

Monitors' report

A LEVEL

SCIENCE

**OCR Level 3 Advanced GCE in Biology A,
Biology B, Chemistry A, Chemistry B,
Geology, Physics A and Physics B**

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

For first teaching in 2015

**Endorsed component (04)
Summer 2025 series**

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Introduction

The current A Level specifications for Biology, Chemistry, Physics and Geology 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 candidates 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 centres' own activities can be used. Candidates must also demonstrate competence routinely and consistently in the requirements of the Common Practical Assessment Criteria (CPAC) in practical skills common to all sciences (1.2.1 in the specifications) through apparatus and techniques specific to each science (1.2.2 in the specifications).

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 practical activities. To evidence this, centres must keep records of when practical work has been carried out, what apparatus and techniques have been used, and the teachers' judgements on candidates' competence in the relevant skills.

Quality assurance of the Practical Endorsement is carried out by monitoring visits. 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. They make sure that the CPAC are being correctly applied, and that procedures and records are being maintained 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.

OCR support



Further guidance, support and resources for delivering the Practical Endorsement can be found on Teach Cambridge, including:

- Practical skills handbook: [Biology](#), [Chemistry](#), [Geology](#) and [Physics](#)
- PAG trackers (Fixed, Flex and Portable)
- CPAC: [Pen portraits](#)
- Practical activities guides: [Biology](#), [Chemistry](#), [Geology](#) and [Physics](#)

To find out more about how the monitoring cycles work, read our blog '[When will our A Level Science Practical Endorsement monitoring take place? Understanding the monitoring cycle](#)'

Overview (all subjects)

The vast majority of centres passed monitoring on the first visit, reflecting strong understanding of the requirements of the Practical Endorsement. Centres requiring a second visit almost always passed from the follow-up visit with appropriate adjustments. This demonstrates the commitment to practical work from teachers, with technician support, and the impact on candidates' practical experiences.

Centres should always have a plan in place (for each class where applicable) to meet the requirements of the Practical Endorsement over the two years of the course. There is no prescribed format other than this being at least termly. A detailed scheme of work with specific dates is not required.

Tracking spreadsheets should accurately reflect the outcomes of candidates in each activity. When using trackers that automatically populate outcomes, teachers should make sure that they adjust those outcomes for individual candidates. Appropriate contemporaneous assessment may be needed to achieve this, with some teachers finding a prepared tick sheet helpful for recording their observations during activities.

Common positive observations:	Common areas for improvement:
- centres have developed effective strategies to support candidates in reaching competency across the range of skills - record keeping has generally improved from previous cycles with many centres using assessment tools to accurately and contemporaneously record student outcomes while minimising workload - optional tick sheets are often used to make temporary records while circulating labs - use of digital tools is increasing, both for meeting 1.2.1 (g) and for measurement and recording more generally - centres are making use of trackers, including the OCR Portable Tracker which can be edited and may be preferable for sharing online - many teachers have shared valuable feedback with Subject Advisors, which has been used to prepare for Cycle 6.	1.2.1 (a) (investigation approaches) requires evidence of candidates making their own choices, which should be described and explained for 1.2.1 (e) (investigation record) - opportunities for candidates to develop referencing skills for 1.2.1 (i) are not always maximised. For example, candidates could look up reference values to compare to their own results from practical work - candidates are sometimes inconsistent in approaches to referencing; a specific referencing system is not required but the information provided should enable the reference to be retrieved, and include a date - frequent reference to section 6 of the Practical skills handbooks during both teaching and assessment can help to make sure candidates' achievement matches the criteria and that assessment is accurate.

OCR support



Subject Advisors are here to support with any queries and feedback around Practical Endorsement. You can contact them via support@ocr.org.uk to ask a question by email or request a Teams meeting or call. There is also an [FAQ page](#) on our Positive about Practical website.

A Level Biology

The Biology monitors have reported the continued use of creative support for practical work, including use of OCR activities as well as centres' own activities. The monitors particularly note the following positives:

- A lot of centres are now using extra 'standalone' activities to develop certain skills particularly for the higher level skills associated with CPAC 2 (1.2.1 (a)) and CPAC 5 (1.2.1(g), (h) and (i)). Activities include planning investigations that may not actually be carried out, evaluating methods, suggesting alternative methods and improvements and alternative research tasks, including referencing.
- Many centres provided candidates with alternative specimens to draw that are simpler than the suggested OCR PAG 1 activities. This has helped candidates to develop their biological drawing skills. Examples included kidney cross sections and cross sections of arteries and veins.
- Some centres are providing effective further opportunities to use software for practical skill 1.2.1 (l), to analyse and process data in graph plotting and formatting spreadsheets for statistical tests.

Common areas for improvement:

- centres limited to lessons of an hour or less have discussed difficulties completing some of the longer practical activities. In these instances, it could be possible to split the PAGs into smaller activities to allow candidates to demonstrate specific skills each time
- there are issues with the incorrect recording of achievement for biological drawings, investigative skills and referencing. Further guidance about the expected standards for these skill areas is available in the [Biological Drawing handbook](#) and the [Practical skills handbooks: Biology](#)
- recording of results for qualitative tests in Practical Activity Group (PAG) 9 frequently lacked the required level of detail such as observations before and after, using appropriate scientific terminology and an interpretation of the observations. Guidance on the expected standards can be found in section 6 of the [Practical skills handbook: Biology](#)
- some centres have not provided candidates with opportunities to draw low power plans, which is a required skill. Suitable specimens for low power plans include cross sections of stems, roots, leaves and blood vessels
- a common issue was the drawing of lines of best fit on graphs. There were many instances where candidates had not chosen the most appropriate line to draw on their graphs, joining points dot to dot when lines of best fit would be most appropriate or opting incorrectly for free hand dot to dot lines when unsure. There is further guidance in the [Mathematical skills handbook: Biology](#)
- to demonstrate competence in skill 1.2.1 (g) (use of software) and 1.2.2 (l) (computer modelling or data logging) we are aware that RasMol can no longer work with the most recent Windows versions and Chromebooks. Many centres are using alternative programmes to RasMol, of which there are a number available, including [mol*](#) and [Jalview](#).

OCR support



An alternative PAG 10 has been suggested in one of our [blogs](#). The blog includes adapted [practical activity instructions](#) which can be used in the classroom.

We have a resource to support a [practical activity](#) making a simple and low-cost colorimeter, that can be used to determine unknown solution concentrations.

A Level Chemistry

Monitors have reported the following encouraging points from the many visits which have taken place this year. Centres are thanked for their thorough preparation in advance of these visits and for welcoming the advice given by the monitor. In fact, monitors often pick up useful hints from centres to pass on to others!

- The majority of centres are now using the Portable PAG Tracker and updating this to reflect candidate achievement of the 1.2.1 skills either during, or soon after, the practical lesson has taken place.
- Most centres' trackers clearly show candidates improving in their acquisition of skills over the course.
- Achievements in skill 1.2.1 (g) are improving as candidates are now starting to apply the same standards in their spreadsheets and graphs as for handwritten tables and graphs.
- Where candidates are given early experience of research and citation, their achievement of skills 1.2.1 (h) and (i) are more secure and can be easier to assess as 'routine and consistent'.

Common areas for improvement:

- best practice is to feedback to candidates on their achievement of their skills, so they know where to focus their efforts in future practical work. Centres have various ways of doing this, always with the best interests of their candidates in mind, and without trying to make the Practical Endorsement into an examination
- some candidates do not achieve skill 1.2.1 (d) in their qualitative work as they do not include sufficient detail in their observations. It would be helpful to encourage candidates to record 'before and after' and 'colour and state' for these. Similarly, table headings for skill 1.2.1 (f) in qualitative recording should be suitably informative and allow the reader to understand what was done to achieve the results
- the assessment of skill 1.2.1 (a) continues to cause problems in some centres. Where candidates are asked to produce a full practical plan, such as in a PAG 12, it is relatively easy to assess whether the candidate has written a method which will work. For some of the PAGs in groups 9-11 this is not the case as candidates are asked to change a variable or choose suitable apparatus. Teachers should encourage candidates to include a note about their choices in their records to award this skill.

OCR support



Our [Practical skills handbook: Chemistry](#), Appendix 6 gives details and examples of how candidates can cite references.

A Level Geology

Monitors report that teachers are very enthusiastic about practical work and fieldwork and that this is reflected in positive comments by candidates. Many of the candidates who follow an A Level Geology course go on to follow Earth Science at higher level study.

- Most centres are offering candidates more than the minimum four days of fieldwork. Some centres are being very innovative in the local fieldwork offered due to financial pressures. Candidates consider their fieldwork a highlight of the course.
- Most candidates now record data in line with guidance in Section 6 and Appendices 3 to 5 of the [Practical skills handbook: Geology](#).
- Drawings are improving. Most candidates follow most of the conventions outlined on page 4 of the [Practical skills handbook: Geology](#).
- Centres are increasingly utilising software. Candidates are routinely using geological databases to collect data. In some centres this has become very sophisticated, with candidates evidencing investigative skills through the interrogation of sites such as [BGS](#), their [GeoIndex](#) and [Google Earth](#).
- Some centres have developed more challenging activities for PAG 12 after monitors advised that evidence for this PAG group had previously not always been sufficiently demanding to showcase the candidate's skills in investigation, research, referencing, data processing and use of software.

Common areas for improvement:

- some teachers are using out of date resources. It is important that Teach Cambridge is checked regularly to identify [subject updates](#). Teachers can also [signup to receive updates](#)
- all drawings should follow the conventions given in the [Geological Drawing handbook](#)
- software use is assessed in terms of data processing. Copying and pasting information from a website does not meet the requirements of skill 1.2.1 (g). To meet this skill, candidates need to use software to process data, for example generating spreadsheets and graphs from data found on a geological database. Practical activity 2.1 gives scope to evidence this skill
- all tables and graphs produced using software should have the same attention to headings, units, decimal places, labels on axes, plotting and presentation as would be expected in handwritten work. See Appendix 6 of the [Practical skills handbook: Geology](#)
- PAG 12 is intended to showcase higher order skills developed throughout the course. Some centres have produced excellent examples. Best examples usually start with a question which asks candidates to compare and contrast or process data in order to reach a conclusion. 'Why is X the best place to cite a wind turbine rather than site Y?' or 'Why is geology of site X different to site Y?'. Best examples present data and process it to draw attention to conclusions based on geological data. 'Topics' with titles such as 'Fossils' are not appropriate as they do not offer opportunities to evidence higher order skills.

Assessment for learning



It is important to introduce higher order skills (investigations, research and referencing and use of software) early enough in the course so that candidates demonstrate mastery before final outcomes are decided. Candidates can be offered frequent opportunities to develop and demonstrate these skills, although not all of the opportunities need to be formally assessed.

A Level Physics

Physics teachers continue to value the benefits of the Practical Endorsement and the range of practical activities suggested by OCR as an effective aid to teaching and learning. These provide the means both for candidates' increased engagement with and understanding of physics concepts. This in turn can aid exam preparation and progression. The flexibility of different activities (including the option of centre-devised activities) allows departments to target areas of interest of their candidates.

A number of departments have chosen to carry out practical activity 11.2 (Determining the specific heat capacity of a material) both by the method provided on the OCR activity sheet and also by the method of mixtures. This has the benefit of comparing the relative efficiency of the methods and initiating discussion about the possible causes of this. In addition, it acts as preparation for potential exam questions on the specific heat capacity of a material that might explore either method.

Common areas for improvement:

- for 1.2.1 (d), (e) and (f) teachers should regularly familiarise themselves with the content of the [Practical skills handbook: Physics](#), to arrive at an understanding of the standard of evidence that candidates should be aiming for in measuring, recording and presenting data. There is also a [blog](#) available to support clarification on these points
- when conducting the activities in PAG 7 (Investigating ionising radiation) appropriate guidance should be followed, for example, from CLEAPSS. For activities using ionising radiation and using a laser light source, it can be helpful as preparation for progression if candidates carry out risk assessments, although full risk assessment are not required for 1.2.1 (b)
- note that simulations and demonstrations are not sufficient to meet the requirements of 1.2.2 (l) use of ionising radiation, including detectors. Support for meeting the requirements can be found in the [Practical activities guide: Physics](#) (pages 23-4).

Misconception



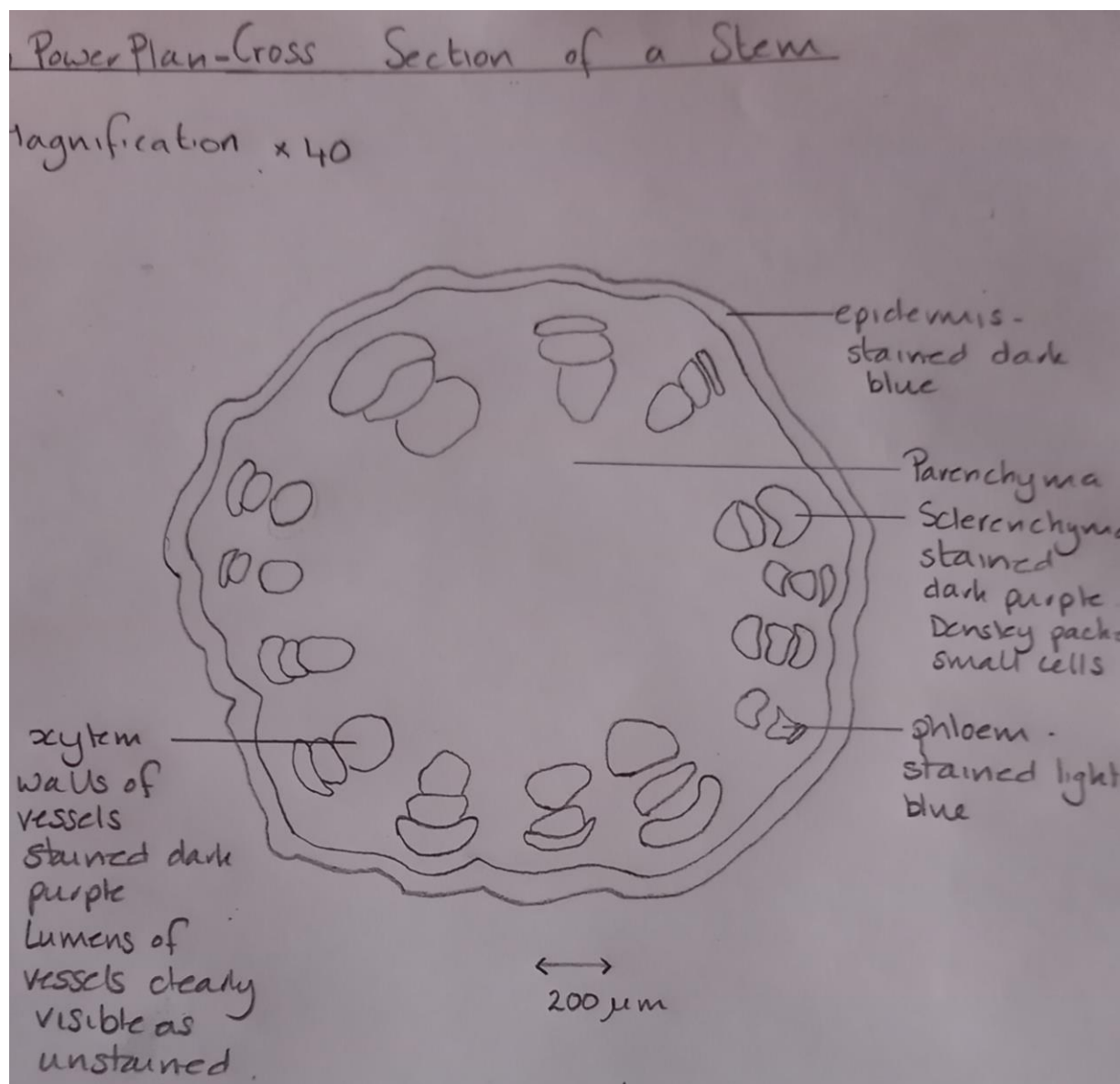
In the guidance provided in the [Practical skills handbook: Physics](#) for 1.2.1(e) keep appropriate records of experimental activities, it states 'Some errors/inconsistencies in the presentation of data are acceptable.'

This has been interpreted by some centres as meaning that the errors concerned can be ignored and need not be addressed. This is not strictly the case, else the candidates concerned will not have the benefit of the errors being highlighted to allow the opportunity for these to be addressed in future activities.

A key consideration here is whether the student recognises an isolated error independently and can correct it, as opposed to needing it explained.

Appendix

Biology exemplar



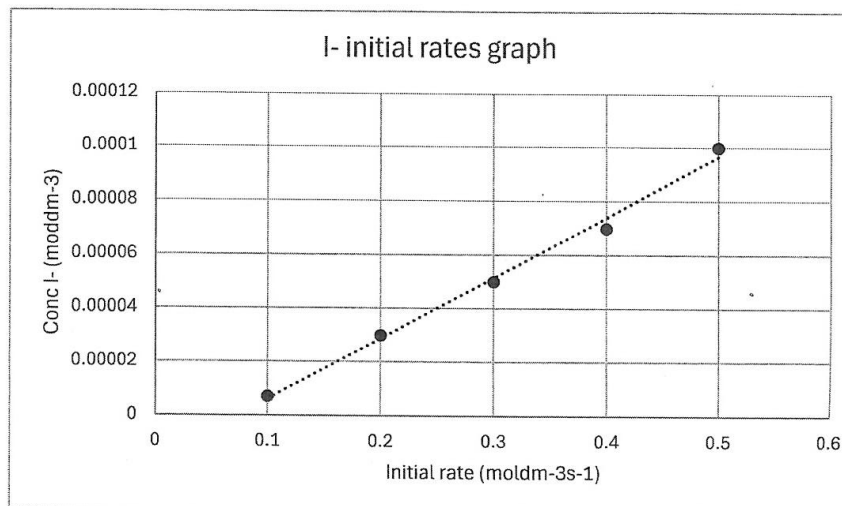
A low power plan that meets the requirements for biological drawings:

- lines are clear and continuous and drawing is representative of the specimen being viewed
- the drawing has been made from the correct magnification which has been recorded
- tissues have been clearly outlined, and no individual cells have been drawn
- a scale bar has been included
- label lines have been ruled with no arrow heads
- descriptive annotations have been included.

Chemistry exemplar

I⁻ is zero order due to linear negative gradient.

I ⁻ vol	initial rate (mol dm ⁻³ s ⁻¹)
0.5	0.0001
0.4	0.00007
0.3	0.00005
0.2	0.00003
0.1	0.000007



The graph from the iodine clock experiment (PAG 11) shows a typical set of results which monitors find when visiting centres. The candidate has used Excel to create a spreadsheet and produce a graph with a straight line, although this does not go through the origin. The title of the graph could be more informative. It would have been even better if the candidate had used superscripts for the units on the axes and table title cells to give correct formatting and consistency of the units.

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