

National Unit Specification: general information

UNIT Sound and Music (Access 3)

NUMBER D376 09

CLUSTER Physics (Access 3)

SUMMARY

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

OUTCOMES

1. Handle information related to sound and music.
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

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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: statement of standards

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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 sound and music.

Performance criteria

- (a) Quantities and their units are used correctly in relation to sound and music.
- (b) Facts are used correctly in relation to sound and music.
- (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:

- Sound waves
- Speed of sound
- Using sound
- Amplified sound.

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 D377 09 Movement 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 D377 09 Movement.

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 planning 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.

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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 Sound and Music.

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

CONTENT STATEMENTS	CONTEXTS, APPLICATIONS, ILLUSTRATIONS AND ACTIVITIES
<p>4.1 Sound waves</p> <ol style="list-style-type: none"> 1 State that for sound to be produced an object must vibrate. 2 State that sound is a wave which transfers energy. 3 State that the frequency of a sound is the number of waves produced in one second. 4 State that frequency is measured in hertz. 5 State that the higher the pitch of a sound the larger the frequency. 6 Identify from oscilloscope traces the signal which would produce: <ol style="list-style-type: none"> (a) the louder sound (b) the higher frequency. 7 Describe how the frequency produced by a vibrating string can be increased by shortening the length of the string and increasing the tightness of the string. 8 Describe how the frequency produced by a vibrating air column can be increased by shortening the length of the air column. <p>4.2 Speed of sound</p> <ol style="list-style-type: none"> 1 Give an example which shows that the speed of sound in air is less than the speed of light in air. 2 Describe a method for measuring the speed of sound in air using the relationship between distance, time and speed. 3 Calculate the speed of sound using: $speed = \frac{distance}{time}$. 	<p>Investigate various sounding objects. Musical instruments, speech, loudspeaker. Use oscilloscope to compare frequencies.</p> <p>Use signal generator and oscilloscope to investigate frequency, amplitude and loudness effects. Slinky. Drums and cymbals.</p> <p>Investigate the factors affecting the frequency produced by a vibrating string.</p> <p>Investigate the frequency produced by a vibrating air column. Musical instruments. Synthesisers. Investigate instrument sounds using computer interface.</p> <p>Produce sound and light signals at the same time. Thunder and lightning, sound switches and computer. Measure the speed of sound in air – measure distance and time.</p>

National Unit Specification: support notes (cont)

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CONTENT STATEMENTS	CONTEXTS, APPLICATIONS, ILLUSTRATIONS AND ACTIVITIES
<p>4.3 Using sound</p> <ol style="list-style-type: none"> 1 State that sound can pass through solids, liquids and gases. 2 State that sound cannot pass through a vacuum. 3 State that the normal range of human hearing is from 20 hertz to 20,000 hertz. 4 State that high frequency sounds beyond the range of human hearing are called ultrasounds. 5 Give one example of the use of ultrasound in medicine. 6 Give one example of a non-medical use of ultrasound. 7 State that sound levels are measured in decibels. 8 Give two examples of noise pollution. 9 State that excessive noise can damage hearing. <p>4.4 Amplified sound</p> <ol style="list-style-type: none"> 1 State that the output signal from an amplifier has the same frequency but a bigger amplitude than the input signal. 2 State the function of each of the three major components needed to amplify speech (microphone, amplifier, loudspeaker). 3 Define voltage gain of an amplifier in terms of input and output voltages. 4 Calculate voltage gain using: $voltage\ gain = \frac{output\ voltage}{input\ voltage}$. 5 Explain why your recorded voice sounds different to you. 6 State the advantages of a compact disc compared to a tape cassette. 	<p>Investigate the transmission of sound through solids, liquids and gases. Plastic cup and string ‘telephone’. Bell in jar connected to vacuum pump. Investigate range of hearing using signal generator and loudspeaker.</p> <p>High frequency deafness. Dog whistles. Bats.</p> <p>Medical uses of ultrasound. Sonar. Use sound level meter to measure ‘noise’. Health and Safety, permitted decibel levels. Investigate ways of minimising the effects of noise, eg ear mufflers, double glazing, sound insulation.</p> <p>Discuss various devices containing amplifiers. Use oscilloscope to compare the input to, and output from, an audio amplifier. Put together a simple amplifier for use with a microphone and loudspeaker.</p> <p>Measure voltage gain of an amplifier. Hi-fi systems.</p> <p>Study the use of graphic equalisers. Record and play back your own voice. Obtain information on compact discs and tape cassettes.</p>