



NQ Verification 2015–16 Key Message Reports

Verification group name:	Chemistry
Levels	N3 – Advanced Higher
Date published:	October 2016

This Report combines all Verification Key Messages for the academic session 2015-2016.



NQ Verification 2015–16 Key Messages Round 1

01

Section 1: Verification group information

Verification group name:	Chemistry
Verification event/visiting information	Event
Date published:	March 2016

National Courses/Units verified:

National 3, National 4, National 5, Higher and Advanced Higher Units

02

Section 2: Comments on assessment

Assessment approaches

Almost all centres verified are using the Unit assessment support packs produced by SQA with a few using prior-verified assessments. Most centres are using the Unit-by-Unit approach with some using the combined approach. At Advanced Higher both package 1 and 2 are Unit-by-Unit approach. The majority of centres submitted evidence for Outcome 2.

Some centres are not using the most recent Unit assessment support packs. The most recent Unit assessment support packs should be used and are available from SQA's secure site. When using the most recent Unit assessment support packs the marking guidance for assessing Assessment Standards 2.1 and 2.2 has been revised from previous versions, centres should therefore refer only to the marking guidance in the most recent Unit assessment support packs.

When a centre accepts responses other than those in the marking guidance there should be annotations to the marking guidance to reflect the additional correct responses. Some centres had made annotations to the marking guidance which was helpful. However, in a few cases the additional responses recorded on the marking guidance were incorrect. Centres should therefore ensure that any additional responses added to the marking guidance are appropriate.

Centres should ensure that assessment instruments used for re-assessment are not too similar to those in the first attempt. When questions are used in the re-assessment that are similar to those used in the first attempt, the level of demand is not equivalent in the re-assessment to that in the initial assessment since candidates would be familiar with the questions.

Assessment judgements

On the vast majority of candidate evidence submitted there were clear annotations where the Assessment Standards had been achieved. The majority of assessment judgements were accurate and reliable. In particular, assessment judgements were more reliable at National 3, 4 and 5. Most centres submitted candidate record sheets to record the assessment decisions which aided the external verification process.

Outcome 1

Only a few centres chosen for verification submitted candidate evidence for Outcome 1. Assessment judgements for Outcome 1 were found to be less reliable than those for Outcome 2. Centres are reminded that in assessing Outcome 1 it is vital that the judging evidence tables contained in the Unit assessment support packs are used to ensure that all aspects of a particular Assessment Standard have been addressed. When selecting an experiment to carry out and assess Outcome 1, centres should ensure that the experiment draws on knowledge and understanding from a key area of the course at that particular level. For example, if an experiment involves rates of reaction then average rate should be calculated if at National 5 level rather than just recording mass changes and plotting a graph.

When assessing Assessment Standard 1.1 at National 3, centres should include assessor comments recording that candidates have been seen to follow procedures safely. Comments could be recorded on an observation checklist. When assessing Assessment Standard 1.5 at National 3, it is essential that candidates give an appropriate point in evaluating which relates to the experiment. Comments relating to behaviour and/or following instructions are not sufficient to achieve the Assessment Standard.

When assessing Assessment Standard 1.2 at National 4, National 5 and Higher, centres should include an assessor checklist to record that candidates have been observed to follow procedures safely. Several centres submitted candidate evidence with an overview record sheet stating Assessment Standard 1.2 had been achieved but with no annotations or checklist to show clearly the basis on which assessment judgements had been made. Centres are encouraged to make use of observation checklists with appropriate comments.

When assessing Assessment Standard 1.3 at National 4, National 5 and Higher, candidates must include raw data. When performing a titration raw data must include the initial and final burette volume. Colour changes at the end point of a titration should be taken as observations and should also be recorded with the raw data.

When completing an Outcome 1 report it is important that candidates are encouraged to make sure that all tabulated results have the correct headings and units and these must be repeated and averaged. The mean values should then be used on any graph resulting from the data.

Outcome 2

When centres are making assessment decisions at National 5, Higher and Advanced Higher, they should consider the appropriate General Marking Principles which can be found in the published Finalised Marking Instructions for each level.

When assessing the Nature's Chemistry Unit at National 5 and Higher or the Organic Chemistry and Instrumental Analysis Unit at Advanced Higher, candidates are often required to draw full structural formulae or name compounds. Centres are reminded, as stated in the General Marking Principles, that the misuse of punctuation when naming compounds should not be a reason not to award a correct response. For some questions it is essential when naming particular compounds that the full systematic name is given as per the marking guidance. For example if candidates are required to state the name of a propanol molecule a correct response would incorporate a number '1' or '2' depending on the particular isomer. When candidates are required to draw a full structural formula with a branch or functional group such as a hydroxyl group a correct response would show the chemical bonds correctly connected. For example, where a correct response for a question requires a methyl branch to be joined to a carbon chain a bond drawn to 'H3' rather than 'C' would be an incorrect response.

Where a particular question requires units to be included in the answer, the units must be correct. When the units are given in the question, for example 'state the energy released, in kJ mol^{-1} ', a correct response would not require units but if a candidate included incorrect units this would be regarded as an incorrect response.

When assessing the Chemical Changes and Structure Unit at Higher using the Unit assessment support pack Unit-by-Unit approach, package 1 — questions 1, 6 and 7 were found to be poorly assessed with assessment decisions not always being reliable. A correct response for question 1 would include the term 'successful' when referring to an increase in the number of collisions. A correct response for question 6 must include both the type of bonding and the structure. The word 'covalent' with no indication of network would not be sufficient for a correct response. In answering question 7 candidates must clearly describe that when graphite sublimes covalent bonds are broken or when fullerene sublimes only weak intermolecular forces or London dispersion forces are broken.

Rigorous, accurate and consistent application of a marking guidance is essential in assessing Outcome 2. This can be facilitated by effective internal verification procedures within a centre.

Centres are encouraged to check the addition of correct responses when assessing Assessment Standard 2.1. Addition errors when totalling the number of correct responses resulted in a few instances of candidates being wrongly assessed as having achieved or not achieved the Assessment Standard.

It is also important that assessors record clearly on the candidate evidence where they decide that an Assessment Standard has been achieved. This would aid the internal verification of the candidate assessment and eventually the external verification process. It is also important that the centre applies the internal verification procedures and clearly demonstrates what the final decision is after any disagreement with the original assessor.

03

Section 3: General comments

This session in Round 1, centres were either selected for verification in Chemistry for Units at National 3, 4 and 5 or for Units at Higher and Advanced Higher. The vast majority of centres were found to be using a valid approach and made reliable assessment decisions.

Some centres submitted candidate evidence for more than one Unit at a particular level. Centres are only required to submit candidate evidence for one Unit, for example if a centre was submitting evidence for Higher Chemistry for Assessment Standard 2.1 the assessment for Chemical Changes and Structure would be sufficient. There is no requirement to submit the evidence for Assessment Standard 2.1 for Nature's Chemistry as well. A centre is free to choose which Unit to submit candidate evidence for at each level. It must choose the same Unit for all candidates at any one level, but it can choose different Units for different levels.

When assessing Assessment Standard 2.2, centres should ensure that questions are assigned correctly. On several occasions centres had wrongly assigned or recorded which questions were processing and which were predicting. Many centres have clearly indicated on assessments which type of problem solving skill is being assessed. A few centres had wrongly assigned the various problem skills either on the assessment or on the candidate record sheets. All centres are advised to ensure that problem solving skills are correctly assigned.

Almost all centres submitted candidate evidence which had been internally verified. For external verification purposes, evidence should be supplied to demonstrate the internal verification process, not only in the provision of a centre/department policy but on the effective use of the policy on the candidates' work.

It is important that centres record clear assessment decisions both on the candidate scripts and on an appropriate recording sheet to allow both internal and external verification to be carried out effectively. During the internal verification process it is vital that the verifier's markings are clearly visible and any final decision, especially where there was a difference of opinion, is made clear. For some evidence submitted, it was not clear what the final decision was.

NQ Verification 2015–16 Key Messages Round 2

01

Section 1: Verification group information

Verification group name:	Chemistry
Verification event/visiting information	Event/visiting
Date published:	June 2016

National Courses/Units verified:

H21M 74	National 4	Added value unit
H4KK 76	Higher	Researching Chemistry
H7XR 77	Advanced Higher	Researching Chemistry

02

Section 2: Comments on assessment

Assessment approaches

H21M 74 Chemistry Assignment (National 4) Added Value Unit

This Unit was verified at an event.

All centres that were verified used the unit assessment support pack to assess outcome 1 in the added value unit. However there were a small number of centres, selected for verification, which had used an older version of the unit assessment support pack. A small number of centres had changed the requirements for one or more of the assessment standards, in some cases this made the assessment less demanding and in others this had increased the level of demand. Centres should ensure that they refer to the most recent unit assessment support pack when making assessment judgements.

For assessment standard 1.1, candidates are required to select an issue which relates to a unit of the National 4 Chemistry course. During external verification this session there was a greater variety of issues investigated and these included: alcohols as fuels, effect of alcohol on health, biofuels, fertilisers, hydrogen as a fuel, electrochemical cells, plastics, de-icers, and radioisotopes. Evidence for assessment standard 1.1 is likely to be generated during the research stage of the assignment and may be found in a log or journal. A few

centres submitted candidate work books/jotters which contained evidence of achieving this assessment standard.

For assessment standard 1.2, candidates are required to record at least two relevant sources of information/data in such a way that it is retrievable by a third party. Candidates must also include the raw information/data from at least two relevant sources. When referencing books candidates should include the title, author, page number and edition number or ISBN and when the source is a website the full URL should be given. There is no requirement for candidates to reference a practical as one of the two sources but when a practical is referenced the title and aim should be included.

For assessment standard 1.3, candidates are required to present information/data in their own way. The presented information/data must be in a suitable format using at least one of the following: table, line graph, bar chart, diagram, or another appropriate format. In order to verify that a candidate has presented the information/data in their own way the original information/data should be included. Candidates must include the correct use of units, headings and labels where appropriate.

For assessment standard 1.4, candidates must explain at least one impact of the issue on the environment and/or society using some relevant knowledge of chemistry. Candidates are required to explain terms and ideas that are correct and at a depth appropriate to National 4 Chemistry. There is no requirement for extended explanations at this level to achieve this assessment standard.

For assessment standard 1.5, candidates must communicate their findings in a way that is clear, concise, relevant and appropriately structured. Evidence may be in the form of a report, a presentation, an information leaflet or a poster. During external verification this session there was greater evidence of candidates producing a poster to communicate their findings.

H4KK 76 Researching Chemistry (Higher)

This unit was verified by visiting centres.

There are two outcomes for this unit at Higher: outcome 1 (assessment standard 1.1) which is a literature research and outcome 2 (assessment standards 2.1 and 2.2) which involves practical research. The research topic should draw on one or more of the key area(s) of the Higher Chemistry course. The chosen topic should be used for both outcomes.

All centres verified used the unit assessment support pack to assess the Researching Chemistry unit. Candidates may be provided with a briefing document with focus questions but provision of a template or pro forma is not permitted.

Assessment standard 1.1 requires candidates to gather information from (at least) two sources to give a clear description of the chemistry of their research topic. Candidates are required to use terms and ideas at a depth appropriate to Higher Chemistry and reference at least two relevant sources in such a way to

allow a third party to retrieve the sources. During visiting verification this session research topics included: vitamin C in fruit juices, sulfite concentration in wine, biodiesel and iodine number, enthalpy of combustion of alcohols, and antioxidants in tea.

Assessment standard 2.1 requires candidates to plan their practical investigation. Candidates may work in groups to undertake the planning stage; however, the plan should include individual roles and responsibilities of all members of the group. An assessor checklist should be used to show that all candidates have made an appropriate contribution to planning.

Assessment standard 2.2 requires candidates to follow procedures safely and record observations/measurements. An observational checklist supported by assessor comment can be used to provide evidence. Results should be presented in an appropriate format such as a table or line graph. Observations such as colours and colour changes should also be recorded.

For both assessment standards 2.1 and 2.2, candidates must keep a regular record of their work.

H7XR Researching Chemistry (Advanced Higher)

This unit was verified by visiting centres.

There are two outcomes for this unit at Advanced Higher. Visiting verification focused on outcome 1.

Assessment standard 1.1 requires candidates to gather information from at least three sources to demonstrate a clear description of the chemistry related to a research topic. Candidates should use terms and ideas at a depth appropriate to Advanced Higher Chemistry and reference at least three relevant sources in such a way to allow a third party to retrieve the sources. During visiting verification this session some of the research topics included: aspirin synthesis and analysis, wine analysis, iron content of iron supplements, synthesis of paracetamol, calcium carbonate content of shells, chloride concentration in water, magnesium and calcium content of milk, percentage by mass of nickel in nickel salts, analysis of fizzy drinks and manganese content in steel.

Assessment standard 1.2 requires candidates to plan their practical research with a clear description of how the practical investigation should be carried out with enough detail to allow another person to follow. The plan must also include a risk assessment. While use of a pro forma or template for collecting evidence for the unit is not permitted, it would be acceptable to provide a standardised risk assessment table in which candidates can record their risk assessment.

Assessment standard 1.3 requires candidates to follow procedures safely and record observations/measurements. An observational checklist supported by assessor comment can be used to provide evidence for the experimental stage. Results should be presented in an appropriate format such as a table, line graph or summary. Observations such as colours and colour changes should also be recorded.

For both assessment standards 1.2 and 1.3, candidates must keep a regular record of their work.

Assessment judgements

H21M 74 Chemistry Assignment (National 4) Added Value Unit

In most cases centres clearly annotated candidate evidence to show where a particular assessment standard had been achieved. This aided the process of external verification. Centres are therefore advised to clearly mark candidate evidence at the specific point where the centre makes a judgement that an assessment standard has been achieved.

Assessment standard 1.1 was assessed well by centres with candidates researching an issue which related to a unit of the National 4 Chemistry course. All topics submitted for external verification related to a unit of the National 4 Chemistry course.

Assessment standard 1.2 was generally assessed well although a few centres had incorrectly judged that candidates had achieved this assessment standard. Centres should ensure that when a textbook is used as one of the sources that page numbers are recorded. Centres should also ensure that all raw data is recorded when a practical source is used. There were occasions where candidates had made transcription errors when copying information/data from a source. Candidates should be encouraged to clearly identify raw data or source data to aid both marking and verification.

Assessment standard 1.3 was assessed well overall but some centres had incorrectly assessed that candidates had achieved this assessment standard despite several errors in presenting information/data. Centres should ensure that line graphs and bar charts are plotted with an appropriate scale (to fill at least half the available graph paper). Centres should ensure that all points or bars are plotted accurately with $\frac{1}{2}$ box tolerance. During external verification several candidates were outwith this tolerance for some or most of the points or bars plotted. Centres should also ensure that units are given on line graphs and bar charts. Where candidates present information using a graphing package minor grid lines should be included to ensure that the accuracy of plotting can be confirmed by an assessor.

Assessment standard 1.4 was generally well assessed. A small number of centres had incorrect judgements as candidates were assessed to have achieved this assessment standard despite insufficient National 4 Chemistry. Centres could refer to candidate evidence on the Understanding Standards section of the SQA Secure website for clarity on the appropriate depth of National 4 Chemistry required to achieve this assessment standard.

Assessment standard 1.5 was well assessed by centres. A small number of centres had incorrect judgements based on insufficient Chemistry knowledge similar to that noted above for assessment standard 1.4.

H4KK 76 Researching Chemistry (Higher)

In order for assessment standard 1.1 to be achieved there needs to be sufficient chemistry and candidates are required to show a clear understanding of the chemistry, using terms and ideas correctly and at an appropriate level for Higher. This should include equations for reactions, explanations of relevant chemistry ideas and terms such as intermolecular bonding, chemistry of functional groups etc. Some centres had interpreted 'statement' as meaning a sentence (or two); at Higher level the statement should have sufficient chemistry for the candidate to clearly demonstrate their understanding of the topic, and may well run to several paragraphs or even a number of pages. Centres could refer to candidate evidence on the Understanding Standards section of the SQA Secure website for clarity on the appropriate depth of Higher Chemistry required to achieve this assessment standard. Almost all candidates verified included at least two retrievable sources of information.

Assessment standard 2.1 was generally assessed well by centres although some centres had not made reliable decisions based on the requirement for candidates to include safety considerations. Centres should ensure that candidates include the main hazards associated with the procedure or substances and measures taken to reduce the hazards. If candidates are working in a small group then the plan should also include the individual roles and responsibilities of all group members.

Assessment standard 2.2 was generally assessed well by centres. Some centres did not include an observation checklist with assessor comments to record that candidates were observed to have followed procedures safely. Some candidates failed to record observations such as colour changes when carrying out a titration. Candidates should be encouraged to record colour changes observed during the practical in addition to noting anticipated colour changes in their plan. Candidates should also record all raw data including initial and final burette readings. Most candidates kept a record of their work with dates noted in a log.

H7XR 77 Researching Chemistry (Advanced Higher)

Evidence provided for this unit was either in the form of a candidate 'day book' or a typed report, both are acceptable. Many candidates provided a typed report which could then be used as part of a project report.

In order for assessment standard 1.1 to be achieved there needs to be sufficient chemistry at Advanced Higher level. This is likely to include descriptions of procedures and/or explanations of techniques such as back titration, melting point analysis or colorimetry. Overall centres assessed this assessment standard well but some centres were accepting insufficient chemistry. Centres could refer to candidate evidence on the Understanding Standards section of the SQA Secure website for clarity on the appropriate depth of Advanced Higher Chemistry required to achieve this assessment standard. The vast majority of candidates provided at least three relevant sources in a retrievable format.

Assessment standard 1.2 was generally assessed well by centres. Occasionally some candidates did not include sufficient detail to allow the procedure to be followed by another person. Candidates should include concentrations of

chemicals as well as volumes used. Some candidates did not include sufficient detail in their risk assessment. Centres should ensure that candidates include the main hazards associated with the procedure or substances and measures taken to reduce the hazards. Some candidates had not kept a record of progress and this is a requirement to achieve assessment standard 1.2. Centres should encourage candidates to keep a regular record or log as they progress through the practical research investigation.

Assessment standard 1.3 was assessed well by centres with only a few candidates not recording all raw data. Most centres provided an observation checklist as evidence for candidates following procedures safely. There was evidence of some centres having regular discussions with candidates on their progress through the practical research investigation. Some candidates failed to record observations such as colour changes when carrying out a titration or give a description of substances such as precipitates. Candidates should be encouraged to record colour changes observed during the practical in addition to noting anticipated colour changes in their plan.

03

Section 3: General comments

The majority of centres verified in round 2 this session have a good understanding of the national standard. Almost all centres verified had evidence of internal verification activity and it was clear that discussions within centres are helping to share an understanding of assessment requirements across National 4, Higher and Advanced Higher Chemistry.

Centres should ensure that they use the most up to date unit assessment support pack. When centres submit evidence for verification they should ensure that the final assessment decision is clearly recorded as this aids the process of external verification. In some cases the assessor and internal verifier had made different assessment decisions but it was not clear what the final decision was. However, most centres use a different colour of ink and the final assessment decision was clear. Centres frequently submitted a record of discussions which took place between the assessor and internal verifier and this is helpful in detailing what the final decision was.

The overall quality of National 4 added value unit assessments was higher than previous years with a wider range of research topics. Most centres have a good understanding of the requirements to achieve the unit and the individual assessment standards.

When centres are assessing the Researching Chemistry units at Higher and Advanced Higher it would be helpful if annotations were used to identify the relevant assessment standard at the appropriate point on candidate evidence. For example, where evidence for assessment standard 1.1 is contained the assessor could note '1.1'. The centre could also make comments on the candidate's assessment record to highlight the relevant feature of the evidence.