

National Unit Specification: general information

UNIT Telecommunications (Access 3)

NUMBER D373 09

CLUSTER Physics (Access 3)

SUMMARY

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

OUTCOMES

1. Handle information related to telecommunications.
2. Report on one practical application of Access 3 Physics.

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 telecommunications.

Performance criteria

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

- Radio
- Television
- Satellites
- Optical fibres
- Telephone.

OUTCOME 2

Report on one practical application of Access 3 Physics.

Performance criteria

- (a) The sources of information are used appropriately.
- (b) The practical application is described clearly.
- (c) Conclusions drawn are valid.

Evidence requirements

A completed report, based on a given structure, on a practical use of radio or television or satellites or optical fibres or telephone, covering the above performance criteria is required. The report must be the individual work of the candidate.

An Outcome 3 report of practical work in the Access 3 Physics unit D375 09 Radiations 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 unit D375 09 Radiations.

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 tasks 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 task relates to the content of Access 3 Physics, that it is about a current practical application of physics and that it provides an appropriate level of demand. Candidates should be provided with an outline structure of a report.

In relation to PC(a), the teacher/lecturer should ensure that the candidate plays an active part in gathering information for the report. Candidates should have access to a range of suitable resources, eg, CD-ROM, library, internet.

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

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PC (b)

- a statement of name of the telecommunication system
- a few concise sentences describing the practical application

PC (c)

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

- one advantage and one disadvantage of the application
- benefits of the application
- comment on effects of the application on individuals and/or society.

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. Advice should be given on how to access suitable sources of information eg CD-ROM, internet and library.

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).

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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 Telecommunications.

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

CONTENT STATEMENTS	CONTEXTS, APPLICATIONS, ILLUSTRATIONS AND ACTIVITIES
<p>1.1 Radio</p> <ol style="list-style-type: none"> 1 State that radio communication does not require wires between transmitter and receiver. 2 State that radio signals are waves which transfer energy. 3 State that radio signals are transmitted through air at a speed of 300 million metres per second. 4 Complete a block diagram of a radio receiver showing in the correct order: the aerial, tuner, decoder, amplifier and loudspeaker. 5 Describe in simple terms the function of the aerial, tuner, amplifier and loudspeaker in a radio receiver. 6 State that the frequency of a radio signal is the number of waves produced in one second. 7 State that the frequency is measured in hertz. 8 State that a radio station can be identified by the frequency of the signal it transmits. <p>1.2 Television</p> <ol style="list-style-type: none"> 1 State that television signals are radio signals with a higher frequency. 2 State that a television station can be identified by the frequency of the signal it transmits. 3 Complete a block diagram of a television receiver showing in the correct order: the aerial, tuner, decoders, amplifiers, tube and loudspeaker. 	<p>Use model transmitter and receiver to transmit a message across the laboratory.</p> <p>View suitable video on radio transmission and reception.</p> <p>Construct a block diagram of a radio receiver. Assemble and examine the main parts of a radio receiver specially built to give a simple layout. Experiments to investigate the function of the main parts of the radio.</p> <p>Obtain information on the frequency of radio stations. Tune into different radio stations.</p> <p>Compare television and radio frequencies. View suitable video on television transmission and reception.</p> <p>Construct a block diagram of a television receiver.</p>

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CONTENT STATEMENTS	CONTEXTS, APPLICATIONS, ILLUSTRATIONS AND ACTIVITIES
<p>1.2 Television (cont)</p> <p>4 Describe in simple terms the function of the aerial, tuner, amplifiers, tube and loudspeaker in a television receiver.</p> <p>5 State that mixing red, green and blue light produces all colours seen on a colour television screen.</p> <p>1.3 Satellites</p> <p>1 Describe how satellites are used in communication.</p> <p>2 State that a geostationary satellite stays above the same point on the Earth's surface.</p> <p>3 State that curved reflectors on receiving aerials make the signal stronger.</p> <p>4 Explain why curved reflectors on receiving aerials make the signal stronger.</p> <p>1.4 Optical fibres</p> <p>1 State that light can be reflected.</p> <p>2 Describe the direction of the reflected light ray from a plane mirror.</p> <p>3 State what is meant by an optical fibre.</p> <p>4 State that optical fibres are used in some telecommunication systems.</p> <p>5 State that optical fibres transmit light signals.</p> <p>6 State that signal transmission along an optical fibre takes place at a speed of nearly 200 million metres per second.</p> <p>7 Describe the transmission of the light signal along an optical fibre.</p> <p>8 State that many telecommunication links into the home are by optical fibres.</p> <p>9 Describe one advantage and one disadvantage of using optical fibres for transmission of signals into the home.</p>	<p>Examine colour television screen or monitor.</p> <p>Investigate colour mixing using raybox kits and colour filters. Use a prism to produce a visible spectrum.</p> <p>View suitable video on communication satellites.</p> <p>Obtain information on communication satellites.</p> <p>Satellite TV.</p> <p>Use raybox kits to investigate the focusing effect of curved reflectors.</p> <p>Simple ray diagrams to demonstrate the focusing effects of curved reflectors.</p> <p>Direction and size of satellite dishes.</p> <p>Use raybox kits to investigate reflection from a plane surface.</p> <p>Use optical fibre to transmit a message.</p> <p>View suitable video on fibre optic communication.</p> <p>Use raybox kits to investigate total internal reflection (qualitatively only).</p> <p>Simple ray diagram to show the path of light along an optical fibre.</p> <p>Obtain information on modern communication links to the home, eg cable television, home banking, Internet.</p> <p>Discuss advantages and disadvantages of optical fibre with radio communication.</p>

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CONTENT STATEMENTS	CONTEXTS, APPLICATIONS, ILLUSTRATIONS AND ACTIVITIES
<p>1.5 Telephone</p> <ol style="list-style-type: none"> 1 State that in a telephone, coded messages or signals are sent out by a transmitter and are picked up by a receiver. 2 State that telephone communication may use electrical signals in metal wires, light signals in optical fibres or radio wave signals in air between transmitter and receiver. 3 State that a mobile phone acts as a radio transmitter and receiver. 4 State one advantage and one disadvantage of a mobile phone. 5 State that the mouthpiece of a telephone is the transmitter and it contains a microphone. 6 State that the earpiece of a telephone is the receiver and it contains a loudspeaker. 7 State the useful energy changes in: <ol style="list-style-type: none"> a) microphone (sound → electrical) b) loudspeaker (electrical → sound). 8 State that a telephone signal in a metal wire is transmitted very quickly, at a speed of almost 300 million metres per second. 9 State that fax is the name given to the transmission of documents by telephone communication. 10 State one advantage of using fax. 11 Describe the effect on the signal pattern displayed on an oscilloscope due to a change in: <ol style="list-style-type: none"> a) loudness of sound b) frequency of sound 	<p>Use a pair of telephones to communicate through wires.</p> <p>Obtain information on mobile phones.</p> <p>Look at telephone handset – dismantle and identify mouthpiece and earpiece</p> <p>Investigate the energy changes in a microphone and a loudspeaker.</p> <p>Obtain information on fax machines.</p> <p>Investigate the electrical signals in telephone wires using an oscilloscope. Use signal generator and oscilloscope to look at frequency and loudness effects.</p>