

Our ref: MH/TH

23 August 2004

To:  
The Person Responsible for Chemistry  
SQA Co-ordinators  
Directors of Education  
Chemistry Assessment Panel Members  
Customer Accounts Managers

Action by Recipient	
	Response required
✓	Note and pass on
	None – update/information only

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Dear Colleague

### **National Qualifications Update – Chemistry**

This letter is intended to provide centres with an update on National Qualifications and should be passed to the member of staff responsible for Chemistry.

#### **1 Summary of changes to Intermediate 1 and Intermediate 2 Chemistry Arrangements documents**

The Sixth edition of the Arrangements documents were published in March 2004 and are effective from sessions 2004-2005. These Arrangements documents have been issued to centres on CD-ROM and are available on the NQ Chemistry section of the non-secure part of the SQA website.

Summaries of the amendments to the Intermediate 1 and Intermediate 2 Chemistry arrangements documents are attached in Appendices A and B.

#### **2 Advanced Higher Chemistry Investigation Guidance**

An updated copy of this guidance is attached to this letter.

The only change to the guide relates to the detail of submission date for the Investigation Report ie *“The submission date for the Investigation Report in Chemistry will be around the end of April. The actual date of submission will be notified to centres via the Operational Guide; Appendix 2: National Qualifications – Calendar of key dates and Appendix 3: Subject-specific submission deadlines.”*

I hope the contents of this letter are helpful to you. Please do not hesitate to contact me if you need further clarification.

Yours faithfully

A handwritten signature in black ink that reads "Mary Hoey". The signature is written in a cursive style with a large, looping 'M' and a 'y' that extends downwards.

Mary Hoey  
Qualifications Manager  
NQ Maths, Science and Language Team

Encs

**Chemistry Subject Update Letter (August 2004)**

**INTERMEDIATE 1 CHEMISTRY ARRANGEMENTS DOCUMENT (SIXTH EDITION – PUBLISHED MARCH 2004)**

**Summary of Changes**

**Notes**

Chemical knowledge which can be assessed is defined by the content statements. The notes are intended to clarify the depth of treatment of chemistry covered. The suggested activities are given to aid delivery of the chemistry content but do not define what can be assessed.

**Unit 1 Chemistry in Action**

**(a) Substances**

**(i) Elements**

*Each element has a name and symbol.* There would be no need for candidates to know the symbols for particular elements.

*Each element in the Periodic table has a number called the atomic number.*  
This has been moved to page 6 of the document.

*Many elements are solid at room temp*  
Changed to *Most elements...*

*Some elements are gases at room temperature.*  
Addition - 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 and non-metals*  
Addition – 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.

*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.

*Many elements have everyday uses*  
Candidates should be able to use page 5 of the data booklet to give a use for an element or to identify an element which can be used for a particular purpose.

*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.

**(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.

**(iv) Hazards**

It is important to develop an awareness of issues related to the use of chemicals.  
Candidates would be expected to link the hazard symbols to the actual hazards.

**(b) Chemical reactions**

**(iii) Word equations**

Moved from suggested activities to notes column – Candidates should be able to write word equations from descriptions of chemical reactions given all reactants and products.

**(c) Bonding**

**(i) Molecules and Ions**

The content statement:  
*Each element in the Periodic Table has a number called the atomic number.*  
has been transferred to (a) (i) Elements.

New content statements inserted after Bonds *between molecules are weak.*  
*Molecular substances tend to have low melting and boiling points.*  
*Molecular substances do not conduct electricity.*

New content statements inserted after 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.*

**(d) Acids and alkalis**

**(ii) Common acids and alkalis**

*"in industry"* deleted from first content statement.

*Common household alkalis include ....soaps.*

Soaps deleted since many show a pH and are advertised as having a pH lower than 7 in the media.

**(iii) Neutralisation**

Alteration to *Alkalis neutralise acids (and vice versa) to form water and a salt.*

Note added – The emphasis is on the neutralisation of acids.

*When neutralised, hydrochloric acid forms chlorine salts, sulphuric acid forms sulphate salts and nitric acid forms nitrate salts.*

Note added. Candidates would be expected to name the salt produced when an acid is neutralised by an alkali.

*Metal carbonates neutralise acids producing water, a salt and carbon dioxide gas.*

Note added. Candidates would be expected to name the salt produced when an acid is neutralised by a metal carbonate.

**Unit 2      Everyday Chemistry**

**(a) Metals**

**(i) Uses**

Content statement changed. *Brass solder and 'stainless' steel are examples of alloys. Metals are alloyed to change their properties for specific uses.*

**(ii) Reactions**

Content statement changed.

*Reactions of metals with an acid produce hydrogen gas **and a salt.***

*Rust indicator can be used to show the extent of the rusting process*

Candidates would be expected to know that the deeper the blue colour the greater the degree of rusting.

Content statement changed.

*Salt increases the rate of corrosion. Replaces Salt spread on roads increases the rate of corrosion on car bodywork.*

**(iii) Corrosion**

Content statement relating to ‘anodising’ has been deleted.

Suggested activity “Demonstrate anodising and dye the oxide layer” was removed.

**(iv) Batteries**

Content statement amended to – *The lead-acid (car) battery is an example of a rechargeable battery.*

Content statement deleted - *The voltage between different pairs of metals varies.*

**(b) Personal needs**

**(ii) Clothing**

*Chemists have developed ways of treating fabrics to improve their properties.*

Note added to correspond with this – Candidates would be expected to know that flame-proofing, water-proofing and stain-proofing are ways of treating fabrics to improve their properties.

Suggested activity - *Investigate... fire-proofing* changed to read *Investigate the suitability of different solutions for flame-proofing.*

An extra suggested activity has been added – *Investigate the effect of water-proofing a fabric.*

Content statement removed – *Some fibres form strong bonds with water molecules: these fibres are hard to drip-dry but they do not feel ‘sweaty’ to wear because they soak up perspiration.*

Suggested activity – *Investigate the ability of fibres to drip-dry and to mop up a spillage (ITO)* moved to come under “*Investigate the strength of different fibres*”.

**(c) Fuels**

**(i) Fire**

Content statement removed - *Different methods are used in different situations.*

*Fire-fighting methods in the lab and the home include the use of a fire blanket, sand, water and carbon dioxide gas and foam.*

Candidates should be able to link the method used to how the fire is extinguished.

**(ii) Finite resources**

Existing content statements amended to read:

*Fossil fuels include coal, natural gas, oil and peat.*

*Coal and peat are formed from plant remains.*

*Oil is formed from remains of marine life.*

*The formation of fossil fuels occurs over a very long period of time.*

*The formation of fossil fuels...*

Notes added to read: *The process of formation of the fossil fuels is not required.*

**(ii) Renewable resources**

*Ethanol is obtained...*

Notes added to read: *Details of the fermentation process are covered in Unit 3.*

*Hydrogen, which can be obtained from water...*

Candidates would not be expected to know details of the electrolysis of water.

**(iv) Important processes**

*The uses of the 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.

*Content statement - The different fractions are used as different fuels* was deleted.

**(v) Pollution problems**

*The burning of some fuels releases sulphur dioxide...*

*Nitrogen and oxygen from the air...*

Content statement added - *Sulphur dioxide and nitrogen dioxide are the main causes of acid rain.*

*Lead compounds which are added to petrol...*

Content statements changed to *Lead free/unleaded petrol has been developed to reduce lead pollution.*

*Benzene fumes...*

Candidates would not be expected to know why benzene is added only that it is toxic.

*Air pollution from...*

Candidates would not be expected to show knowledge of the reactions taking place in a catalytic converter.

**(d) Plastics**

**(i) Uses**

*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 examples specified in the content statement.

**(ii) Advantages and disadvantages**

*For some uses plastics have advantages over...*

Candidates should be able to link advantages of plastics over natural materials to their uses and vice versa.

*Some degradable plastics...* the word *some* has been deleted.

*Some plastics burn or smoulder...*

Candidates would not be expected to know the names of other toxic gases. eg hydrogen cyanide and hydrogen chloride.

*With incineration....there are problems with emissions.*

Candidates would be expected to recognise that the problem with emissions is that the fumes could be toxic.

*Recycling can be difficult...*

Candidates would be expected to recognise that the difficulty is one of separation of the different kinds of plastics.

*The uses of thermosetting plastics*

Knowledge of specific plastics is not required.

**(iv) Making plastics**

The following content statements have been added: *The process of making a polymer...*

*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.*

**Unit 3 Chemistry and Life**

**(b) The effects of chemicals on the growth of plants**

**(ii) Fertilisers**

*The presence of large quantities of nitrates leaves the water lifeless.*

Candidates would not be expected to know details of the eutrophication process.

*Some plants such as clover beans... another content statement added below this.*

Plants which convert nitrogen from the air into nitrates can be used to increase soil fertility.

**(c) Food and diet**

**(i) Elements in the body**

*Minerals supply the body...* Knowledge of particular trace elements and their effect on the body is not required.

**a. Reactions of carbohydrates**

*Starch is a polymer...*

Candidates would not be expected to know details of the polymerisation.

*During digestion....*

Candidates would not be expected to know the details of the hydrolysis.

*Saturates are believed...*

The use of "saturates" and "polyunsaturates" does not imply that candidates should have any knowledge of structure but simply that these are terms used in the classification of fats and oils.

*Proteins are polymers made up of...*

Knowledge of the polymerisation process and the structures of amino acids are not required.

*In the body, animals make particular proteins for specific purposes.*

Candidates are not expected to know the names and functions of particular proteins.

**(vi) Fibre, vitamins and food additives**

*Lack of important vitamins can cause poor health*

Knowledge of specific health conditions is not required.

**(d) Drugs**

**(i) Alcohol**

*The alcohol produced by fermentation is called ethanol.* The following content statement has been inserted:

*The concentration of alcohol produced by fermentation is limited.*

Knowledge of the actual limit is not required.

**Chemistry Subject Update Letter (August 2004)**

**Intermediate 2 Chemistry**

**Depth of Treatment of the Content**

**Unit 1 Building Blocks**

**(a) Substances**

**(i) Elements**

*Elements are classified...*

Candidates would be expected to use the data booklet if asked to give specific examples of elements in particular classifications.

**(ii) Compounds and mixtures**

*Exothermic reactions release energy...*

The use of reaction profiles should be restricted to the identification of exothermic and endothermic reactions.

*Air is a mixture of gases.*

Candidates would be expected to know the approximate composition of air and that the gases in air include nitrogen, oxygen, carbon dioxide and noble gases.

**(b) Reaction rates**

**(i) Following the course of a reaction**

*The rate of a reaction, or stage in a reaction...*

Candidates would be expected to calculate the time taken for a reaction from rate information.

**(ii) Factors affecting rate**

*The collision theory can be used...*

The use of collision theory to explain the effect of temperature on reaction rate is not required.

**(iii) Catalysts**

*Heterogeneous catalysts work by....*

Reference to activation energy, collision geometry or bond weakening is not required.

*The surface activity of a catalyst...*

Candidates would be expected to have some understanding of active sites and that catalyst poisoning involves the blocking of these sites.

*Cars with catalytic converters only use 'lead-free' petrol to prevent poisoning of the catalyst.*

This content statement has been removed.

*Enzymes catalyse the...*

Knowledge of specific enzymes is not required.

*There are many everyday examples of uses of enzymes...*

Candidates would be expected to give an example of the use of an enzyme. Examples to include use in biological washing powders and in fermentation.

**(c) The structure of the atom**

**(iii) Isotopes**

*Relative atomic mass of an element...*

Candidates should be able to deduce the most abundant isotope given the mass numbers of the isotopes and the relative atomic mass of the element.

**(d) Bonding, structure and properties**

**(i) Bonding**

*Polar covalent bonds are formed when...*

No understanding of electronegativity or the use of electronegativity values is required.

*Positive ions are formed by...*

Candidates should be able to extend the use of nuclide notation to ions.

**(ii) Structure**

*Diagrams can be drawn to show the shape...*

Candidates should be able to draw the shapes of linear, bent, pyramidal and tetrahedral two-element molecules.

**(iii) Properties**

*Metals, ionic compounds and covalent...*

Content statement amended to read:

*Metals, ionic compounds and covalent network substances have high melting and boiling points due to the strong forces of attraction which need to be overcome.*

*Discrete covalent substances have....*

Content statement amended to read:

*Discrete covalent substances have low melting and boiling points due to the weak forces of attraction that need to be overcome.*

*Ionic compounds are usually soluble in water.*

Knowledge of lattice breaking versus hydration (solvation) energies is not required.

**(e) Chemical symbolism**

**(ii) Formulae: using Roman numerals and brackets**

*Formulae can be written for compounds using Roman...*

Content statement amended to read:

*Formulae can be written for compounds which include Roman numerals in their names, eg iron(III) chloride.*

*Formulae can be written for compounds requiring...*

Content statement amended to read:

*Formulae requiring brackets can be written for compounds, eg  $Mg(OH)_2$ .*

*Formulae requiring brackets...*

Candidates should be able to extend the use of brackets to writing formulae for compounds which include Roman numerals in their names, eg iron(III) hydroxide,  $Fe(OH)_3$ .

**Unit 2 Carbon Compounds**

**(a) Fuels**

**(i) Combustion**

*Air pollution from the combustion of hydrocarbons can be...*

Candidates would be expected to know that catalytic converters reduce emissions of nitrogen oxides, carbon monoxide and unburnt hydrocarbons.

**(b) Nomenclature and structural formulae**

**(i) Hydrocarbons**

New content statement inserted after *The alkanes are a subset...*

*The general formula for the alkanes is  $C_nH_{2n+2}$ .*

New content statement inserted after *The alkenes are a subset...*

*The general formula for the alkenes is  $C_nH_{2n}$ .*

New content statement inserted after *The cycloalkanes are a subset...*

*The general formula for the cycloalkanes is  $C_nH_{2n}$ .*

**(ii) Isomers**

*Isomers are compounds...*

'e' removed from 'formulae' so content statement reads:

*Isomers are compounds with the same molecular formula but different structural formulae.*

**(iii) Alkanols and alkanolic acids**

*Straight-chain alkanols can be named, incorporating...*

The classification of alkanols as primary or secondary is not required.

**(c) Reactions of carbon compounds**

**(i) Addition reactions**

*An alkene reacts with hydrogen...*

Candidates would be expected to name and draw the full structural formula of the alkane product.

*The reactions of an alkene with bromine...*

Candidates should be able to draw full structural formulae for possible products of the addition of bromine or water to an alkene.

**(iii) Ethanol**

New content statement inserted before *An enzyme in yeast...*

*Fermentation is the breakdown of glucose to form ethanol and carbon dioxide.*

The content statements: *Ethanol, for alcoholic drinks, can...* and *An enzyme in yeast acts...* have been interchanged.

*There is a limit to the ethanol...*

Candidates would be expected to know why there is a limit to the ethanol concentration of fermentation products.

**(a) Plastics and synthetic fibres**

**(i) Uses**

*Kevlar, which is very strong...*

Knowledge of the structures for Kevlar and poly(ethenol) is not required.

*The everyday uses of plastics....*

Candidates would be expected to be aware of a range of uses of plastics and should be able to link the uses of plastics to the examples specified in the content statements.

*For some uses, synthetic materials...*

Candidates should be able to link advantages of synthetic materials over natural materials to their uses and vice versa.

*Biopol is a recently...*

Knowledge of the structure for Biopol is not required.

*Some plastics burn or...*

Content statement amended to read:

*Some plastics burn or smoulder to give off toxic fumes, including carbon monoxide, hydrogen chloride and hydrogen cyanide.*

**(a) Natural products**

**(i) Carbohydrates**

New content statement inserted after *Carbohydrates form an...*

*Photosynthesis is the process by which plants make carbohydrates from carbon dioxide and water using light energy in the presence of chlorophyll; oxygen is released in the process.*

New content statement inserted after *Carbohydrates supply the...*

*Respiration is the process by which the body obtains a supply of energy by breaking down carbohydrates (using oxygen) to give carbon dioxide and water.*

*Carbohydrates are compounds which contain...*

Candidates would be expected to recognise a molecular formula as that for a carbohydrate but knowledge of molecular formulae for particular carbohydrates is not required.

*Body enzymes function best...*

Knowledge of the denaturing process is not required.

**(iii) Fats and oils**

*The hydrolysis of fats and...*

Candidates would be expected to know the structure for glycerol.

**Unit 3 Acids, Bases and Metals**

**(a) Acids and bases**

**(i) The pH scale**

*Acids and alkalis are in common use...*

Candidates would be expected to know that household acids include vinegar, lemonade, soda water and Coke and that household alkalis include baking soda, dishwashing powder and bleach.

*In water and neutral...*

Knowledge of actual concentrations of hydrogen and hydroxide ions in acids, neutral solutions and alkalis is not required.

**(iii) Strong and weak acids and bases**

*Equimolar solutions of strong and weak acids...*

A volumetric comparison of equimolar solutions of strong and weak acids is not required.

*Equimolar solutions of strong and weak bases...*

A volumetric comparison of equimolar solutions of strong and weak bases is not required.

**(b) Salt preparation**

**(i) Reactions of acids**

*An acid reacts with some metals to give off hydrogen gas.*

Candidates would be expected to know that only metals above hydrogen in the electrochemical series react with acids.

**(ii) Volumetric titrations**

*The concentration of acids/alkalis can...*

Candidates would also be expected to calculate the volumes of acids/alkalis required for neutralisation from titration data.

**(c) Metals**

**(i) The electrochemical series**

*Electricity can be produced in a cell...*

Candidates would be expected to know that the further apart metals are in the electrochemical series the higher is the voltage produced by a cell.

**(iii) Reactions of metals**

*Metals react with oxygen, water...*

Candidates would be expected to use the electrochemical series as a guide and to know that metals below copper would not react with oxygen, metals below magnesium would not react with water and metals below hydrogen would not react with dilute acid.

**(iv) Metal ores**

*The less reactive metals, including...*

Candidates would be expected to know that extracting metals from their ores is an example of reduction.

*Some metals can be obtained from....*

Candidates should be able to suggest the method used to extract a metal from its ore by considering the position of the metal in the electrochemical series.

*The production of carbon monoxide and...*

Content statement amended to read:

*The production of carbon monoxide and the reduction of iron oxide are key reactions which take place in the Blast Furnace.*

Candidates would be expected to know the two reactions involved in the production of carbon monoxide.

**(v) Corrosion**

*Corrosion is a chemical reaction which...*

Candidates would be expected to know that corrosion is an example of oxidation.

*Different metals corrode...*

Candidates would be expected to link the rate of corrosion of a metal to the reactivity of the metal.

New content statement inserted after *Ferroxyl indicator can be...*

*Ferroxyl indicator turns blue in the presence of iron(II) ions and pink in the presence of hydroxide ions.*

*Acid rain increases the rate...*

Candidates would be expected to be able to explain why acid rain/salt increases the rate of corrosion.

*Salt spread on roads increases...*

Content statement amended to read:

*Salt increases the rate of corrosion.*