



**National Qualifications 2015  
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:

D380 11 Electricity and Electronics (Intermediate 2)  
D381 11 Waves and Optics (Intermediate 2)  
D380 12 Electricity and Electronics (Higher)  
D383 12 Mechanics and Properties of Matter (Higher)  
D385 13 Mechanics (Advanced Higher)  
D386 13 Electrical Phenomena (Advanced Higher)  
D388 13 Physics Investigation (Advanced Higher)

## General comments

The material provided by centres 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. In almost all cases, assessment decisions were confirmed by internal verification systems.

One centre failed to provide Outcome 3 material, and in a small number of 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 centres understood the national standards applicable to this Unit. In most centres evidence was marked by the responsible teacher/lecturer, with clear indication of where the Performance Criteria were achieved. Some centres had carried out an internal verification exercise confirming assessment decisions prior to the external verifier's visit.

## Unit specifications, instruments of assessment and exemplification materials

In both visiting and central verification procedures, all centres showed an awareness 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 assessing the Outcomes of the Units. In general, experiments appropriate to the level of the Unit were selected to provide evidence supporting assessment judgements for Outcome 3.

## Evidence Requirements

Almost all of the selected centres submitted the required evidence for central verification, both the Outcome 1/2 scripts and the Outcome 3 report on a practical activity, for the selected Unit.

One centre, however, failed to include all the required material.

At Advanced Higher visiting verification, all centres showed an understanding of the Evidence Requirements. In a small number of centres, however, the candidates' records showed no indication of assessment having taken place during the investigation process.

### **Administration of assessments**

At central verification, there was clear evidence at all levels that the marking schemes for the National Assessment Bank materials were applied carefully, with reference made to the Physics General Marking Instructions. A number of centres had annotated the marking schemes indicating alternative acceptable candidate responses.

In most centres the candidates' responses had been internally verified by cross-marking, although in a small number of cases there was difficulty in differentiating between the marks awarded by the assessor and those awarded by the internal verifier.

Although the experiment chosen for Outcome 3 was at an appropriate level, the candidates' laboratory reports did not always meet national standards, especially in the treatment of uncertainties and in evaluation at Higher and Advanced Higher levels. The more limited evidence of internal verification of this material may have led to national standards not always being met for this Outcome.

At Advanced Higher level, a number of centres had accessed university facilities to broaden the range of Outcome 3 experiments available to candidates. In such cases it remains the centre's responsibility to ensure that the level of support given to candidates is in line with that offered in the Candidate Guide. Support beyond this level, for example by providing candidates with table headings and units, would render the assessment invalid.

Verifiers for the Advanced Higher Investigation Unit found that candidates had been provided with guidance 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 candidate record was completed well. However, references and contributions made by others to the investigation were often not noted in the candidate record. For Outcome 2, the recording of data and its analysis was generally well documented, with an increased use of Excel or similar computer packages for graphical analysis. Often the treatment of uncertainties was incomplete at the time of external verification, with candidates indicating that this would be tackled during the write-up of the investigation report.

Internal verification of this material had been carried out in the majority of centres visited.

## Areas of good practice

There was increased evidence of internal verification and cross-marking in centres, particularly for Outcome 1/2 assessments, and of centre and departmental policies on internal verification. Centres whose material showed evidence of cross-marking, even for a sample of candidates, were more likely to achieve consistency with national standards. Teachers in one centre commented to the visiting verifier that the internal verification exercise had initiated a professional discussion of standards.

In central verification, candidates performed well in assessments related to Outcomes 1 and 2. The application of the marking schemes was good, with good use made of the General Marking Instructions for Physics. There was evidence of increased use of pro formas, detailing the marks awarded for each question by both the teacher/lecturer and the internal verifier. For Outcome 3, most candidates produced reports in their own words, with an appropriate structure, clear aims, procedures and conclusions appropriate to the experimental data gathered. At Advanced Higher and Higher levels there were a number of good examples of data analysis and uncertainties treatment, with sample calculations shown.

In Advanced Higher visiting verification, a number of examples of good practice were noted. Checklists, designed to track the progress of individual candidates through the Performance Criteria, were evident in almost all centres. The checklists allowed the candidate, the teacher/lecturer, and the internal verifier to be aware of the progress of candidates. In many centres, a candidate guide to investigations was included as part of the candidates' records. In only a small number of centres, uncertainties had been noted as part of the recording of experimental data. This allowed candidates to reflect, at an early stage, on the quality of their data. Candidates from a number of centres commented favourably on the balance between supervision/advice and independent study that the Investigation Unit affords.

## Specific areas for improvement

Centres should ensure the marking of Outcome 3 reports is clear, indicating the location of the evidence supporting the assessment decisions.

In the case of candidate scripts or reports being cross-marked as part of the internal verification process, centres should ensure it is clear which mark is the assessor's and which is the internal verifier's. In the case of a disagreement in assessment judgement between the assessor and internal verifier, the centre's final decision should also be made clear.

Centres should stress to candidates the need for care to use correct units when recording values from experimental data. (eg the unit of  $T^2$  is  $s^2$ , and the abbreviation for *radians* is *rad*.)

Centres should be aware that a Unit pass cannot be resulted without an Outcome 3 assessment having taken place and passed.

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

- ◆ Ensure that the conclusion drawn is linked to the aim of the experiment and that it is supported by experimental data.
- ◆ Note that when candidates are graphing experimental data, the points should be clearly and accurately indicated and the best-fit line clearly drawn. The line should be extended towards the origin if the aim is to verify a proportionality relationship. Care should be taken, however, not to force a straight line to pass through the origin. Should a straight line fail to provide evidence of direct proportionality by passing through the origin, an appropriate conclusion should be given, such as the relationship is 'linear'. Discussion on possible reasons for the result could be addressed in the evaluation.
- ◆ Note that graphs produced by Excel or similar computer packages should be of an appropriate size, with both major and minor gridlines, and data points clearly discernible but not excessively large.
- ◆ Ensure at Higher and Advanced Higher levels that the treatment of uncertainties is at a level similar to that indicated in the course assessment documentation.
- ◆ Note that random uncertainty can be used only for repeated measurements of a value. Care should also be taken when averaging measurements. In finding a value for ' $g$ ' using a simple pendulum for example, if repeated measurements were made of the period of a fixed-length pendulum, it would be valid to take an average of these measurements. It would be invalid to average values of ' $g$ ' obtained from a number of different pendulum lengths.
- ◆ Ensure that the evaluation at Higher and Advanced Higher levels is appropriate to the level of award. At these levels, 'use a better meter' is not acceptable as an evaluation. It may be more appropriate to refer to the uncertainties in measurements made, reflecting on the precision of experimental data, suggesting how the larger uncertainties could be reduced, or speculating on any systematic uncertainty within the experiment which may have caused a best-fit straight line to 'miss' the origin.