Position Statement

Summative assessment of chemistry at 14-18

Last reviewed: August 2025

Summary

Assessment is a powerful force in shaping how chemistry is taught and experienced in schools. However, current high-stakes, exam-focused assessment practices often narrow the curriculum, prioritise factual recall and undervalue essential skills such as practical investigation, creativity and critical thinking. This approach can disadvantage many learners and limit engagement with the subject. To ensure chemistry remains inclusive and future-ready, the approach to assessment needs to evolve. Assessment should reflect the nature of chemistry and prepare learners for further study and the scientific workplace. A rebalanced approach – valuing both conceptual depth and hands-on experience – will foster deeper learning, value all learners and a wider breadth of scientific ability. This includes direct assessment of practical skills, improved accessibility in assessment design (including tiering and language demand) and a move to carefully implemented digital innovations over time.

Recommendations

1. Exam regulators should work alongside key stakeholders to develop a broader range of robust assessment formats in chemistry. A more varied approach would better reflect how chemistry is practised in real-world settings and allow students – particularly those with SEND or neurodiverse profiles - to demonstrate their abilities beyond terminal written exams.[i] The impact on teacher workload and manageability must be considered, alongside equity issues surrounding non-examined assessment (NEA) tasks.[1]

2. Practical chemistry skills should be directly assessed using authentic tasks rather than written proxies wherever possible; in England this should be part of curriculum and assessment reform at GCSE, while regulators in Wales, Scotland and Northern Ireland should explore increasing the weighting, validity and consistency of practical assessment.[2]

   Options to explore include:

   - A GCSE/National level practical endorsement (similar to A-level)
   - practical exams where students carry out a simple task
   - Oral or video-based demonstration of understanding of a practical task they have completed.

   The balance between practical vs written assessment should align with the purpose and intentions of each qualification (e.g. vocational vs academic), while ensuring assessments remain manageable for teachers.

[1] These may include disadvantaging students with poor attendance, those with less support at home to complete ongoing assessment pieces etc.

[2] We do not advocate for this to be through continuous/controlled assessment or coursework.

3. Retain tiering[3] in science GCSEs and review the overlap between tiers to support fairness and progression. All students should have equitable access to knowledge and be prepared for post-16 science pathways, through all specified content being required for both tiers.[4]

4. Review examination structure (terminal[5] vs modular[6] exams) on a nation-by-nation basis, balancing student wellbeing, exam burden and the cumulative nature of chemistry learning with the specific aims of each qualification. If modular examinations are introduced, regulators should limit their frequency to reduce disruption to learning.

5. To support inclusive assessment, awarding organisations should improve the linguistic and visual accessibility of written assessments by using familiar language, concise sentences and clear formatting. Unspecified technical terms should be avoided. Regulators should provide clearer guidance to ensure STEM questions assess subject knowledge - not general literacy - particularly for the benefit of EAL learners and those with SEND.[7]

6. Exam regulators should work with awarding organisations to trial digital assessment in chemistry in a way that enhances accessibility, such as enabling adjustable text, screen reader compatibility and adaptive questioning where appropriate. Any rollout of digital assessment should be accompanied by investment in equitable access to devices, connectivity and digital literacy, to avoid compounding existing inequalities.

Background

Assessment plays a powerful role in shaping chemistry education.[ii] It influences curriculum priorities, student engagement and perceptions of success. However, the reliance on high-stakes written assessments can narrow the curriculum - limiting depth and equity - and prioritising factual recall over deeper learning. This approach can drive teaching towards test preparation, heighten student stress, reduce engagement and disadvantage learners with different strengths – particularly those with SEND, from under-resourced schools, or those who excel in practical work. Broader, more equitable measures of learning will support more inclusive and meaningful educational outcomes.[iii]

Timed written exams tend to undervalue vital skills such as empirical reasoning, experimentation, creativity, collaboration, oracy, and critical thinking. When these capabilities are excluded from assessment, they are often deprioritised in teaching, limiting students' exposure to the full scope of chemistry and its real-world applications. This not only affects progression into further study and careers,[ii,iv] but also risks undermining chemistry's role in building a skilled and diverse future workforce.[i,v]

Across the UK, practical work is inconsistently assessed. In England, GCSE practical work is not directly examined, while in Wales and Northern Ireland it accounts for just 10% of the final grade. These assessments rarely capture students' experimental skills or inquiry-based understanding.[iv] In a high-stakes system, curriculum time and resources are directed toward examinable content, squeezing out hands-on science[8] – especially in schools facing tight budgets or strong accountability pressures.[vi] Employers and universities already consider those entering the workplace to lack key practical skills, representing a potential constraint to the growth of the chemicals sector.[vii] If hands-on science opportunities continue to be squeezed, this need for foundational practical skills in the workplace is at risk of not being met.

[3] The use of differentiated exam papers (usually split into foundation and higher tier) to assess students at different levels of attainment.

[4] Issues around 'getting through the content' for foundation tier classes can be addressed through ensuring the amount of content specified is appropriate for the size of that qualification. The Science Teaching Survey consistently indicates that the current curriculum is overloaded, and a reduction in content is needed. [See: https://www.rsc.org/policy-and-campaigning/education/the-science-teaching-survey/top-issues-impacting-student-learning-outcomes]

[5] Public examinations taken at the end of a course e.g. in year 11 at GCSE level in England.

[6] Public examinations taken periodically throughout a course. For example, in Wales – where a modular approach is used – exams are taken in both year 10 and year 11.

[7] The introduction of alternative modes of assessment (other than terminal written exams) may also offer a more inclusive experience for young people who struggle with formal written assessments e.g. those who are neurodiverse.

[8] In England at key stage 3 32% of teachers report carrying out hands-on practical work with their classes at least once a week, but at KS4 this drops to just 18%. In Scotland, 68% of third level classes experience hands-on practical at least once a week, but only 23% of National 5 classes do so.

Although A level and Higher qualifications include practical endorsements and assignments, hands-on work remains infrequent.[9,10,viii] Teachers report greater flexibility to embed practical work into the curriculum due to these endorsements, but systemic pressures still limit practical engagement.[ix] Without high quality practical work, chemistry risks becoming a subject taught about science rather than through it.[x]

To support inclusive, engaging and future-focused chemistry education, assessment must be rebalanced. Valuing both hands-on experience and deeper conceptual understanding will support more secure learning, fairer outcomes, improve inclusivity,[i,ii] and better alignment with the skills required by employers and universities.

Key messages

1. **Chemistry assessment needs to include a broader range of methods to reflect the diverse nature of the subject.** Despite regional differences, there remains a widespread reliance on terminal written exams across the UK.[11] A more balanced and varied assessment approach would better reflect real-world chemistry practical and provide students with broader opportunities to demonstrate their skills.[iii,iv]

2. **Assessment structure should consider both student wellbeing and measuring attainment.** The quantity and length of examinations and the high-stakes nature of them should be reviewed through the lens of student wellbeing, to try and strike a balance between maintaining standards and enabling all students to show their potential. This review should include looking at terminal vs modular assessment. Although evidence suggests examination structure makes little difference to grading outcomes,[xi] there may be positive student wellbeing impacts from a more modular approach.[xii] Similarly, linear examinations also offer positive aspects such as encouraging deeper understanding and offering teachers more flexibility in delivery of content.[i,ii,iv,xiii]

3. **Practical work needs to be valued and assessed directly.** Teachers are supportive of increasing the amount of direct assessment of practical skills where it already takes place in the UK.[12] Teachers with practical assessment experience report greater confidence in the fairness and educational value of such assessments.[13,i,iv,ix,xiv]

4. **Tiering in assessment should support progression and equity.** Tiering plays an important role in ensuring students are assessed in line with their current attainment, supporting achievement and access to further education and careers. When designed inclusively, tiering should offer flexibility and appropriate challenge. Differentiating through question demand rather than content and an increased overlap in the grades achievable in foundation and higher tiers may go some way to mediating potential limitations from using tiering.[iv,xv]

5. **Assessments should be designed to enable every pupil to demonstrate their ability.** Fair and rigorous assessment should be inclusive by design, enabling all students - regardless of background, ability, or disability - to demonstrate their skills. This includes using plain language, clear layout (e.g. avoiding turning the page to review information) and using images and colour so they don't disadvantage, e.g. colour-blind students.[xvi] Providing accessible formats, assistive technologies and exam aids can shift focus from rote memorisation to meaningful application, fostering deeper scientific understanding and better reflecting real-world practice.[i,ii,xvii]

[9] Following reform in 2015, a practical endorsement element was added to A level chemistry. Although not part of a student's final grade, the requirement to assess students against set criteria, along with monitoring by awarding bodies, was intended to encourage opportunities to undertake practical work. In Scotland, Highers students complete an assignment based around a practical experiment, worth 20% of their final grade.

[10] In England 15% of teachers report completing hands-on practical work with their KS5/Higher classes at least once a week; In Scotland 17%; Wales 7%; Northern Ireland 34%.

[11] Teachers – particularly in England – have told us repeatedly about the limitations of such models [see: https://www.rsc.org/policy-and-campaigning/education/the-science-teaching-survey; 2024 full data set].

[12] 78% of teachers in Northern Ireland and 65% in Wales favour externally assessed practical exams [see: https://www.rsc.org/policy-and-campaigning/education/the-science-teaching-survey; 2024 full data set]

[13] In England teachers have previously noted that the removal of practical exams has reduced student engagement with laboratory work and weakened practical competencies.

6. **Generative AI (GenAI) presents opportunities for alternative assessment models and reducing teacher burden, but it should be used with caution.** GenAI is evolving rapidly and presents opportunities for its use in student assessment. Early trials - providing feedback and tailored support to students on written tasks[xviii] - show it performs best when given very specific, structured requirements, prompts and clear criteria (such as the National Curriculum).[xix] However, any use of GenAI in statutory assessment (e.g. evaluating oral or video evidence of student understanding, adaptive testing) must be trialled and developed iteratively and carefully to maintain standards and fairness. GenAI also potentially has an impact on the validity of non-examined assessment methods (e.g. written work completed over time) and this should be considered.[xx]

7. **Digital assessment offers new opportunities.** Digital assessment offers valuable new opportunities to assess skills like experimental design, data analysis, and conceptual reasoning through simulations and interactive tasks. However, it should complement – not replace – traditional methods. Any implementation of digital assessment must be cautious and inclusive, requiring substantial investment in infrastructure, staff training and accessibility support to avoid deepening existing digital divides. A phased, research-informed roll-out is essential to ensure that digital assessment promotes equity, supports diverse learners and strengthens the overall assessment system.[iv,xiv]

For any queries relating to this position statement, please contact: EducationPolicy@rsc.org

References

[i] McDowall, A., Kiseleva, M. (2024). A rapid review of supports for neurodivergent students in higher education. Implications for research and practice. *Neurodiversity*, 2, 1-16, DOI: 10.1177/27546330241291769

[ii] Rethinking Assessment (2024), 'Blueprint for change', available at: https://rethinkingassessment.com/

[iii] Independent Assessment Commission (2022), 'New ERA final report', available at: https://www.neweraassessment.org.uk/findings

[iv] Cambridge University Press & Assessment (2025), 'Striking the balance: a review of 11-16 curriculum and assessment in England', available at: https://teach.ocr.org.uk/striking-the-balance

[v] Lucas, B. (2023). Beyond the baccalaureate: Learning from across the world. London: Edge Foundation.

[vi] Royal Society of Chemistry (2023), 'Science Teaching Survey 2023; barriers to practical work', available at: https://www.rsc.org/policy-and-campaigning/education/the-science-teaching-survey/2023/negative-impact-of-underfunding

[vii] Royal Society of Chemistry (2024), 'Future workforce and educational pathways', available at: https://www.rsc.org/policy-and-campaigning/discovery-and-innovation/future-workforce-and-educational-pathways

[viii] Royal Society of Chemistry (2025), 'Science Teaching Survey 2025', unpublished.

[ix] Ofqual (2017), 'The impact of qualification reform on A level science practical work', available at: https://assets.publishing.service.gov.uk/media/5ca5b7f4ed915d0c4eba189c/Research_report_on_A_level_science_practicals_paper_1.pdf

[x] Royal Society of Chemistry (2024), 'Practical chemistry education: A vision for practical chemistry in 5-19 education', available at: https://www.rsc.org/policy-and-campaigning/policy-library/practical-chemistry-education

[xi] Ofqual (2019), 'Examination reform: impact of linear and modular examinations at GCSE', available at: https://assets.publishing.service.gov.uk/media/5cc6b2faed915d0568ba3bdd/Modular_linear_report_final.pdf

[xii] Royal Society of Chemistry (2024), 'Science Teaching Survey 2024: full data set', available at: https://www.rsc.org/policy-and-campaigning/education/the-science-teaching-survey

[xiii] Vidal Rodeiro, C. L., Nadas, R. (2011). The effects of GCSE modularisation: a comparison between modular and linear examinations in secondary education. *Cambridge Assessment: Research Matters* (11). Available at: https://www.cambridgeassessment.org.uk/Images/471466-the-effects-of-gcse-modularisation-a-comparison-between-modular-and-linear-examinations-in-secondary-education.pdf

[xiv] CBI (2019), 'Getting young people 'work ready'', available at: https://www.cbi.org.uk/media/2960/cbi_work-readiness.pdf

[xv] Cambridge Assessment (2013), 'Tiering in GCSE – which structure holds most promise?', available at: https://www.cambridgeassessment.org.uk/Images/138921-tiering-in-gcse-which-structure-holds-most-promise-.pdf

[xvi] Ofqual (2025), 'Ofqual handbook: general conditions of recognition; section D – general requirements for regulated qualifications', available at: https://www.gov.uk/guidance/ofqual-handbook/section-d-general-requirements-for-regulated-qualifications

[xvii] Ofqual (2020), 'Online and on-screen assessment in high stakes, sessional qualifications', available at: https://www.gov.uk/government/publications/online-and-on-screen-assessment-in-high-stakes-sessional-qualifications

[xviii] Department for Education (2025), 'Policy paper: Generative artificial intelligence (AI) in education', available at: https://www.gov.uk/government/publications/generative-artificial-intelligence-in-education/generative-artificial-intelligence-ai-in-education

[xix] Department for Education (2024), 'Use cases for Generative AI in education', available at: https://assets.publishing.service.gov.uk/media/671108a18a62ffa8df77b2bf/Use_Cases_for_Generative_AI_in_Education_-_Technical_report_October_2024.pdf

[xx] Joint Council for Qualifications (2025), 'AI use in assessments: your role in protecting the integrity of qualifications', available at: https://www.jcq.org.uk/wp-content/uploads/2025/04/AI-Use-in-Assessments_Apr25_FINAL.pdf