

## National Unit Specification: general information

<b>UNIT</b>	Energy Matters (Higher)
<b>NUMBER</b>	D069 12
<b>COURSE</b>	Chemistry (Higher)

### SUMMARY

The unit seeks to develop knowledge and understanding, problem solving and practical abilities in the context of reaction rates; enthalpy; patterns in the Periodic Table; bonding, structure and properties; and the mole.

### OUTCOMES

- 1 Demonstrate knowledge and understanding related to *Energy Matters*.
- 2 Solve problems related to *Energy Matters*.
- 3 Collect and analyse information related to *Higher Chemistry* obtained by experiment.

### RECOMMENDED ENTRY

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

- Standard Grade Chemistry at Grades 1 and 2
- the Intermediate 2 Chemistry course or its component units

together with

- Standard Grade Mathematics at Grades 1 and 2 or Intermediate 2 Mathematics.

(The preferred entry level from Standard Grade is based on achievement in the Knowledge and Understanding and Problem Solving elements.)

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### Administrative Information

<b>Superclass:</b>	RD
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## **National Unit Specification: general information (cont)**

**UNIT** Energy Matters (Higher)

### **CREDIT VALUE**

1 credit at Higher.

### **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, 2001).

## National Unit Specification: statement of standards

### UNIT Energy Matters (Higher)

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 *Energy Matters*.

##### Performance criteria

- (a) Knowledge and understanding of reaction rates is clearly shown in appropriate ways.
- (b) Knowledge and understanding of enthalpy is clearly shown in appropriate ways.
- (c) Knowledge and understanding of patterns in the Periodic Table is clearly shown in appropriate ways.
- (d) Knowledge and understanding of bonding, structure and properties is clearly shown in appropriate ways.
- (e) Knowledge and understanding of the mole is 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 reaction rates*

- (i) Following the course of a reaction
- (ii) Factors affecting rate
- (iii) The idea of excess
- (iv) Catalysts

##### *Knowledge and understanding of enthalpy*

- (i) Potential energy diagrams
- (ii) Enthalpy changes

##### *Knowledge and understanding of patterns in the Periodic Table*

Further detail not needed

##### *Knowledge and understanding of bonding, structure and properties*

- (i) Types of bonding
- (ii) Intermolecular forces of attraction
- (iii) Structure
- (iv) Properties

##### *Knowledge and understanding of the mole*

- (i) The Avogadro Constant
- (ii) Molar volume
- (iii) Reacting volumes

## National Unit Specification: statement of standards (cont)

### UNIT Energy Matters (Higher)

#### OUTCOME 2

Solve problems related to *Energy Matters*.

##### Performance criteria

- (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.
- (e) Predictions and generalisations made are based on available evidence.

**Note:** The lettering system for PCs is common to all units in the Higher Chemistry course. Not all of the PCs feature in all of the units. For example, PC (a) 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 of the above performance criteria.

#### OUTCOME 3

Collect and analyse information related to *Higher 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) Recorded experimental information is analysed and presented in an appropriate format.
- (e) 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 concentration changes on reaction rate
- the effect of temperature changes on reaction rate
- enthalpy of combustion.

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, some of which must be unfamiliar; 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 (d) must be in the format of a table or graph(s) as appropriate. Conclusions drawn should be justified by reference to supporting 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.

## National Unit Specification: support notes

### UNIT Energy Matters (Higher)

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 THE 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 LEARNING AND TEACHING 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.

## National Unit Specification: support notes (cont)

### UNIT Energy Matters (Higher)

- 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) Readings or observations (raw data) should be analysed/presented using the following, as appropriate:
- a table with suitable headings and units
  - a table with ascending or descending independent variable
  - a table showing appropriate computations
  - a correct calculation
  - a graph with independent and dependent variables plotted on horizontal and vertical axes respectively
  - a graph with suitable scales and axes labelled with quantities and units
  - a graph with data correctly plotted with a line or curve of best fit.
- e) Conclusions should contain, as appropriate:
- the overall pattern to readings
  - the trends in analysed information or results
  - the connection between variables
  - an analysis of the observations
  - the findings from completed calculations.

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.

## **National Unit Specification: support notes (cont)**

### **UNIT Energy Matters (Higher)**

#### **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 and to make decisions about appropriate scales and labels on graph axes.

#### **Transfer of evidence**

Candidates may transfer evidence of Outcome 3 from Unit 1 (Energy Matters) of Higher to Unit 1 (Building Blocks) of Intermediate 2 in respect of the prescribed practical activities 'The Effect of Concentration Changes on Reaction Rate' and 'The Effect of Temperature Changes on Reaction Rate'. The prescribed practical activity 'Enthalpy of Combustion' (Higher) cannot be transferred since it is not in the context of any unit of Intermediate 2.

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).