

The logo consists of the letters 'N5' in a large, bold, white font, set against a solid purple square background.

National 5
Course Assessment
Specification



National 5 Physics Course Assessment Specification (C757 75)

Valid from August 2013

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Please refer to the note of changes at the end of this Course Assessment Specification for details of changes from previous version (where applicable).

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Course outline

Course title:	National 5 Physics
SCQF level:	5 (24 SCQF credit points)
Course code:	C757 75
Course assessment code:	X757 75

The purpose of the Course Assessment Specification is to ensure consistent and transparent assessment year on year. It describes the structure of the Course assessment and the mandatory skills, knowledge and understanding that will be assessed.

Course assessment structure

Component 1 — question paper (scaled from 110 marks)	80 marks
Component 2 — assignment	20 marks
Total marks	100 marks

This Course includes six SCQF credit points to allow additional time for preparation for Course assessment. The Course assessment covers the added value of the Course.

Equality and inclusion

This Course Assessment Specification has been designed to ensure that there are no unnecessary barriers to assessment. Assessments have been designed to promote equal opportunities while maintaining the integrity of the qualification.

For guidance on assessment arrangements for disabled learners and/or those with additional support needs, please follow the link to the Assessment Arrangements web page: www.sqa.org.uk/sqa/14977.html.

Guidance on inclusive approaches to delivery and assessment of this Course is provided in the *Course Support Notes*.

Assessment

To gain the award of the Course, the candidate must pass all of the Units as well as the Course assessment. Course assessment will provide the basis for grading attainment in the Course award.

Course assessment

SQA will produce and give instructions for the production and conduct of Course assessments based on the information provided in this document.

Added value

The purpose of the Course assessment is to assess added value of the Course as well as confirming attainment in the Course and providing a grade. The added value for the Course will address the key purposes and aims of the Course, as defined in the Course Rationale. It will do this by addressing one or more of breadth, challenge, or application.

In this Course assessment, added value will focus on the following:

- ◆ breadth — drawing on knowledge and skills from across the Course
- ◆ challenge — requiring greater depth or extension of knowledge and/or skills
- ◆ application — requiring application of knowledge and/or skills in practical or theoretical contexts as appropriate

This added value consists of:

- ◆ a question paper which requires candidates to demonstrate aspects of breadth, challenge and application; candidates will apply breadth and depth of skills, knowledge and understanding from across the Course to answer questions in physics
- ◆ an assignment which requires candidates to demonstrate aspects of challenge and application; candidates will apply skills of scientific inquiry, using related knowledge, to carry out a meaningful and appropriately challenging task in physics and communicate findings

Grading

Course assessment will provide the basis for grading attainment in the Course award.

The Course assessment is graded A–D. The grade is determined on the basis of the total mark for all Course assessments together.

A candidate's overall grade will be determined by their performance across the Course assessment.

Grade description for C

For the award of Grade C, candidates will have demonstrated successful performance in all of the Units of the Course. In the Course assessment, candidates will typically have demonstrated successful performance in relation to the mandatory skills, knowledge and understanding for the Course.

Grade description for A

For the award of Grade A, candidates will have demonstrated successful performance in all of the Units of the Course. In the Course assessment, candidates will typically have demonstrated a consistently high level of performance in relation to the mandatory skills, knowledge and understanding for the Course.

In addition, candidates achieving a Grade A will have demonstrated a high overall level of performance by:

- ◆ retaining knowledge and understanding over a long period of time
- ◆ showing a deeper level of knowledge and understanding
- ◆ integrating and applying skills, knowledge and understanding across the three component Units of the Course
- ◆ displaying problem solving skills in less familiar and more complex contexts
- ◆ applying skills of scientific inquiry and analytical thinking in complex contexts that involve more complex data

Credit

To take account of the extended range of learning and teaching approaches, remediation, consolidation of learning and integration needed for preparation for external assessment, six SCQF credit points are available in Courses at National 5 and Higher, and eight SCQF credit points in Courses at Advanced Higher. These points will be awarded when a grade D or better is achieved.

Structure and coverage of the Course assessment

The Course assessment will consist of two Components: an assessment method titled 'a question paper' and an assessment method, titled 'an assignment'. The question paper will have two Sections. The assignment will have one Section.

Component 1 — question paper

The purpose of this question paper is to assess breadth and depth of knowledge and understanding from across the Units.

The paper will assess scientific inquiry skills, analytical thinking skills and the impact of applications on society and the environment.

The question paper will give candidates an opportunity to demonstrate the following skills, knowledge and understanding by:

- ◆ demonstrating knowledge and understanding of physics by making statements, describing information, providing explanations and integrating knowledge
- ◆ applying knowledge of physics to new situations, interpreting information and solving problems
- ◆ planning or designing experiments/practical investigations to test given hypotheses or to illustrate particular effects, applying safety measures
- ◆ selecting information and presenting information appropriately in a variety of forms
- ◆ processing information (using calculations and units, where appropriate)
- ◆ making predictions based on evidence/information
- ◆ drawing valid conclusions and giving explanations supported by evidence/justification
- ◆ identifying a source of uncertainty and suggesting an improvement to an experiment/practical investigation

The mandatory skills and knowledge are specified in the 'Further mandatory information on Course coverage' section at the end of this Course Assessment Specification.

The question paper will have 110 marks. This will be scaled by SQA to 80 marks out of a total of 100 marks. This is 80% of the overall marks for the Course assessment.

This question paper has two Sections.

Section 1(Objective Test) will have 20 marks.

Section 2 will contain restricted and extended response questions and will have 90 marks. This will be scaled to 60 marks.

Marks will be distributed approximately proportionally across the three Units.

The majority of the marks will be awarded for applying knowledge and understanding. The other marks will be awarded for applying scientific inquiry, scientific analytical thinking and problem solving skills.

A data sheet containing relevant data and formulae will be provided.

Component 2 — assignment

This assignment requires candidates to apply skills, knowledge and understanding to investigate a relevant topic in physics and its effect on the environment and/or society. The effect may be positive and/or negative. The topic should draw on one or more of the key areas of the Course, and should be chosen with guidance from the assessor.

The assignment will assess the application of skills of scientific inquiry and related physics knowledge and understanding.

The assignment will give candidates an opportunity to demonstrate the following skills, knowledge and understanding by:

- ◆ applying knowledge of physics to new situations and interpreting information
- ◆ selecting information and presenting information appropriately in a variety of forms
- ◆ processing the information (using calculations and units, where appropriate)
- ◆ drawing valid conclusions and giving explanations supported by evidence/justification
- ◆ communicating findings/information

The assignment will have 20 marks out of a total of 100 marks. This is 20% of the overall marks for the Course assessment.

The majority of the marks will be awarded for applying scientific inquiry and analytical thinking skills. The other marks will be awarded for applying knowledge and understanding related to the topic chosen.

The assignment offers challenge by requiring skills, knowledge and understanding to be applied in a context that is one or more of the following:

- ◆ unfamiliar
- ◆ familiar but investigated in greater depth
- ◆ integrates a number of familiar contexts

This assignment has two stages:

- ◆ a research stage
- ◆ a communication stage

For their assignment, candidates are required to:

- ◆ choose, with support, a relevant topic in physics that has an effect on the environment and/or society
- ◆ devise an appropriate aim
- ◆ describe the relevant application(s) of physics and explain the effect on the environment/society
- ◆ research the topic by selecting, processing and presenting relevant data/information
- ◆ draw a conclusion
- ◆ describe underpinning physics knowledge and understanding and explain its relevance to the topic researched
- ◆ communicate the findings of the research in a report

Setting, conducting and marking of assessment

Question paper

This question paper will be set and marked by SQA, and conducted in centres under conditions specified for external examinations by SQA. Candidates will complete this in 2 hours.

Controlled assessment — assignment

This assignment is:

- ◆ set by centres within SQA guidelines
- ◆ conducted under a high degree of supervision and control

Evidence will be submitted to SQA for external marking.

All marking will be quality assured by SQA.

Setting the assessment

Set by centres within SQA guidelines.

Conducting the assessment

The **research** stage will be conducted under some supervision and control.

The **communication** stage will be conducted under a high degree of supervision. SQA will provide Assignment General assessment information and Assignment Assessment task documents. SQA will specify the material to be taken into the communication stage of the assignment.

The production of the report will be carried out:

- ◆ in time to meet a submission date set by SQA
- ◆ independently by the candidate

Further mandatory information on Course coverage

The following gives details of mandatory skills, knowledge and understanding for the National 5 Physics Course. Course assessment will involve sampling the skills, knowledge and understanding. This list of skills, knowledge and understanding also provides the basis for the assessment of Units of the Course.

The following gives details of the skills:

- ◆ demonstrating knowledge and understanding by making statements, describing information, providing explanations and integrating knowledge
- ◆ applying knowledge of physics to new situations, interpreting information and solving problems
- ◆ planning, designing, and safely carrying out experimental/practical investigations to test given hypotheses or to illustrate particular effects
- ◆ selecting information and presenting information appropriately in a variety of forms
- ◆ processing information (using calculations and units where appropriate)
- ◆ making predictions based on evidence/information
- ◆ drawing valid conclusions and giving explanations supported by evidence/justification
- ◆ identifying sources of uncertainty and suggesting improvements to experiments/practical investigations
- ◆ communicating findings/information

These skills will be assessed, across the Course, in the context of the mandatory knowledge.

The following table specifies the mandatory knowledge for the National 5 Physics Course assessment.

Electricity and Energy

Conservation of energy

- ◆ Knowledge of the principle of 'conservation of energy' applied to examples where energy is transferred between stores. Identification and explanation of 'loss' of energy where energy is transferred.
- ◆ Use of an appropriate relationship to solve problems involving potential energy, mass, gravitational field strength and height.
- ◆ Use of an appropriate relationship to solve problems involving kinetic energy, mass and speed.
- ◆ Use of appropriate relationships to solve problems involving conservation of energy.

Electrical charge carriers and electric fields

- ◆ Definition of electrical current as the electric charge transferred per unit time.
- ◆ Use of an appropriate relationship to solve problems involving charge, current and time.
- ◆ Knowledge of the difference between alternating and direct current.

Potential difference (voltage)

- ◆ Awareness of the effect of an electric field on a charged particle.
- ◆ Knowledge that the potential difference (voltage) of the supply is a measure of the energy given to the charge carriers in a circuit.

Ohm's Law

- ◆ Use of a V-I graph to determine resistance.
- ◆ Use of an appropriate relationship to solve problems involving potential difference (voltage), current and resistance.
- ◆ Knowledge of the qualitative relationship between the temperature and the resistance of a conductor.

Practical electrical and electronic circuits

- ◆ Measurement of current, voltage and resistance, using appropriate meters in complex circuits.
- ◆ Knowledge of the circuit symbol, function and application of standard electrical and electronic components including cell, battery, lamp, switch, resistor, variable resistor, voltmeter, ammeter, LED, motor, microphone, loudspeaker, photovoltaic cell, fuse, diode, capacitor, thermistor, LDR, relay, transistor.
- ◆ For transistors, familiarity with the symbols for an npn transistor and an n-channel enhancement mode MOSFET. Explanation of their function as a switch in transistor switching circuits.
- ◆ Knowledge of current and voltage relationships in series and parallel circuits.
- ◆ Use of appropriate relationships to solve problems involving the total resistance of resistors in series and in parallel circuits, and circuits with a combination of series and parallel resistors.

Electrical power

- ◆ Use of an appropriate relationship to solve problems involving energy, power and time.
- ◆ Use of appropriate relationships to solve problems involving power, potential difference (voltage), current and resistance in electrical circuits.

- ◆ Selection of an appropriate fuse rating given the power rating of an electrical appliance.

Specific heat capacity

- ◆ Knowledge that different materials require different quantities of heat to raise the temperature of unit mass by one degree celsius.
- ◆ Knowledge that the temperature of a substance is a measure of the mean kinetic energy of its particles.
- ◆ Explanation of the connection between temperature and heat energy.
- ◆ Use of an appropriate relationship to solve problems involving mass, heat energy, temperature change and specific heat capacity.
- ◆ Use of the principle of conservation of energy to determine heat transfer.

Gas laws and the kinetic model

- ◆ Knowledge that pressure is the force per unit area exerted on a surface.
- ◆ Description of how the kinetic model accounts for the pressure of a gas.
- ◆ Use of an appropriate relationship to carry out calculations involving pressure, force and area.
- ◆ Knowledge of the relationship between kelvins and degrees celsius and the absolute zero of temperature.
- ◆ Explanation of the pressure-volume, pressure-temperature and volume-temperature laws qualitatively in terms of a kinetic model.
- ◆ Use of appropriate relationships to solve problems involving the volume, pressure and kelvin temperature of a fixed mass of gas.

Waves and Radiation

Wave parameters and behaviours

- ◆ Knowledge that energy can be transferred as waves.
- ◆ Determination of frequency, period, wavelength, amplitude and wave speed for longitudinal and transverse waves.
- ◆ Use of appropriate relationships to solve problems involving wave speed, frequency, period, wavelength, distance and time.
- ◆ Awareness of the practical limitations of demonstrating diffraction.
- ◆ Comparison of long wave and short-wave diffraction.

Electromagnetic spectrum

- ◆ Knowledge of the relative frequency and wavelength of bands of the electromagnetic spectrum with reference to typical sources, detectors and applications.
- ◆ Knowledge of the qualitative relationship between the frequency and energy associated with a form of radiation.
- ◆ Knowledge that all radiations in the electromagnetic spectrum travel at the speed of light.

Light

- ◆ In ray diagrams showing refraction, identification of the normal, angle of incidence and angle of refraction.
- ◆ Description of refraction in terms of change of wave speed, change of wavelength and change of direction (where the angle of incidence is greater than 0°).

Nuclear radiation

- ◆ Knowledge of the nature of alpha, beta and gamma radiation, the relative

effect of their ionisation, and their relative penetration.

- ◆ Use of an appropriate relationship to solve problems involving activity, number of nuclear disintegrations and time.
- ◆ Knowledge of background radiation sources.
- ◆ Use of appropriate relationships to solve problems involving absorbed dose, equivalent dose, energy, mass and radiation weighting factor.
- ◆ Comparison of equivalent dose due to a variety of natural and artificial sources.
- ◆ Awareness of equivalent dose rate and exposure safety limits for the public and for workers in radiation industries in terms of annual effective equivalent dose.
- ◆ Use of an appropriate relationship to carry out calculations involving equivalent dose rate, equivalent dose and time.
- ◆ Awareness of applications of nuclear radiation.
- ◆ Definition of *half-life*.
- ◆ Use of graphical or numerical data to determine the half-life of a radioactive material.
- ◆ Qualitative description of fission and fusion, with emphasis on the importance of these processes in the generation of energy.

Dynamics and Space

Velocity and displacement — vectors and scalars

- ◆ Definition of vector and scalar quantities.
- ◆ Identification of force, speed, velocity, distance, displacement, acceleration, mass, time and energy as vector or scalar quantities.
- ◆ Calculation of the resultant of two vector quantities in one dimension or at right angles.
- ◆ Determination of displacement and/or distance using scale diagram or calculation.
- ◆ Use of appropriate relationships to solve problems involving velocity, displacement and time.

Velocity-time graphs

- ◆ Sketch of velocity–time graphs for objects from recorded or experimental data.
- ◆ Interpretation of velocity–time graph to describe the motion of an object.
- ◆ Determination of displacement from a velocity–time graph.

Acceleration

- ◆ Use of an appropriate relationship to solve problems involving acceleration, initial velocity (or speed), final velocity (or speed) and time.
- ◆ Determination of acceleration from a velocity–time graph.

Newton's laws

- ◆ Application of Newton's laws and balanced forces to explain constant velocity (or speed), making reference to frictional forces.
- ◆ Use of an appropriate relationship to solve problems involving unbalanced force, mass and acceleration for situations where more than one force is acting.
- ◆ Use of an appropriate relationship to solve problems involving work done, unbalanced force and distance/displacement.
- ◆ Use of an appropriate relationship to solve problems involving weight, mass

and gravitational field strength, including on different planets.

- ◆ Knowledge of Newton's second law including its application to space travel, rocket launch and landing.
- ◆ Knowledge of Newton's third law and its application to explain motion resulting from a 'reaction' force.
- ◆ Use of Newton's laws to explain free-fall and terminal velocity.

Projectile motion

- ◆ Explanation of projectile motion.
- ◆ Use of appropriate relationships to solve problems involving projectile motion from a horizontal launch, including the use of motion graphs.
- ◆ Explanation of satellite orbits in terms of projectile motion.

Space exploration

- ◆ Awareness of evidence supporting current understanding of the universe from telescopes and space exploration.
- ◆ Awareness of the benefits of satellites, for example GPS, weather forecasting, communications and space exploration (Hubble telescope, ISS)
- ◆ Qualitative awareness of the relationship between the altitude of a satellite and its period.
- ◆ Awareness of the potential benefits of space exploration.
- ◆ Awareness of the risks associated with manned space exploration, for example fuel load on takeoff, potential exposure to radiation, pressure differential and challenges of re-entry to a planet's atmosphere.
- ◆ Use of an appropriate relationship to solve problems involving heat energy, mass and specific latent heat.

Cosmology

- ◆ Use of the term 'light year' and conversion between light years and metres.
- ◆ Description of the observable universe — origin and age of universe.
- ◆ Awareness of the use of different parts of the electromagnetic spectrum in obtaining information about astronomical objects.
- ◆ Identification of continuous and line spectra.
- ◆ Use of spectral data for known elements, to identify the elements present in stars.

Administrative information

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History of changes to Course Assessment Specification

Course details	Version	Description of change	Authorised by	Date
	1.1	Further information and clarification on scope and structure of the question paper/assignment given in the 'Structure and coverage of Course assessment' section. Setting, conducting and marking of assessment section: wording added to clarify assessment conditions; Further mandatory information section: amendment to wording to clarify activities in skills list, plus changes to wording in Course/Unit content to clarify meaning and benchmarking	Qualifications Development Manager	June 2013
	2.0	Language describing content made consistent throughout table in 'Further mandatory information on Course coverage' section. Mandatory Information on Course coverage has had significant clarification added in order to clarify both the meaning and the depth of treatment required.	Qualifications Manager	April 2015

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