Qualification Accredited

OCR
Oxford Cambridge and RSA

A LEVEL

Monitors' report

SCIENCE

H414/04, H420/04, H422/04, H432/04, H433/04, H556/04 , H557/04

For first teaching in 2015

Endorsed component (04)
Summer 2022 series

Contents

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Introduction

The current A Level specifications for Biology, Chemistry, Physics and Geology encourage the development of skills, knowledge and understanding in science through teaching and learning opportunities for regular hands-on practical work.

To gain a 'Pass' in the Practical Endorsement candidates must carry out a minimum of 12 practical activities, demonstrating competence in the requirements of the Common Practical Assessment Criteria (CPAC), in skills common to all sciences (1.2.1 in the specifications) and in apparatus and techniques specific to each science (1.2.2 in the specifications). Centres can use our suggested activities, their own activities, or activities from other sources to meet these requirements.

Candidates must keep an independent record of their practical work throughout the course. The assessment of the Practical Endorsement is carried out by teachers as they observe candidates carrying out the practical activities. To evidence this, centres must keep records of when practicals have been carried out and of teacher judgements of candidate competence in the relevant skills, apparatus, and techniques.

Our visiting monitors carry out quality assurance of the Practical Endorsement. Visits take place in two-year cycles; individual centres receive a single monitoring visit for a single science subject during the two-year cycle. Exceptions are for large centres, defined as one with more than 140 A Level entries for any one of the A Level sciences, which receive monitoring visits for all sciences. Additionally, Geology visits are separate to those for Biology, Chemistry, and Physics, so centres delivering A Level Geology should expect a Geology monitoring visit once every cycle. Any centres new to OCR should notify us that they intend to make A Level entries so that a monitoring visit can be scheduled during the teaching of the first cohort.

Monitoring visits are intended to be supportive, helping centres to deliver the Practical Endorsement effectively. Monitors make sure that the (CPAC) are being correctly applied, and that procedures and records are being maintained in order to meet the requirements of the Practical Endorsement.

You can use all practical work carried out as a part of the programme of study to assess demonstration of the competences required, rather than limiting practical assessment discrete assessment opportunities. Teachers are encouraged to plan their programmes of work to integrate practical activities with the acquisition of knowledge and understanding across the course of study.

Advance Information for Summer 2022 assessments

To support student revision, advance information was published about the focus of exams for Summer 2022 assessments. Advance information was available for most GCSE, AS and A Level subjects, Core Maths, FSMQ, and Cambridge Nationals Information Technologies. You can find more information on our website.

Further support

Our Positive about Practical page includes further guidance, support and resources for delivering the Practical Endorsement.

Overview

The first year of the fourth monitoring cycle took place during a period when the effects of the pandemic were still very much in evidence and with mitigations to the requirements for the awarding of the Practical Endorsement. The requirements for delivery, assessment and monitoring will return to the pre-pandemic arrangements in September 2022.

Practical endorsement monitoring

Cross-board guidance on the return to face-to-face practical endorsement monitoring visit will be available on our Positive about Practical page at the beginning of the 2022-23 academic year.

Monitoring took place remotely and this involved a lot of extra work for teachers uploading evidence of learner work. We want to thank you for this huge effort, on top of all the other stressors teachers have had to deal with, over the last two years.

Centres varied enormously in the quantity of practical work possible because of lockdowns, staff and learner absence and concerns about health and safety. Most centres have, with great ingenuity and resilience, been able to provide candidates with sufficient, suitable practical opportunities to help them to achieve the Practical Endorsement. Most candidates were able to meet the 1.2.1 skills at least twice and by so doing satisfy the CPAC. On occasions this was managed by carrying out some short 'standalone' practical based activities to fill gaps in achievement where practical work had been curtailed. While the requirement to carry out at least 12 activities was lifted this year, many centres exceeded this number even if they had not done as many activities as usual.

In cases of a successful monitoring outcome there is often further guidance provided for the centre and it is important that this is heeded. We expect departments to have implemented this guidance on subsequent visits. The monitoring activity should be seen as useful CPD support, and the main outcomes shared to make sure that other subjects within science meet the requirements. Some centres we monitor are not aware of what has been said during previous monitoring of the other science subjects.

Most centres demonstrated a good understanding of the Practical Endorsement and its implementation. This resulted in them passing monitoring. A minority of centres did not achieve this on the first visit. Further work enabled this to happen at a later stage for most centres in this position. These centres are thanked for their willingness to work with monitors in order to rectify any issues identified.

CPAC 1: Follows written procedures: As candidates progress through the course, it is expected that the amount of verbal guidance given in addition to the written procedures will decrease. Candidates may well fail to demonstrate this competence at the start of the course, and this is not an issue if they can demonstrate it as they progress. The records of candidate achievement should reflect this.

CPAC 2: Applies investigative approaches and methods when using instruments and equipment: There was often a lack of evidence of candidates having the opportunity to choose equipment, decide on variables or measurements. To incorporate this, teachers can use practical activities which require candidates to make a justified choice of what to use from a selection of available equipment or materials. Candidates could select, for example: materials or quantities of materials; dependent and independent variables; types of apparatus and measuring instruments; types of measurements and the ranges of these.

CPAC 3: Safely uses a range of practical equipment and materials: In remote monitoring, teachers had assessed candidates as having worked safely. Many had also carried out thorough risk assessments.

CPAC 4: Makes and records observations: Most but not all candidates made and retained contemporaneous records of their observations. If candidates are working in groups, all candidates should be making and recording observations. In cases where it is necessary to work in groups, these should be changed round periodically and contain no more than two candidates. There is still occasional inconsistency around the number of significant figures recorded, table construction and graphs and these should be addressed. For guidance, centres should follow the section on significant figures in the OCR Practical Skills Handbook.

CPAC 5: Researches, references and reports: The use of correct citation continues to be a frequent issue; this can be addressed by teaching candidates to use an established referencing system (e.g. Harvard). Advice on this is given in Appendix 7 of the Practical Skills Handbooks. Opportunities in the OCR Activities to research and reference were not always taken. Where the opportunities had been taken, the consistency of approach was variable

Lead teacher training

Overall, the requirement for the Lead Teachers to undertake the mandatory training is being met. Where the teaching of a subject is shared between members of staff, the individuals concerned could all undertake the training as a means of standardisation of teachers' assessment.

https://practicalendorsement.ocr.org.uk/

Common areas for improvement

Keep an appropriate plan of practical activities to be undertaken, and when

Several centres lacked clear plans of **when** it was proposed to carry out sufficient practical activities which meet the requirements of CPAC and which **particular** practicals were to be used. Where the centres concerned could demonstrate through the required teachers' and candidates' records that sufficient practical activities had been undertaken, this issue could be mitigated by the centre providing plans immediately following the visit, prior to the submission of the Monitor's report. Where the plan is not followed, for example if planned activities do not take place when expected, it is important that the plan is revised so that the activities planned, and the activities completed on the PAG tracker are in agreement. This is important in order to ensure that all groups complete all activities during the course.

Applying the standards

The Practical Endorsement involves the direct observation and assessment of practical skills. It is important that assessment by teachers of the practical skills 1.2.1(b), (c), (d) and (j), and the use of apparatus and techniques in 1.2.2 is contemporaneous. Candidate records should include primary data on which the assessment is based.

We observed many examples of good practice, with a lot of centres devising systems for recording assessments during practical lessons, often involving tick sheets that are also being used to provide feedback to the candidates.

In some centres, candidates were inconsistent with the number of significant figures they recorded data to during practical work across the sciences. Teachers are encouraged to refer to the Practical Skills Handbooks and look carefully at the appendices. Appendices 4 – 7 (or key excerpts) can be shared with candidates. It is vital that teachers have a clear understanding of the standards of the evidence required to satisfy the practical skills as exemplified in Appendix 3 of the handbook, not only for the purposes of the Practical Endorsement but also so candidates can gain maximum marks in the practical questions on the written papers.

Different teachers at the same centre sometimes applied standards differently. It is important that the standards are shared by all teachers with responsibility for carrying out practical activities which are used for the Practical Endorsement.

It is recommended that all teachers complete the lead teacher online training:

https://practicalendorsement.ocr.org.uk/

Tracking candidate progress

We have continued to develop our practical endorsement trackers, and a "portable" version with greater functionality is available from Interchange for biology, chemistry and physics. This tracker is more readily shareable and supported on different applications such as Google Sheets.

We have also produced a video containing guidance on the use of the flexible and portable trackers:

https://www.youtube.com/watch?v=ZFr4c4k4mVM&t=919s

There is no requirement to use an OCR tracker to record achievement and a minority of centres are using their own systems. Many of the bespoke trackers were elegantly fit for purpose. They demonstrated evidence of the development of candidates' skills and competencies over time. The design of some did not allow monitors to see which criteria had been 'assessed' or which candidates had achieved these during practical activities. Others did not indicate when candidates had achieved competence in certain skills, which is a requirement.

A problem presented when a centre recorded the assessment of CPAC only rather than the individual skills in 1.2.1 of the OCR specification. In many cases these centres were actually assessing these skills, as evidenced on the annotation of learner work, and simply had to change their methods of recording achievement.

Make sure your centre is using the latest versions of all documents (including PAG sheets where appropriate). You should sign up for email alerts (http://www.ocr.org.uk/i-want-to/email-updates) so that you do not miss updates.

A number of centres used some or all their own practical activities to show the required skills and competencies but did not map these correctly to the criteria. Many centres have only recorded the minimum number of practical activities in their trackers. While this is sufficient for the requirements of the Practical Endorsement, recording all practical activities in the tracker provides further evidence for the development of skills. Centres are encouraged to include records of their own practical activities.

Candidate Practical Records

Most candidates are keeping records of practical activities in lab books or folders. Some centres found that folders meant that some work was lost whereas this did not happen when books were used. If you choose to purchase published Practical Endorsement worksheets/workbooks, evaluate the mapping in these resources carefully and amend when necessary. Some aspects of activities, such as the provision of pre-prepared results tables, are too scaffolded to allow the awarding of some of the skills required for the Practical Endorsement.

Practical activities recorded in the student lab records and the records of achievement generally correlated well, although there are still a significant number of instances where the record of skills being achieved does not match the evidence in the lab books. It is **essential** that there is clear match between the candidate's work and the assessment criteria. Use the blank or 'not achieved' status where the evidence does not fully meet all aspects of a particular skill.

Candidates have generally found being made aware of the skills that are being assessed in each practical activity and whether or not they have achieved them to be very useful. These are specified in the Teacher and Technician guidance document for each activity, and they could simply be copied and directly pasted into the Candidate Instructions document. This would also have the benefit of providing teachers with a checklist during activities. Some candidates were not aware of what they had to do to meet the criteria for some skills, so centres should make sure this is clear before activities take place.

Many centres provide tracking sheets that list which practical activities will be carried out over the course or allow candidates to record the practical activities as they are carried out. These can act as a useful index for the lab records and are often cross-referenced to skills that may be assessed. Most centres are endeavouring to make sure candidates date the work in their lab records.

A very small number of centres were unable to supply an adequate number of candidate practical records. Additionally, some of the records examined by monitors were incomplete and/or did not show the evidence required. It is essential that candidate records are available during monitoring visits, and that they are dated and include primary data.

Centre Practical Records

It is a requirement that centres have an accurate record of which candidates did or did not meet the CPAC criteria for each practical activity. Candidates' skills and competencies which are directly assessed should be monitored during each activity. A record of the criteria 'achieved'/'not achieved' ('Y' or blank) should be made during or shortly after the activity.

Some centres left the older versions of a tracker to show 'achieved', or on the Portable tracker inserted a Y, even when candidates clearly did not adequately demonstrate competence. Centres must make sure that any competencies not demonstrated, or which were not required of the candidate are changed to 'not achieved' or deleted/'unmapped' on the tracker.

It is possible to correct a candidate who does not meet a particular required standard at the start of the activity and observe that they become reliably competent during that activity. The candidate can then be said to have achieved that skill or competency.

Common questions

Should I only use the OCR suggested practicals for assessment towards the Practical Endorsement?

- it is not mandatory to use our suggested practical activities. You can use any practical activities that provide candidates with opportunities to demonstrate all the required skills and competencies. There is also no requirement to complete all of our suggested practicals as part of your delivery of the Practical Endorsement

- any practical work you do with candidates can be counted towards their progress in the Practical Endorsement. We recommend that you do so, as it provides additional opportunities for candidates to demonstrate competence. Any practical activities you do in addition to the OCR suggest practical activities simply need to be mapped to the criteria – use of our flexible or portable tracker allows you to do this easily

- practical activities from other organisations can be used but some may be too structured to allow the awarding of certain CPAC criteria. The mapping of these should be checked carefully before use and adjustments to the activity should be made if necessary.

Can I use the published lab books for the OCR practical endorsement in place of OCR's suggested activities?

- you can use activities from these lab books in place of our suggested activities. However, be aware that these lab books are not endorsed by OCR and there are caveats to their use

- some published lab books overly scaffold the provided activities, for example providing candidates with pre-prepared results tables, which prohibits candidates from independently demonstrating competence in some aspects of the endorsement. If you use them, we recommend that you evaluate the practical activity mapping provided in these lab books and adapt either the activities or the mapping to be appropriate.

Does candidate practical work need to be written up and marked?

- candidates do not have to formally write up practical activities and taking results 'in rough' to copy up later should be actively discouraged. Candidate records of practical work should be contemporaneous. Teachers should make judgements on the primary data and, even if it's later written up, the rough work must be retained in the candidate record

- all candidate practical work should be dated, as this allows monitors to check for agreement between your tracker and the candidate practical work

- candidates do not have to answer the Extension Questions as part of the Practical Endorsement, although the questions can aid them in their preparations for the written examinations. If they are used, there is also no requirement for teachers to mark candidate responses to these questions

- there is no requirement from OCR for candidates' practical records to be marked. Teachers should keep to their centre's policy on marking. Many teachers and candidates have found marking and providing formative feedback on candidate practical work useful in supporting skill development and providing evidence of assessment of skills.

How can I accurately assess candidate competence during a practical?

- achievement is not automatic upon completing activities. Candidates should not be recorded as having achieved all skills that could be assessed in each practical activity without assessments having been made. It is expected that candidates will show progression in their skill acquisition over the two-year course. Not achieving some competencies in earlier practical work is not a problem if they are able to demonstrate competency routinely and consistently later in the course

- some skills are assessed very frequently during the course of the Practical Endorsement (for example, following written instructions). You don't need to assess every skill on every occasion, and it can be beneficial to just concentrate on fewer skills, particularly if they are skills that candidates have less opportunity to practice. The tracker should be adjusted to reflect the skills you assess. This can help you with judgements of competence in larger classes

- if you require candidates to work in groups during practical work, all candidates must make and record observations. Change groups regularly and make sure they contain no more than two candidates

- asking candidates to self-assess their competence can be a useful pedagogical tool. However, their competence still needs to be assessed directly by the teacher. If you rely on candidates' self-assessments alone, you are unable to confirm that the evidence is either valid or authentic for each candidate.

How do I know if and when my centre requires a monitoring visit?

- monitoring visits take place in two-year cycles. The 2021-22 academic year was the first year of the fourth cycle, which means that the next academic year will be the second year of the fourth cycle

- all centres receive a visit for a single science subject during the two-year monitoring cycle. Exceptions are large centres (with more than 140 entries for a single A Level science) and centres that only become known to us after the entries deadline in February of each year. Centres who fail multiple visits in a single subject may also trigger visits for other subjects at their centre.

- Geology is monitored separately from Biology, Chemistry and Physics, so if you offer Geology A Level you will also receive a Geology monitoring visit in every two-year cycle

- your centre can be visited at any point during the two-year monitoring cycle. The year in which you were visited for the previous cycle usually has no bearing on whether you're visited in the first or second year of a cycle. Some centres may find themselves being visited in consecutive years, while others may find they have a larger gap between visits

- if you are not sure whether or not your centre requires a visit in a particular year, it is best to check directly with us. This avoids the need for last-minute visits at the end of the monitoring cycle which can be inconvenient for both you and your candidates.

How long do we have to keep candidate work and records of their progress in the Practical Endorsement?

- candidate work does not need to be securely held or formally submitted. We actively encourage candidates to be responsible for it. The only point at which centres are required to hold candidate work is in preparation for a monitoring visit, as it will form part of the evidence for the Practical Endorsement being implemented appropriately

- during the course, it may be advantageous for you to keep candidates' records at your centre. However, at the end of the course candidates will need their work for three reasons:
    - it is the candidate's independent record and belongs to them
    - they will need their work to revise for practical-based questions in the written assessments
    - it may be advantageous for candidates to take it with them to university or refer back to it during future study.

- we recommend that you keep data tracking candidate progress for the lifetime of the qualification. This can be as simple as retaining a copy of the tracker for each year's candidates.

Answers to further common questions are available on the Positive About Practical page

Key recommendations

- read and act on updates from us regarding the Practical Endorsement. We send important updates as Subject Information Updates, and send useful information and guidance via the Science Torchlight newsletter. At least one person in your department should be signed up to receive this newsletter to make sure you don't miss anything. You can sign up to receive the newsletter

- as part of the report to your centre after a visit, your monitor may include 'Further guidance for the centre'. It's important that you discuss this guidance in your department and act on it

- make sure all teachers in your centre have a good understanding of the standards. While it is only a requirement that the lead teacher completes the online Lead Teacher Training, it can be useful for the other teachers in your department to complete it too

- make sure all record keeping – tracker and candidate records – is up to date and accurate

- ask for help if needed. Our subject advisors are always available to support you

- encourage your candidates to take responsibility for their progress – give constructive feedback and signpost the criteria for them.

Helpful resources

Teaching resources, including practical activities and planning:

Biology A webpage

Biology B webpage

Chemistry A webpage

Chemistry B webpage

Physics A webpage

Physics B webpage

Geology A webpage

Online Lead Teacher Training

Practical Skills Handbooks:

Biology

Chemistry

Physics

Geology

Drawing Skills booklet:

Biology

Geology

Practical Endorsement FAQs
Flexible Tracker: Available on Interchange

Portable Tracker

Biology

Chemistry

Physics

'Positive about Practical' OCR page

Practical Activities Support Guide:

Biology

Chemistry

Physics

Practical endorsement skills tick table:

Biology

Chemistry

Physics

If centres wish to receive advice about the suitability and the mapping of practical activities, they can contact: science@ocr.org.uk

A Level Biology A - H420/04, A Level Biology B (Advancing Biology) - H422/04

Most centres are still basing the delivery of the Practical Endorsement around OCR's suggested practical activities though more use of alternative activities was seen in the last cycle. Most teachers appreciate that alternative and extra practical activities may be used to assess candidate competence resulting in more practical work being included in the delivery of A Level Biology. The majority of centres planned to integrate practical activities into the delivery of the subject content though all centres experienced varying degrees of disruption as a result of the impact of the Covid pandemic.

Many teachers have found the delivery of the Practical Endorsement particularly challenging over the last two years with some centres facing extreme difficulties as a result of the impact of the pandemic. Despite this, the majority of centres found ways of supporting their candidates to develop the required skills. Some of the creative alternative activities could continue to be used to support skill development, such as further planning and researching activities and the use of interactive online simulations.

Some centres are only using 12 of our suggested practical activities to assess skills, even when further practical work is being carried out. In some instances, this has contributed to a misunderstanding that the Practical Endorsement is achieved by 'passing PAGs' rather than demonstrating competence in a range of practical skills. Candidates should record all practical activities in their lab books/folders; you can use these records to show progression of skill development. You can easily map extra practical activities on our Flexible or Portable PAG Tracker to assess candidates against the endorsement criteria.

Most centres maintain records of candidate achievement of skill criteria appropriately. More centres are routinely recording achievement of skills in feedback to candidates which is recorded in their lab books. This is often in the form of skills tick tables. Candidates and teachers have both found this effective in terms of providing efficient, targeted feedback to support progression, and keeping candidates informed about their progress towards achieving the Practical Endorsement.

Monitors saw some issues with the correct recording of when competence in skill areas has been demonstrated. This was most commonly in relation to skills relating to biological drawings, investigative skills and referencing. Further guidance about the expected standards for these skill areas is available in the Biological Drawing Skills Booklet and the Practical Skills Handbook (Appendix 7 for referencing guidance). Centres have found the learner checklists that are in the Biological Drawing Skills Handbook effective in supporting candidates to develop the skills required to correctly record and present observations and measurements in tables, graphs and drawings.

Many of the records relating to the application of investigative skills lacked evidence of the choices candidates had made in developing their plans. CPAC 2 and 5 require higher level skills that many candidates found more challenging to achieve initially. Many centres have been successful in supporting their candidates to develop these skills by providing extra opportunities to develop them throughout both years of the course.

Other common issues were the drawing of lines of best fit on graphs and the recording of results for qualitative tests. There were many instances where candidates had not chosen the most appropriate line to draw on their graphs (for example, joining points dot-to-dot when lines of best fit would be most appropriate, or opting for free hand dot-to-dot lines when unsure). Recording of results for qualitative tests in PAG 9 frequently lacked the required level of detail which should include observations before and after using appropriate scientific terminology, and an interpretation of the observations.

Where there is more than one teacher delivering the Practical Endorsement there have been instances where there is inconsistency in interpretation of the standards and assessment decisions being made. It is important that assessment decisions are standardised and that all teachers involved are fully aware of the requirements of the Practical Endorsement and the standards expected for skills to be assessed as achieved.

With the delivery of the Practical Endorsement now being in its seventh year most centres are demonstrating a greater understanding of what is required and have procedures in place that are being refined to best suit the working of the centres. This includes developing and using alternative practical activities to our suggested practicals and using "standalone" extra activities to develop particular skills particularly for the more difficult to achieve, higher level skills associated with CPACs 2 (1.2.1a) and 5 (1.2.1g, h and i). Most centres are finding that, when schools are fully operational and not impacted by the pandemic, the required amount of practical work can be successfully delivered with available teaching time. However, where teaching time is less than five hours a week there have been time constraints. Centres that are limited to lessons of an hour or less, with no double lessons in the timetable, have also had difficulties completing some of the longer practical activities in the available time.

A Level Chemistry A – H432/04, A Level Chemistry B (Salters) – H433/04

Candidates achieved the practical endorsement this year through the exceptional commitment and expertise of Chemistry Teachers in overcoming a variety of pandemic related issues. Despite the difficulties, many centres have continued to deliver excellent candidate training in practical work. Evidence shows that high standards are both expected from and achieved by candidates in the majority of centres.

Where this was not found to be the case, the majority of Lead Teachers have been very keen to make the changes necessary for their centre to be 'Passed'. It is, however, important that such centres follow through the advice offered in the final section ('Further Guidance') of the report to ensure continued compliance. This information should be embedded into the departmental culture so that when staff changes occur, the compliance continues.

Teachers have been determined to ensure candidates could move into the next stage of education or working life equipped with the requisite skills and competencies despite the pandemic. They showed imagination and determination to assess all the skills required at least twice and to encourage good habits in practical work through targeted feedback to candidates.

The use of demonstrations, simulations and videos to introduce some of the techniques was common during remote learning but most centres have been able to give candidates to opportunity to carry out these techniques for themselves on return to face-to-face learning. One or two centres have decided to embed some of these alternative assessment methods into their practical planning as they have proved so effective and successful, particularly where they can be used at any time for absentees from the main session.

A very small number of centres seemed to have been unaware of the guidance issued during the pandemic regarding how the Practical Endorsement was to be assessed. Lead teachers need to ensure they both receive and digest the updates we send regularly. Next year, all modifications will be removed, and we return to expecting all skills in 1.2.1 to be covered routinely and consistently and all techniques in 1.2.2 to be carried out hands-on by all candidates.

Most centres are using our suggested practical activities and one of our trackers. A number of centres have made the decision to move to the Portable Tracker whilst some had not even heard about this resource. Some centres use their own trackers and/or their own practical activities which they have mapped against the criteria to ensure that assessment of achievement is valid. Occasionally, centres using their own tracker have not ensured that its design allows for the accurate record keeping of all the skills to be assessed.

It is important to check that the tracker shows an accurate and up to date record of which candidates did and did not achieve the skills which were required of them during a particular practical activity. **The inaccuracy of records continues to be the most common reason for centres having to undergo a second monitoring visit to gain a Pass.**

General issues which have caused problems in Chemistry Monitoring are covered earlier in this document. Specific issues raised by teachers in visits often relate to the time taken and lack of sufficient equipment for some of the Organic Chemistry practicals. In the pandemic, some centres have shortened these practicals but some have not altered the mapping on the tracker to reflect this and consequently ended up with inaccurate records. Candidates often have to work in groups to carry out reflux and distillation. Most teachers have developed a method of ensuring that individuals master these techniques despite working together, though this is an area for improvement for some centres.

A small number of centres recorded candidate competencies which were clearly 'wrong' in some way. Where the class or a candidate does not get the expected answer, for example in PAG 2.3 where X has to be identified in a carbonate, this should be explored. It may be simply that the learner has made a calculation error or that the solutions have been made up incorrectly. It's always a good idea to try out the practical before candidates do it to check it gives the expected results. If the balance or burette was not used correctly by an individual candidate, skill 1.2.1(c) should not be awarded.

The manner in which CPAC 2 skills are assessed is often a talking point in a visit because some centres have not required candidates to provide adequate written evidence of planning and making choices for 1.2.1(a). PAGs 4.3 and 7.3 are more demanding of candidates than others in these groups and allow for early introduction of these important skills. Some of the activities in PAG 12 involve researching a method and, too often, candidates are simply 'copying and pasting' rather than devising their own method by considering what is available and making choices. Centres have pre-empted by using plagiarism to detect this issue. Where teachers end up with a number of different plans from their candidates, you can issue a single method at the start of the practical work to save your technician having to make up lots of solutions of different concentrations. PAGs in groups 9 and 10 include opportunities for candidates to make choices and these are often missed by centres or 'given' upfront. If that is an active decision on your part, you should alter the tracker so that 1.2.1(a) is not included in the achievement.

Some centres, even if they remember to ask candidates to write a risk assessment, do not always insist that these include products and procedures as well as reactants, are specific to the state and concentration of the chemicals involved and allow for modifications during the actual practical work. Most centres get their candidates to cite the research carried out for these and hence 'kill two birds with one stone' for skills 1.2.1(h) and (i).

Finally, for skill 1.2.1(g) there is a distinction between 'using software' and 'using software well' which often crops up. Poor graphs (for example, dot-to-dot lines, no labelling of axes and no title), are often seen and monitors will challenge centres to introduce aspirational use of software. It is suggested that centres teach candidates how to use Excel/alternative before they assess its use.

We thank centres for their professional approach to delivering the Practical Endorsement and engaging positively with our visiting monitors. As a result, we are confident that, in most centres, the Practical Endorsement is equipping our A Level Chemistry candidates with a valuable range of practical skills both now and for the future.

A Level Physics A - H556/04, A Level Physics B (Advancing Physics) H557/04

Most teachers of A Level Physics are found to be committed to the use of practical activity during their teaching of the subject as an aid to candidates' engagement and understanding of Physics. The teachers felt that the developmental approach of the Practical Endorsement was beneficial to the candidates and enhanced their enjoyment of the subject while being an effective aid to teaching and learning.

Most centres expressed appreciation of and made full use of our suggested activities to effectively cover the Common Practical Assessment Criteria (CPAC), the associated Practical Skills and the Use of Apparatus and Techniques (sections 1.2.1 and 1.2.2 of the specification respectively). Some centres have included extra tasks on the OCR Student activity sheets in order to increase the opportunities for candidates to provide evidence for particular skills. For example, extra tasks to compare their experimental results with accepted values for extra opportunities for research and citing for practical skills 1.2.1(h), 1.2.1(i) and CPAC 5.

A small number of centres are using materials other than those provided by OCR. Some of these materials are not particularly helpful as they either do not map closely or do not map at all to the practical skills 1.2.1, use of apparatus and techniques 1.2.2 and the CPAC targeted by the OCR activities. Centres need to make sure that their teacher records accurately reflect the skills and CPAC targeted or otherwise by the activities and candidates' achievements of these.

Similarly, most centres have adopted one of the OCR-devised PAG trackers to maintain and meet the requirements for teachers' records of candidates' progress. Whereas some teachers found the use of the PAG Tracker daunting, the majority persisted with the use of the Tracker and were able to appreciate its benefits. The most recent 'portable' PAG tracker has already found favour with some centres. Where centres have devised their own tracker, these do not always provide the same mapping to the practical skills 1.2.1, use of apparatus and techniques, 1.2.2 and the CPAC, nor do they provide the same functionality as the OCR trackers.

In general, Physics departments have sufficient laboratory resources and effective technician support to deliver the requirements of the practical activity. Centres need to make sure they have sufficient resources to meet the requirements, particularly for 1.2.2 (h) use of a signal generator and oscilloscope, including volts/division and time-base; 1.2.2 (i) generating and measuring waves, using microphone and loudspeaker, or ripple tank, or vibration transducer, or microwave / radio wave source; and 1.2.2(l) using ionising radiation, including detectors. For guidance, teachers and technicians should refer to the OCR Physics Practical Skills handbook Appendix 2: 'Apparatus list'. This appendix lists the apparatus likely to be required in order to complete a practical scheme of work that covers all requirements of the qualification.

When Physics teachers are using an OCR-devised practical activity for the first time, it is strongly recommended that the teachers with, if possible, the laboratory technician carry out the activity separately beforehand to confirm that the apparatus and experimental conditions will allow candidates to carry out the activity to achieve a useful set of results.

When confirming achievement of CPAC 4 'Makes and records observations', teachers should be mindful that the standards for 1.2.1(d) make and record observations and measurements; 1.2.1(e) keep appropriate records of experimental activities; and 1.2.1(f) present information and data in a scientific way must be met.

Candidates need to be mindful of the need for clear presentation of results recorded in a manner that follows convention; the resolution of the measuring instruments being used must be reflected in the number of significant figures recorded and these must be consistent; graphs should have an informative title, the scales on graphs should be linear and allow for ease of interpolation of values. To support their candidates in the presentation of their evidence and records of their activities, Physics teachers could usefully issue the appendices 4: Measurement, 5: Units and 6: Graphical Skills from the OCR Practical Skills Handbook during their induction, to be retained for the duration of the course; and Appendix 7: Referencing, at the point when candidates are first asked to carry out research.

One area of concern relates to CPAC (2) 'Applies investigative approaches and methods when using apparatus and equipment'. This requires candidates to identify and explain the principles behind a suitable technique to carry out an activity in which, for example, they choose:

- the materials, or amounts of materials, to use
- which variables to measure and which to control
- what measurements or observations to make, when to make these and the size of the intervals between them
- the apparatus to complete a procedure that is safe and appropriate.

Applying investigative approaches should include completing tasks that do not include complete step-by-step instructions, such as those found in Physics textbooks. However, activities may still be structured in some form. For example:

- providing a basic method, with candidates asked to modify this to measure the effect of changing a certain variable
- providing a limited range of equipment, with candidates asked to think about how they can use what they have been given to solve a practical problem
- providing a certain amount of information, allowing candidates to consider how to use familiar techniques or procedures to investigate and solve a problem.

A Level Geology – H414/04

Centres generally have worked to provide a rich and varied experience to candidates despite the difficulties of the last couple of years. Many centres have completed residential fieldwork. Some have taken candidates to local sites.

The main issue faced by centres currently is falling enrolment in the subject and the impact on the viability of continuing to offer Geology as an A Level subject. This appears to have arisen as a result of the three A Level model replacing the previous 4 AS model and the reluctance of centres to commit to running courses in September unless there is a full cohort of candidates committed to the course ahead of timetabling in the summer term. Geology teachers are aware that many candidates have previously enrolled onto the courses after examination results or have chosen Geology as a fourth subject under the previous model. In both cases, once the courses start the subject becomes a popular subject, with candidates who complete the course often choosing to continue with Earth Sciences for higher-level study.

These areas were often identified as showing scope for further development:

- it is essential that candidates are supported to demonstrate the skills. Some centre 'do the activities' without previously briefing the candidates about what it is expected or ensuring that candidates practice the necessary skills. Some candidates do not appear to know what they need to do to meet the criteria for skills such as 'recording data in a scientific manner'
- data recording skills and drawing skills need to be developed in full agreement with the descriptions in Appendices 3 to 6 of the Practical Skills Handbook and with the guidance on pages 4-5 of the drawing skills handbook. This should be firmly embedded by the end of AS and before any fieldwork takes place
- higher order skills need to be evidenced 'routinely and consistently' by the end of the course. In order to meet this requirement, it is essential that they are introduced early enough to generate sufficient evidence of each skill on more than one occasion. This applies to the skills of processing data using software, design of investigations, research and citation of references
- for all skills it is essential that they are both taught and assessed to a standard appropriate to an Advanced Level qualification and in agreement with standards described in the Practical Skills Handbook Appendices 3 to 7.

Areas for improvement in specific skills

Recording Data

- all numerical and observational data should be recorded in tables which the candidates design themselves. If tables are provided, they no longer have full access to an 'achieved' status in all criteria
- tables need to include appropriate headings, with units and data entered should be recorded to the same number of decimal places and should be appropriate to the measuring instrument used
- when candidates record any processed value (for example density) they should also record the raw data they collected to enable this value to be calculated (for example mass and volume)
- for diagrams or observations involving descriptions, judgements should be made on observations not inferences, for example if a mineral is named on a diagram this needs to show the observations (colour, shape etc) that the candidate recorded in order to infer its identity
- candidates typically use geological vocabulary fluently. This may be given if the terms are descriptive (e.g., shape)
- diagrams should follow the conventions described on page 4 of the Practical Skills Handbook.

Software use

Many candidates show themselves proficient with interrogating databases (such as that used in PAG 2.1) and in presenting data using spreadsheets. For secure A Level standards, the following points may be helpful:

- tables of data in spreadsheets should include units with appropriate superscript
- cells should be formatted to an appropriate number of decimal places
- graphs should follow the same criteria as those for handwritten graphs (see appendix 6 of the Practical Skills Handbook), that is, axes should be labelled with units, there should be a title, points should be accurately shown with small crosses. Various graph paper backgrounds are available in most spreadsheets. Graphs should also be of a size appropriate to show the relationship fully
- candidate records should retain both the tables and the graphs produced in the package.

Investigation Skills

It is relatively common for candidates to omit this skill entirely from their written work. It is essential that it is securely evidenced. The description in Appendix 3 of the Practical Skills Handbook for Skill 1.2.1a emphasises that candidates need to demonstrate proficiency in making their own choices of sampling strategies and procedures. Fieldwork is an opportunity to both develop and evidence this skill.

Research and citation of references.

It is essential that research is to an advanced standard. 'Topic' type factual research where candidates copy and paste factual information from websites is too limited in challenge to securely evidence this skill area.

We suggest that candidates carry out research in response to a question or that they carry out research to compare and contrast two geological sites and seek to explain similarities and differences identified. They can do this via an online resource such as Google Earth. You could also extend or adapt PAG 2.1 into a viable research task. Candidates must formally acknowledge references using a system such as Harvard or Vancouver. Full guidance is given in Appendix 7 of the Practical Skills Handbook.

Practical endorsement outcomes

Student attainment of a pass in the practical endorsement has remained high. The combined percentage of candidates achieving a pass in biology, chemistry and physics, across all exam boards, is shown below:

Academic year	Practical endorsement pass rate (%)
2018-2019	98.7
2019-2020	99.3
2020-2021	98.7

A slight increase in the pass rate is evident for the 2019-2020 academic year. It is likely that this slight increase in the number of candidates achieving a pass was due to the relaxation of some of the criteria required for a pass due to the pandemic. The reinstatement of the majority of the criteria last year appears to have returned pass rates to their previous level.

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