

-SQA- SCOTTISH QUALIFICATIONS AUTHORITY

NATIONAL CERTIFICATE MODULE: UNIT SPECIFICATION

GENERAL INFORMATION

-Module Number-	3181213	-Session-1993-94
-Superclass-	RD	
-Title-	INTRODUCTION TO CHEMISTRY	

-DESCRIPTION-

GENERAL COMPETENCE FOR UNIT: Applying the concept of a chemical reaction in a variety of situations, the concept of structure and bonding to a variety of substances, the concept of neutralisation as well as relating atomic structure to the Periodic Table.

OUTCOMES

1. apply the concept of a chemical reaction in a variety of situations;
2. relate the structure of atoms to the Periodic Table;
3. apply the concept of structure and bonding to a variety of substances;
4. apply the concept of neutralisation.

CREDIT VALUE: 1 NC Credit

ACCESS STATEMENT: There is no access statement for this module.

For further information contact: Committee and Administration Unit, SQA, Hanover House, 24 Douglas Street, Glasgow G2 7NQ.

This specification is distributed free to all approved centres. Additional copies may be purchased from SQA (Sales and Despatch section) at a cost of £1.50 (minimum order £5).

NATIONAL CERTIFICATE MODULE: UNIT SPECIFICATION**STATEMENT OF STANDARDS****UNIT NUMBER:** 3181213**UNIT TITLE:** INTRODUCTION TO CHEMISTRY

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

OUTCOME 1. APPLY THE CONCEPT OF A CHEMICAL REACTION IN A VARIETY OF SITUATIONS

PERFORMANCE CRITERIA

- (a) The identification of a chemical change from a given set of observed changes is correct.
- (b) The prediction of the effect of a change in a given reaction condition on the rate of a reaction is correct.

RANGE STATEMENT

Reaction conditions: temperature; concentration, particle size.

EVIDENCE REQUIREMENTS

Written evidence of the ability to identify a chemical change. The candidate must be presented on one single occasion with 5 different descriptions of changes and must identify which are chemical.

The candidate must give written evidence on one single occasion of the prediction of the effect of a change in a given reaction condition covering the range of conditions.

An appropriate performance level must be used when judging sufficiency of evidence. (Refer to assessment procedures within support notes).

OUTCOME 2. RELATE THE STRUCTURE OF ATOMS TO THE PERIODIC TABLE

- (a) The descriptions of the position, mass and charge of the electrons, protons and neutrons in an atom are correct.
- (b) The prediction of the position of an element in the periodic table given its electron arrangement is correct.
- (c) The description of the properties of an element from each of groups 1, 7 and 0 specified in terms of its electron arrangement is correct.

RANGE STATEMENT

The range statement for this outcome is specified within the performance criteria.

EVIDENCE REQUIREMENTS

Written evidence of the ability to provide descriptions of the position, mass and charge of electrons, protons and neutrons in an atom, the prediction of the position of an element in the periodic table, and a description of the properties of an element from each of groups 1, 7 and 0 as specified above.

Performance Criterion (b) must be demonstrated at least 5 times on one occasion. Performance Criterion (c) must be demonstrated for an element from each group specified. For Performance Criteria (b) and (c) no data booklet is to be used.

An appropriate performance level must be used when judging sufficiency of evidence. (refer to assessment procedures within support notes).

OUTCOME 3. APPLY THE CONCEPT OF STRUCTURE AND BONDING TO A VARIETY OF SUBSTANCES**PERFORMANCE CRITERIA**

- (a) The description of the bonding in covalent and ionic substances is accurate in terms of electrons.
- (b) The classification of a specified element is correct with respect to single atoms, covalent molecules, covalent network or metals.
- (c) The categorisation of a specified compound as being covalent or ionic given its properties is correct.
- (d) The formula derived for a given substance containing up to 3 elements is correct.

RANGE STATEMENT

The range statement for this outcome is specified within the performance criteria.

EVIDENCE REQUIREMENTS

Written evidence of the ability to describe bonding in covalent and ionic substances, classify a specified element, categorise a compound as being covalent or ionic and derive a formula as specified above.

Performance Criterion (c) should be demonstrated 5 times on one occasion. At least 2 properties should be given for each compound, and must not be the same for each question.

An appropriate performance level must be used when judging sufficiency of evidence. (refer to assessment procedures within support notes).

OUTCOME 4. APPLY THE CONCEPT OF NEUTRALISATION**PERFORMANCE CRITERIA**

- (a) The prediction of the effect on pH of the addition of a given substance to water is correct.
- (b) The explanation of the pH changes occurring during a given neutralisation is correct in terms of the relative concentration of H^+ or OH^- ions.
- (c) The word equation for the reaction of a specified acid with a given substance is correct.

RANGE STATEMENT

Substances: common acids; common alkalis; soluble acid oxides; soluble and insoluble basic oxides.

Reactions: acids with metals; basic oxides; alkalis and carbonates.

EVIDENCE REQUIREMENTS

Written evidence of the ability to predict the effect on pH of the addition of a given substance to water covering the range of substances.

Written evidence of the ability to provide an explanation of the pH changes occurring during a given neutralisation and a word equation for the reaction of a specified acid with a given substance.

An appropriate performance level must be used when judging sufficiency of evidence. (refer to assessment procedures within support notes).

ASSESSMENT RECORDS

In order to achieve this unit, candidates are required to present sufficient evidence that they have met all the performance criteria for each outcome within the range specified. Details of these requirements are given for each outcome. The assessment instruments used should follow the general guidance offered by the SQA assessment model and an integrative approach to assessment is encouraged. (See references at the end of support notes).

Accurate records should be made of assessment instruments used showing how evidence is generated for each outcome and giving marking schemes and/or checklists, etc. Records of candidates' achievements should be kept. These records will be available for external verification.

SPECIAL NEEDS

In certain cases, modified outcomes and range statements can be proposed for certification. See references at end of Support Notes.

© Copyright SQA 1993

Please note that this publication may be reproduced in whole or in part for educational purposes provided that:

- (i) no profit is derived from the reproduction;
- (ii) if reproduced in part, the source is acknowledged.

NATIONAL CERTIFICATE MODULE: UNIT SPECIFICATION**SUPPORT NOTES****UNIT NUMBER** 3181213**UNIT TITLE** INTRODUCTION TO CHEMISTRY

SUPPORT NOTES: This part of the unit specification is offered as guidance. None of the sections of the support notes is mandatory.

NOTIONAL DESIGN LENGTH: SQA allocates a notional design length to a unit on the basis of time estimated for achievement of the stated standards by a candidate whose starting point is as described in the access statement. The notional design length for this unit is 40 hours. The use of notional design length for programme design and timetabling is advisory only.

PURPOSE This module is designed to introduce the candidate to some of the basic concepts of chemistry. It is suitable for candidates in a wide range of vocational areas. It could be integrated with other National Certificate provision or used as a stand alone module.

SQA publishes summaries of NC units for easy reference, publicity purposes, centre handbooks, etc. The summary statement for this unit is as follows:

This module will enable you to apply the concepts of chemical reactions in a variety of situations, apply structure and bonding to a variety of substances and the concept of acidity to a variety of reactions. You will also learn how to relate the structure of atoms to the Periodic Table.

CONTENT/CONTEXT Safety regulations and safe working practices and procedures should be observed at all times.

Corresponding to Outcomes 1-4:

1. Identification of a chemical reaction by change in appearance detectable energy change or formation of new substances; examples of important reactions. The effect of particle size, concentration, temperature and catalyst on reaction rate; examples in everyday life; examples of catalysts; interpretation of data on the change in a quantity with respect to time in terms of rate; control variables in such investigations.
2. Classifications of elements in a variety of ways; Periodic Table; use of the terms - period and group; similarity of properties within groups; identification of main group elements, halogens, alkali metals, noble gases and outline of main properties; atoms as building blocks of elements; location, charge and mass of proton, electron and neutron; atomic numbers; electrons in energy levels; electron arrangement and position in the Periodic Table; elements and symbols; isotopes; atomic number and mass number; nuclide notation.

3. Ions as atoms having gained or lost electrons; bonding in elements - monatomic, covalent, metallic; properties of elements related to bonding; bonding in terms of sharing or transfer of electron; electron arrangement of ions; ion migration; colour of ions; explanation of conduction of electricity in elements and solutions or melts of ionic compounds; differences between mixtures and compounds; naming compounds using "ide" and "ite" or "ate" rule; writing correct formulae from molecular pictures or models; writing formulae using Data Book; use of brackets and ion charges; use of Roman numerals in formulae and names including prefixes "mono", "di", "tri", etc.
4. Soluble non-metal oxides as acids; soluble metal oxides as alkalis; insoluble metal oxides as bases; acid rain; pH; ions present in acidic and alkaline solutions; concentrations of H^+ and OH^- equal in neutral solutions; effect of dilution on pH; neutralisation; naming salts; precipitation of insoluble salts; reactions of acids with metals, metal oxides, metal hydroxides, metal carbonates; definition of acids and bases; titration.

APPROACHES TO GENERATING EVIDENCE During the work of the module candidates should have several opportunities to develop their practical and problem-solving skills. Each candidate should be assessed at appropriate points throughout the module. Where a candidate is unsuccessful in achieving an outcome, provision should be made for remediation and reassessment.

Laboratory practical work is likely to play a significant part in this module. Candidate practical work to illustrate reactions and properties of elements and compounds could apply to the outcomes.

Each performance criterion may be assessed separately.

Safety considerations should be observed at all times.

A candidate-centred, resource-based approach is likely to be the most flexible for this module. The outcomes from this and other Stage 1 Chemistry modules can be integrated so that concepts can be developed throughout the programme.

Selection of data, tabulating and drawing conclusions are examples of a problem-solving approach which is appropriate for establishing the concepts involved in elements, compounds, bonding and the Periodic Table. Reinforcement and remediation could be accomplished through commercially available computer software packages.

Tutor exposition and demonstration may be required for consolidation of the outcomes.

ASSESSMENT PROCEDURES Centres may use the Instrument of Assessment which are considered by tutors/trainers to be the most appropriate. Examples of Instruments of Assessment which could be used are as follows:

Outcome 1: It is recommended that for Performance Criterion (a) 5 objective questions are set to provide the necessary evidence requirements. 3 objective questions should be set for Performance Criterion (b) to assess the given range. Thus an appropriate performance evidence will be the full and correct completion of all 8 of the objective questions.

Outcome 2: 11 objective questions could be used here. The questions could be allocated as follows:

PC	(a)	position, mass and charge for each of:	
		electron	1
		neutron	1
		proton	1
PC	(b)	position of elements	5
PC	(c)	properties of elements 2 properties for each element from a given list of properties.	3

An appropriate performance level would be the full and correct completion of the 11 objective questions.

Several types of objective questions may be appropriate for the above assessments.

Outcome 3 It is recommended that objective and restricted responses questions are used here.

The questions could be allocated as follows:

PC	(a)	covalent	1 restricted response
		ionic	1 restricted response
PC	(b)		5 objective questions including at least 1 for each type
PC	(c)		at least 2 properties for each compound. These should not be the same for each question. 5 Objective questions

PC (d) at least 3 formulae
should include
3 elements
5 objective questions

An appropriate performance level for this outcome would be the full and correct completion of the questions for PC's (a), (b) and (c) and 4 correct responses from 5 for PC (d).

Outcome 4 Objective and Restricted Response questions should be set for this outcome.

The objective questions should be allocated as follows:

PC (a) effect on pH: - 10
given substances to include
a range from common acids,
acidic oxides, soluble and
non-soluble bases.

PC (c) word equations: - 4
named substances to include
metal, metal oxide, metal
hydroxide, metal carbonate.

Several types of objective questions may be appropriate for the above assessments. It is suggested that a completion question using a grid could be used for (a) and short answer questions could be used for (c).

The 1 restricted response question should be allocated to Performance Criterion (b). The candidate will be required to explain the pH changes occurring during neutralisation of acid by alkali or neutralisation of alkali by acid.

An appropriate performance level for the Outcome will be demonstrated by the candidate achieving at least 8 correct responses for (a), the correct response for (b) and 4 correct responses for (c).

PROGRESSION Candidates may progress onto other Stage 1 Chemistry modules.

RECOGNITION Many SQA NC units are recognised for entry/recruitment purposes. For up-to-date information see the SQA guide 'Recognised and Recommended Groupings'.

REFERENCES

1. Guidelines for Module Writers.
2. SQA's National Standards for Assessment and Verification.
3. For a fuller discussion on assessment issues, please refer to SQA's Guide to Assessment.
4. Procedures for special needs statements are set out in SQA's guide 'Students with Special Needs'.

© Copyright SQA 1993

Please note that this publication may be reproduced in whole or in part for educational purposes provided that:

- (i) no profit is derived from the reproduction;
- (ii) if reproduced in part, the source is acknowledged.