SCOTTISH QUALIFICATIONS AUTHORITY

National Unit Specification: general information

UNIT Movement (Access 3)

NUMBER D377 09

CLUSTER Physics (Access 3)

SUMMARY

The unit seeks to develop the candidate's knowledge and understanding of simple concepts and facts related to movement. It also provides an opportunity for developing the ability to apply this knowledge and understanding in the handling and analysis of information related to movement.

OUTCOMES

1. Handle information related to movement.
2. Collect and analyse information related to Access 3 Physics obtained by experiment.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates will normally be expected to have attained appropriate Access 2 units.

CREDIT VALUE

0.5 credit at Access 3.

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).

Administrative Information

Superclass: RC

Publication date: June 2002

Source: Scottish Qualifications Authority

Version: 03

National Unit Specification: statement of standards

UNIT Movement (Access 3)

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

Handle information related to movement.

Performance criteria

(a) Quantities and their units are used correctly in relation to movement.
(b) Facts are used correctly in relation to movement.
(c) Relevant information is selected and presented appropriately.
(d) 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 Content Statements in each of the following areas:

- Forces
- Speed and acceleration
- Moving objects.

OUTCOME 2

Collect and analyse information related to Access 3 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.

Evidence requirements

A completed report, based on a given structure, of one experimental activity related to Access 3 Physics covering the above performance criteria is required. Evidence submitted in support of attainment of PC (d) must be in the form 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; selecting resources; carrying out the experiment. Depending on the activity, the collection of the information may be through group work.

An Outcome 3 report of practical work in the Access 3 Physics unit D374 09 Practical Electricity or D376 09 Sound and Music may be used as evidence of achievement of Outcome 3 of this unit. An Outcome 3 report of practical work in this unit may be used as evidence of achievement of Outcome 3 of the Access 3 Physics units D374 09 Practical Electricity and D376 09 Sound and Music.

National Unit Specification: support notes

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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 on the following pages. The subheadings in the tables correspond to the areas mentioned in the evidence requirements for Outcome 1. The practical activities chosen for Outcome 2 must relate to the content of Access 3 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. The use of the suggested contexts, applications, illustrations and activities is recommended. It is suggested that emphasis is given to practical activities and the associated knowledge and understanding are developed during these activities. Practical activities also provide opportunities to develop a wide range of skills associated with scientific enquiry.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Outcome 1

This outcome is assessed by an end of unit test with questions covering all of the associated performance criteria. Each question can assess achievement of a number of performance criteria. Assessment items are available from the National Assessment Bank.

Outcome 2

The teacher/lecturer should ensure that the experimental activity to be undertaken in connection with the assessment of Outcome 2 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 Access 3 Physics and candidates should be made aware of the range of skills which must be demonstrated to ensure attainment of Outcome 2. Candidates should be provided with an outline structure of a report.

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 the experiment, deciding how it will be managed, selecting resources and carrying out the experiment.

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

National Unit Specification: support notes (cont)

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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 observations 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
- a bar chart.

PC (e)
Conclusions should contain, as appropriate, a statement relating to:

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

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).

National Unit Specification: support notes (cont)

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The Content Statements given in the left-hand column of the table below describe in detail what the candidate should be able to do in demonstrating knowledge and understanding associated with Movement.

The right-hand column gives suggested contexts, applications, illustrations and activities associated with the Content Statements.

CONTENT STATEMENTS	CONTEXTS, APPLICATIONS, ILLUSTRATIONS AND ACTIVITIES
5.1 Forces	
1 Describe how to use a newton balance to measure force.	Investigate the effect of forces on an object.
2 State that weight is a force and is the Earth's pull on an object.	Use newton balance to lift and pull different objects.
3 Calculate weight using: *weight = 10 × mass*.	Find force needed to lift known masses and use results to show that the ratio of weight to mass is 10 newtons per kilogram.
4 State that the force of friction can oppose the motion of an object.	Investigate which type of surface has the best 'grip'.
5 Describe one way in which the force of friction can be increased.	
6 Describe one way in which the force of friction can be decreased.	Experiments on 'removing' friction. Lubrication, car tyres, brakes, road conditions, sports shoes.
7 State that streamlining reduces the effect of air friction on an object.	Investigate the effect of the shape of an object on reducing friction.
8 Describe two features of a car which improve streamlining.	
9 State that equal forces acting in opposite directions on an object are called balanced forces.	Tug-of-war, aircraft in flight, skydiver.
10 Identify situations where the forces acting on an object are (a) balanced (b) not balanced.	
11 State that when the forces acting on an object are balanced the movement of the object does not change.	Qualitative only – calculations are not required. Stationary objects and objects moving at constant speed in a straight line
12 State that when the forces acting on an object are not balanced the speed and/or direction of movement of the object changes.	Qualitative only – calculations are not required. Objects changing speed and objects changing direction.

National Unit Specification: support notes (cont)

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CONTENT STATEMENTS	CONTEXTS, APPLICATIONS, ILLUSTRATIONS AND ACTIVITIES
5.2 Speed and acceleration	
1 Describe how to measure average speed.	Measure average speeds for everyday moving objects, eg car, student, bicycle. Average speeds for car, train and bus journeys.
2 Calculate average speed using: $\textit{average speed} = \frac{\textit{distance}}{\textit{time}}$.	Average speeds for different athletic events.
3 Describe the term 'acceleration'.	Information on performance figures for cars.
5.3 Moving objects	
1 Describe how the effect of a collision increases with the mass and speed of the objects involved.	Observe collisions between objects – vary mass and speed. Linear air track experiments. Car collisions, rugby players. Observe motion in Newton's cradle.
2 State that the change in speed of an object increases with: (a) the size of the force acting (b) the time the force acts.	Investigate the effect of force and contact time on a ball. Racquet sports, hockey, cricket, etc.
3 State that the range of a ball thrown at an angle is affected by: (a) the speed of the throw (b) the angle of the throw.	Investigate the factors affecting the range of a ball thrown at an angle.
4 State that the height a ball rebounds on hitting a surface is affected by: (a) the speed on impact (b) the material of the surface (c) the material of the ball.	Investigate the factors affecting the rebound height of a ball.