



Internal Assessment Report 2010: Physics (138)

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

D388 13: Physics Investigation (Advanced Higher)

D387 13: Wave Phenomena (Advanced Higher)

D386 13: Electrical Phenomena (Advanced Higher)

D383 12: Mechanics and Properties of Matter (Higher)

D384 12: Radiation and Matter (Higher)

D380 12: Electricity and Electronics (Higher)

D379 11: Mechanics and Heat (Intermediate 2)

D380 11: Electricity and Electronics (Intermediate 2)

D382 11: Radioactivity (Intermediate 2)

D381 11: Waves and Optics (Intermediate 2)

D373 10: Telecommunications (Intermediate 1)

D374 10: Practical Electricity (Intermediate 1)

D376 10: Sound and Music (Intermediate 1)

D377 10: Movement (Intermediate 1)

D378 10: Electronics (Intermediate 1)

D375 10: Radiations (Intermediate 1)

D373 09: Telecommunications (Access 3)

D376 09: Sound and Music (Access 3)

D377 09: Movement (Access 3)

All Units were verified centrally, except D388 13: Physics Investigation (Advanced Higher), which underwent visiting verification.

General comments

The material required for the central verification event was generally well presented and easily accessible, indicating a general understanding of the requirements of National Standards in the Physics Units which make up the National Courses.

The visiting verification of the Advanced Higher Investigation Unit, however, raised several issues. The role of the visiting External Verifiers was not clearly understood. Quality assurance against national standards could not take place initially, as candidates' work had not been assessed in several centres.

Evidence must be marked by the responsible teacher/lecturer, with indication of where the Performance Criteria have been achieved. It is good practice to have carried out internal verification of this assessment before external verification.

All centres verified used the National Assessment Bank Materials (NABs) for assessment of the Units. At all levels, verifiers found clear evidence that overall the mark schemes for the NABs were applied carefully, though occasionally some centres are still awarding half marks where marking instructions clearly state (1) or (0).

All centres verified selected an appropriate experiment to provide assessment evidence for the Outcome 3 (Outcome 2 for Access 3). However, the evidence continued to show weaknesses in the Performance Criteria (d), (e), (f) and (g) — graphical work, in developing conclusions from data, and in the evaluation of experimental work, particularly at Higher and Advanced Higher levels, and in quantifying uncertainties at Advanced Higher level. This led to several centres receiving a 'Not Accepted' decision.

During discussion with candidates during the visiting external verification, some verifiers found that candidates did not understand the purpose of maintaining a record of work ('daybook'). The information on the planning of the Investigation (Outcome 1) in the record of work 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 not often 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 from 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, hence the opportunity to consider the efficacy of their experiments as they carried out the investigation was missed.

Generally, centres submitted the required evidence for central verification of the selected Unit, though about 6% of centres failed to include evidence for Outcome 3. The omission of experimental reports led to the centre receiving a 'Not Accept' decision.

At central verification, it was found in some cases that there was no indication of the decision as to whether the candidate had passed or failed on the candidate's script. The decision was indicated only by the final result supplied to SQA.

At visiting verification, in some cases the candidate's record of work contained no indication of assessment taking place during the progress of the Investigation.

There was of a growing awareness of the need for procedures for the internal verification of the internal assessment in a centre. Candidates scripts for Outcomes 1 and 2 with results that were near the pass/fail borderline had been cross marked in a large number of centres.

A few centres demonstrated good practice with the inclusion in the evidence submitted of a marking scheme for Outcome 3. This aids consistency of assessment decisions made within the centre. Checklists of attainment, particularly for Outcome 3, were also used by some centres.

Some internal verification was evident for the marking of the NABs, with a signature and date of the process indicated. However, little was evident in the marking of the Outcome 3 reports.

Areas of good practice

Generally, 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.

Candidates performed well in the assessments relating to Outcomes 1 and 2. Overall the application of the mark schemes for the NABs was good, with the general marking instructions being used. However, care should be taken with interpretation of the marking instructions; a half mark should not be awarded when the scheme allows either (1) or (0).

For Outcome 3, many candidates produced a well structured report, giving procedural details, diagrams and valid conclusions for an experiment at the appropriate level. However, the quality of graphical work was very variable, with evidence of misplotting of points and poor drawing of the best fit line. The evaluation of experimental work at Higher and Advanced Higher level was often poor.

In some cases, there was no indication of the decision as to whether the candidate had passed or failed on the candidate's script.

Areas for improvement

Centres should:

- ◆ refer to the publication *Physics: General Marking Instructions* (1999), if queries occur when interpreting the marking instructions for the NABs. This will aid consistency in standards
- ◆ ensure that their marking of practical reports is clear and that, for each candidate, there is a clear indication on the script of the assessment decision of the centre staff for each Performance Criteria
- ◆ carry out and record internal verification of all assessment decisions
- ◆ 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. Discussions on the possible reasons for the result could be dealt with in the evaluation of the experiment
- ◆ note that if computer drawn graphs are used by candidates, they should be large with appropriate scales and axes — refer to the Excel in Physics HSDU document
- ◆ take care with significant figures when computer generated data is used
- ◆ 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 take care when averaging results to ensure this is valid
- ◆ ensure that the conclusion drawn is linked to the aim of the experiment, particularly at Advanced Higher
- ◆ ensure that the evaluation at Higher and Advanced Higher is appropriate to the level of award. A 'more accurate meter' is not acceptable at these levels. It may be appropriate to evaluate the uncertainties in measurements and then proceed to suggest how these uncertainties could be reduced
- ◆ note that a positive evaluation may be appropriate
- ◆ note that a Unit cannot be resulted without an Outcome 3 assessment having taken place
- ◆ note that the experiment used for an Outcome 3 report must relate to the theory in the Units being taught