

## A LEVEL

*Monitors' report*

# SCIENCE

**H420, H422, H432, H433, H556, H557**

For first teaching in 2015

## Summer 2018 series

### Endorsed component (04)

Version 2

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## Introduction

The reformed A Level specifications for biology, chemistry, geology and physics are intended to 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 learners must carry out a minimum of 12 practical activities from the practical activity groups (PAGs) defined in the specifications. Either OCR's suggested activities or a centre's own activities can be used. To gain a Pass grade, learners must demonstrate competence in the requirements of the CPAC (Common Practical Assessment Criteria), 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).

Learners 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 learners carrying out practical activities. To evidence this, centres must keep records of when practicals have been carried out and of teacher judgements of learner competence in the relevant skills, apparatus, and techniques.

Quality assurance of the Practical Endorsement is carried out by visiting monitors. Visits take place in two-year cycles; individual centres are monitored once during these two-year cycles, with visits limited to one of the sciences. 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. 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. They ensure that the Common Practical Assessment Criteria are being correctly applied, and that procedures and records are being maintained in order to meet the requirements of the Practical Endorsement.

All practical work carried out as a part of the programme of study is intended to be used as the basis for demonstration of the competences required, rather than the assessment being limited to 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.

### *Further support*

Further guidance, support, and resources for delivering the Practical Endorsement can be found on our 'Positive about Practical' page:



<http://www.ocr.org.uk/qualifications/by-subject/science/positive-about-practical/>

## Overview

The first year of the second monitoring cycle has found that the vast majority of centres are providing learners with sufficient, suitable practical opportunities to enable them to achieve the Practical Endorsement. Most learners are able to meet the CPAC by the end of the two years and so achieve the Practical Endorsement.

The vast majority of centres demonstrated a robust understanding of the Practical Endorsement. This resulted in the award of a Monitoring Visit Outcome of 'Yes'. A minority of centres did not achieve this on the first visit. Further work enabled this to happen at a later stage for most in this position. These centres are thanked for their willingness to work with Monitors in order to rectify any issues identified.

CPAC 1 was easily evidenced in observed practicals. Centres must guard against continuing to provide verbal guidance in addition to the written procedures as learners progress over the duration of the course. It is quite understandable for learners to fail to achieve this competence at the start of the course and for the reasons for this needing to be explained to them. The learners' records of achievement should also reflect this.

CPAC 2 was often lacking evidence of candidates being given the opportunity to choose equipment; this can be addressed by using or developing practical exercises which require learners to make a justified choice of what to use from a selection of available equipment. Learners 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 was easily evidenced in observed practicals. In almost all cases when observed, learners treated one another and the laboratory environment with due regard and consideration, and health and safety rules were followed.

CPAC 4 was validated from learner records. Most but not all learners made and retained contemporaneous records of their observations. Centres need to ensure that, when learners are working in groups, each and every learner makes observations and records these. There was some poor practice in terms of inconsistency around the number of significant figures recorded that should be addressed. For guidance, centres should follow the section on significant figures in the OCR Practical Skills handbook.

CPAC 5 was often lacking correct citation; this can be addressed by teaching learners to use an established referencing system (e.g. Harvard). Advice on this is given in Appendix 7 of the Practical Skills Handbooks. Some of the research and referencing opportunities in the OCR Activities were not always taken advantage of. Where the opportunities had been taken, the consistency of approach was variable.

## Most common causes of centres not passing

### *Lack of a record of which learners have met the criteria for each practical activity*

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. Learners' skills and competencies which are directly assessed should be monitored during each activity. A record of the criteria 'achieved'/'not achieved' should be made during or shortly after the activity.

Some centres left the tracker to show 'achieved' even when candidates had clearly did not make observations or record data appropriately. In this case, the use of the tracker was simply an attendance register and was not acceptable.

It is possible to correct a learner who does not meet a particular required standard at the start of the activity and observe that s/he becomes reliably competent during that activity. The learner can then be said to have achieved that skill or competency. A judgement has to be made and the decision recorded. In most cases this means the tracker is left as the default 'achieved' status; at times it will need to be adjusted to 'not achieved'.

### *Applying the standards*

Assessments of practical skills by teachers are generally to the required standard. Assessments should be made at the time the practical activities are being carried out and there have been centres where this has not been taking place. However, many examples of good practice have been observed 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 learners.

A small number of centres were unaware of the standards required for the Practical Endorsement. Not giving burette readings to the nearest  $0.05 \text{ cm}^3$  during Chemistry practical work was a case in point, and there was some poor practice in terms of inconsistency around the number of significant figures recorded during practical work across the sciences.

Teachers are encouraged to refer to the Practical Skills Handbooks and look carefully at the appendices. The entire handbook, and in particular appendix 4, can be shared with learners. It is vital that teachers have a clear understanding of the standards, not only for the purposes of the Practical Endorsement but also so learners can gain maximum marks in the practical questions on the written papers.

There were some inconsistencies in the application of these standards between different teachers at the same centre. 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 as part of their CPD:

<https://practicalendorsement.ocr.org.uk/login/index.php>

### *Lacking an appropriate plan of practical activities to be undertaken, and when*

The absence of clear plans of when it is proposed to carry out sufficient practical activities which meet the requirements of CPAC was an issue at several centres. Where the centres concerned could demonstrate through the required teachers' and learners' 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.

OCR has a model scheme of work on the OCR website. This contains suggested timings for teaching the specification topics, links to relevant delivery guides, and other useful guidance to support scheme of work planning. The timings may be amended to suit individual centres' delivery plans.



Alternatively, centres can also use the scheme of work building tool on the OCR website:

<http://www.ocr.org.uk/qualifications/gcse-and-a-level-reform/create-a-scheme-of-work/>

### *Problems with tracking learner progress*

Where centres were using the OCR PAG tracker, and teachers had familiarised themselves with its operation, they found it greatly simplified record keeping. Although some teachers found using the PAG tracker a challenge to begin with, equally they found the benefits of the automation and functionality within the tracker make it worthwhile to persist with it.



OCR has continued to develop the PAG tracker and a flexible version with greater functionality is available from the OCR website.

<http://www.ocr.org.uk/qualifications/by-subject/science/positive-about-practical/>



Guidance on the use of the OCR Flexible PAG Tracker is available on the OCR website:

<https://www.youtube.com/watch?list=PLtzR6sheDAMG1YtelV5YJuijZHy0xQfna&v=HxaT1M5EaoM>

Some centres experienced difficulties with the use of the OCR tracker (size of cohort, transfer from first to second year and centre IT/hardware difficulties, for example). There is no requirement to use the OCR PAG 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.

Centres should ensure they are using the latest versions of all documents (including PAG sheets where appropriate) and sign up for email alerts

(<https://www.ocr.org.uk/qualifications/email-updates/>) so that these are not missed. In

### ***Problems with tracking learner progress***

many cases, the use of the newer flexible tracker, for 30 learners, would go some way to solving the difficulties centres experienced with both mapping and tracking of practical work. Please note that there is no requirement for centres to use a single tracker file for all of their learners; some centres have used individual trackers for different class groups in order to make use of the OCR PAG tracker easier.

A number of centres used some or all of 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 requirement of twelve practical activities in their trackers. This is sufficient; however, recording all practical activities in the tracker provides further evidence for the development of skills. It is recommended that all practical activities be recorded.

### ***Learner practical records***

The majority of learners are keeping records of practical activities in lab books or folders. There has generally been good correlation between practical activities recorded in the lab records and the records of achievement, though there are still many instances where the record of skills being achieved does not match the evidence in the lab books.

Learners 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. Many centres provide tracking sheets that list which practical activities will be carried out over the course, or allow learners 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. They can also provide another useful prompt for trackers to be dated which is required to cross reference them to records of achievement. Most centres are now endeavouring to ensure learners date the work in their lab records.

Centres can usefully engage their learners in the requirements of the Practical Endorsement through sharing the elements of the Practical Skills 1.2.1 and the Use of Apparatus and Techniques 1.2.2 that are being addressed in each PAG activity. These are specified in the Teacher and Technician guidance document for each activity and they could simply be copied and directly pasted into the Learner Instructions document. This would also have the benefit of providing teachers with a checklist during activities.

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

## Common misconceptions

### *Practical activities*

- It is not mandatory to use OCR PAG practical activities. Any practical activities that provide learners with opportunities to demonstrate all the required skills and competencies may be used.
- Some centres used some or all of their own practical activities to show the required skills and competencies but did not map these correctly to the criteria.
- Others felt they had to do all of the OCR PAG practical activities.
- Commercial 'off the peg' practical activities can be used but 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.
- Some centres treated PAG practical activities and other practical activities very differently, with the former seen as 'assessments'. This is not in keeping with the spirit of the Practical Endorsement. Non-PAG activities can easily be incorporated into the (flexible) tracker and used to show development of skills and competencies across the course.

### *Learner records*

- Practical activities do not have to be formally written up and taking results "in rough" to copy up later should be actively discouraged. Learner records of practical work should be contemporaneous.
- Learner practical work does have to be dated.
- Learners do not have to answer the Extension Questions as part of the Practical Endorsement, though it can aid them in their preparations for the written examinations. If they are used, there is also no requirement for teachers to mark learner responses to these questions.
- There is no external requirement for learners' practical records to be marked, although teachers should comply with their centre's policy on marking. Many teachers and learners have found it useful in supporting skill development and providing evidence of assessment of skills.



### ***Direct assessment of practical skills***

- A small number of centres made no judgement of candidates' skills or competencies during a practical activity and/or did not record this.
- There are some teachers that have assumed that achievement is automatic upon completing activities. This has resulted in learners having been recorded as having achieved all skills that could be assessed in each practical activity without assessments having been made. Some teachers have expressed concern about not achieving skills, thinking it could result in learners not being able to achieve the Practical Endorsement. This is not the case and it is expected that learners will show progression in their skill acquisition over the two-year course.
- At some centres, learners recorded data on paper and then 'wrote up' their work neatly later. Centres are encouraged to insist that learners keep contemporaneous records. It is certainly the case that judgements regarding these skills and competencies are to be made based on primary data and not the neat write up.
- Many teachers continue to assess all the skills it is possible to assess in each practical activity even when learners have already routinely and consistently demonstrated competence in skill areas. This frequently occurs with some of the more commonly used skills such as following written instructions. It is not necessary to assess every skill possible every time and it can be beneficial to just concentrate on fewer skills, particularly if they are skills that learners have less opportunity to practise.
- Some centres did not observe the use of skills directly but relied on the evidence of their activity recorded by learners to credit the achievement of these skills by implication. Using this approach, centres are unable to confirm that the evidence is either valid or authentic for each learner.

## Avoiding potential malpractice

### *What can be done?*

- Read and act on updates from OCR regarding the Practical Endorsement.
- Re-read the Reports issued to any of the Sciences at your centre; discuss and act on the 'Further Guidance for the centre'.
- In large departments, ensure all teachers have a good understanding of the standards.
- Re-visit the online training for Lead Teachers.
- Ensure all record keeping – tracker and learner records – is up to date and accurate.
- Ask for help if needed. OCR will happily support you if requested.
- 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:

<http://www.ocr.org.uk/qualifications/as-a-level-gce/as-a-level-gce-biology-a-h020-h420-from-2015/planning-and-teaching/>

Biology B:

<https://www.ocr.org.uk/qualifications/as-and-a-level/biology-b-advancing-biology-h022-h422-from-2015/planning-and-teaching/>

Chemistry A:

<http://www.ocr.org.uk/qualifications/as-a-level-gce/as-a-level-gce-chemistry-a-h032-h432-from-2015/planning-and-teaching/>

Chemistry B:

<http://www.ocr.org.uk/qualifications/as-a-level-gce/as-a-level-gce-chemistry-b-salters-h033-h433-from-2015/planning-and-teaching/>

Physics A:

<http://www.ocr.org.uk/qualifications/as-a-level-gce/as-a-level-gce-physics-a-h156-h556-from-2015/planning-and-teaching/>

Physics B:

<https://www.ocr.org.uk/qualifications/as-and-a-level/physics-b-advancing-physics-h157-h557-from-2015/planning-and-teaching/>

### Online Lead Teacher Training:

<https://practicalendorsement.ocr.org.uk/login/index.php>

### Practical Skills Handbooks:

Biology: <http://www.ocr.org.uk/Images/294468-practical-skills.pdf>

Chemistry: <http://www.ocr.org.uk/Images/208932-practical-skills.pdf>

Physics: <http://www.ocr.org.uk/Images/295483-practical-skills-handbook.pdf>

### A Level Biology Drawing Skills booklet:

<http://www.ocr.org.uk/Images/251799-drawing-skills-booklet.pdf>

### Practical Endorsement FAQs:

<https://www.ocr.org.uk/subjects/science/positive-about-practical/faqs/>

### Flexible Tracker:

Available on Interchange: <https://interchange.ocr.org.uk/>

### 'Positive about Practical' OCR page:

<http://www.ocr.org.uk/qualifications/by-subject/science/positive-about-practical/>

### Portable Tracker:

Biology: [https://interchange.ocr.org.uk/Downloads/Biology\\_Portable\\_Tracker.zip?downloadId=877655](https://interchange.ocr.org.uk/Downloads/Biology_Portable_Tracker.zip?downloadId=877655)

Chemistry: [https://interchange.ocr.org.uk/Downloads/Chemistry\\_Portable\\_Tracker.zip?downloadId=877657](https://interchange.ocr.org.uk/Downloads/Chemistry_Portable_Tracker.zip?downloadId=877657)

Physics:

[https://interchange.ocr.org.uk/Downloads/Physics\\_Portable\\_Tracker.zip?downloadId=877658](https://interchange.ocr.org.uk/Downloads/Physics_Portable_Tracker.zip?downloadId=877658)

**Practical Activities Support Guide:**

Biology: <https://www.ocr.org.uk/Images/597719-practical-activities-support-guide.pdf>

Chemistry: <https://www.ocr.org.uk/Images/598371-practical-activities-support-guide.pdf>

Physics: <https://www.ocr.org.uk/Images/599951-practical-activities-support-guide.pdf>

**Practical endorsement skills tick table:**

Biology: [https://interchange.ocr.org.uk/Downloads/Biology\\_Practical\\_endorsement\\_skills\\_tick\\_table.zip?downloadId=879783](https://interchange.ocr.org.uk/Downloads/Biology_Practical_endorsement_skills_tick_table.zip?downloadId=879783)

Chemistry: [https://interchange.ocr.org.uk/Downloads/Chemistry\\_Practical\\_endorsement\\_skills\\_tick\\_table.zip?downloadId=879784](https://interchange.ocr.org.uk/Downloads/Chemistry_Practical_endorsement_skills_tick_table.zip?downloadId=879784)

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If centres wish to receive advice about the suitability and the mapping of practical activities, they can contact: [pass@ocr.org.uk](mailto:pass@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 centres are beginning to include more centre devised activities, either to provide further practical opportunities or as alternatives. The vast majority of centres have integrated the practical activities into the delivery of the subject content wherever possible.

Records of learner achievement of skill criteria are generally being maintained appropriately, though there have been some issues with the correct recording of when competence in skill areas has been demonstrated. Learner records of practical activities are usually being kept appropriately, most commonly in the form of lab books or folders.

The majority of teachers are finding this method of assessing practical skills preferable to previous systems. They appreciate that alternative and extra practical activities may be used to assess learner competence resulting in the inclusion of more practical work into the teaching of A Level Biology. Most teachers feel that the Practical Endorsement is resulting in learners developing a higher level of skill in a wider range of transferable practical skills.

### *Lead teacher training*

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

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

The majority of learners also feel they are developing useful skills and greater confidence working in laboratories. Most learners say they are enjoying the practical component of A Level Biology and feel it enhances their understanding of theory. Monitoring of the delivery of the Practical Endorsement has generally found that, where sufficient practical opportunities have been provided, learner's laboratory skills are developing over the two years, and that most are able to demonstrate an ability to work competently and confidently, with increasing degrees of independence, as they progress through the course.

With the delivery of the Practical Endorsement now being in its third year most centres feel they have a greater understanding of what is required and have procedures in place that are being refined to best suit the working of the centres. Initially some centres had problems with lack of equipment but most have now acquired extra equipment or found suitable alternative activities that can be carried out with what they have available. Most centres are finding that the required amount of practical work can successfully be delivered with available teaching time, though where teaching time is less than five hours a week there have been time constraints.

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

Many centres are delivering excellent learner training in practical skills and competencies. Evidence shows that high standards are both expected and achieved. It has been encouraging to see innovative and outstanding work in this important area of A Level Chemistry. The change from Centre Assessed practical work to the new system has been embraced with goodwill and enthusiasm by the majority of centres.

Teachers' perceptions of the Practical Endorsement were largely positive and accurate. Learners were keen to speak of their enjoyment of the practical activities and the benefits of these in relation to the written examination. Some could explain how they knew they were making progress in practical skills from the feedback provided by their teachers.

A minority of Chemistry B teachers felt that the former in-depth Salters project admirably equipped their candidates and were sorry to see this replaced. Though the Practical Endorsement does allow for such projects to still be run and count towards learners' progress, teachers mostly cited a lack of time as their reason for not doing so.

### **Lead teacher training**

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

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

Centres are thanked for their professional approach to delivering the Practical Endorsement and engaging positively with the Visiting Monitors. As a result, we are confident that, in the majority of centres, the Practical Endorsement is equipping our A Level Chemistry learners with a valuable range of practical skills and competencies 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 were found to be committed to the use of practical activity during their teaching of the subject as an aid to learners' engagement and understanding of Physics.

The teachers felt that the developmental approach of the Practical Endorsement was beneficial to the learners and enhanced their enjoyment of the subject whilst being an effective aid to teaching and learning.

A majority of centres expressed appreciation of and made full use of the OCR-devised activities to ensure effective coverage of 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).

Similarly, the majority of centres had adopted the OCR-devised PAG tracker to maintain and meet the requirements for teachers' records of learners' 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.

In general, the Physics departments have sufficient laboratory resources and effective technician support to deliver the requirements of the practical activity.

In addition to the PAG activities, most centres carry out additional activities in respect of many of the syllabus topics. In most cases these were not mapped to the CPAC and were not used to contribute to learner achievement of these. As the delivery of the Practical Endorsement matures, centres could usefully incorporate their own activities to reflect local interests and conditions and to contribute to learners' achievement of the CPAC.

### *Lead teacher training*

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

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

For most learners, the inclusion of practical activities as a part of the Physics course was as expected and many expressed that this is one of the motivations for selecting science subjects for their A Level studies. The developmental approach was also appreciated with learners commenting:

- The activities were enjoyable and helped them to gain a deeper understanding of the subject. Whilst one or two activities were more challenging to achieve acceptable results in, this also contributed to their understanding of controlling experimental conditions.

- The activities helped to underpin what they had learned through applying this knowledge and helped to make this more concrete.
- The use of observations and measurements of their activities and then producing graphs of their findings helped underpin the understanding of the mathematical relationship between variables.
- They found it enjoyable to put theory into practice and found it is easier to recall things in an examination when they had experience of it.
- Learners expressed that it was good to be familiarised with equipment and apparatus when carrying out experiments, helping them visualise principles and to put into practice what had been learnt.
- The range of activities provided ample of practice in preparation for different scenarios in the examination.



## 2015-17 outcomes

The first monitoring cycle for the Practical Endorsement component of the reformed A Level Biology, Chemistry and Physics qualifications concluded in June 2017. The majority of centres passed their initial monitoring visit, with a minority of centres requiring further visits. After additional visits had taken place, only 1% of centres failed to pass a monitoring visit.

	Cross board
<b>Centre first-time pass rate</b>	<b>91%</b>
<b>Centre pass rate (after additional visits)</b>	<b>99%</b>
<b>Biology first-time pass rate</b>	<b>92%</b>
<b>Chemistry first-time pass rate</b>	<b>91%</b>
<b>Physics first-time pass rate</b>	<b>89%</b>
<b>Student pass rate</b>	<b>99%</b>

99% of learners entered for A Level Biology, Chemistry and Physics qualifications achieved a 'Pass' in the Practical Endorsement. Considering the period of time over which practical work is completed during A Level study, it is not surprising that the majority of learners achieved a 'Pass'. Learners achieving a higher A Level grade were slightly more likely to do so.

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Call us on  
**01223 553998**

Alternatively, you can email us on  
**support@ocr.org.uk**

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