



**National Qualifications 2012
Internal Assessment Report
Physics**

The purpose of this report is to provide feedback to centres on verification in National Qualifications in this subject.

National Qualifications (NQ) Units

Titles/levels of NQ Units verified:

D385 13	Mechanics (Advanced Higher)	Central
D387 13	Wave Phenomena (Advanced Higher)	Central
D386 13	Electrical Phenomena (Advanced Higher)	Central
D383 12	Mechanics and properties of Matter (Higher)	Central
D384 12	Radiation and Matter (Higher)	Central
D380 12	Electricity and Electronics (Higher)	Central
D379 11	Mechanics and Heat (Intermediate 2)	Central
D380 11	Electricity and Electronics (Intermediate 2)	Central
D381 11	Waves and Optics (Intermediate 2)	Central
D373 10	Telecommunications (Intermediate 1)	Central
D374 10	Practical Electricity (Intermediate 1)	Central
D377 10	Movement (Intermediate 1)	Central
D388 13	Physics Investigation (Advanced Higher)	Visiting
FE45 12	Researching Physics	Visiting

General comments

The material provided for the central verification event indicates a general understanding of the requirements of the assessment and the National Standards for the Physics Units that make up the National Courses. The material was generally well presented and easily accessible. However some centres failed to provide the Outcome 3 material and in several instances the requirements of the National Standards for Outcome 3 were not fully understood.

The visiting verification of the Advanced Higher Investigation unit indicated that generally centres understood the National Standards applicable to this Unit.

This was the first year of presentation for the new Revised Higher Unit — Researching Physics. The visiting verification indicated that centres generally understood the requirements stated in the Unit specification.

Unit specifications, instruments of assessment and exemplification materials

During both visiting and central verification procedures, all centres showed that generally the assessors were aware of the Unit specifications and the instruments of assessment with the accompanying exemplification materials associated with the Units.

All centres verified centrally used the National Assessment Bank Materials for the theoretical Outcomes of the Units. Generally experiments appropriate to the level of Unit were selected to provide evidence for Outcome 3.

All centres delivering the new Revised Higher were aware of the new Unit specification, instruments of assessment and the available exemplification materials.

Evidence Requirements

Most centres submitted the required evidence for central verification – both the written Outcome 1/2 and the practical Outcome 3 report – for the selected Unit. However eight per cent of centres failed to include all the required material.

In several centres it was found at central verification that there was no indication of the decision made by the centre as to whether the candidate had passed or failed to achieve the performance criteria for Outcome 3. The decision was indicated only by the final result – pass/fail – supplied to SQA on the VS00 report form.

At the Advanced Higher visiting verification, centres generally showed a clear understanding of the evidence requirements. However, several centres did not provide a teacher statement that the record of work presented was the candidate's own work (O2pc(a)). Also, in some centres the candidate's record of work contained no indication of assessment taking place during the progress of the investigation.

At the Revised Higher visiting verification, centres generally showed a clear understanding of the evidence requirements although many centres had still to complete and assess Outcomes 2 and 3.

Administration of assessments

Verifiers at the central procedures found clear evidence, at all levels, that the marks schemes for the National Assessment Bank materials were applied carefully, with reference being made to the Physics General Marking Instructions. Generally this material had been internally verified by cross marking. Although the experiment chosen for Outcome 3 was at an appropriate level, the Outcome 3 material — the laboratory reports — did not always cover the National Standards. There was only limited evidence of internal verification of this material which may have led to National Standards not being met on this Outcome.

Verifiers for the Advanced Higher Investigation Unit found that candidates had been provided with guidance information as to the requirements of the Unit at the start of the investigation. The information on the planning of the investigation (Outcome 1) in the record of work with dates was generally completed to an improved standard, with more detail given, and often with rejection of methods included. However contributions made by others to the investigation were often not noted in the record of work.

For Outcome 2 the recording of data and its analysis was generally well documented. Graphical work was not always provided in the record of work, but separate sheets or the final report were presented as evidence instead. The treatment of uncertainties was in many cases incomplete at the time of verification. Candidates tended to leave tackling uncertainties until the write up of the investigation, and so missed the opportunity to consider the efficacy of their experiments as they carried out the investigation. Internal verification of this material had been carried out by about half the centres visited.

Verifiers for the Revised Higher Researching Physics Unit found that generally the organisation of the recording of candidate achievement was of a high standard. Centres were generally using the four published exemplars of topical issues — Skin Cancer, Earthquakes, Exoplanets and Optoelectronics — as assessment material. Internal verification of the available assessed evidence had been carried out by about half the centres visited.

Areas of good practice

Generally, in all areas, centres had conducted the assessments fairly and consistently. There was increased evidence of cross marking/internal verification in a number of centres, particularly for the O1 and O2 assessment. Where cross marking by referral to a principal teacher or internal verifier and/or departmental discussion of standards takes place, assessment across a department was more likely to achieve consistency with National Standards.

For the central verification, candidates performed well in the theory assessments relating to Outcomes 1 and 2. Overall the application of the mark schemes for the NABs was good, with the General Marking Instructions for Physics being used. For Outcome 3, many candidates produced a well-structured report in their own words, giving procedural details, diagrams and valid conclusions for an experiment at the appropriate level.

For the Advanced Higher visiting verification, several examples of good practice were noted. In several instances, the achievement of performance criteria was indicated on the candidate's record of work. In some centres an expanded pc checklist was attached to the record of work, to be completed by the assessor and dated when each part of the pc had been overtaken, thus enabling a class record of achievement to be maintained. This allows both the candidate and the assessor to follow the progress of achievement of the Unit. In a small number of cases, uncertainties were noted at each stage of the experimental work.

For the Revised Higher visiting verification, the following examples of good practice were noted. One centre used jotters as a 'daybook', providing a way of keeping track of the candidates work. These could be annotated by a member of staff and the achievement of the performance criteria could be indicated. Another centre produced a student check sheet for candidates to self-evaluate their achievement of Outcomes and Performance Criteria. In one centre the school librarian was involved in supporting 'Focus Question' research. A few centres used computer programs to check for plagiarism in the answering of focus questions.

Specific areas for improvement

When carrying out the assessment process on Units, centres should:

- ◆ ensure the marking of practical reports is clear and that, for each candidate, there is a clear indication on the script as to where the candidates have achieved the performance criteria.
- ◆ carry out internal verification on assessment decisions being made and record the process with dates and signatures.
- ◆ note that a unit cannot be resulted without an Outcome 3 assessment having taken place.

When candidates are preparing the evidence for Outcome 3 reports, centres should:

- ◆ ensure that procedures detailed in the report enable another person to carry out the experiment again and that the report throughout is in the candidate's own words.
- ◆ note that when candidates are graphing information, the points should be clearly and accurately indicated and the best fit line clearly drawn. This line should not be forced through the origin. If the line fails to provide the evidence of direct proportionality by passing through the origin, an appropriate conclusion should be given such as the relationship is 'linear' or 'as one quantity increases the other quantity increases linearly'. Discussions on the possible reasons for the result could be dealt with in the evaluation of the experiment when discussing experimental uncertainty.
- ◆ note that if computer-drawn graphs are used by candidates, they should be large with appropriate scales and axes — see Excel in Physics HSDU.
- ◆ ensure that uncertainties are considered at a complexity indicated in the appropriate arrangements document, particularly at Advanced Higher, and that magnitude of uncertainties are reflected on when evaluating the experiment. Improvements to the experiment can be linked to a reduction in uncertainty values. This particularly applies when a quantity such as 'g' is being determined at Advanced Higher level — reflection on the magnitude of the uncertainty with respect to the obtained and expected value can be considered.
- ◆ note that random uncertainties can only be used for repeated readings (usually five) of a particular value and care should be taken when averaging results to ensure this is valid.
- ◆ ensure that the evaluation at Higher and Advanced Higher is appropriate to the level of award. 'Use a more accurate meter' is not acceptable at these levels as an evaluation. It may be appropriate to evaluate the uncertainties in measurements and then proceed to suggest how these uncertainties could be reduced.
- ◆ note that for the simple pendulum experiment at Advanced Higher level, the equation to calculate 'g' can only be applied when the angle of swing is small — in the order of seven degrees.
- ◆ ensure that the conclusion drawn is linked to the aim of the experiment.
- ◆ note that a positive evaluation may be appropriate.

For the new Revised Higher Researching Physics Unit, the following points should be noted:

- ◆ bibliographies and web URL information should be listed with each focus question. The information provided should contain enough detail to enable another person to access the information easily. At least two sources are needed for each question.
- ◆ the revised exemplar document from SQA provides information on the type of focus question answer for Outcome 1 that would be expected from a candidate. The answer should be in the candidate's own words.
- ◆ the observation checklist for Outcome 2 should be signed and dated.
- ◆ the aim of the investigative work should be found at the start of the scientific communication, not part way through.
- ◆ raw data with units and any data analysis should be included in the candidate's communication for Outcome 3
- ◆ for uncertainties, if the experiment does not require a quantity to be determined, the minimum acceptable are scale reading uncertainties.