



GCE A LEVEL EXAMINERS' REPORTS

**CHEMISTRY
A LEVEL**

SUMMER 2023

Introduction

Our Principal Examiners' reports offer valuable feedback on the recent assessment series. They are written by our Principal Examiners and Principal Moderators after the completion of marking and moderation, and detail how candidates have performed.

This report offers an overall summary of candidates' performance, including the assessment objectives/skills/topics/themes being tested, and highlights the characteristics of successful performance and where performance could be improved. It goes on to look in detail at each question/section of each component, pinpointing aspects that proved challenging to some candidates and suggesting some reasons as to why that might be.ⁱ

The information found in this report can provide invaluable insight for practitioners to support their teaching and learning activity. We would also encourage practitioners to share this document – in its entirety or in part – with their learners to help with exam preparation, to understand how to avoid pitfalls and to add to their revision toolbox.

Further support

Document	Description	Link
Professional Learning / CPD	Eduqas offers an extensive annual programme of online and face-to-face Professional Learning events. Access interactive feedback, review example candidate responses, gain practical ideas for the classroom and put questions to our dedicated team by registering for one of our events here.	https://www.eduqas.co.uk/home/professional-learning/
Past papers	Access the bank of past papers for this qualification, including the most recent assessments. Please note that we do not make past papers available on the public website until 6 months after the examination.	www.wjecservices.co.uk or on the Eduqas subject page
Grade boundary information	Grade boundaries are the minimum number of marks needed to achieve each grade. For unitised specifications grade boundaries are expressed on a Uniform Mark Scale (UMS). UMS grade boundaries remain the same every year as the range of UMS mark percentages allocated to a particular grade does not change. UMS grade boundaries are published at overall subject and unit level. For linear specifications, a single grade is awarded for the overall subject, rather than for each component that contributes towards the overall grade. Grade boundaries are published on results day.	For unitised specifications click here: Results and Grade Boundaries (eduqas.co.uk)

Exam Results Analysis	WJEC Eduqas provides information to examination centres via the WJEC secure website. This is restricted to centre staff only. Access is granted to centre staff by the Examinations Officer at the centre.	www.wjecservices.co.uk
Classroom Resources	Access our extensive range of FREE classroom resources, including blended learning materials, exam walk-throughs and knowledge organisers to support teaching and learning.	https://resources.eduqas.co.uk/
Bank of Professional Learning materials	Access our bank of Professional Learning materials from previous events from our secure website and additional pre-recorded materials available in the public domain.	www.wjecservices.co.uk or on the Eduqas subject page.
Become an examiner with Eduqas.	We are always looking to recruit new examiners or moderators. These opportunities can provide you with invaluable insight into the assessment process, enhance your skill set, increase your understanding of your subject and inform your teaching.	Exam Marking jobs Examiner & Moderator Vacancies From Eduqas

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Subject Officer's Executive Summary

Only around 100 candidates entered this qualification and they were mostly very able learners who performed well in all areas.

Recall of key knowledge was good and firm understanding of key concepts was evident in most cases. Mathematical skills were very good.

Questions requiring first-hand experience of practical work often less well answered, particularly when candidates were required to suggest changes to practical methods or evaluate the impact of such changes.

This year's A Level cohort had no experience of GCSE examinations due to the pandemic and some candidates lacked elements of exam technique.

Performance overall was very pleasing.

Areas for improvement	Classroom resources	Brief description of resource
Understanding of practical methods	AS and A Level Chemistry Edugas Home Experiments on Film (science.cymru)	A Level Chemistry Lab Book found in the Resources for Students tab has full details for all specified practical work Experiments on Film is a video resource designed to complement the hands-on practical work
Exam technique	Resource (edugas.co.uk)	Exam walk-through presentations based on the summer 2019 papers; focus on key information given in questions, command words, approaches to answering particular types of questions and much more

CHEMISTRY

GCE A LEVEL

Summer 2023

COMPONENT 1 – PHYSICAL AND INORGANIC CHEMISTRY

Overview of the Component

Performance in Component 1 was similar to that in the previous exam season. Almost all candidates completed all the exam paper and attempted all part questions. They often gave good answers leading to strong marks for many candidates.

The component focuses on inorganic chemistry and physical chemistry. The inorganic chemistry content includes a range of reactions and principles which explain these as well as the use of a range of chemical tests and properties to identify the species present. Candidates could describe many of these in their answers however fewer were able to apply these to form conclusions.

The physical chemistry includes many calculations and concepts such as electrochemistry, energetics, rates and equilibria and where these required candidates to calculate values many were able to produce strong answers. Applying these concepts was more challenging and led fewer candidates to produce good answers.

The component gives candidates the opportunity to show the full range of assessment objectives requiring them to recall and apply knowledge and skills, to analyse evidence and come to judgements. Most candidates were able to recall and apply basic concepts and observations across a range of topics to answer many questions well.

This component requires candidates to use a wider range of mathematical skills than the other components in the course. In general candidates performed well on these questions, showing that they could apply a wide range of mathematical conventions to calculate and express their answers.

Practical methods and experimental data are examined in some questions in this component. In general these led to poorer answers by some candidates and questions which required candidates to suggest changes to practical methods or evaluate the impact of these led to some of the poorest answers in the paper.

Comments on individual questions/sections

SECTION A

Most questions in this section were answered well, with many candidates gaining almost full marks. The points below indicate the small number of common errors in some answers.

- Q.1** Weaker answers to this question did not refer to electron pairs or a covalent bond.
- Q.2** Most recognised that the convergence limit was needed, but weaker answers did not reference the Lyman series.
- Q.4.** The most common errors in this question were to give rate unit as $\text{mol dm}^{-3} \text{ s}^{-1}$ and to discuss individual data points rather than the overall relationship between values.

- Q.6** The second part of this question was often answered partially by adding a new, lower E_a on the graph but there was no use of this to identify the additional particles above the activation energy by shading or labelling.

SECTION B

- Q.7**
- (a) This was poorly answered by a minority of candidates who gave an answer based on the compounds of lead and carbon rather than the elements carbon and lead. The answers of these candidates included much irrelevant content on the inert pair effect and acid-base reactions. They often did not discuss conductivity and melting temperature.
 - (b) Most of the marks on this part-question were for stages in the calculation of the percentages of the two oxides of lead in a mixture. Many candidates identified the correct final percentage of lead(IV) oxide in the mixture. The most common errors involved confusing PbO and PbO₂ and errors in the calculation of the final percentages, leading to an incorrect answer of 50%.
- Q.8**
- (a) A few candidates incorrectly included 4s² electrons in the configuration.
 - (b) This was very well answered. The most common marks lost were for incorrect colours for the ions.
 - (c) Weaker answers to this question did not apply the percentage to correctly calculate the concentrations of each substance in the equilibrium mixture. Incorrect calculations gave the percentage of CO in the mixture values from as low as 5.45% to as high as 89.2%. The final part of the question required candidates to evaluate different reasons for choosing a particular method, but many candidates struggled with this. The most common correct answer involved a discussion of percentage conversion but few were able to give further reasons.
 - (d) Most gained some marks here but fewer than half gained full marks. The question required candidates to explain observations, but most answers discussed only one observation and ignored the lack of reaction between copper and H⁺ ions from acid.
- Q.9**
- (a) Many candidates gained both marks but it was not uncommon to see answers which illustrated the final ions only and did not show the changes during the formation of the ions from the atoms.
 - (b)
 - (i) Evaluating the problems with given masses of solids in the reaction proved challenging for many candidates and few gained all three marks. Many thought that using larger masses would slow the reaction down, rather than identifying that the heat released would raise the temperature of the water beyond its boiling temperature.
 - (ii) Most gained at least two marks here although many made errors in their calculations or failed to use the standard enthalpy change of formation of water which prevented them from gaining full marks.

- Q.9 (c)** This was well answered with candidates able to recall patterns in entropies and use entropy changes to find the minimum temperature for a reaction. The most common mark lost was in part (i) where candidates stated that entropy depends on physical state without linking this to disorder or degrees of freedom.
- Q.10 (a)** This part-question required candidates to use a range of mathematical skills including graph drawing, units and exponentials and logs. Most gained the majority of marks. The most challenging part was part (ii) which used exponentials and logs to find a temperature. Weaker answers were ones where candidates could not rearrange the equation appropriately to find the temperature or combine two equations correctly.
- (c)** A few candidates did not recall the isotopes of chlorine correctly which affected their answers in part (ii). When using the isotopes to predict the molecular isotope peaks most could identify the 9:1 isotope ratio for the minimum and maximum mass peaks but a minority could not calculate the correct height ratio for the third peak. A small number did not give the masses for the molecular ion peaks and gave masses of 70, 72 and 74 based on the chlorine isotopes only.
- (d)** This question was answered more poorly than many others. Many discussed differing repulsion of single and double bonds rather than identifying the presence of lone pairs on the chlorine atom.
- Q.11 (a)** Most candidates were able to correctly identify the strong and weak acids and attained higher band marks in this question. The explanations were not always of a high standard, and some were vague and lacked the detail needed to gain full marks. Examples of weaker answers included discussions of end-points rather than equivalence points or straight regions of the curves rather than vertical regions.
- (b)** It was not uncommon to see candidates attempt complex and incorrect calculations in this question based on an expression for K_a . Some attempted to use the first pH value available on the graph without appreciating that this was not the initial pH.
- (d)** The method and mass needed to make the standard solution were well answered. The pH of the sodium hydroxide was not calculated correctly by some candidates. Those getting incorrect answers had often not used K_w in the calculation.
- Q.12 (a)** Most answers grouped **A**, **D** and **E** as the smaller ionisation energies and **B** and **C** as the larger ones. It was common to see ionisation energies **A**, **D** and **E** in an incorrect order. Most candidates included a discussion of shielding and nuclear charge but in some cases these were not used correctly which led to incorrect orders for the ionisation energies.
- (b)** Most candidates gained at least two marks here. Weaker answers did not refer to the intermolecular nature of the forces discussed. A few did not include hydrogen bonding in their discussion and gave an order of boiling temperatures based on van der Waals forces only.

- Q.12 (c)** Some observations were used by most candidates, and these included the flame tests and the colour of one solution. About half of candidates were able to use all the other observations to identify all the ions present in each solution, but even these candidates often assigned the ions to the incorrect solutions. It was disappointing to see that a minority of candidates could not write correct formulae for these compounds.

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COMPONENT 2 – ORGANIC CHEMISTRY AND ANALYSIS

Overview of the Component

This paper was generally accessible and performance was very good.

Questions where candidates had to apply their knowledge to unfamiliar situations were the most challenging but, in general, these were quite well attempted. Questions requiring mathematical skills were answered quite well, as were questions that explored candidates' knowledge of practical work.

Component 2 papers tend to require a fair amount of reading but there was no evidence that candidates were rushed. There were far fewer weak scripts seen than in recent years and many candidates scored 90 or more marks in this 120-mark paper.

Comments on individual questions/sections

SECTION A

- Q.1** Most candidates could clearly describe homolytic bond fission and usually provided an equation showing the formation of two methyl radicals. Some showed the formation of an ethyl radical and a hydrogen atom, which was acceptable.
- Q.2** The formulae of but-1-ene and but-2-ene were expected but some gave the *E*- and *Z*- forms of but-2-ene rather than the two structural isomers.
- Q.3** The question asked for an equation but some did not balance due to the lack of a water molecule as one of the products.
- Q.5** (a) Potassium manganate was not accepted without the correct oxidation state of manganese.
- (b) A few candidates gave the structure of ethylbenzene as their answer. Although this has an M_r of 106 it is an unlikely product in this oxidation reaction.
- Q.7** Most candidates realised that no colour would be seen under these conditions.

SECTION B

- Q.10** (a) (i) This question was well answered with many candidates being aware of the greater stability of the secondary carbocation intermediate, leading to the formation of (1-bromoethyl)benzene.
- (iii) The boiling temperatures of these two (bromoethyl)benzenes are too close to be separated by simple distillation and fractional distillation was the expected answer.

- Q.10 (b) (ii)** The initial product of the reaction is the amine salt and candidates were expected to write that 'the lone pair of electrons on the nitrogen atom was able to accept a hydrogen ion'. Weaker answers such as 'the compound has a lone pair' or 'ammonia is a base' gained no credit.
- (iii)** II An explanation was required here and often this was not adequately provided.
- (c)** The question asked for three factors that should be considered when this method was used. A number of vague answers were given that did not relate to this quantitative analytical method.
- (d)** There were some very good answers to this mole calculation with many candidates identifying R as an ethyl group.
- Q.11 (a)** This was the first of the two QER questions and asked candidates to compare the chemistry of two isomers of formula $C_2H_4O_2$. Many achieved 5 or 6 marks, giving well-structured responses.
- (b) (i)** Boiling temperatures in the range 140-160°C were accepted. A clear reason was required for the second mark. Many candidates realised that the boiling temperature rose by about 30°C each time a CH_2 group was added to the structure of the thiol.
- (c)** This was a more challenging mole calculation but a number of reasoned and correct responses were seen.
- Q.12 (a)** Most candidates knew the result of a positive Fehling's test and could give another compound that would also form the brown-red precipitate.
- (c)** Most candidates provided two correct reasons why the yield of ethanal was only 45%.
- (d)** The percentage of lactic acid in the sample of yoghurt was 0.6% and many candidates gained full credit for their calculation.
- (e) (i)** Many clear explanations for the NMR spectrum of 'lactide' were seen.
- (iii)** The correct formula for tin(II) octanoate was usually given. A suitable molecular formula for this compound was accepted.
- Q.13 (a)** This was the second of the QER questions and asked candidates to write a method for the formation of 2-nitro-1-methylbenzene starting from methylbenzene. Many answers were of a high standard and lacked only a suggestion of how to separate any other possible isomers.
- (c)** Not all candidates stated that tin/iron and concentrated hydrochloric acid were the usual reducing agents when preparing an aromatic amine from a nitro-compound.
- (e)** Balancing this equation proved problematic for a number of candidates. The most common error was to give an incorrect number of hydrogen molecules as a result of forgetting that the water molecule contains two hydrogen atoms.

- Q.14** (a) (i) The name of the α -amino acid and its skeletal formula were usually correct but some gave the skeletal formula of an amino acid with its NH_2 group in a different position.
- (c) (ii) Nearly all candidates realised that the presence of moisture in the apparatus would result in hydrolysis of the acyl chloride and/or the starting inorganic covalent chloride.
- (d) (i) There were many correct suggestions for the formulae of the mass spectrum fragments. Candidates should remember to include the positive charge alongside the formulae.
- (iv) Most candidates gained both marks for this question by using one of the two appropriate methods to obtain an answer of 0.61 dm^3 .
- Q.15** (a) (i) There were five marks for this question on microanalysis. This proved to be quite difficult for many candidates. The masses of water and carbon dioxide produced were given. These figures were then used to find the mass of hydrogen and carbon present in the primary alcohol. A number of candidates did obtain the correct empirical formula, $\text{C}_3\text{H}_6\text{O}$.
To get the molecular formula mark it was necessary to state that the compound contained only one oxygen atom in each molecule and that the molecular formula was therefore the same as the empirical formula. Those who gave the correct molecular formula were usually able to suggest a correct displayed formula for the unsaturated primary alcohol in part (ii).
- (b) (iv) The groups that give a positive reaction for the triiodomethane test were well known, as was the appearance of the product.
- (v) An adequate description of rearrangement was sometimes lacking but candidates clearly understood the meaning of 'elimination'.
- Q.16** (c) (i) Most candidates stated the reason why aqueous sodium hydroxide does not react with compound **R**, which has two bromine atoms bonded directly to the benzene ring.
- (iii) Compound **S** was 84% pure and this was calculated correctly by many candidates.
- (iv) To obtain both marks in this question, it was necessary to comment on the number of ^1H NMR signals in both compounds **S** and **T** and to give the peak area ratio in each in each case.
- (v) Although most candidates stated that the side-chain hydrogen atoms in compound **U** were equivalent, they did not go on to state that the adjoining carbon atom had no hydrogen atoms bonded to it and that the ^1H NMR signal was therefore a singlet.

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COMPONENT 3 – CHEMISTRY IN PRACTICE

Overview of the Component

This paper proved successful in that it differentiated well. Some marks were accessible to almost all candidates whilst others were gained only by the most able. The most successfully answered was question 1, with question 3 the least successfully answered.

Good attempts were made at most of the calculations, where many candidates set out their answers sufficiently clearly to be able to allow partial credit when the final answer was incorrect.

There was no indication that candidates had a problem with the length of the paper, with answer spaces that were left blank being uncommon and tending to indicate a lack of knowledge and understanding rather than time constraints.

Comments on individual questions/sections

- Q.1**
- (a)** The majority of candidates gained 2 marks for determining the maximum temperature change ΔT using appropriate lines of best fit. Both negative and positive values of ΔT , within the range of 9.9-10.3°C, were awarded full marks.
 - (b)** The majority of candidates calculated the value of ΔH correctly. However, a negative ΔH value was seen frequently, with these candidates clearly not linking the decrease in temperature seen on the graph with an endothermic reaction and therefore a positive ΔH value. A small minority over-truncated the calculated ΔH value and gave answers to only 2 significant figures.
 - (c)** Generally well answered. However, a number of candidates incorrectly gave the answer 'no heat was lost to the surroundings' as one assumption made when finding ΔH .
 - (g)** Only a minority answered this correctly.
- Q.2**
- (a)** Of the correct answers to this question, the majority referred to the removal of excess insoluble copper(II) carbonate by filtration. Very few referred to the difficulty in separating the excess acid or that any excess acid would contaminate the salt solution.
 - (b)** Some excellent answers with candidates able to describe the practical steps for making pure copper(II) chloride from copper(II) carbonate and hydrochloric acid. However, a number confused the process of 'crystallisation' with that of 'recrystallisation', and statements such as 'heat to constant mass', 'rinse surface with minimum volume of solvent', 'rinse with dilute HCl' and 'dry in an oven below its melting point' were often seen.

- (d) This was well answered however, few candidates suggested repeating the titration to obtain concordant results in part (iv).
- (e) (ii) The majority of candidates scored 1 mark for comparing the mole ratio for the reaction of the carbonate with sulfuric acid and hydrochloric acid. Although they identified that the volume of sulfuric acid would be less than that of the hydrochloric acid, very few stated that the volume of sulfuric acid would be *half* that of the hydrochloric acid, and hence that the percentage error in the burette reading would be *doubled*.
- (iii) Whilst the vast majority were able to calculate the volume of carbon dioxide formed, some candidates failed to convert the volume in dm^3 (or in m^3) into cm^3 as needed.

Q.3 This question assessed the quality of extended response (QER) in the context of basic/amphoteric oxides. The facility factor of 37 is the lowest on the paper. Some excellent answers were seen but the majority of marks were limited by candidates describing the addition of aqueous sodium hydroxide to the metal oxides and not the metal anion formed in the reaction with sulfuric acid. Other common errors included:

- describing 'effervescence' during the acid/metal oxide reaction
- giving incorrect colours and/or formulae for the metal hydroxide and the complex formed on addition of excess sodium hydroxide to the Cr^{3+} ion
- describing $\text{Fe}(\text{OH})_2$ as soluble in excess, and $\text{Cr}(\text{OH})_3$ as insoluble in excess
- concluding that FeO was amphoteric and/or that Cr_2O_3 was basic.

Q.4 This was generally well done but it was surprising to see that some A level candidates only scored 2 or 3 marks of the 10 marks available here. Very few candidates correctly identified the nitrile (**D**) as the starting compound in the preparation of the amine (**F**).

- Q.5** (a) The majority of candidates scored at least 1 out of 3 marks for this part-question. Common errors included omitting the second negative charge on the ethanedioate anion and including 2H^+ in the second dissociation equation. Although a number of candidates gave the correct value for the dissociation constant for each stage, very few explained in terms of the difficulty of removal of the second proton from the negatively charged ion.
- (b) It was clear that most candidates understood how to calculate the initial pH of the weak acid. Some identified and corrected their error in part (a) after calculating an initial pH of 2.6 rather than 1.1 as given in the question. The majority of candidates correctly gave the volumes at the first and second equivalence points as 15 cm^3 and 30 cm^3 respectively, and could explain in terms of the mole ratio and relative concentrations of the ethanedioic acid : potassium hydroxide.
- (d) (i) Most candidates scored 1 out of 2 for sketching a curve with the volume at the first and second equivalence points lower than on the original curve. Very few showed a higher initial pH and both equivalence points at the same pH as the original curve.

- Q.5** **(d)** **(ii)** Similarly, most candidates scored 1 out of 2 for sketching a curve with the same volume at the first and second equivalence points as the original curve. Although some candidates gave a slightly higher pH at both equivalence points than the original curve, very few drew a curve with a higher initial pH.
- (e)** **(ii)** Candidates referred to the need for an indicator to change colour in the vertical region of the titration curve but only very few linked their answer to both equivalence points being at different pH values.

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PRACTICAL ENDORSEMENT

Overview of the Component

From September 2022 we returned to face-to-face monitoring after a period when we carried out remote monitoring due to restrictions imposed by the pandemic. This year also saw a return to the requirement that all aspects of the Practical Endorsement should be met. We only observed a relatively small number of centres with the majority having been monitored in the previous year of the cycle.

It is perhaps worth reminding centres of good practice that we have seen in the delivery of Practical Endorsement:

- Clear planning of practical work. A good plan identifies not only when specified practicals will be conducted but also states the specific CPAC that will be assessed. The plan may be part of the Scheme of Work or a separate document.
- Planning allows for the development of skills within Practical Endorsement.
- The maintenance of accurate and up-to-date Teacher and Candidate Records.
- Candidates know which CPACs are assessed in a particular practical and understand what they need to do in order to succeed.
- Practical books are used in 'real time' at the bench by candidates when collecting experimental data. We do not expect to see practical books which are in immaculate condition! Candidates should **not** write on scraps of paper and later copy the work up neatly into practical books.
- Simple annotation of the candidate work shows where the candidate achieves or fails to achieve a CPAC, (e.g. with *CPAC 3(a)* ✓ or *CPAC5(b)* ✗). If a candidate does not succeed feedback is given so they have a better chance of getting it next time. (Feedback on how to improve may be given verbally or in writing.)

Important note: Many centres now record the CPAC element assessed in a practical which helps ensure all aspects of CPAC are covered. However if teacher records do not show this level of detail (i.e. the element assessed) then teachers should annotate the candidate work showing the element achieved (e.g. *CPAC 3(a)* ✓ or *CPAC 3(a&b)* ✓). Monitors will always check to ensure all elements of each CPAC are covered and will ask teachers how they ensure all aspects of the skills are achieved by each candidate.

- Marking which shows a progression in candidate skills. We do **not** expect to see every candidate getting every criterion each time they are assessed. Indeed, when this happens there will be legitimate concerns about whether the work has been appropriately assessed. There should be a progression. The key question is whether the candidate competent at the end of the course. In short we would expect to see that there are places where candidate work is marked as 'not achieved'.
- There is evidence of standardisation across all subject teachers when Practical Endorsement is delivered by a team of teachers.

Important note: This is a requirement of Practical Endorsement that is recorded in the monitor's report of the centre and must be implemented for a centre to pass the monitoring visit. Please expect questions on how you do this if visited by a monitor.

Comments on individual questions/sections

CPAC statements

Centres are reminded that in order to award a pass for Practical Endorsement, a candidate needs to 'consistently and routinely meet the criteria'. This does **not** mean a candidate gets a CPAC every time it is assessed. It does mean that a candidate evidences a pass for each CPAC statement on a number of occasions. It is important that suitable opportunities have been built into the assessment plan which allow candidates to generate this evidence. It should be noted that candidates can work in groups when assessed. However, each candidate must generate suitable evidence that they **independently** meet the criteria. Centres must give careful consideration to how group work is conducted so that individual candidates can be assessed on their own performance.

CPAC 1

The assessment of this CPAC requires the candidate to correctly follow written instructions to carry out an experimental technique or procedure. If a teacher feels it is necessary to intervene and correct a candidate's technique etc. then the candidate should not be awarded the CPAC.

In the vast majority of cases the monitor accepted the teacher's judgement unless there was strong evidence to suggest the CPAC was incorrectly awarded.

CPAC 2

This is the most difficult CPAC for candidates to evidence since it involves higher level skills. **Please give careful thought to where and when you are going to assess each element of this CPAC** in Chemistry. It is also important that sufficient time is given to candidates to develop the necessary skills before assessment occurs. Generally, we do not expect to see this CPAC assessed in the first two terms of an A level course. However, we do expect to see evidence of some assessment of this criterion by the end of the first year. This skill may be evidenced by a candidate planning to carry out a procedure and then adapting their approach as necessary. Centres can make their own choices about where to assess CPAC 2, however volumetric analysis, rate and energy practicals are possible good choices. Identifying unknown compounds in organic or inorganic chemistry are also good contenders for aspects of CPAC 2. In each case candidates need to gain basic skills in these areas before the higher level CPAC 2 skill is assessed.

It is **not** necessary to assess every element of CPAC 2 each time this CPAC is assessed. However, it is a requirement that each element of CPAC 2 is met during the course. If you are monitored, the monitor will look at the coverage of each element.

CPAC 3

There are many opportunities to assess this skill in Chemistry. It is not necessary to assess this skill every time a practical is completed. Do **not** use practical work where hazards are minimal to assess this skill; rather select practical work where there are some meaningful hazards/risks.

CPAC 3(a) requires candidates to identify hazards and assess the risks associated with the hazards. A simple written risk assessment is the easiest and best way of evidencing this aspect of the skill.

CPAC 3(b) should be assessed by observation of candidates during a practical session.

CPAC 4

This CPAC deals with both qualitative and quantitative data.

CPAC 4(a) is about making accurate observations. A few centres awarded this element of the CPAC where the evidence in the candidates' work showed that they were not working to the required standard. The following points should be borne in mind when assessing this CPAC:

- Observations should be made directly into practical books. They should not be written on scraps of paper and copied up later.
- Please **avoid** using templates for tables that direct candidates how to record data. Templates may be useful to teach candidates a good approach to recording data early in the course but when it comes to assessment, candidates **must** devise their own tables. If you give the candidate a table, then CPAC 4 **cannot** be awarded. Where necessary, remove table templates to allow candidates to construct their own.
- The tables which candidates construct **must** have appropriate headings and units.
- The units must be written in the table column head and not in the body of the table. If units are missing, do **not** award criterion.

CPAC 4(b) is about obtaining accurate, precise and sufficient data. Please carefully check candidates' data.

- Is it recorded to the appropriate precision? We still notice that some centres are too lenient on this. If readings are not always consistently recorded, then do not award the criterion. Make sure that recordings are to the correct number of decimal places. Please be very stringent on recording of masses and titres in particular. Do not give a 'pass' to data recorded incorrectly.
- Is there sufficient data? Is the data what you expect? Please set suitable standards at the beginning of the course. It does not matter if a candidate did not always achieve the criterion.

CPAC 5

This important higher-level skill should be assessed from early in the course. There is no shortage of suitable assessment opportunities. CPAC 5 has two elements:

(a) Uses appropriate software and/or tools to process data, carry out research and report findings.

(b) Sources of information are cited demonstrating that research has taken place, supporting planning and conclusions.

CPAC 5(a)

There should be evidence of candidates processing data using graphs and calculations. Centres should require candidates to use software (e.g. Excel) to draw graphs on a number of occasions.

- Make sure graphs are constructed correctly, i.e. there is a title, each axis is correctly labelled, points plotted correctly, an appropriate scale used, etc. Candidates will need to be shown how to use Excel to correctly title graphs and so on. It is evident that candidates do not always know how to use Excel appropriately.
- Processing data also involves carrying out calculations. This may involve transformation of data using mathematical equations, changing units, finding gradients etc.

CPAC 5(a) also includes 'carry out research and report findings'. The report does not need to be long; it may simply be the conclusion they draw from their data. However, it is not appropriate to award this CPAC for a one-word answer. A conclusion requires a reasoned response to the data observed.

CPAC 5(b)

Candidates must show evidence of referencing sources of information. This aspect of CPAC is still not getting enough attention from many centres and is generally poorly evidenced in candidate work. Just a few centres are to be commended for having candidates demonstrating referencing on multiple occasions; a few of these even using the Harvard System (which exceeds requirements for this CPAC). Opportunities for assessing referencing **must** be built in from early in the course. The information referenced may be for data or a quote; the information may come from a textbook, journal, website or EDUQAS data booklet.

Summary

Successful delivery of Practical Endorsement needs careful thought and planning. Make sure that there are ample opportunities for candidates to evidence all elements of each CPAC statement over the two years of the course. We do **not** expect candidates to achieve each CPAC every time practical work is assessed. Where CPAC is met every time by all candidates then that is an indicator that a centre may not be appropriately assessing.

Ensure that candidates are clearly informed which CPAC is assessed in a particular practical session.

Make Practical Endorsement a servant of the subject. Use Practical Endorsement to make better chemists. Do not let it become an end in itself.

Make sure that candidates are informed whether or not they have achieved Practical Endorsement before the final outcomes are submitted to Eduqas in accordance with JCQ requirements. Eduqas will not change centre gradings if a centre has passed the monitoring visit.

Supporting you

Useful contacts and links

Our friendly subject team are on hand to support you between 8.30am and 5.30pm, Monday to Friday.

Tel: 029 22404252

Email: science@edugas.co.uk

Qualification webpage: [AS and A Level Chemistry | Edugas](#)

See other useful contacts here: [Useful Contacts | Edugas](#)

CPD Training / Professional Learning

Access our popular, free online CPD/PL courses to receive exam feedback and put questions to our subject team, and attend one of our face-to-face events, focused on enhancing teaching and learning, providing practical classroom ideas and developing understanding of marking and assessment.

Please find details for all our courses here: <https://www.edugas.co.uk/home/professional-learning/>

Regional Rep Team

Our regional team covers all areas of England and can provide face-to-face and online advice at a time which is convenient to you.

Get in contact today and discover how our team can support you and your students.

[Regional Support Team | Edugas](#)

Eduqas Qualifications

We are one of the largest providers of qualifications for schools, academies, sixth form and further education colleges across England, offering valued qualifications to suit a range of abilities. Each and every one of our qualifications is carefully designed to engage students and to equip them for the next stage of their lives.

We support our education communities by providing trusted qualifications and specialist support, to allow our students the opportunity to reach their full potential.



WJEC
245 Western Avenue
Cardiff CF5 2YX
Tel No 029 2026 5000
Fax 029 2057 5994
E-mail: exams@wjec.co.uk
website: www.wjec.co.uk

ⁱ Please note that where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.