

## National Unit Specification: general information

**UNIT** Waves and Optics (Intermediate 2)

**NUMBER** D381 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 waves and optics. 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 waves and optics.
- 2 Solve problems related to waves and optics.
- 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

**Publication date:** June 2002

**Source:** Scottish Qualifications Authority

**Version:** 04

© Scottish Qualifications Authority 2002

This publication may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged.

Additional copies of this unit specification can be purchased from the Scottish Qualifications Authority. The cost for each unit specification is £2.50 (minimum order £5).

## **National Unit Specification: general information (cont)**

**UNIT**      Waves and Optics (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**      Waves and Optics (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 waves and optics.

##### **Performance criteria**

- (a) Quantities and their units are used correctly in relation to waves and optics.
- (b) Relationships and mathematical techniques are used correctly in relation to waves and optics.
- (c) Principles are used correctly in relation to waves and optics.

##### **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:

- Waves
- Reflection
- Refraction.

#### **OUTCOME 2**

Solve problems related to waves and optics.

##### **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.

- Waves
- Reflection
- Refraction.

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

### **UNIT**      Waves and Optics (Intermediate 2)

#### **OUTCOME 3**

Collect and analyse information related to Intermediate 2 Physics 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 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 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 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 in planning the experiment; deciding how it is to be managed; identifying and obtaining resources, some of which must be unfamiliar; carrying out the experiment. The report must be the individual work of the candidate and must be based on an experiment 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 this unit may be used as evidence of the achievement of Outcome 3 of the Intermediate 2 Physics units D379 11 Mechanics and Heat, D380 11 Electricity and Electronics and D382 11 Radioactivity. An Outcome 3 report of practical work in the Intermediate 2 Physics unit D379 11 Mechanics and Heat or D380 11 Electricity and Electronics 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 the unit D382 11 Radioactivity, a report of practical work in that unit may not be used as evidence of the achievement of Outcome 3 in this unit.

## **National Unit Specification: support notes**

### **UNIT       Waves and Optics (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 the 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 achieved 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 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 affords opportunity for the candidate to demonstrate the ability to undertake the planning and organising of an experimental activity at an appropriate level of demand. The activity must relate to the content of Intermediate 2 Physics and candidates should be made aware of the range of skills which must be demonstrated to ensure attainment of Outcome 3.

In relation to PC (a), the teacher/lecturer should check by observation that the candidate participates in the collection of the experimental information by playing an active part in planning the experiment, deciding how it will be managed, identifying and obtaining resources (some of which must be unfamiliar to the candidate) and carrying out the experiment.

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

## National Unit Specification: support notes (cont)

### UNIT Waves and Optics (Intermediate 2)

#### 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.

#### 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

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

### **UNIT**      Waves and Optics (Intermediate 2)

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 give limited support to 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).