Physics (National 5)

Draft National Course Assessment Specification

This edition: November 2011, draft version 1.0

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

Contents

Course outline

Course title:	Physics (National 5)
SCQF level:	5 (24 SCQF credit points)
Course code:	to be advised
Course assessment code:	to be advised

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	80 marks
Component 2 — assignment	20 marks
Total marks	**100 marks**

This Course includes six SCQF credit points for 40 additional programmed hours to allow 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 will be provided in the *Course Support Notes*.

Assessment

To gain the award of the Course, the learner must pass all 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 learners to demonstrate aspects of breadth, challenge and application; learners will apply breadth and depth of skills, knowledge and understanding from across the Course to answer questions in physics
- an assignment which requires learners to demonstrate aspects of challenge and application; learners 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 learner's overall grade will be determined by their performance across the Course assessment.

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

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: a question paper, and 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 of knowledge from across the Units, depth of understanding, and application of this knowledge and understanding to solve problems and to explain the impact of physics applications on society/the environment..

This question will give learners an opportunity to demonstrate the following skills, knowledge and understanding:

- integrate and apply physics knowledge and understanding
- apply scientific inquiry skills
- apply scientific analytical thinking skills
- explain the impact of applications to society/the environment

The question paper will have 80 marks (80% of the total mark).

This question paper has two Sections.

Section 1, titled 'Objective Test', will have 20 marks.

Section 2, titled 'Paper 2', will contain restricted and extended response questions and will have 60 marks.

Marks will be distributed approximately evenly 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 and analytical thinking skills.

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

Component 2 — assignment
The purpose of this assignment is to assess the application of skills of scientific investigative/research and the impact of applications to society/the environment, using related knowledge, by carrying out a meaningful and appropriately challenging task in physics and communicating findings.

This assignment will give learners an opportunity to demonstrate the following skills, knowledge and understanding:

- investigate/research an appropriate physics topic/issue
- process the information gathered, using scientific investigative/research skills
- apply knowledge and understanding related to the topic/issue
- present a reasoned and well-developed conclusion, supported by evidence

The assignment will have 20 marks (20% of the total marks).

This assignment has one Section.

The majority of the marks will be awarded for applying scientific investigative/research skills. The other marks will be awarded for applying related knowledge and understanding.

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. Learners will complete this in 1 hour and 30 minutes.

Controlled assessment — assignment

This assignment is:

- set by SQA
- 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.

Learners will complete the write-up of this assignment in no more than 1 hour and under open book supervised conditions.

SQA will provide an assignment specification for the generation of evidence. Learners will have a choice of topic/issue to be investigated/researched. SQA will specify the extent of the material to be taken into the write-up.

The production of evidence for assessment will be conducted:

- with the use of specified resources
- in time to meet a submission date set by SQA
- independently by the learner

Further mandatory information on Course coverage

The following gives details of mandatory skills, knowledge and understanding for the Physics (National 5) 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 of scientific inquiry, investigation and analytical thinking.

Learners should:

- apply knowledge and understanding of physics to unfamiliar situations, interpret information and solve problems
- select information from a variety of sources
- present information appropriately in a variety of forms
- process information, using calculations where appropriate
- plan, design and carry out investigations/research to test hypotheses or to illustrate effects
- evaluate experimental procedures
- draw valid conclusions and give explanations supported by evidence or justification
- make predictions based on evidence/information
- communicate findings

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

The following tables specify the mandatory knowledge for the Physics (National 5) Course assessment.

Electricity and Energy

Conservation of energy

Principle of 'conservation of energy' applied to examples where energy is transferred between stores. Identify and explain 'loss' of energy where energy is transferred.

Electrical charge carriers and electric fields

Definition of electric charge in terms of the atomic model.
Applications of charge and electrostatics.
Electrical current as the electrical charge transferred per unit time.
Use appropriate relationship to carry out calculations involving charge, current and time.
Semiconductors and their applications.
The difference between alternating and direct current.

Potential difference (voltage)

Effect of electric field on a charge.
The potential difference (voltage) of the supply is a measure of the energy given to the charge carrier in a circuit.
Use of an appropriate relationship to calculate potential difference, work done and charge.
Potential difference is the energy work done in moving a unit charge.

Practical electrical and electronic circuits

Measurement of current, voltage and resistance, using appropriate meters in complex circuits.
The function and application of standard electrical and electronic components: cell, battery, lamp, switch, resistor, variable resistor, voltmeter, ammeter, LED, motor, loudspeaker, photo voltaic cell, fuse, diode, capacitor, thermistor, LDR.
Current and voltage relationships in a parallel circuit.
Use of an appropriate relationship to calculate the resistance of resistors in series and in parallel circuits.

Ohm's Law

Use of a V-I graph to determine resistance.
Use of an appropriate relationship to calculate potential difference (voltage), current and resistance. The relationship between temperature and resistance of a conductor.

Electrical power

Use of an energy, power and time relationship.
Use of an appropriate relationship to determine the power, voltage, current and resistance in electrical circuits.

Specific heat capacity

The same mass of different materials requires different quantities of heat to raise the temperature of unit mass by one degree Celsius.
The temperature of a substance is a measure of the mean kinetic energy of its particles.
Explain the difference between temperature and heat energy.
Use appropriate relationships to carry out calculations involving mass, heat energy, temperature change and specific heat capacity.
Apply conservation of energy transfer to determine heat loss.

Gas laws and the kinetic model
Pressure is the force per unit area exerted on a surface.
Use an appropriate relationship to calculate pressure, force and area.
Explanation of the relationship between the volume, pressure and temperature of a fixed mass of gas using qualitative kinetic theory.
Use of appropriate relationship to calculate the volume, pressure and temperature of a fixed mass of gas. The relationship between Kelvin, degrees Celsius and absolute zero of temperature.

Waves and Radiations

Wave parameters and behaviours
Determination of frequency, wavelength, amplitude and wave speed for transverse waves.
Use of the relationship between wave speed, frequency and wavelength.
Diffraction and practical applications.

Sound
Observation of the Doppler effect; apparent change in frequency due to relative motion (qualitative).
Practical applications of the Doppler effect.

Electromagnetic spectrum
Relative frequency and wavelength of bands of the electromagnetic spectrum with reference to typical sources and applications.
Relationship between the frequency and energy associated with a form of radiation.

Light
Refraction of light including identification of the normal, angle of incidence and angle of refraction.
Description of refraction in terms of change of wave speed.
Total internal reflection including relevant applications.
Experimental determination of critical angle and relative transmission of light.
Quantitative determination of critical angle and relationship between critical angle and refractive index.

Nuclear radiation
The nature of alpha, beta and gamma radiation: relative effect of ionization, absorption, shielding.
Background radiation sources and determination.
Equivalent dose and comparison of equivalent dose due to a variety of natural and artificial sources.
Applications and uses of nuclear radiation.
Half-life and use of graphical or numerical data to determine the half-life.
Nuclear equations to describe radioactive decay and fission and fusion reactions.
Mass and energy equivalence, including calculations where ‘lost’ mass is given.
A qualitative description of fission and fusion, emphasising the importance of these processes in the generation of energy.

Dynamics and Space

Vectors and scalars

Vector and scalar quantities; force, speed, velocity, distance, displacement, acceleration, mass, time and energy.
Calculation of the resultant of two vector quantities.

Displacement

Determination of displacement and/or distance using scale diagram or calculation.

Velocity

Use of appropriate relationships to calculate velocity in one dimension.

Velocity-time graphs

Velocity-time graphs for objects from recorded or experimental data.
Interpretation of velocity time graph to describe the motion of an object.
Displacement from a velocity time graph.

Acceleration

Acceleration of a vehicle between two points using appropriate relationships with initial and final velocity and time of change.
Acceleration from a velocity time graph.

Newton's Laws

Applications of Newton's Laws and balanced forces to explain constant velocity, making reference to frictional forces
Calculations involving the relationship between unbalanced force, mass and acceleration for situations where more than one force is acting.
Calculations involving the relationship between weight, mass and gravitational field strength during interplanetary rocket flight.
Application of Newton's Second Law to space travel, including rocket launch and landing.
Application of Newton's Third Law 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.
Calculations of projectile motion from a horizontal launch using appropriate relationships and graphs.
Explanation of satellite orbits in terms of projectile motion.

Space exploration

Space exploration and its impact on our understanding of the universe, the current model of the universe having evolved over a long period of time. Evidence to support current understanding, in simple terms.
Impact of space exploration on our understanding of planet Earth, including use of satellites for environmental monitoring.
Technologies arising from space exploration and its impact on everyday life.
Risks and benefits associated with space exploration, including challenges of re-entry to a planet's atmosphere. Includes descriptions of the need for thermal protection systems to protect spacecraft on re-entry, including qualitative and quantitative specific heat capacity and latent heat of vaporisation.

Cosmology
Use of the term 'light year' and conversion between light years and metres.
Age of the universe.
Observable universe – description and origin of universe.
The use of different parts of the electromagnetic spectrum in obtaining information about astronomical objects.
Identification of continuous and line spectra.
Using spectral data for known elements, to identify the elements present in stars.
Description of the three main groups of radiation received from space as electromagnetic radiation, cosmic rays and neutrinos.

Administrative information

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Superclass: to be advised

History of changes

Course details	Version	Description of change	Authorised by	Date

Note: You are advised to check SQA's website (**www.sqa.org.uk**) to ensure you are using the most up-to-date version of the Course Specification.