

National Unit Specification: general information

UNIT Radioactivity (Intermediate 2)

NUMBER D382 11

COURSE Physics (Intermediate 2)

SUMMARY

The unit seeks to develop the candidate's knowledge and understanding of the basic concepts and principles related to radioactivity. The unit also provides an opportunity for developing the ability to apply these concepts and principles in the analysis of a wide variety of applications.

OUTCOMES

- 1 Demonstrate knowledge and understanding related to radioactivity.
- 2 Solve problems related to radioactivity.
- 3 Collect and analyse information related to Intermediate 2 Physics obtained by experiment.

RECOMMENDED ENTRY

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

- Standard Grade Physics with Knowledge and Understanding and Problem Solving at grade 3 or 4
- or**
- Standard Grade Biology, Chemistry or Science with Knowledge and Understanding and Problem Solving at grade 1, 2 or 3
- or**
- Intermediate 1 Physics
- and**
- Standard Grade Mathematics at grade 3 or 4 **or** Intermediate 1 Mathematics

CREDIT VALUE

0.5 credit at Intermediate 2.

Administrative Information

Superclass: RC

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National Unit Specification: general information (cont)

UNIT Radioactivity (Intermediate 2)

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 Radioactivity (Intermediate 2)

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 radioactivity.

Performance criteria

- (a) Quantities and their units are used correctly in relation to radioactivity.
- (b) Relationships and mathematical techniques are used correctly in relation to radioactivity.
- (c) Principles are used correctly in relation to radioactivity.
- (d) Models are described correctly in relation to radioactivity.

Evidence requirements

Evidence of an appropriate level of achievement must be generated from a closed book test with items covering all the above performance criteria. The test must sample the Content Statements, given in the National Course Specification: course details, in each of the following areas:

- Ionising radiations
- Dosimetry
- Half life and safety
- Nuclear reactors.

OUTCOME 2

Solve problems related to radioactivity.

Performance criteria

- (a) Relevant information is selected and presented appropriately.
- (b) Information is accurately processed using calculations where appropriate.
- (c) Conclusions drawn are valid, and explanations given are supported by evidence.

Evidence requirements

Evidence of an appropriate level of achievement must be generated from a closed book test with items covering all the above performance criteria. The test must sample the areas shown below.

- Ionising radiations
- Dosimetry
- Half life and safety
- Nuclear reactors.

National Unit Specification: statement of standards (cont)

UNIT Radioactivity (Intermediate 2)

OUTCOME 3

Collect and analyse information related to Intermediate 2 Physics obtained by experiment or radioactivity simulation.

Performance criteria

- (a) The information is collected by active participation in the experiment or radioactivity simulation.
- (b) The experimental procedures are described accurately.
- (c) Relevant measurements and observations are recorded in an appropriate format.
- (d) Recorded information is analysed and presented in an appropriate format.
- (e) Conclusions drawn are valid.
- (f) The experimental procedures are evaluated with supporting argument.

Evidence requirements

A report of one experimental activity related to Intermediate 2 Physics covering all of the above performance criteria is required. Evidence submitted in support of attainment of PC (d) must be in the format of a table or graph as appropriate. The report must be the individual work of the candidate and must be based on either an experiment, or a suitable radioactivity simulation, in which the candidate has been involved. Depending on the activity, the collection of the information may be through group work.

An Outcome 3 report of practical work in the Intermediate 2 unit, D379 11 Mechanics and Heat or D380 11 Electricity and Electronics or D381 11 Waves and Optics may be used as evidence of the achievement of Outcome 3 of this unit.

As simulation is permitted in the assessment of Outcome 3 of this unit, a report of practical work in this unit may not be used as evidence of the achievement of Outcome 3 in any other Intermediate 2 Physics Unit.

National Unit Specification: support notes

UNIT Radioactivity (Intermediate 2)

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 20 hours.

GUIDANCE ON CONTENT AND CONTEXT FOR THIS UNIT

The content and suggested contexts, applications, illustrations and activities for this unit are given in the National Course Specification: course details. The subheadings in the tables in the course details correspond to the areas mentioned in the evidence requirements for Outcome 1 and Outcome 2. The practical activities chosen for Outcome 3 must relate to the content of Intermediate 2 Physics and must allow opportunity for all the performance criteria for this outcome to be demonstrated within any single report.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

The learning and teaching of this unit are most effective when the concepts, principles and theories are set in a relevant context, eg by making reference to applications of physics and to real-world situations. Suitable approaches to learning and teaching are detailed in the National Course Specification.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Outcomes 1 and 2

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

Outcome 3

The teacher/lecturer should ensure that the experimental activity to be undertaken in connection with the assessment of Outcome 3 is at an appropriate level of demand. The experimental activity must relate to the content of Intermediate 2 Physics and candidates should be made aware of the range of skills that must be demonstrated to ensure attainment of Outcome 3.

Due attention to safety requirements and age limitations with regard to the use of radioactive sources is necessary for any experimental work in radioactivity. Thus, simulations and videos on radioactivity are acceptable for this unit. As simulation is permitted in the assessment of Outcome 3 of this unit a report of practical work in this unit may not be used as evidence of the achievement of Outcome 3 in any other Intermediate 2 Physics Unit.

National Unit Specification: support notes (cont)

UNIT Radioactivity (Intermediate 2)

In relation to PC (a), where actual experimental work is undertaken, the teacher/lecturer should check by direct observation that the candidate participates in the collection the experimental information by playing an active part in the experiment.

Alternatively, the candidate could collect experimental information on radioactivity by:

- participating in a simulation
- watching a video of an experiment.

In relation to PCs (b) to (f) the following provides an indication of what may be included in a candidate's report.

PC (b)

Many experiments will follow a given procedure or method hence there is no need for a detailed description. The procedure may be described briefly in outline. The impersonal passive voice should be encouraged. The following should be included, as appropriate:

- aim of the experiment
- a labelled diagram, description of apparatus, instruments used
- how the independent variable was altered
- how measurements were taken or observations made.

PC (c)

Readings or observation should be recorded in a clear table. The table must include:

- correct headings
- appropriate units
- correctly entered readings/observations.

PC (d).

Readings should be analysed and 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 graph with independent and dependent variables plotted
- a graph with suitable scales and axes labelled with quantities and units
- a graph with data correctly plotted with a line or a curve of best fit.

PC (e)

Conclusions should contain, as appropriate, a statement relating to:

- overall pattern to readings or observations
- trends in analysed information or results
- connection between variables
- measurement of a physical quantity.

National Unit Specification: support notes (cont)

UNIT Radioactivity (Intermediate 2)

PC (f)

The experimental procedures should be evaluated with supporting argument by including a few brief sentences, as appropriate, commenting on:

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

The references under each performance criterion give an indication of what should be provided as evidence in order to achieve the criterion. The relevance of these will vary according to the experiment. These references are intended to assist the teacher/lecturer in making a judgement of the candidate's achievement against the performance criteria. It is appropriate to support candidates in producing their reports. Re-drafting 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.

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).