SCOTTISH QUALIFICATIONS AUTHORITY

CHEMISTRY
Intermediate 1

Sixth edition – published March 2004

NOTE OF CHANGES TO ARRANGEMENTS
SIXTH EDITION PUBLISHED MARCH 2004

COURSE TITLE: Chemistry (Intermediate 1)

COURSE NUMBER: C012 10

National Course Specification

Course Details: Clarification to depth of treatment of content throughout

National Unit Specification:

All Units: No change

National Course Specification

CHEMISTRY (INTERMEDIATE 1)

COURSE NUMBER C012 10

COURSE STRUCTURE

The course has three mandatory units, as follows:

D063 10	***Chemistry in Action (Int 1)***	***1 credit (40 hours)***
D064 10	***Everyday Chemistry (Int 1)***	***1 credit (40 hours)***
D065 10	***Chemistry and Life (Int 1)***	***1 credit (40 hours)***

In common with all courses, this course includes a further 40 hours over and above the 120 hours for the component units. This is for induction, extending the range of learning and teaching approaches, support, consolidation, integration of learning and preparation for external assessment. This time is an important element of the course and advice on its use is included in the course details.

It is recommended that the *Chemistry in Action (Int 1)* unit be studied first.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following awards or its equivalent:

- Standard Grade Biology, Physics or Science at grades 4 to 7
- Standard Grade Chemistry at grades 5 to 7
- appropriate units at Access level.

Administrative Information

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National Course Specification (cont)

COURSE Chemistry (Intermediate 1)

CORE SKILLS

Core skills for this qualification remain subject to confirmation and details will be available at a later date.

Additional information about core skills is published in the *Catalogue of Core Skills in National Qualifications* (SQA, publication code BA0906).

CREDIT VALUE

SCQF points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification is allocated a number of SCQF Credit Points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.

COURSE	SCQF LEVEL	SCQF CREDIT POINTS
Intermediate 1	4	24

National Course Specification: course details

COURSE Chemistry (Intermediate 1)

RATIONALE

The study of chemistry at Intermediate 1 provides candidates with the opportunity to develop a knowledge and understanding of the physical and natural environments within an applications and issues-based chemistry context. The course also continues the development of the problem solving and practical skills associated with scientific enquiry.

As such, the course is designed to provide opportunities in appropriate contexts for the candidates to acquire:

- knowledge and understanding of chemical facts, theories and symbols
- the ability to solve chemical problems
- the ability to carry out chemical techniques and investigations
- positive attitudes by helping candidates to be open-minded and willing to recognise alternative points of view, and to be interested in science and aware that they can take decisions which affect the wellbeing of themselves and others and the quality of their environment.

In problem solving, the candidates will be expected to:

- select and present information
- carry out calculations
- plan, design and evaluate experimental procedures
- draw conclusions and give explanations
- make generalisations and predictions.

As a result of engaging in practical work candidates will be expected to:

- describe experimental procedures
- record relevant measurements and observations
- analyse experimental information
- draw valid conclusions
- evaluate experimental procedures with supporting argument.

In addition, the learning experiences make an important contribution to the candidates' general education by:

- emphasising the relevance of chemistry to everyday living
- developing core skills
- raising awareness of the links between the subject and the world of work in general and the chemical industry in particular
- providing opportunities for independent and co-operative learning.

National Course Specification: course details (cont)

COURSE Chemistry (Intermediate 1)

COURSE CONTENT

The Content Statements given in the left-hand column of the tables on the following pages describe in detail the knowledge and understanding associated with the three units of the course, all of which will be subject to sampling in the external assessment. Achievement will require to be shown in a variety of ways, that is, candidates will be expected to 'state', 'describe', 'explain', 'identify' etc as appropriate. The right-hand column gives Suggested Activities related to the Content Statements. Opportunities to make use of information technology are indicated by (ITO).

It should be noted that the content has been arranged to tie in with the performance criteria and evidence requirements for each of the units. Teachers and lecturers may wish to reorder for learning and teaching purposes.

It should also be noted that, while the units are valuable in their own right, candidates will gain considerable additional benefit from completing this course, since there will be opportunities for the integration of skills across the units and for tackling problem solving of a more complex nature than that required for attainment of the units.

All candidates will be expected to carry out the prescribed practical activities listed below. These are highlighted in italics under Suggested Activities.

ACTIVITY	UNIT
The Effect of Temperature Changes on Dissolving Speed	1
The Effect of Concentration Changes on Reaction Speed	1
Testing the pH of Solutions	1
Electrical Conductivity	2
Reaction of Metals with Dilute Acid	2
Factors which Affect Lathering	2
Solubility	3
Burning Carbohydrates	3
Testing for Sugars and Starch	3

National Course Specification: course details (cont)

Unit 1: Chemistry in Action (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
a) Substances **(i) Elements** Everything in the world is made from about 100 elements. Each element has a name and a symbol.	There would be no need for candidates to know the symbols for particular elements.	Refer to different versions of Periodic Tables. Examine as many samples of elements as possible, and write a description of some.
Chemists have arranged elements in the Periodic Table. Each element in the Periodic Table has a number called the atomic number. Most elements are solid at room temperature. Mercury and bromine are liquid at room temperature.		Use a database to obtain information (ITO). Set up a simplified database (ITO). Examine samples or photographs to make a key to identify selected elements (ITO).
Some elements are gases at room temperature.	Candidates would be expected to give examples of elements which are gases at room temperature. These should include hydrogen, nitrogen and oxygen.	
Elements can be classified as metals or non-metals. There are more metals than non-metals.	A heavy black line is sometimes used to divide the metals from the non-metals in the Periodic Table. The metals lie to the left.	Make a table to show the year of discovery of some elements (ITO). Find out about how the discovery of the elements was related to social and industrial factors.
Some elements, including gold, silver and copper, have been known for a long time. The most recently discovered elements have been made by scientists.	Candidates would be expected to use dates of discovery to identify the element most likely to have been made by scientists.	Make a list of some elements which have been made by scientists; find out the origins of their names.

National Course Specification: course details (cont)

Unit 1: Chemistry in Action (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
Many elements have everyday uses.	Candidates should be able to use the data booklet to give a use for an element or to identify an element which can be used for a particular purpose.	Make a collection of elements in everyday use and record uses in a table. Refer to a Periodic Table. Use a database to obtain information (ITO)
Elements in a column of the Periodic Table show similar chemical properties.	This should not be based on any treatment of electron arrangements and there is no need for candidates to know specific group properties.	Demonstrate the reactions of the Group 1 metals. Find out the meanings of the names of the noble gases. Use a database to obtain information (ITO).
(ii) Compounds and mixtures Compounds are formed when elements react together.	Candidates should be able to distinguish between elements, compounds and mixtures from diagrams which could include representations of atoms, molecules and ions.	React pairs of elements and compare compounds formed with the elements. Classify substances as element or compound from names and formulae and record information in a table.
Most compounds with a name ending in '-ide' contain the two elements indicated; the ending '-ite' or '-ate' indicates the additional element oxygen.		Examine samples of common compounds and record names and elements contained in a table. Use models.
Mixtures occur when two or more substances come together without reacting. Air is a mixture of gases. Air is approximately 80% nitrogen and 20% oxygen.		Make a list of everyday mixtures. Make some mixtures and compare with the elements in the compound. Separate mixtures by chromatography. Use models.
The test for oxygen is that it relights a glowing splint. There is not enough oxygen in the air for the test to be positive.		Draw a chart to show the distribution of gases in the air (ITO). Find out, by experiment, the test for oxygen.

National Course Specification: course details (cont)

Unit 1: Chemistry in Action (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
(iii) Solutions A solution is formed when a substance dissolves in a liquid. A substance which dissolves in a liquid is soluble; a substance which does not dissolve is insoluble. A saturated solution is one in which no more substance can be dissolved.		Demonstrate what happens when making cups of tea and coffee. Demonstrate conservation of mass in dissolving. Separate a sand and salt mixture. Evaporate sea water to dryness to show the dissolved solids. Grow crystals from saturated solutions. Investigate what happens when different everyday solids and liquids are added to water and other liquids. *Investigate factors which affect the speed of dissolving (ITO).* Investigate factors which affect the formation of saturated solutions. Investigate the amounts of salt in snack foods.
A dilute solution has a lower concentration of dissolved substance than a concentrated solution. A solution is diluted by adding more liquid.		Dissolve copper sulphate in water to make solutions of different concentrations. Add water to a concentrated solution and observe the change. Dilute concentrated fruit juice. Concentrate a solution by evaporation. Draw diagrams.

National Course Specification: course details (cont)

Unit 1: Chemistry in Action (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
Carbon dioxide gas is dissolved in some drinks to make them fizzy. The test for carbon dioxide is that it turns limewater milky. Chlorine is dissolved in drinking water to kill bacteria. Sodium fluoride is dissolved in drinking water to help to prevent tooth decay. Lead compounds in drinking water can be harmful to health.		Find out, by experiment, the test for carbon dioxide. Identify carbon dioxide as the gas dissolved in lemonade. Investigate the effect of temperature on dissolved carbon dioxide in fizzy drinks. Detect fluoride in water samples. Refer to public information leaflets to find out about the links between fluoride in water and lower levels of tooth decay. Make a table to list the percentages of sodium fluoride in different toothpastes. Carry out calculations to find out which toothpaste, in terms of fluoride, represents the best value for money. Investigate the effect of fluoride toothpaste on egg-shell. Investigate the solubility of lead in different water samples. Find out about the effects of lead poisoning. Produce a poster or a public information leaflet to make the case for the treatment of drinking water or to warn about the dangers of lead water-piping (ITO).

National Course Specification: course details (cont)

Unit 1: Chemistry in Action (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
iv) Hazards Regulations on the use of chemicals exist for the safety of everyone who uses chemicals at work. Each hazard of toxic, corrosive, flammable, harmful/irritant is given a simple symbol which can be easily recognised. Hazard warning labels are attached to all appropriate chemicals. Hazard symbols are on road tankers to indicate dangers in the event of spillage.	It is important to develop awareness of issues related to the use of chemicals. Candidates would be expected to link the hazard symbols to the actual hazards.	Draw the symbols on the hazard labels. Categorise common chemicals from labels.
b) Chemical reactions **(i) Identification** All chemical reactions involve the formation of one or more new substances. Chemical reactions can be identified by changes in appearance of substance, including colour change, gas evolved, precipitate formed. Chemical reactions can be identified by energy changes.		Carry out/demonstrate a selection of experiments.
A wide variety of chemical reactions occur in the world around us.		Make a list of everyday chemical reactions. View a videotape.

National Course Specification: course details (cont)

Unit 1: Chemistry in Action (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
(ii) Speed of reactions Changes in particle size, temperature and concentration affect the speed of reactions, both in the laboratory and in our everyday life.		*Investigate the effect of particle size, temperature and concentration on the speed of reactions (ITO).* Make a list of everyday reactions which are affected by changes in particle size, temperature and concentration.
Catalysts are substances which speed up some reactions and are not used up by the reactions. Enzymes are catalysts which affect living things. There are many everyday examples of uses of catalysts and enzymes.		Investigate the effect of a catalyst and/or an enzyme on reaction rate. Make a list of everyday uses of catalysts and enzymes.
(iii) Word equations A chemical reaction can be described by a word equation.	Candidates should be able to write word equations from descriptions of chemical reactions given all reactants and products.	
c) Bonding **(i) Molecules and ions** Every element is made up of very small particles called atoms**.** Atoms of different elements are different.		Draw pictures of atoms in different elements. Demonstrate diffusion experiments. Investigate the speed of diffusion of gases.

National Course Specification: course details (cont)

Unit 1: Chemistry in Action (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
Some substances are made up of molecules. Molecules are made up of two or more atoms held together by strong bonds. Bonds between molecules are weak. Molecular substances tend to have low melting and boiling points. Molecular substances do not conduct electricity.		Use models. Investigate the solubility of everyday molecular substances in water and other solvents. Investigate the conductivity of everyday molecular substances (solid, liquid and solution). Examine samples of everyday molecular substances and record name and state in a table. Make a table to list melting and boiling points of elements and compounds. Melt solids. Obtain information from a database (ITO).
Some substances are made up of ions. Ions can be positively or negatively charged. Ionic compounds are made up of oppositely charged ions. Bonds between ions are strong. Ionic compounds tend to have high melting and boiling points. Ionic compounds conduct electricity when dissolved in water and when molten.		Use models. Investigate the solubility of everyday ionic substances in water and other solvents. Investigate the conductivity of everyday ionic substances (solid, liquid and solution). Examine samples of everyday ionic substances and record name and state in a table. Make a table to list melting and boiling points. Heat solids. Obtain information from a database (ITO).
(ii) Formulae: using models Formulae are written from models or pictorial representations.		Write formulae.
(iii) Formulae: using prefixes Formulae are written using prefixes, eg 'mono-', 'di-', 'tri-', 'tetra-'.		Write formulae and name compounds.

National Course Specification: course details (cont)

Unit 1: Chemistry in Action (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
d) Acids and alkalis **(i) The pH scale** The pH scale ranges from below 0 to above 14. Universal indicator, pH paper or a pH meter can be used to find the pH of solutions. Acids have a pH of less than 7; pure water and neutral solutions have a pH equal to 7; alkalis have a pH of more than 7. The lower the pH of an acid, the greater the acidity; the higher the pH of an alkali, the greater the alkalinity. Diluting acids and alkalis decreases the acidity and alkalinity.		Test the pH of solutions and classify as acid/neutral/alkali. Make a pH chart (ITO). Extract and use natural indicators. Investigate the effect on pH of diluting acids and alkalis.
(ii) Common acids and alkalis Acids and alkalis are in common use in the home and the laboratory. Common laboratory acids include hydrochloric acid, sulphuric acid and nitric acid. Common laboratory alkalis include sodium hydroxide, lime water and ammonia solution.		Make a table of names and formulae. Identify the hazard label(s).
Common household acids include vinegar, lemonade, soda water and Coke. Common household alkalis include baking soda, oven cleaner, dishwashing powder and bleach.		*Test the pH of household solutions.* Identify the hazard label(s).

National Course Specification: course details (cont)

Unit 1: Chemistry in Action (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
(iii) Neutralisation Alkalis neutralise acids (and vice versa) to form water and a salt. Neutralisation moves the pH of the acid up towards 7. Neutralisation moves the pH of the alkali down towards 7. When neutralised, hydrochloric acid forms chloride salts, sulphuric acid forms sulphate salts and nitric acid forms nitrate salts.	The emphasis is on the neutralisation of acids. Candidates would be expected to name the salt produced when an acid is neutralised by an alkali.	Investigate changes in pH in acid/alkali neutralisations. Prepare a salt.
Metal carbonates neutralise acids producing water, a salt and carbon dioxide gas.	Candidates would be expected to name the salt produced when an acid is neutralised by a metal carbonate.	Demonstrate/carry out a selection of reactions. Prepare a salt.
Everyday examples of neutralisation include reducing soil acidity, reducing acidity in lakes and treatment of indigestion.		Investigate the effect of adding lime to soil and acid rain-water. Investigate the neutralising effect of indigestion tablets. Use audio-visual material to find out about everyday examples of neutralisation.

National Course Specification: course details (cont)

Unit 1: Chemistry in Action (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
(iv) Acid rain Carbon, sulphur and nitrogen react with oxygen to produce carbon dioxide, sulphur dioxide and nitrogen dioxide respectively. Carbon dioxide, sulphur dioxide and nitrogen dioxide dissolve in water to form acidic solutions. Sulphur dioxide, produced by the burning of fossil fuels, and nitrogen dioxide, produced by the sparking of air in car engines, dissolve in water in the atmosphere to produce acid rain. Acid rain has damaging effects on buildings made from carbonate rock, structures made of iron or steel, soils and plant and animal life.		Burn carbon and sulphur and test the pH of solutions of the oxides. Demonstrate the sparking of air. Demonstrate the solubility of sulphur dioxide in water. Use audio-visual material to find out about the causes and effects of acid rain and the social and economic implications. Test the pH of water samples from different places. Investigate the effect of acid on different rocks. Investigate the effect of sulphur dioxide on different materials. Investigate the effect of sulphur dioxide on plant growth. Prepare an advert for a newspaper or a public information leaflet on the effects of acid rain (ITO).

National Course Specification: course details (cont)

Unit 2: Everyday Chemistry (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
a) Metals **(i) Uses** Some metals, including gold, silver and copper, are found uncombined in the Earth's crust. Most metals are found combined with other elements. Some metals, including iron, are extracted from their ores by heating with carbon. Some metals, including aluminium, are extracted from their ores using electricity. Metal elements and carbon (graphite) are conductors of electricity and most non-metal elements are non-conductors of electricity. The specific properties of metals, including density, thermal and electrical conductivity, malleability, strength, are related to their uses. An alloy is a mixture of metals, or of metals with non-metals. Brass, solder and 'stainless' steel are examples of alloys. Metals are alloyed to change their properties for specific uses.		Make a list of some metals found uncombined. Examine samples of ores/minerals and make a table to show the elements in them. Extract a metal from its ore by heating with carbon. Find out about the Blast Furnace. Find out about aluminium extraction. Electrolyse a solution to obtain the metal. *Investigate the electrical conductivity of metals and non-metals.* Use audio-visual material. Investigate the properties of different metals. Find out about the composition and uses of alloys. Compare the properties of alloys with those of the constituent elements.

National Course Specification: course details (cont)
Unit 2: Everyday Chemistry (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
ii) Reactions Metal oxides are produced in the reactions of metals with oxygen. Reactions of metals with water produce hydrogen. Reactions of metals with acid produce hydrogen gas and a salt. Some metals, including copper, silver and gold, do not react with dilute acid. Differences in the reactions give an indication of the reactivity of the metals.		*Investigate the reactions of metals with oxygen, water and dilute acid* Use the results of experiments to place metals in order of reactivity. Prepare a salt.
The test for hydrogen is that it burns with a 'pop'.		Find, by experiment, the test for hydrogen. Demonstrate that hydrogen is less dense than air. Find out about the use of hydrogen in balloons.
(iii) Corrosion Corrosion is a chemical reaction which involves the surface of a metal changing from an element to a compound. Rusting is the corrosion of iron. Rusting results in a loss of structural strength.		Examine different metals/materials left exposed to the atmosphere. Use audio-visual material. Look for signs of corrosion in the local environment. Find out about the economic costs of corrosion.
Both oxygen (from the air) and water are required for rusting.		Carry out test-tube experiments.
Rust indicator can be used to show the extent of the rusting process. Acid rain increases the rate of corrosion. Salt increases the rate of corrosion.	Candidates would be expected to know that the deeper the blue colour the greater the degree of rusting.	Investigate the effect of acid rain and salt on the rusting process.

National Course Specification: course details (cont)

Unit 2: Everyday Chemistry (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
Painting, greasing, electroplating, galvanising, tin-plating and coating with plastic give a surface barrier to air and water which can provide protection against corrosion.		Find out about corrosion prevention. Carry out test-tube experiments. Electroplate a metal. View a videotape.
Iron does not rust when attached to more reactive metals. Zinc (galvanising) and scrap magnesium are used to protect iron.		Investigate the effect on rusting of attaching different metals to iron.
(iv) Batteries In a battery, electricity comes from a chemical reaction. Batteries require to be replaced due to the chemicals being used up in the reaction. The lead-acid (car) battery is an example of a rechargeable battery.		Examine a wide variety of batteries, including rechargeable batteries. Set up and use a lead-acid cell. Demonstrate that electrical energy can be obtained from a chemical reaction.
Electricity can be produced by connecting different metals together, with a solution containing ions, to form a cell. The purpose of the ion solution is to complete the circuit. The voltage is related to the difference in the reactivity of the metals.		Make a lemon cell. Use a voltmeter to measure the voltage of various metal couples. Investigate the factors which affect the voltage in a simple cell. Test the conductivity of solutions.

National Course Specification: course details (cont)

Unit 2: Everyday Chemistry (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
b) Personal needs **(i) Keeping clean** When cleaning hair, skin and clothes the main problem is oil and grease; this is because oil and grease are insoluble in water alone. Cleaning chemicals are required to break up the oil and grease into tiny droplets which can then mix with water; this happens because cleaning chemicals are soluble in both water and oil and grease. Examples of manufactured products which contain cleaning chemicals include soaps, detergents, shampoos, washing-up liquids and powders.		Find out about how improvements in the way in which people keep themselves and their clothes clean have helped to improve public health. Mix oil and water and examine the effect of adding a few drops of washing-up liquid. Make a list of manufactured products which can be used for cleaning skin, hair, clothes and dishes. Use models to illustrate the cleansing action of soap. Use audio-visual material. Demonstrate the making of soap. *Investigate factors which effect the lathering of soaps and detergents.*
Some soaps form a scum with hard water. Soapless detergents are used to form a lather with hard water.		Test the suitability of soaps and detergents for use in hard water areas. Compare the hardness of water samples.
Dry-cleaning uses special solvents which are particularly good at dissolving oil and grease stains.		Find out about the properties required of dry-cleaning solvents. Investigate the suitability of solvents for dry-cleaning.

National Course Specification: course details (cont)

Unit 2: Everyday Chemistry (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
(ii) Clothing Clothing fabrics are made from thin strands called fibres. Natural fibres come from plants and animals. Synthetic fibres are made by the chemical industry. Examples of natural fibres include silk, wool and cotton; examples of synthetic fibres include nylon and polyesters, eg Terylene. Synthetic fibres can be used to make fabrics with specific properties.		Make a table to list some natural and synthetic fibres. Find out about how some natural fibres are formed. Make a list of some important properties of clothing fabrics. Investigate the important properties of different fabrics. Demonstrate/carry out the making of nylon. Investigate the strength of different fibres. Investigate the ability of fibres to drip-dry and to mop up a spillage (ITO).
Fibres are made up of long chain molecules called polymers.		Use models.
Dyes are coloured compounds which are used to give bright colours to clothing.		Extract natural dyes from strongly coloured plants and investigate the effectiveness of the dyes. Investigate the effectiveness of synthetic dyes. Demonstrate the selectivity of dyes.
Chemists have developed ways of treating fabrics to improve their properties.	Candidates would be expected to know that flame-proofing, water-proofing and stain-proofing are ways of treating fabrics to improve their properties.	Make a list of ways of treating fabrics. Investigate the suitability of different solutions for flame-proofing. Investigate the effect of water-proofing a fabric.

National Course Specification: course details (cont)

Unit 2: Everyday Chemistry (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
c) Fuels		
(i) Fire		
A fuel is a chemical which is burned to produce energy. When a substance burns it reacts with oxygen. Combustion is another word for burning.		Demonstrate the burning of a fuel using the Arculus technique. Demonstrate the combustion of iron wool. Investigate burning using candles (ITO). Compare the temperature of different flames.
A fire needs a fuel, oxygen (usually from the air) and a temperature high enough to start the fire and keep it going; take away any one of the three and the fire goes out.		Make a drawing of the fire triangle and demonstrate the effect of removing one side.
Fire-fighting methods in the lab and the home include the use of a fire blanket, sand, water, and carbon dioxide gas and foam. Water must not be used with oil, petrol and electrical fires.	Candidates should be able to link the method used to how the fire is extinguished.	Find out about how to deal with different kinds of fires in the lab and at home. Make a fire extinguisher. Visit a fire station or invite a speaker from a fire station.
(ii) Finite resources		
Fossil fuels include coal, natural gas, oil and peat. Coal and peat are formed from plant remains. Oil is formed from the remains of marine life.		Make a list of different fossil fuels and give a use for the energy which can be obtained from each. Investigate the ease of burning of different fuels.
The formation of fossil fuels occurs over a very long period of time.	Knowledge of the process by which fossil fuels are formed, is not required.	Investigate the energy produced on burning different fuels (ITO).

National Course Specification: course details (cont)

Unit 2: Everyday Chemistry (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
Fossil fuels are finite resources, ie they cannot be replaced. Over-use of fossil fuels may lead to a fuel crisis. Oil spillages can cause great damage to marine life and the environment.		Use audio-visual material. Find out about fuel conservation.
The compounds which are found in fossil fuels are mainly hydrocarbons. A hydrocarbon is a compound which contains hydrogen and carbon only. Hydrocarbons burn in a plentiful supply of air to produce carbon dioxide and water.		Burn a hydrocarbon and test products for carbon dioxide and water. Find out about condensation problems.
(iii) Renewable resources Methane, ethanol and hydrogen are renewable sources of energy, ie they can be replaced. Methane is found in biogas which can be generated by the decomposition of waste plant material. Ethanol is obtained from sugar cane and can be mixed with petrol to make a fuel for cars.	Details of the fermentation process are covered in Unit 3.	Find out about the use of methane as a fuel. Demonstrate the explosive combustion of methane. Find out about the use of ethanol as a fuel. Carry out demonstrations with ethanol.

National Course Specification: course details (cont)

Unit 2: Everyday Chemistry (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
Hydrogen, which can be obtained from water, is a likely fuel for the future.	Candidates would not be expected to know details of the electrolysis of water.	Carry out demonstrations with hydrogen. Carry out the electrolysis of water and test for hydrogen.
(iv) Important processes Crude oil is a mixture of hydrocarbons. A fraction is a group of hydrocarbons with boiling points within a given range. Fractional distillation is the process used to separate crude oil into fractions according to the boiling points of the components in the fractions. Hydrocarbons which consist of smaller molecules tend to boil more easily than hydrocarbons which consist of larger molecules.		Use audio-visual material. Demonstrate fractional distillation of simulated crude oil and compare evaporation rate, viscosity and flammability of fractions.
The uses of fractions are related to the ease of evaporation, viscosity, flammability and boiling point range of the fractions.	Candidates should be able to link the properties of fractions to their uses, eg lubricating oils because of their viscosity.	

National Course Specification: course details (cont)

Unit 2: Everyday Chemistry (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
Fractional distillation of crude oil yields more long chain hydrocarbons than are useful for present-day industrial purposes. Cracking is an industrial method for producing a mixture of smaller, more useful molecules.		Carry out the cracking of liquid paraffin. Use models.
(v) Pollution problems Carbon, and carbon monoxide, a poisonous gas, can be produced when hydrocarbons burn in a low supply of oxygen.		Refer to newspaper articles.
The burning of some fuels releases sulphur dioxide, a poisonous gas, into the atmosphere. Nitrogen and oxygen from the air can react inside a car engine to form nitrogen dioxide which is a poisonous gas. Sulphur dioxide and nitrogen dioxide are the main causes of acid rain. Lead free/unleaded petrol has been developed to reduce lead pollution.		Find out about attempts to reduce pollution associated with internal combustion engines. Demonstrate the sparking of air. Investigate concentrations of nitrogen dioxide in the atmosphere.
Benzene fumes in unleaded petrol are toxic.	Candidates would not be expected to know why benzene is added, only that it is toxic.	
Soot particles produced by the incomplete combustion of diesel are harmful.		
Air pollution from the burning of hydrocarbons can be reduced by the use of catalytic converters which convert the pollutant gases to harmless gases.	Candidates would not be expected to show knowledge of the reactions taking place in a catalytic converter.	

National Course Specification: course details (cont)

Unit 2: Everyday Chemistry (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
d) Plastics		
(i) Uses Plastics are synthetic materials, ie made by the chemical industry. Most plastics are made from oil.		Use audio-visual material.
Examples of plastics include polythene, polystyrene, perspex, PVC, nylon, Kevlar, bakelite, formica and silicones.		Examine samples of plastics and write a description of some.
The everyday uses of plastics are related to their properties**.**	Candidates should be able to link the uses of plastics to their properties. This should be limited to the plastics specified in the content statement.	Find out about the uses of plastics in and around the modern home and how the uses of plastics are related to their properties. Obtain information from a database (ITO). Demonstrate the addition of acetone to polystyrene.
(ii) Advantages and disadvantages For some uses, plastics have advantages over natural materials and vice versa.	Candidates should be able to link advantages of plastics over natural materials to their uses and vice versa.	Investigate the properties of plastics. Make a list of natural and synthetic materials used for the same purpose.
Biodegradable materials are broken down by bacteria in the soil and rot away. Most plastics are not biodegradable and their durability and lightness can cause environmental problems. Degradable plastics have been developed by chemists to alleviate the problems of plastic waste.		Observe the litter left by people in the local environment. Design an advert for a paper or a public information leaflet aimed at reducing litter (ITO). Find out about the manufacture, uses and degradability of biopol.

National Course Specification: course details (cont)

Unit 2: Everyday Chemistry (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
Some plastics burn or smoulder to give off toxic fumes, including carbon monoxide.	Candidates would not be expected to know the names of other toxic gases, eg hydrogen cyanide and hydrogen chloride.	Refer to newspaper articles.
Options for disposal of plastics include incineration, recycling and burying. With incineration the heat generated can be used as a source of energy but there are problems with emissions. Since oil is a finite resource, recycling is to be encouraged and chemists are looking for renewable sources of plastics.	Candidates would be expected to recognise that the problem with emissions is that the fumes could be toxic.	Find out about the local arrangements for refuse disposal. Find out about recycling initiatives including the use of a coding system. Make a table to show the advantages and disadvantages associated with the different options for disposal.
Recycling can be difficult because of the many different kinds of plastic in common use.	Candidates would be expected to recognise that the difficulty is one of separation of the different kinds of plastics.	
(iii) Thermoplastic/thermosetting plastics Plastics can be either thermoplastic or thermosetting. A thermoplastic is one which can be reshaped on heating. A thermosetting plastic cannot be reshaped by heating. The uses of thermosetting plastics are related to their heat and electrical insulation properties.	Knowledge of specific plastics is not required.	Make a list of uses for thermosetting plastics. Investigate the effect of a hot nail on different plastics. Use a database to obtain information (ITO).
(iv) Making plastics Plastics are made up of polymers. Polymer molecules are made from many small molecules called monomers. The process of making a polymer by joining many monomers together is called polymerisation. Some polymers can be named by adding the prefix, 'poly', to the name of the monomer, eg poly(ethene), polystyrene. Poly(ethene) is also called polythene.		Use models.

National Course Specification: course details (cont)

Unit 3: Chemistry and Life (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
a) Photosynthesis and respiration **(i) Photosynthesis** Plants make their own food by taking in substances from the environment. Plants use light energy to produce glucose from carbon dioxide and water in a process called photosynthesis; oxygen gas is also produced. During photosynthesis carbon dioxide is absorbed through the leaves of plants. Water is drawn up through the roots and oxygen gas is released into the air through the leaves. The light energy required for photosynthesis is absorbed by the chlorophyll in the leaves. **(ii) Respiration** Animals require sources of energy for use in a number of ways, including warmth and movement. Animals can obtain energy by the reaction of glucose with oxygen to produce water and carbon dioxide in a process called respiration. Animals obtain glucose by eating food which has come from plants. Respiration is the reverse of photosynthesis. The processes of photosynthesis and respiration maintain constant amounts of oxygen and carbon dioxide in the air.		Investigate the effect of absence of light, chlorophyll and carbon dioxide on growth of plants. Investigate water levels in soils (ITO). Demonstrate that plants produce oxygen. Demonstrate/carry out the combustion of a carbohydrate. Breathe out into limewater and onto a cold surface. Design a poster to show the relationship between respiration and photosynthesis (ITO).

National Course Specification: course details (cont)

Unit 3: Chemistry and Life (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
(iii) The greenhouse effect Carbon dioxide in the atmosphere causes the greenhouse effect. Extensive clearing of forests reduces the amount of carbon dioxide removed from the atmosphere by photosynthesis. Increased levels of carbon dioxide in the air may also be due to increased combustion of fuels. An increase in the level of carbon dioxide in the atmosphere could cause the atmosphere to retain more of the sun's energy as heat, a process known as global warming.		Refer to newspaper and magazine articles. Demonstrate the greenhouse effect (ITO).
b) The effects of chemicals on the growth of plants **(i) Using chemicals to save plants** The yield of healthy crops can be reduced in the following ways: • crops are eaten by pests, eg insects and slugs • bacteria and fungi can cause plants to become diseased • weeds can inhibit growth of plants by using up essential substances in the soil. Pesticides are used to control pests, fungicides prevent diseases and herbicides kill weeds.		Classify some of the products which are sold in garden centres**.** Find out about the properties of the ideal pesticide.
Pesticides are toxic and so must be used with care. Natural predators can also be used to safely control pests.		Find out about the damage which can result from the careless use of pesticides. Find out about the use of natural predators.

National Course Specification: course details (cont)

Unit 3: Chemistry and Life (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
(ii) Fertilisers Nitrogen, phosphorus and potassium are essential elements for healthy plant growth. These elements are taken in through the roots of plants as compounds which are in solution.		Obtain trade names of fertilisers and identify NPK content. Make a fertiliser by neutralisation followed by evaporation. View a videotape.
In areas of natural vegetation, decay of vegetable and animal remains returns all essential elements to the soil. Harvesting of crops prevents the natural return of essential elements to the soil. Fertilisers are added to the soil to restore essential elements. Examples of natural fertilisers include compost and manure.		Investigate the amounts of organic materials in the soil (ITO).
Increased demand for food has resulted in the use of artificial fertilisers. Artificial fertilisers are made by the chemical industry.		Investigate the effect of ammonium, nitrate, phosphate and potassium compounds on the growth of plants.
The major artificial fertilisers are ammonium, nitrate, phosphate and potassium compounds.		Test unknowns for ammonium, potassium and phosphate compounds.
To be effective, fertilisers must be soluble in water.		*Investigate the solubility of ammonium salts, potassium salts, nitrates and phosphates.*

National Course Specification: course details (cont)

Unit 3: Chemistry and Life (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
The extensive use of nitrate fertilisers may have increased the levels of nitrate in rivers and lochs, and the public water supply. The presence of large quantities of nitrates can leave the water lifeless.	Candidates would not be expected to know details of the eutrophication process.	Find out about the effects of increased levels of nitrates in water. Use a computer program.
Some plants such as clover, beans and peas have root nodules in which nitrogen from the air is converted into nitrates. Plants which convert nitrogen from the air into nitrates can be used to increase soil fertility.		Examine root nodules.
c) Food and diet		
(i) Elements in the body A balanced diet provides the body with all the essential elements and compounds. The major constituent elements of the human body are oxygen, carbon, hydrogen and nitrogen. Elements are present in the diet and in the body as chemical compounds and not as the free elements. Essential compounds include carbohydrates, fats and proteins. More than 60% of body weight is made up of water.		Refer to public information leaflets to find out about the requirements of a balanced diet. Produce a poster or a public information leaflet to raise awareness about the importance of healthy eating (ITO). Make a table or chart to show nutritional information on food labels (ITO). Make a table or chart to show the average percentages of elements in the body (ITO). Use a computer program.
Minerals supply the body with small quantities of calcium for bones and teeth, iron for the blood, as well as trace elements. Some trace elements if taken in too large quantities are toxic.	Knowledge of particular trace elements and their effects on the body is not required.	Find out about the effects of mineral deficiencies. Extract iron from breakfast cereals.

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
(ii) Different carbohydrates Carbohydrates form an important class of food made by plants. Carbohydrates are used by the body to produce energy.		Make a list of foods which are high in carbohydrate. Refer to published data to draw a bar graph to compare energy values of different foods. *Investigate the energy released on burning different carbohydrates (ITO).* Demonstrate the explosive combustion of a carbohydrate.
Carbohydrates are compounds which contain carbon, hydrogen and oxygen. Carbohydrates can be divided into sugars and starches. Examples of sugars include glucose, fructose, maltose and sucrose (table sugar).		Make a table giving the names of carbohydrates and their formulae. Examine models of carbohydrate molecules. Demonstrate the addition of concentrated sulphuric acid to sucrose.
Most sugars can be detected by the Benedict's test; sucrose is an exception. Starch can be distinguished from other carbohydrates by the iodine test.		Find out, by experiment, the test for sugars and starch. *Test for sugars and starch in foods.*
Starch is not sweet and does not dissolve readily in water; sugars are sweet and very soluble in water.		Investigate the solubility of sugars and starch.
(iii) Reactions of carbohydrates Sugars are carbohydrates with small molecules. Starch is a polymer made of many glucose molecules linked together. Plants convert the glucose into starch for storing energy.	Candidates would not be expected to know details of the polymerisation.	Use models.

National Course Specification: course details (cont)

Unit 3: Chemistry and Life (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
During digestion starch is broken down to glucose which is carried by the blood stream to body cells where respiration occurs. Starch can be broken down by acid and by enzymes.	Candidates would not be expected to know the details of the hydrolysis.	Use models. Investigate the effect of amylase and/or acid on rate of breakdown of starch.
Body enzymes function best at body temperature and are destroyed at higher temperatures.		Investigate enzyme activity.
(iv) Fats and oils Fats and oils form an important class of food obtained from both plants and animals. Fats and oils are much more concentrated sources of energy than carbohydrates.		Make a list of foods which are high in fats and oils. Make a table or chart to compare energy values of different foods. Compare burning of fats and oils. Make a table or chart to compare average percentages of fats in different foods.
Fats and oils can be detected by a filter paper test.		Test for fats and oils in foods.
Saturates are believed to increase the cholesterol level in the bloodstream and this in turn may cause heart disease. Polyunsaturates are considered to be less potentially harmful to the heart. Medical opinion suggests that total fat consumption should be reduced and, where possible, foods with polyunsaturates should be eaten.	The use of "saturates" and "polyunsaturates" does not imply that candidates should have any knowledge of their structures but simply that these are terms used in the classification of fats and oils.	Refer to nutritional information on labels to make a table to show the masses of saturates and unsaturates in fats and oils; carry out calculations to find the percentages. Refer to information from medical leaflets to find out about the links between saturates/polyunsaturates and heart disease.

National Course Specification: course details (cont)

Unit 3: Chemistry and Life (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
(v) Proteins Proteins form an important class of food obtained from both plants and animals. Proteins provide material for body growth and repair. Proteins can be detected by heating with soda lime and testing for an alkaline gas.		Make a list of foods which are high in proteins. Make a table or chart to compare the average percentages of proteins in different foods. Test for proteins in foods.
Proteins are chemical compounds of carbon, hydrogen, oxygen and nitrogen. Proteins are polymers made up of many amino acid molecules linked together. In the body, animals make particular proteins for specific purposes. The amino acids required to make animal proteins are obtained from animal and vegetable foods. During digestion proteins in foods are broken down to amino acids. A vegetarian diet must include a wide variety of vegetables to supply all the necessary amino acids.	Knowledge of the polymerisation process and the structures of amino acids are not required. Candidates are not expected to know the names and functions of particular proteins.	Use models and diagrams. Examine molecular models of amino acids and write their formulae. Test for proteins in hair or nails.
(vi) Fibre, vitamins and food additives Fibre keeps the gut working well, preventing constipation. Fibre absorbs water and swells; this provides bulk for the gut muscles to work on as food is squeezed along.		Make a list of foods which are high in fibre. Investigate the amounts of fibre in cereals. Make a list of foods with vitamin supplements.
Vitamins are complex carbon compounds which are required to keep the body healthy. Lack of important vitamins can cause poor health.	Knowledge of specific health conditions is not required.	Make a table to show the effects of deficiency of vitamins A, B, C and D. Investigate the effect of cooking on vitamin C (ITO). Investigate the levels of vitamin C in foods.

National Course Specification: course details (cont)

Unit 3: Chemistry and Life (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
Food additives can be used to: • supply or enhance the nutritional value of food, eg vitamins and minerals, • improve the keeping qualities of food, eg food preservatives, • alter the appearance of food, eg food colouring, and • alter the flavour of food, eg food flavouring. Food additives can be used only if they have been tested and approved.		Identify food additives and the classes to which they belong from the lists of ingredients on food labels. Separate food colours by paper chromatography. Find out about the issues related to using animals for testing food additives.
d) Drugs **(i) Alcohol** A drug is a substance which alters the way the body works. Drugs can damage health because of the way they can affect the body and lifestyle. Alcohol is a drug which, if taken in excess, can have many harmful effects on the body, particularly the liver and the brain. A bottle of alcopop or a pint of beer contains approximately 2 units of alcohol; a pub measure of spirit or a glass of wine contains approximately 1 unit of alcohol. Alcohol is broken down by the body at about 1 unit per hour.		Refer to public information booklets to find out about the affect of alcohol on the body and the links between the use of alcohol and road accidents. Make a table to list the advantages and disadvantages of random breath-testing. Demonstrate the breathalyser reaction. Carry out calculations to find out the length of time required to lose alcohol after different patterns of drinking.

National Course Specification: course details (cont)

Unit 3: Chemistry and Life (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
Alcoholic drinks can be made by the fermentation of starch and sugars present in fruit and vegetables. The type of alcoholic drink varies with the plant source of the carbohydrate. During fermentation glucose is broken down to form alcohol; carbon dioxide is also produced. The fermentation process is catalysed by enzymes present in yeast. The alcohol produced by fermentation is called ethanol. The concentration of alcohol produced by fermentation is limited.	Knowledge of the actual limit is not required.	Carry out the fermentation of a glucose solution/fruit juice. View a videotape. Make a table to show the source of the sugars in different alcoholic drinks.
Distillation is a method of increasing the alcohol concentration of fermentation products. Water and alcohols can be partially separated by distillation because they have different boiling points.		Distill a water/alcohol mixture. Make a table to show the percentage of alcohol in different drinks. Find out about the whisky industry.
(ii) Other drugs Some drugs, including medicines, alcohol, nicotine and caffeine are legal; others, including cannabis, LSD and ecstasy are illegal. Being unable to manage without a drug is called addiction. Methanol, another alcohol, is very toxic causing blindness and death. Methylated spirits (meths) contains methanol and has both a colour and a bad tasting substance added to it to prevent people from drinking it.		Make a table to list legal and illegal drugs. Refer to public information booklets to find out about the dangers of illegal drugs. Produce a poster or a public information leaflet to raise awareness about the harmful effects of drugs (ITO).

National Course Specification: course details (cont)

Unit 3: Chemistry and Life (Intermediate 1)

CONTENT STATEMENTS	NOTES	SUGGESTED ACTIVITIES
Chemical reactions are going on all the time to keep the body working properly. Medicines contain drugs which help the body when it is not working correctly. Some drugs, including antibiotics, can fight micro-organisms which interfere with the chemical reactions.		Make a table of common medicines and their uses.
Medicines are usually made up of many chemicals and only the active ingredient works on the body.		Refer to the packaging of medicine to make a table to show the ingredients, including percentage of active ingredients.

National Course Specification: course details (cont)

COURSE Chemistry (Intermediate 1)

ASSESSMENT

To gain the award of the course, the candidate must achieve all the component units of the course as well as the external assessment.

The external assessment will provide the basis for grading attainment in the course award.

When units are taken as component parts of a course, candidates will have the opportunity to demonstrate achievement beyond that required to attain each of the unit outcomes. This attainment may, where appropriate, be recorded and used to contribute towards course estimates, and to provide evidence for appeals. Further information and advice on assessment can be seen in the Subject Guide and National Assessment Bank. Further information on key principles of assessment are provided in the paper, *Assessment* (HSDU, 1996) and in *Managing Assessment* (HSDU, 1998).

DETAILS OF THE INSTRUMENTS FOR EXTERNAL ASSESSMENT

External assessment will be through a question paper which samples across the performance criteria associated with the three outcomes in each of the three units which comprise the course. The detailed knowledge and understanding required for each unit is listed in the course content.

The examination will consist of one paper of 1 hour 30 minutes with a total allocation of 60 marks.

The paper will be in two sections:

Section A	Fixed response questions	20 marks
Section B	Extended-answer questions	40 marks.

Section A will be made up of 20 multiple-choice questions.

In Section B approximately 4 marks will be allocated to questions which will draw on the candidates' experience of the prescribed practical activities. Of the 60 marks in the paper between 34 and 37 marks will be allocated to the assessment of knowledge and understanding and between 23 and 26 marks will be allocated to the assessment of problem solving.

Candidates will be expected to answer all questions.

National Course Specification: course details (cont)

COURSE Chemistry (Intermediate 1)

GRADE DESCRIPTIONS

Grade C

In the course assessment, candidates at Grade C will have demonstrated success in achieving the component units of the course. As well as meeting the performance criteria for the three outcomes candidates achieving a Grade C will have demonstrated an overall satisfactory level of performance by:

- retaining knowledge and understanding over a longer period of time
- integrating knowledge and understanding across the three component units of the course
- displaying problem solving skills in less familiar contexts.

Grade A

In addition candidates achieving a Grade A will have demonstrated a high overall level of performance by:

- retaining knowledge and understanding over a longer period of time
- showing a deeper level of knowledge and understanding
- integrating knowledge and understanding across the three component units of the course
- displaying problem solving skills in less familiar and more complex contexts.

DETAILS OF THE INSTRUMENTS FOR INTERNAL ASSESSMENT

Outcomes 1 and 2

For each unit, Outcomes 1 and 2 will be assessed by a single holistic closed-book test. The ratio of marks allocated to Outcomes 1 and 2 will be 3:2.

In each test, all of the performance criteria and aspects of evidence requirements for Outcome 1 and all of the specified performance criteria for Outcome 2, will be assessed.

Outcome 3

Candidates are required to produce one report on an experiment covering all of the performance criteria and related to Intermediate 1 Chemistry.

The report must be based on one of the Unit 1 prescribed practical activities listed below:

- The Effect of Temperature Changes on Dissolving Speed
- The Effect of Concentration Changes on Reaction Speed
- Testing the pH of Solutions.

National Course Specification: course details (cont)

COURSE Chemistry (Intermediate 1)

APPROACHES TO LEARNING AND TEACHING

Appropriate selection from a variety of learning and teaching approaches is required to deliver both knowledge-based and skill-based objectives to candidates with different needs and abilities. In doing so, opportunities should be provided for candidates to work independently, sometimes in small groups and on other occasions as a whole class. Exposition, used in conjunction with questioning and discussion, is a very effective way of developing candidates' knowledge and understanding of the more theoretical chemical concepts as well as a good means of introducing new topics and consolidating completed topics. Resource-based learning can help candidates to acquire knowledge and understanding through the practice of the problem solving and practical skills associated with scientific enquiry. Where resource-based approaches are used, careful thought should be given to the selection of resources, including worksheets, and to the provision of opportunities for blending in whole-class presentations. Both teachers/lecturers and candidates should make full use of opportunities to use models to help the understanding of concepts in chemistry and to use information technology to support learning and to process data.

Practical work should include a balance of illustrative teacher/lecturer demonstrated experiments, which can help to make knowledge more memorable and facilitate understanding, and techniques which will develop the skills associated with the types of practical activity which have a clear and important place within the normal study of chemistry. Candidates should also have the opportunity to carry out investigations to enable problem solving skills to be developed within a practical context.

The chemistry courses have been designed to give emphasis to applications and issues and should be presented in a manner which allows candidates to recognise the relevance of the theoretical knowledge to their lives and everyday experiences. In addition, the learning and teaching approaches which are employed should provide opportunities for the development of core skills.

Effective learning and teaching in chemistry cannot take place without effective communication, from the candidates as well as the teacher/lecturer, and at all times the safety of the candidates should be a matter of priority.

Use of the additional 40 hours

This time may be used:

- to provide an introduction to the course and assessment methods
- to allow candidates to develop their ability to integrate knowledge, understanding and skills acquired through the study of the different component units
- to allow some more practical work, on an individual basis if appropriate, within the units to enhance skills and understanding
- for consolidation and integration of learning
- for remediation
- for practice in examination techniques and preparation for the external examination
- to complete reports on prescribed practical activities.

National Course Specification: course details (cont)

COURSE Chemistry (Intermediate 1)

SPECIAL NEEDS

This course specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment Arrangements* (SQA, 2001).

National Unit Specification: general information

UNIT Chemistry in Action (Intermediate 1)

NUMBER D063 10

COURSE Chemistry (Intermediate 1)

SUMMARY

The unit seeks to develop knowledge and understanding, problem solving and practical abilities in the context of substances; chemical reactions; bonding; and acids and alkalis.

OUTCOMES

1 Demonstrate knowledge and understanding related to *Chemistry in Action*.
2 Solve problems related to *Chemistry in Action*.
3 Collect and analyse information related to *Intermediate 1 Chemistry* obtained by experiment.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following awards or its equivalent:

- Standard Grade Biology, Physics or Science at grades 4 to 7
- Standard Grade Chemistry at grades 5 to 7
- appropriate units at Access level.

Administrative Information

Superclass: RD

Publication date: March 2004

Source: Scottish Qualifications Authority

Version: 05

National Unit Specification: general information (cont)

UNIT Chemistry in Action (Intermediate 1)

CREDIT VALUE

1 credit at Intermediate 1 (6 SCQF credit points at SCQF level 4*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

CORE SKILLS

Core skills for this qualification remain subject to confirmation and details will be available at a later date.

Additional information about core skills is published in the *Catalogue of Core Skills in National Qualifications* (SQA, publication code BA0906).

National Unit Specification: statement of standards

UNIT Chemistry in Action (Intermediate 1)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME 1

Demonstrate knowledge and understanding related to *Chemistry in Action.*

Performance criteria

(a) Knowledge and understanding of substances are clearly shown in appropriate ways.
(b) Knowledge and understanding of chemical reactions are clearly shown in appropriate ways.
(c) Knowledge and understanding of bonding is clearly shown in appropriate ways.
(d) Knowledge and understanding of acids and alkalis are clearly shown in appropriate ways.

Evidence requirements

Evidence of an appropriate level of achievement from a closed-book test with items covering all of the following aspects of the above performance criteria.

Knowledge and understanding of substances

(i) Elements
(ii) Compounds and mixtures
(iii) Solutions
(iv) Hazards

Knowledge and understanding of chemical reactions

(i) Identification
(ii) Speed of reactions
(iii) Word equations

Knowledge and understanding of bonding

(i) Molecules and ions
(ii) Formulae: using models
(iii) Formulae: using prefixes

Knowledge and understanding of acids and alkalis

(i) The pH scale
(ii) Common acids and alkalis
(iii) Neutralisation
(iv) Acid rain

National Unit Specification: statement of standards (cont)

UNIT Chemistry in Action (Intermediate 1)

OUTCOME 2

Solve problems related to *Chemistry in Action*.

Performance criteria

(a) Relevant information is selected and presented in an appropriate way.
(c) Conclusions drawn are valid and explanations given are supported by evidence.
(d) Experimental procedures are planned, designed and evaluated in an appropriate way.
(e) Predictions and generalisations made are based on available evidence.

Note: the lettering system for PCs is common to all units in the Intermediate 1 Chemistry course. Not all of the PCs feature in all of the units. For example, PC (b) does NOT feature in this unit, although it does feature in other units in the course.

Evidence requirements

Evidence of an appropriate level of achievement from a closed-book test with items covering all the above performance criteria.

OUTCOME 3

Collect and analyse information related to *Intermediate 1 Chemistry* obtained by experiment.

Performance criteria

(a) The information is collected by active participation in the experiment.
(b) The experimental procedures are described accurately.
(c) Relevant measurements and observations are recorded in an appropriate format.
(d) Conclusions drawn are valid.

Evidence requirements

A report of one experimental activity is required covering the above performance criteria and related to one of the following experiments:

- the effect of temperature changes on dissolving speed
- the effect of concentration changes on reaction speed
- testing the pH of solutions.

The teacher/lecturer responsible must attest that the report is the individual work of the candidate derived from active participation in an experiment involving the candidate planning the experiment; deciding how it is managed; identifying and obtaining the necessary resources, and carrying out the experiment. Depending on the activity, the collection of the information may be group work.

Evidence submitted in support of attainment of PC (c) must be in the format of a table or graph(s) as appropriate. Conclusions drawn should be based on the evidence and include an evaluation. The evaluation should cover all stages of the experiment, including the initial analysis of the situation, and planning and organising the experimental procedures and reviewing the strengths and weaknesses of the procedures.

National Unit Specification: support notes

UNIT Chemistry in Action (Intermediate 1)

This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON CONTENT AND CONTEXT FOR THIS UNIT

The recommended content together with suggested activities for this unit are detailed in the course specification. The subheadings in these tables correspond to the aspects mentioned in the evidence requirements for Outcome 1. The prescribed practical activities for the unit are listed in the *Course Contents*.

GUIDANCE ON TEACHING AND LEARNING APPROACHES FOR THIS UNIT

General advice is contained in the course specification and more detailed advice will be contained in the Subject Guide for chemistry.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Outcomes 1 and 2

It is recommended that a holistic approach is taken for assessment of these outcomes. Outcomes 1 and 2 can be assessed by an integrated end of unit test with questions covering all the performance criteria. Within one question, assessment of knowledge and understanding and problem solving can occur. Each question can address a number of performance criteria from either Outcome 1 or 2. Appropriate assessment items are available from the National Assessment Bank.

Outcome 3

Opportunities to generate evidence for attainment at Outcome 3 will arise during the practical work related to the prescribed practical activities.

Related to PC (a), the teacher/lecturer checks by observation that the candidate has taken an active part in the collection of information by experiment.

Candidates should provide a structured report with an appropriate title. The report should relate to the performance criteria as follows:

b) As experiments will follow a given procedure or method there is no need for a detailed description. The procedure, or the steps in the procedure, should be described briefly in outline. The impersonal passive voice should be used. The following should be used as appropriate:

- aim of the experiment
- a labelled diagram, description of apparatus, instruments used
- how measurements were taken or observations made
- comments on safety.

c) Readings or observations (raw data) should be recorded using the following as appropriate:

- a table with correct headings and appropriate units
- a table with readings/observations entered correctly
- a statement of results.

d) Conclusions should contain at least one of the following:

- the overall pattern to readings
- the trends in analysed information or results
- the connection between variables
- An analysis of the observations.

Conclusions should also include evaluation of the experimental procedures and could make reference to one of the following:

- effectiveness of procedures
- control of variables
- limitations of equipment
- possible improvements
- possible sources of error.

The bullet points under each performance criterion give an indication of what should be addressed to achieve a pass. The relevance of the bullet points will vary according to the experiment. These bullet points are intended as helpful guidance. The decision of pass or fail is to be made by the professional judgement of the presenting centre (subject to moderation) against the performance criteria.

Redrafting

It is appropriate to support candidates in producing a report to meet the performance criteria. Redrafting of reports after necessary supportive criticism is to be encouraged both as part of the learning and teaching process and to produce evidence for assessment. Redrafting is only required for the specific performance criteria identified in need of further attention, ie the entire report does not require to be rewritten.

Conditions required to complete the report

Candidates may complete their reports outwith class time provided reasonable measures are taken to ensure that the report is the individual work of the candidate.

Teachers and lecturers may wish candidates to write up reports under their direct supervision so that they can provide appropriate advice and support. However, they may feel confident that any redrafting required need not be undertaken under such close supervision as it will be evident in the candidate's response that it is his or her unaided work. Under such circumstances it would be acceptable for such redrafting to take place outwith class time.

National Unit Specification: support notes (cont)

UNIT Chemistry in Action (Intermediate 1)

Use of IT

Candidates may, if they wish, present their reports in a word-processed format. Candidates may use Excel (or any other suitable data analysis software) when tackling Outcome 3. However, candidates must not be given a spreadsheet with pre-prepared column headings or formula since they are being assessed on their ability to enter quantities and units into a table.

Transfer of evidence

Candidates may transfer evidence of Outcome 3 from Unit 1 Building Blocks of Intermediate 2 in respect of the prescribed practical activities 'The Effect of Temperature Changes on Reaction Rates'. The prescribed practical activity 'Electrolysis' (Int 2) cannot be transferred to Intermediate 1.

Candidates, who are repeating a year, may use evidence of an appropriate standard generated in a previous year.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment Arrangements* (SQA, 2001).

National Unit Specification: general information

UNIT Everyday Chemistry (Intermediate 1)

NUMBER D064 10

COURSE Chemistry (Intermediate 1)

SUMMARY

The unit seeks to develop knowledge and understanding, problem solving and practical abilities in the context of metals; personal needs; fuels; and plastics.

OUTCOMES

1 Demonstrate knowledge and understanding related to *Everyday Chemistry*.
2 Solve problems related to *Everyday Chemistry*.
3 Collect and analyse information related to *Intermediate 1 Chemistry* obtained by experiment.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following awards or its equivalent:

- Standard Grade Biology, Physics or Science at grades 4 to 7
- Standard Grade Chemistry at grades 5 to 7
- appropriate units at Access level.

Administrative Information

Superclass: RD

Publication date: March 2004

Source: Scottish Qualifications Authority

Version: 05

National Unit Specification: general information (cont)

UNIT Everyday Chemistry (Intermediate 1)

CREDIT VALUE
1 credit at Intermediate 1 (6 SCQF credit points at SCQF level 4*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

CORE SKILLS

Core skills for this qualification remain subject to confirmation and details will be available at a later date.

Additional information about core skills is published in the *Catalogue of Core Skills in National Qualifications* (SQA, publication code BA09062).

National Unit Specification: statement of standards

UNIT Everyday Chemistry (Intermediate 1)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME 1

Demonstrate knowledge and understanding related to *Everyday Chemistry*.

Performance criteria

(a) Knowledge and understanding of metals are clearly shown in appropriate ways.
(b) Knowledge and understanding of personal needs are clearly shown in appropriate ways.
(c) Knowledge and understanding of fuels are clearly shown in appropriate ways.
(d) Knowledge and understanding of plastics are clearly shown in appropriate ways.

Evidence requirements

Evidence of an appropriate achievement from a closed-book test with items covering all of the following aspects of the above performance criteria.

Knowledge and understanding of metals

(i) Uses
(ii) Reactions
(iii) Corrosion
(iv) Batteries

Knowledge and understanding of personal needs

(i) Keeping clean
(ii) Clothing

Knowledge and understanding of fuels

(i) Fire
(ii) Finite resources
(iii) Renewable resources
(iv) Important processes
(v) Pollution problems

Knowledge and understanding of plastics

(i) Uses
(ii) Advantages and disadvantages
(iii) Thermoplastic/thermosetting plastics
(iv) Making plastics

National Unit Specification: statement of standards (cont)

UNIT Everyday Chemistry (Intermediate 1)

OUTCOME 2

Solve problems related to *Everyday Chemistry*.

Performance criteria

(a) Relevant information is selected and presented in an appropriate way.
(b) Information is accurately processed using calculations where appropriate.
(c) Conclusions drawn are valid and explanations given are supported by evidence.
(d) Experimental procedures are planned, designed and evaluated in an appropriate way.

Note: the lettering system for PCs is common to all units in the Intermediate 1 Chemistry course. Not all of the PCs feature in all of the units. For example, PC (e) does NOT feature in this unit, although it does feature in other units in the course.

Evidence requirements

Evidence of an appropriate level of achievement from a closed-book test with items covering all the above performance criteria.

OUTCOME 3

Collect and analyse information related to *Intermediate 1 Chemistry* obtained by experiment.

Performance criteria

(a) The information is collected by active participation in the experiment.
(b) The experimental procedures are described accurately.
(c) Relevant measurements and observations are recorded in an appropriate format.
(d) Conclusions drawn are valid.

Evidence requirements

A report of one experimental activity is required, covering the above performance criteria and related to the contents and notes specified for Intermediate 1 Chemistry. The report must be the individual work of the candidate and based on an experiment in which the candidate has been involved. Depending on the activity the collection of the information may be group work.

National Unit Specification: support notes

UNIT Everyday Chemistry (Intermediate 1)

This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON CONTENT AND CONTEXT FOR THIS UNIT

The recommended content together with suggested activities for this unit are detailed in the course specification. The subheadings in these tables correspond to the aspects mentioned in the evidence requirements for Outcome 1. The prescribed practical activities for the unit are listed in the *Course Contents*.

GUIDANCE ON TEACHING AND LEARNING APPROACHES FOR THIS UNIT

General advice is contained in the course specification and more detailed advice will be contained in the Subject Guide for chemistry.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Outcomes 1 and 2

It is recommended that a holistic approach is taken for assessment of these outcomes. Outcomes 1 and 2 can be assessed by an integrated end of unit test with questions covering all the performance criteria. Within one question, assessment of knowledge and understanding and problem solving can occur. Each question can address a number of performance criteria from either Outcome 1 or 2. Appropriate assessment items are available from the National Assessment Bank.

Outcome 3

Opportunities to generate evidence for attainment at Outcome 3 will arise during the practical work related to the prescribed practical activities.

Related to PC (a), the teacher/lecturer checks by observation that the candidate has taken part in the collection of information by experiment.

Candidates should provide a structured report with an appropriate title. The report should relate to the performance criteria as follows:

b) As experiments will follow a given procedure or method there is no need for a detailed description. The procedure, or the steps in the procedure, should be described briefly in outline. The impersonal passive voice should be used. The following should be used as appropriate:

- aim of the experiment
- a labelled diagram, description of apparatus, instruments used
- how measurements were taken or observations made
- comments on safety.

c) Readings or observations (raw data) should be recorded using the following as appropriate:

- a table with correct headings and appropriate units
- a table with readings/observations entered correctly
- a statement of results.

d) Conclusions should contain at least one of the following:

- the overall pattern to readings
- the trends in analysed information or results
- the connection between variables
- an analysis of the observations.

The bullet points under each performance criterion give an indication of what should be addressed to achieve a pass. The relevance of the bullet points will vary according to the experiment. These bullet points are intended as helpful guidance. The decision of pass or fail is to be made by the professional judgement of the presenting centre (subject to moderation) against the performance criteria.

Redrafting

It is appropriate to support candidates in producing a report to meet the performance criteria. Redrafting of reports after necessary supportive criticism is to be encouraged both as part of the learning and teaching process and to produce evidence for assessment. Redrafting is only required for the specific performance criteria identified in need of further attention, ie the entire report does not require to be rewritten.

Conditions required to complete the report

Candidates may complete their reports outwith class time provided reasonable measures are taken to ensure that the report is the individual work of the candidate.

Teachers and lecturers may wish candidates to write up reports under their direct supervision so that they can provide appropriate advice and support. However, they may feel confident that any redrafting required need not be undertaken under such close supervision as it will be evident in the candidate's response that it is his or her unaided work. Under such circumstances it would be acceptable for such redrafting to take place outwith class time.

Use of IT

Candidates may, if they wish, present their reports in a word-processed format. Candidates may use Excel or any other suitable data analysis software when tackling Outcome 3. However, candidates must not be given a spreadsheet with pre-prepared column headings or formula since they are being assessed on their ability to enter quantities and units into a table.

Transfer of evidence

If candidates are taking this unit as part of a course and produce only one report for Outcome 3 across the course, then that report must be on a Unit 1 (Chemistry in Action) prescribed practical activity.

Candidates, who are repeating a year, may use evidence of an appropriate standard generated in a previous year.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment Arrangements* (SQA, 2001).

National Unit Specification: general information

UNIT Chemistry and Life (Intermediate 1)

NUMBER D065 10

COURSE Chemistry (Intermediate 1)

SUMMARY

The unit seeks to develop knowledge and understanding, problem solving and practical abilities in the context of photosynthesis and respiration; the effects of chemicals on the growth of plants; food and diet; and drugs.

OUTCOMES

1 Demonstrate knowledge and understanding related to *Chemistry and Life*.
2 Solve problems related to *Chemistry and Life*.
3 Collect and analyse information related to *Intermediate 1 Chemistry* obtained by experiment.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following awards or its equivalent:

- Standard Grade Biology, Physics or Science at grades 4 to 7
- Standard Grade Chemistry at grades 5 to 7
- appropriate units at Access level.

Administrative Information

Superclass: RH

Publication date: March 2004

Source: Scottish Qualifications Authority

Version: 05

National Unit Specification: general information (cont)

UNIT Chemistry and Life (Intermediate 1)

CREDIT VALUE
1 credit at Intermediate 1 (6SCQF credit points at SCQF level 4*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

CORE SKILLS

Core skills for this qualification remain subject to confirmation and details will be available at a later date.

Additional information about core skills is published in the *Catalogue of Core Skills in National Qualifications* (SQA, publication code BA0906).

National Unit Specification: statement of standards

UNIT Chemistry and Life (Intermediate 1)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME 1

Demonstrate knowledge and understanding related to *Chemistry and Life*.

Performance criteria

(a) Knowledge and understanding of photosynthesis and respiration are clearly shown in appropriate ways.
(b) Knowledge and understanding of the effects of chemicals on the growth of plants are clearly shown in appropriate ways.
(c) Knowledge and understanding of food and diet are clearly shown in appropriate ways.
(d) Knowledge and understanding of drugs are clearly shown in appropriate ways.

Evidence requirements

Evidence of an appropriate achievement from a closed-book test with items covering all of the following aspects of the above performance criteria.

Knowledge and understanding of photosynthesis and respiration

(i) Photosynthesis
(ii) Respiration
(iii) The greenhouse effect

Knowledge and understanding of the effects of chemicals on the growth of plants

(i) Using chemicals to save plants
(ii) Fertilisers

Knowledge and understanding of food and diet

(i) Elements in the body
(ii) Different carbohydrates
(iii) Reactions of carbohydrates
(iv) Fats and oils
(v) Proteins
(vi) Fibre, vitamins and food additives

Knowledge and understanding of drugs

(i) Alcohol
(ii) Other drugs

National Unit Specification: statement of standards (cont)

UNIT Chemistry and Life (Intermediate 1)

OUTCOME 2

Solve problems related to *Chemistry and Life*.

Performance criteria

(a) Relevant information is selected and presented in an appropriate way.
(b) Information is accurately processed using calculations where appropriate.
(c) Conclusions drawn are valid and explanations given are supported by evidence.
(e) Predictions and generalisations made are based on available evidence.

Note: the lettering system for PCs is common to all units in the Intermediate 1 Chemistry course. Not all of the PCs feature in all of the units. For example, PC (d) does NOT feature in this unit, although it does features in other units in the course.

Evidence requirements

Evidence of an appropriate level of achievement from a closed-book test with items covering all the above performance criteria.

OUTCOME 3

Collect and analyse information related to *Intermediate 1 Chemistry* obtained by experiment.

Performance criteria

(a) The information is collected by active participation in the experiment.
(b) The experimental procedures are described accurately.
(c) Relevant measurements and observations are recorded in an appropriate format.
(d) Conclusions drawn are valid.

Evidence requirements

A report of one experimental activity is required, covering the above performance criteria and related to the contents and notes specified for Intermediate 1 Chemistry. The report must be the individual work of the candidate and based on an experiment in which the candidate has been involved. Depending on the activity the collection of the information may be group work.

National Unit Specification: support notes

UNIT Everyday Chemistry (Intermediate 1)

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GUIDANCE ON CONTENT AND CONTEXT FOR THIS UNIT

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National Unit Specification: support notes (cont)

UNIT Everyday Chemistry (Intermediate 1)

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