qualifications for students with disabilities and other difficulties without compromising the assessment of skills, knowledge, understanding or competence.

Please see the Edexcel website (www.edexcel.com) for:

- the Joint Council for Qualifications (JCQ) policy *Access Arrangements and Special Considerations, Regulations and Guidance Relating to Students who are Eligible for Adjustments in Examinations*
- the forms to submit for requests for access arrangements and special considerations
- dates for submission of the forms.

Requests for access arrangements and special considerations must be addressed to:

Special Requirements
Edexcel
One90 High Holborn
London WC1V 7BH

Health and safety

Students must follow the Health and Safety rules which normally operate in their laboratories. This will include the following:

- eye protection must always be worn
- laboratory coats must always be worn
- plastic gloves must be worn when supplied for a particular exercise
- all substances should be regarded as being potentially toxic and hazardous
- HazChem labels (eg flammable) should be read and appropriate precautions (eg keep liquid away from flame) taken
- all substances spilled on the skin should be rinsed off immediately
- chemicals must never be tasted
- gases and vapours should never be smelt **unless the question instructs the candidates to do so and then only with great care**.

With all laboratory practicals it is essential that centres carry out a detailed risk assessment before allowing students to carry out the practical. For further information on risk assessments and chemical hazards please refer to the CLEAPSS website (www.cleapss.org.uk).

Assessing your students

The first assessment opportunity for Chemistry Paper 1 and Paper 2 of this qualification will take place in the June 2011 series and in each January and June series thereafter for the lifetime of the specification.

Your student assessment opportunities

Paper	June 2011	Jan 2012	June 2012	Jan 2013
Chemistry Paper 1	✓	✓	✓	✓
Chemistry Paper 2	✓	✓	✓	✓

Awarding and reporting

The grading, awarding and certification of this qualification will follow the processes outlined in the current GCSE/GCE Code of Practice for courses starting in September 2009, which is published by the Qualifications and Curriculum Authority (QCA). The IGCSE qualification will be graded and certificated on an eight-grade scale from A* to G.

Students whose level of achievement is below the minimum standard for Grade G will receive an unclassified U. Where unclassified is received it will not be recorded on the certificate.

The first certification opportunity for the Edexcel IGCSE in Chemistry will be June 2011.

Language of assessment

Assessment of this specification will be available in English only. Assessment materials will be published in English only and all work submitted for examination and moderation must be produced in English.

Malpractice and plagiarism

For up-to-date advice on malpractice and plagiarism, please refer to the JCQ's *Suspected Malpractice in Examinations: Policies and Procedures* document on the JCQ website www.jcq.org.uk.

Student recruitment

Edexcel's access policy concerning recruitment to our qualifications is that:

- they must be available to anyone who is capable of reaching the required standard
- they must be free from barriers that restrict access and progression
- equal opportunities exist for all students.

Progression

This qualification supports progression to:

- Edexcel GCE Advanced Subsidiary and Advanced Level in Chemistry
- Edexcel Level 3 BTEC National Award/Certificate/Diploma in Applied Science.

Grade descriptions

Grade A

Candidates can:

- recall a wide range of knowledge from all areas of the specification
- use detailed scientific knowledge and understanding in many different applications relating to scientific systems or phenomena, eg routinely use a range of balanced chemical equations and the particle model to explain variations in reaction rates. Candidates draw together and communicate knowledge from more than one area, routinely use scientific or mathematical conventions in support of arguments, and use a wide range of scientific and technical vocabulary throughout their work
- use scientific knowledge and understanding to select an appropriate strategy for a task, identifying the key factors to be considered. They make systematic observations in qualitative work and decide which observations are relevant to the task in hand. When making measurements they decide the level of precision needed and can recall or use a range of apparatus to make appropriately precise measurements. They select a method of presenting data which is appropriate to the task; they use information from a range of sources where it is appropriate to do so. They identify and explain anomalous observations and measurements and the salient features of graphs
- use scientific knowledge and understanding to identify and explain patterns and draw conclusions from the evidence by combining data of more than one kind or from more than one source. They identify shortcomings in the evidence, use scientific knowledge and understanding to draw conclusions from their evidence and suggest improvements to the methods used that would enable them to collect more reliable evidence.

Grade C

Candidates can:

- recall a range of scientific information from all areas of the specification, eg recall simple chemical symbols and formulae
- use and apply scientific knowledge and understanding in some general contexts, eg use simple balanced equations
- describe links between related phenomena in different contexts, use diagrams, charts and graphs to support arguments, use appropriate scientific and technical vocabulary in a range of contexts
- use scientific knowledge and understanding to identify an approach to a question: for example, identifying key factors which can be varied and controlled. Candidates can recall or use a range of apparatus to make careful and precise measurements and systematic observations, and can recognise when it is necessary to repeat measurements and observations. They present data systematically, in graphs where appropriate, and use lines of best fit. Candidates identify and explain patterns within data and draw conclusions consistent with the evidence. They explain these conclusions on the basis of their scientific knowledge and understanding, and evaluate how strongly their evidence supports the conclusions.

Grade F

Candidates can:

- recall a limited range of information, eg state some uses of materials obtained from oil
- use and apply knowledge and understanding in some specific everyday contexts, eg suggest a way of speeding up a particular chemical reaction
- make some use of scientific and technical vocabulary and make simple generalisations from information
- devise fair tests in contexts which involve only a few factors. They can recall or use simple apparatus to make measurements appropriate to the task and record observations and measurements in tables and graphs. Candidates obtain information from simple tables, charts and graphs and identify simple patterns in information and observations. They offer explanations consistent with the evidence obtained.

Support and training

Edexcel support services

Edexcel has a wide range of support services to help you implement this qualification successfully.

ResultsPlus — ResultsPlus is an application launched by Edexcel to help subject teachers, senior management teams, and students by providing detailed analysis of examination performance. Reports that compare performance between subjects, classes, your centre and similar centres can be generated in 'one-click'. Skills maps that show performance according to the specification topic being tested are available for some subjects. For further information about which subjects will be analysed through ResultsPlus, and for information on how to access and use the service, please visit www.edexcel.com/resultsplus.

Ask the Expert — Ask the Expert is a new service, launched in 2007, that provides direct email access to senior subject specialists who will be able to answer any questions you might have about this or any other specification. All of our specialists are senior examiners, moderators or verifiers and they will answer your email personally. You can read a biography for all of them and learn more about this unique service on our website at www.edexcel.com/asktheexpert.

Ask Edexcel — Ask Edexcel is Edexcel's online question and answer service. You can access it at www.edexcel.com/ask or by going to the main website and selecting the Ask Edexcel menu item on the left.

The service allows you to search through a database of thousands of questions and answers on everything Edexcel offers. If you don't find an answer to your question, you can choose to submit it straight to us. One of our customer services team will log your query, find an answer and send it to you. They'll also consider adding it to the database if appropriate. This way the volume of helpful information that can be accessed via the service is growing all the time.

Examzone — The Examzone site is aimed at students sitting external examinations and gives information on revision, advice from examiners and guidance on results, including re-marking, re-sitting and progression opportunities. Further services for students — many of which will also be of interest to parents — will be available in the near future. Links to this site can be found on the main homepage at www.examzone.co.uk.

Training

A programme of professional development and training courses, covering various aspects of the specification and examination, will be arranged by Edexcel. Full details can be obtained from our website: www.edexcel.com.

Appendix 1: Periodic Table

THE PERIODIC TABLE

Group

Period	1	2											3	4	5	6	7	0
1							1 **H** Hydrogen 1											4 **He** Helium 2
2	7 **Li** Lithium 3	9 **Be** Beryllium 4											11 **B** Boron 5	12 **C** Carbon 6	14 **N** Nitrogen 7	16 **O** Oxygen 8	19 **F** Fluorine 9	20 **Ne** Neon 10
3	23 **Na** Sodium 11	24 **Mg** Magnesium 12											27 **Al** Aluminium 13	28 **Si** Silicon 14	31 **P** Phosphorus 15	32 **S** Sulfur 16	35.5 **Cl** Chlorine 17	40 **Ar** Argon 18
4	39 **K** Potassium 19	40 **Ca** Calcium 20	45 **Sc** Scandium 21	48 **Ti** Titanium 22	51 **V** Vanadium 23	52 **Cr** Chromium 24	55 **Mn** Manganese 25	56 **Fe** Iron 26	59 **Co** Cobalt 27	59 **Ni** Nickel 28	63.5 **Cu** Copper 29	65 **Zn** Zinc 30	70 **Ga** Gallium 31	73 **Ge** Germanium 32	75 **As** Arsenic 33	79 **Se** Selenium 34	80 **Br** Bromine 35	84 **Kr** Krypton 36
5	86 **Rb** Rubidium 37	88 **Sr** Strontium 38	89 **Y** Yttrium 39	91 **Zr** Zirconium 40	93 **Nb** Niobium 41	96 **Mo** Molybdenum 42	99 **Tc** Technetium 43	101 **Ru** Ruthenium 44	103 **Rh** Rhodium 45	106 **Pd** Palladium 46	108 **Ag** Silver 47	112 **Cd** Cadmium 48	115 **In** Indium 49	119 **Sn** Tin 50	122 **Sb** Antimony 51	128 **Te** Tellurium 52	127 **I** Iodine 53	131 **Xe** Xenon 54
6	133 **Cs** Caesium 55	137 **Ba** Barium 56	139 **La** Lanthanum 57	179 **Hf** Hafnium 72	181 **Ta** Tantalum 73	184 **W** Tungsten 74	186 **Re** Rhenium 75	190 **Os** Osmium 76	192 **Ir** Iridium 77	195 **Pt** Platinum 78	197 **Au** Gold 79	201 **Hg** Mercury 80	204 **Tl** Thallium 81	207 **Pb** Lead 82	209 **Bi** Bismuth 83	210 **Po** Polonium 84	210 **At** Astatine 85	222 **Rn** Radon 86
7	223 **Fr** Francium 87	226 **Ra** Radium 88	227 **Ac** Actinium 89															

Key

Relative atomic mass
Symbol
Name
Atomic number

2111db201009S:\LT\PD\IGCSE\IGCSE Chemistry (4CH0) Issue 3.1-32/0

October 2009

For more information on Edexcel and BTEC qualifications
please visit our website: edexcel.com

Edexcel Limited. Registered in England and Wales No. 4496750
Registered Office: One90 High Holborn, London WC1V 7BH. VAT Reg No 780 0898 07