GCE A LEVEL EXAMINERS' REPORTS

GEOLOGY
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

Subject Officer's Executive Summary

Each component had a similar structure to those in previous years. The performance of candidates on the three written examination components was similar to that seen in 2019, the only other time that this specification has been assessed without any Covid related adaptations, with the papers showing broadly similar levels of accessibility. Candidates fared quite well in many recall and problem-solving situations. Questions requiring the use of mathematical skills triggered a varying quality of responses, with some such as the calculation of percentage error or the use of the chi-squared significance table often being poorly answered. The QER questions were generally not well answered, in particular each of those in the Component 3 options and also that assessing the design of a fieldwork investigation in Component 1.

Areas for improvement	Classroom resources	Brief description of resource
Planning fieldwork investigations	**COMPONENT 1 EXAM WALK THROUGH 2019**	PowerPoint with audio commentary. Slides for q5 exemplify how to tackle a fieldwork planning question
Fold characteristics. Faulting and stress orientation	**ROCK DEFORMATION KNOWLEDGE ORGANISER**	Knowledge organiser

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COMPONENT 1 - GEOLOGICAL INVESTIGATIONS

Overview of the Component

As in line with previous years Section A had two stand-alone questions with Section B being an integrated geological practical paper that included a map, specimens and photographs.

The topics covered this year included: volcanic hazards, chemical weathering, mineral testing and identification, igneous petrology, brachiopods, oolitic limestone, and structural geology.

The following skills were assessed: mineral testing and identification, data interpretation, chi-squared tests, drawing fossils, planning a field investigation, geological map interpretation and drawing a geological cross-section.

Overall performance was similar to that in 2019 when there were no Covid related adaptations.

Comments on individual questions/sections

Q.1 A surprisingly high minority of candidates were unable to correctly add arrows to show the movement of the North American and Eurasian plates. Nearly all candidates had little difficulty determining the height of Hekla but most struggled to estimate the area of Katla. A few candidates tried to use a range of mathematical techniques rather than estimate the area by comparing to Hekla.

The rest of question 1 proved to be the most accessible part of the paper and it was pleasing to see the candidates articulate a variety of different methods that could be used to predict volcanic eruptions.

Q.2 There was a considerable range in the candidates' abilities to explain a solid solution series and to describe the products and processes involved in the tropical weathering of an arkose sandstone. Nearly all the candidates had little difficulty identifying plagioclase feldspar as having the largest range of crystallisation temperatures and most could explain why Mg^{2+} can substitute for Fe^{2+}.

In part (c) most candidates failed to relate the temperatures shown in Figure 2a to the temperatures found at the Earth's surface.

Most candidates had little difficulty describing what would happen to the feldspar component of an arkose sandstone, the most common error was a failure to discuss what would happen to the quartz grains.

Q.3 While most candidates were able to give detailed descriptions of the mineral tests, the most common errors were to give vague answers such as “scratch the mineral” or “use a hand lens” without stating what the mineral should be scratched with or what the hand lens should be used to look for.

It appeared that some candidates had failed to carry out the tests and just copied the hardness from the mineral data sheet or stated what would be anticipated to happen e.g. “the mineral won’t be scratched by the steel pin”. No credit was awarded in these cases. While most candidates had little difficulty correctly identifying biotite mica the most common error was mistaking feldspar for quartz.

It was disappointing to see a significant minority of candidates using sedimentary terms such as “well sorted” and “angular” when asked to describe the texture of an igneous rock, and a minority of candidates suggest that the coarse crystals were a product of fast cooling. As some specimens were porphyritic, credit was given for a correct description of how porphyritic texture forms.

Q.4 Most candidates struggled to appreciate that the North arrow on Figure 4a was pointing towards the right and not in the traditional ‘straight up the page’ direction, and as such were unable to give the correct orientation.

It was pleasing to see that the vast majority of candidates had little difficulty in completing Table 4. However, it was clear that only around 50% of the candidates were able to correctly use a chi-squared significance chart.

While some candidates were able to relate the orientation of the phenocrysts to the position with the pluton and magma flow, a minority of candidates suggested that the alignment was due to magnetism.

Q.5 While most candidates had little difficulty describing the oolitic limestone of Specimen B, a minority of candidates then decided to draw Specimen B instead of Specimen K. It was pleasing to see that most candidates had little difficulty identifying Specimen K as a brachiopod and giving a suitable reason.

However, it was disappointing that most candidates failed to discuss the principle of uniformitarianism when asked about the environment of deposition for Specimens B and K. Most candidates could not correctly identify Rock Unit E as a Greywacke with the most common error being to suggest that it was an Arkose Sandstone.

Q.6 This question produced a wide range of marks. Those candidates that embraced the spirit of the question and planned an investigation scored highly. However, the most common responses could be put into two categories. Either a generic response was given with some suitable observations but which made no reference to Rock Units A, B, C and E. These answers were placed in the bottom band. Alternatively, a geological history of Rock Units A, B, C and E was given, for which candidates were not awarded any credit.

Q.7 It was pleasing to see that the majority of candidates correctly drew the axial plane trace, labelled the unconformity and added the direction of plunge. It was surprising that the majority of candidates could not correctly deduce the vertical displacement of Fault F1 despite being given two spot heights for the horizontal unconformity on either side. The majority of candidates were unable to correctly identify both types of fault.

Q.8 Completing the geological cross-section continues to be a good discriminator which again produced a wide range of marks. Although a few candidates achieved full marks, the most common errors were not plotting the apparent dip and missing the cross-cut between the E/F boundary and the base of D. Pleasingly the overall quality of cross-sections was an improvement on last year's cohort.

Q.9 This question produced a wide range of marks with most candidates picking up credit for recognising that the episodes of deformation took place at different times and being able to relate this to cross-cutting relationships. The most common errors were failing to recognise that not all rocks had been deformed 3 times and suggesting that the strike-slip fault was formed by compressional stress rather than shear stress.

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COMPONENT 2 - GEOLOGICAL PRINCIPLES AND PROCESSES

Overview of the Component

As in previous years, the paper consisted of six questions. Topics covered this year, included: Phanerozoic faunal diversity; evolutionary models; the density and composition of Earth's layers; metamorphic pathways and stability fields; tectonic plate boundaries, hotspots, and magma generation; Neoproterozoic glacial deposits and the Snowball Earth hypothesis; and a North Sea petroleum and zone fossil sequence. Overall performance was similar to that in 2019 when there were no Covid related adaptations.

Comments on individual questions/sections

Q.1 The vast majority of candidates were able to identify the fossils in part (a) and competently describe changes in the Figure 1a graph; evidently candidates had observed the 3-mark requirement and had concisely identified three changes, quoting figures where appropriate. In contrast, candidates struggled to calculate the percentage change in the number of 'Modern' faunal families. Some did not isolate 'Modern' faunal families, incorrectly including 'Palaeozoic' fauna in their calculation. Others did not use subtraction to work out the change in number, and others did not correctly calculate a percentage change, dividing the difference by the larger of the two values instead. In part (c) the highest marks were awarded to those who identified periods which did *and* those which did not support the statement, rather than just giving an example of a period or periods which *did* appear to end in mass extinction. The most common error involved candidates confusing periods with eras. In part (d) the best responses demonstrated that the candidate recognised the two evolutionary models and could describe their differences; other candidates simply had not written enough to warrant four marks.

Q.2 In the second question, most candidates showed competence in identifying three diagnostic properties of peridotite using the information provided in Figure 2, and many calculated the density of the sample with ease. Difficulty arose in calculating the percentage uncertainty; it was clear that very few candidates were confident in calculating this, although almost all candidates attempted the question in some capacity. In the final section of part (b) candidates demonstrated good scientific acuity overall, with a good understanding of resolution and anomalous results etc. Candidates who were less successful focussed instead on reducing error, and provided generic suggestions, often confusing accuracy with precision. In part (c) most candidates (in a similar fashion to Question 1 part (b)) were confident in describing the Figure 2c graph, providing relevant quoted data and commenting on the two-stage nature of the density increase, and labelling 'P' with precision. However, the latter part of the question proved more challenging, not all managing to identify the fragment as a xenolith, which made it difficult to award marks. The best answers explained the process of stoping, but some went as far as to describe assimilation instead, thereby not achieving the mark. In part (d) some did not refer to the data in Figure 2c and instead gave sweeping statements about Earth's density, but most were able to refer to the outer core's liquid iron state.

Q.3 Almost all candidates successfully stated the necessary temperature and pressure values, showing an initial understanding of how to interpret Figure 3a. In part (b) the highest scoring responses showed evidence of careful planning to ensure all aspects of the question were covered in the response. Candidates would be encouraged to underline or make a list of what they are comparing in their answer to help access all marks. Low-scoring responses tended to dedicate too much time to describing the two pathways in minute detail with little, if any, comparison of the two. A small number of responses described the conditions within each stability field with no reference to the pathways themselves. A few answers revealed misconceptions about contact versus regional metamorphism, and others had quoted imprecise maxima for temperature and pressure in each pathway. But the majority of low-scoring responses simply did not refer to all the required aspects (the maxima values for each, the stability field or fields each pathway passed through, the types and grades of metamorphism each reached, and a comparison of the timing of these events). A large proportion of candidates did not even refer to ‘pathway 2’ taking twice as long to complete. In part (c) most recognised the presence of kyanite and sillimanite in the photomicrograph matching that of ‘pathway 2’, but fewer candidates identified and explained the presence of foliation or the significance of garnet crystals. It is worth noting that a few candidates exhibited confusion between metamorphism and igneous processes, incorrectly using igneous textural terms and explanations. In the final part of this question candidates typically made one or two correct statements, usually about temperature or time, but not many accessed the third mark.

Q.4 In general, part (a) of this question was answered well. Candidates provided named examples as instructed and evaluated *both* aspects of the statement. Similarly in part (b) those candidates able to correctly interpret the P wave velocity scale were able to confidently identify and refer precisely to sections of Figure 4b and explain why they do or do not support Morgan's suggestion. In part (c), again, the majority of candidates shaded the correct area on both graphs and explained clearly why they had done this, making reference to the geotherm and the point of melting. Candidates who lost marks had usually shaded parts of the divergent plate boundary and hotspot cross-sectional diagram by mistake. On the whole, candidates exhibited a good understanding of the difference between divergent plate boundaries and hotspots in terms of magma formation. In part (c) (iii) candidates who did not access full marks usually focussed on the presence of oceanic crust in both settings and misidentified this as the initial source for both magmas.

Q.5 Completing Figure 5b was straightforward for most. In part (a) (ii), those that directed their response towards magnetism were, for the most part, able to achieve full marks. But in general candidates struggled with this question and those who lost marks tended to give detailed descriptions of glacial deposits and erosional formations. In part (a) (iii) successful answers gave a concise description of the location of both sets of ice sheets, providing latitudinal data and more importantly showing an understanding of latitudes; some answers, for example, described Quaternary ice sheets as extending *from* a north latitude *to* a south latitude without demonstrating a clear understanding of their concentration at the poles. In part (b) the best answers referred to all three figures with a good grasp of what each figure shows. Common misunderstandings centred around Figure 5a and grasping the notion that the deposits are positioned today at different latitudes to those at which they formed. The best answers recognised limitations with the data presented, commenting on the lack of longitudinal data for example. Some candidates interpreted Figure 5c as evidence for dropstones, using this knowledge and the location of the deposit’s formation, to evaluate the hypothesis further. Other responses communicated a good understanding of the hypothesis itself but did not directly draw upon the data to inform a conclusion.

Q.6 Most candidates were able to access the question well, interpreting Figure 6a with ease, completing Table 2, and calculating the geothermal gradient with success. In part (a) (iii) some candidates understood that the depth of peak oil formation would occur at a shallower depth, but very few obtained the second mark. To achieve this, candidates needed to correctly explain the effect on the breaking of hydrocarbon bonds. For others, ambiguity in the literacy of the answer made it difficult to award any marks, e.g., vaguely referring to a 'lower' depth. In part (b) successful candidates were able to apply their knowledge of oil-bearing sections, and in doing so, identify a potential source, reservoir, and caprock whilst demonstrating an understanding of hydrocarbon systems and the upward migration of oil. This section of the question highlighted common misconceptions about porosity and permeability. In part (c) a good number of candidates were able to comprehend the instructions provided and correctly label the microfossil zones. Candidates who lost marks mostly made simple errors such as working *up* the sequence, or lack of precision when drawing the boundaries. In the last part of the question candidates were required to engage with the data given in Figures 6b and 6c in some detail. Many answers relied too heavily on generic statements about zone fossils rather than using the data as the basis for description and then evaluation. Successful responses used all data provided to make a sensible comparison between ammonites and microfossils.

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COMPONENT 3 – GEOLOGICAL APPLICATIONS

Overview of the Component

As in previous years, the paper consisted of two Geohazards questions, a series of questions related to a Geological Survey map, and three questions assessing each of the three options. Topics covered this year included: tsunami hazards, metal pollution, fold and fault characteristics, springs and wells, and ground subsidence. Overall performance was similar to that in 2019 when there were no Covid related adaptations.

Comments on individual questions/sections

SECTION A

Q.1 In Question 1, the latter parts of the question required candidates to engage with the data given in Figures 1b and 1c in some detail. Many answers relied too heavily on generic statements about tsunami waves and hazards rather than using the data as the basis for description and explanation. Successful responses used all of the data provided and the information that the candidates had drawn out from the preceding parts of the question to make an evaluation of the risk from this specific tsunami event.

Q.2 In Question 2 a similar issue was seen. Candidates who achieved the highest marks in parts (b) & (c) of this question were able to apply the data given, as well as answers to previous parts of the question, to form their responses. For example, making the link between the acidity of the mine water and the concentration of lead in the water was key to high quality answers. In part (c) (i) many candidates didn't use the data or their previous answers to consider the link between pH and the solubility of lead. Part (c) (ii) saw a wide variety of responses with the best answers considering how the problem could be stopped at source rather than dealing with its products. For questions (c) (ii) and (d) only solutions that were practicable in reality were credited. For example: there were a lot of suggestions that an impermeable barrier between tunnel 9 and the river would solve the pollution problem in the river, and the use of shotcrete on loose mine waste was a common answer for part (d). Neither of these answers were awarded marks.

SECTION B

Q.3 This question tried to introduce some key features of the map and produced a wide range of marks. Candidates need to take care to add detail of map evidence, such as stating lithologies, when describing and explaining features from the geological map. Some candidates failed to use the correct trigonometry function (often using tan instead of sin) when calculating the dip is section (b) (iii). Candidates should sketch what they are calculating to help them identify the correct function.

Q.4 This question focussed on the geological structures on the map. Many candidates could not distinguish between the terms antiform and anticline. The vast majority of candidates were able to identify that the Harrogate anticline was plunging, however, few noticed that it was plunging in two directions, south-west and north-east. A common misconception was highlighted in (a) (iii) with many candidates discussing asymmetry as a function of either outcrop width or dip angle. The best answers discussed asymmetry and limb length or location and trends of the axial planar trace. In part (c), many students identified the fault as being younger than the fold and therefore the statement is incorrect, however, the best answers noted that both features were compressional, with north-west to south-east compression, and had a similar trend, north-east to south-west. Therefore, they could have both formed during the same crustal shortening event. Candidates generally struggled with section (d), the main reason for this was a focus on lithology as opposed to structure. The most successful candidates noted that the springs were located around the fault and axial plane of the fold which could allow water to the surface through fractures and tension cracks created, increasing secondary porosity and permeability. Credit was awarded for good discussions regarding the juxtaposition of lithologies due to fault movement.

Q.5 Candidates struggled with the triangular plot in this question. Most were able to complete the calculation and plotting of spring T. However, very few were able to draw a line to show the Mg:Ca ratio of 1:1. The vast majority of pupils plotted a line from 50% Ca to 50% Mg and few recognised that the line had to extend through 100% Na. This lead to deficiencies in (a) (iv) as they did not have the correct line to help them with this question. The best answers noted that that the Mg:Ca ratio was very close to 1:1, especially at high levels of Na, but was more variable below 40% Na and above 60% Ca. In part (b) the best responses noted that multiple reasons for variation in chemistry were needed to attain full marks. Most candidates focussed on variation in lithology and credit was awarded for sound development of this with reference to specific ions, e.g. increase in Ca^{2+} with a limestone country rock.

Q.6 Candidates were able to access the first section of this question well and showed competence describing and comparing rose diagrams. Candidates found parts (b) and (c) more challenging. The best answers on section (c) were seen where candidates analysed Figure 6a carefully and noted ground water flow, dip direction and depth of soluble gypsum to fully answer the question. In part (d) successful candidates noted the similarities between the two locations – lithology, shallow dip to east, stronger roof rock to the east – to identify that the area in box A was at risk of subsidence.

SECTION C
Option 1 – Quaternary Geology

Q.7 Question 7 examined the link between Quaternary deposits and the processes that form them. Most candidates were able to explain how the texture of rock unit A was the result of erosional and depositional processes, often in a glacial context. Many candidates were not able to recognise the alignment of clasts in Figure 7a. Credit was given to candidates who explained how glacial processes could have resulted in a deposit with similarities to the one shown. Many candidates were able to recognise the fluvial origin of Unit B on Figure 7b. However, a few candidates interpreted these sediments as being deposited in a completely unrelated environment from those deposited on land in a glacial climate as in Units A and C. Turbidity currents were identified by a minority of candidates as the environment of deposition. A very wide range of responses were seen to part (c). There were a minority of candidates who, having explained the processes of varve formation were unable to make the link to using them for incremental dating.

Q.8 In Question 8, most candidates were able to describe the distribution of areas of crustal uplift. However, many candidates demonstrated a limited understanding of the process of isostatic readjustment with an explanation of the displacement of mantle rocks only featuring in some of the best answers. A few candidates attempted to explain the uplift shown as a result of tectonic activity. The calculation was completed accurately by many candidates. The minority of candidates who dropped a mark on this part of the question failed to read the intersection of the line with the vertical axis of Figure 8b with sufficient accuracy. A range of answers was seen for part (c), though understanding of the formation of raised beaches is poorly developed in many candidates' knowledge.

Q.9 Question 9 garnered a very wide range of responses. Candidates whose marks were confined to the lowest band often gave a pre-prepared response to describe the Milankovitch cycles or demonstrated a very brief general description of ice cores. Many candidates were able to give a good explanation of how ice cores could be used to reconstruct climates, most often through the atmospheric chemistry preserved in air bubbles in ice cores and, to a lesser extent, with an explanation of how oxygen isotopic records are used in paleoclimatology. The best answers, from few candidates, were able to make the link with the extent of the ice core record from Antarctica in particular to reconstruct the climate over timescales that would reflect the cycles identified by Milankovitch.

Option 2 – Geological Evolution of Britain

Q.10 The answers to Question 10 appeared to show a better understanding of gravity anomalies than had been seen in previous occasions that the concept has been examined. Most candidates made a descriptive statement on the size or shape of the gravity anomaly, though there were many examples of inaccurate use of the scale on Figure 10a. Most candidates recognised the density of the Palaeogene gabbro on Figure 10b as the cause of the positive anomaly, though these responses could often have been developed further by using the density values as comparators with the country rock on Skye to gain both of the marks available. Most candidates were aware that the Isle of Skye is too far north to be affected by the Variscan orogenic belt, however there were only a minority of candidates who answered this question in enough detail to achieve full marks for their response.

Q.11 Question 11 used the Mochras Borehole, exemplified in the course specification, to compare the record with other boreholes from across the British Isles. Most candidates were able to identify the type of fault shown on Figure 11a, though a minority then found it more challenging to explain some of the further details about this fault. Many candidates found it challenging to explain the use of boreholes in determining the geology of Britain and relating the records from the three boreholes shown in Figure 11b to make their interpretation. Most candidates focused on the use of ammonites as zone fossils in part (c), with only a minority of the stronger answers relating the occurrence of these fossils to the boreholes shown. Candidates should be encouraged to use the previous parts of a question to inform their responses to the more synoptic parts later in the question. Many of the responses to part (d) showed that candidates weren't using both of the figures that they were referred to, with the quality of many answers being limited as a result.

Q.12 Question 12 saw a very wide range of responses. Most candidates were able, to some degree, to explain how palaeomagnetic data may be preserved within igneous rocks. Many candidates were able to give some account of the changing record of magnetic inclination in British rocks, with a few answers that further developed this by explaining apparent polar wandering curves. However, many answers lacked the detail in their explanations to push answers into the top mark band. Only the strongest responses were able to link the magnetic record with the sedimentary record to show how Britain's latitude changes through the Phanerozoic Eon. Candidates should be encouraged to use specific examples from the geological record of the British area to support their answers in this question.

Option 3 - GEOLOGY OF THE LITHOSPHERE

Q.13 Candidates were able to score well on this question which tackled familiar themes of sea floor spreading and ocean basin development. Candidates found part (b) (i) most challenging as they were inclined to discuss the formation of magnetic reversals at ocean ridges, as opposed to the comparison of these reversals with continental lavas to calculate the rate of sea floor spreading. The candidates that scored highest discussed the dating of continental reversals through radiometric methods, their comparison with reversals in ocean basins and finally the distance from the ridge to calculate rate. In part (ii) the most successful candidates discussed ocean island chains, such as Hawaii, or GPS measurements to calculate rate. Part (c) was well answered, however some candidates failed to give a sufficient level of detail to achieve 4 marks – candidates should pay close attention to the number of marks available for questions to ensure their answer contains sufficient detail.

Q.14 In this question the focus was deformation. Candidates showed a familiarity with the stress strain curve in part (a) (i) and were able to score well describing the graph. The most successful candidates used key terminology such as yield strength and elastic limit to good effect. The majority of candidates were unable to achieve two marks for part (a) (ii), failing to realise that a higher confining pressure would increase the yield strength of the rock and extend its plastic zone. Part (b) rewarded those who studied the figures carefully. Many candidates noted that there was a thrust fault in both Figures 14a and 14b, however, those who scored the highest noted that the dip direction of this fault was different. Consequently therefore, Figure 14b could not have been a photograph at location A looking west. Candidates scored well on parts (c) and (d) showing a strong understanding of differing deformation at different depths within the lithosphere.

Q.15 Most candidates showed a sound understanding of seismic waves and the factors that affect their velocity in relation to the lithosphere – asthenosphere boundary. Those who achieved the upper band (5-6 marks) made sound comments regarding rigidity, incompressibility, and density. For top marks these properties were linked to wave behaviour, refraction as well as velocity. Many candidates still refer to the asthenosphere as being partially molten, usually quoting a 5 % molten figure. It is worth noting that the asthenosphere is almost entirely solid, which can flow due to its temperature being very close to its melting point. Some candidates confused the effect of density on seismic velocity, those that were most successful noted that increasing density would decrease seismic velocity and therefore rigidity must increase at a greater rate than density as they travel further into the Earth. Annotated diagrams which showed correct refractions with explanations scored well.

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PRACTICAL ENDORSEMENT

Overview of the Component

From September 2022 we returned to face-to-face monitoring after a period while 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. Perhaps, as a result of the difficulties of the last few years, some centres had taken 'their eyes off the ball' of practical assessment. Centres are reminded that Practical Endorsement is an integral part of the A level specification and needs to be delivered in its entirety.

It is perhaps worth reminding centres of some key features which characterise centres which successfully implement practical endorsement:

- Clear planning of both practical work (and field 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 as well as the assessment of skills within Practical Endorsement.
- Regularly maintained and updated 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. It surprised the monitor while observing practical work that on a few occasions candidates were not told what they would be assessed on in the practical.
- 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 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, 'Is the candidate competent at the end of the course?' In short we expect to see that there are places where candidate work is marked 'not achieved'.

- Although A level Geology is generally delivered by one teacher, where more than one teacher is involved there is evidence of standardisation across all teachers delivering the specification. **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.
- Centres have read and acted upon recommendations from previous monitor reports.

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 means 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 he or she **independently** meets the criteria. Therefore, centres must give careful consideration to how group work is conducted so that individual candidates can be assessed on their own performance.

CPAC 1

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 the 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 make sure that you know where and when you are going to assess this CPAC. 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 of the A level course

This skill may be evidenced as a candidate plan to carry out a procedure and then adapting their approach as necessary. Field work presents centres with excellent opportunities to assess this skill; these opportunities should be taken. Obviously, candidates must first have the opportunity to develop the skills before they can be expected to carry them out independently. The '[Lab based fieldwork exercise'](#) lays out an approach which allows candidates to generate suitable evidence towards most aspects of this CPAC. Centres are strongly encouraged to use this as a training exercise before doing field work. Centres can also use this as a model to assess fieldwork.

The monitoring team have also seen candidates asked to complete extension activities to practical work (e.g. to **SP20** – candidates plan how to investigate how heat flow depends upon grain size). Incidentally this is a good activity to evidence **2c** which can be difficult to do in geology. On another occasion, candidates were given a tray of equipment and asked to use the most appropriate equipment to measure the density of different minerals. Candidates were asked to justify the equipment they used.

CPAC 3
There is no need to assess this skill every time a practical is completed. Do not use practical work to assess this where hazards are minimal; rather select practical work where there are some meaningful hazards / risks. Field work is an ideal place for candidates to be assessed and should be used.

CPAC 3(a) requires learners to identify hazards and assess the risks associated with the hazards.

A simple written risk assessment is the best way of evidencing this aspect of the skill.

CPAC3(b) should be assessed by observation of learners conduct during a practical session. Once again field work is an ideal place to observe candidates' approach to safe working.

CPAC 4
Both practical records and field notebooks are also a good source of evidence for CPAC4.

There is a tendency for centres to give too much support through the use of templates when assessing this CPAC. There is also a propensity to generously give CPAC 4 when work is not tabulated correctly or recorded to the necessary precision. A monitor will certainly notice this, and it may result in the centre to be found non-compliant with the requirements of Practical Endorsement if this fault runs through the assessment of the group.

Remember, the monitor is looking at the evidence you assessed this work appropriately. When the candidate draws a diagram, please ensure good practice is followed before awarding the criterion. For example, where relevant:
- The diagram is reasonably accurate
- A sharp pencil used
- There is a title
- Continuous clear lines are used
- Key structures are labelled
- Scale bar present
- Annotation lines are straight, and annotations written horizontally
- Shading not used
- Field sketches should have compass directions on each side of the sketch

CPAC4(a) making accurate observations. Observations should be made directly into their practical books or field books. They should not be written on to scraps of paper and copied up later. Please **avoid** using proforma that direct candidates how to record data. Proforma are 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 CPAC4 must not be awarded. Where necessary, remove table templates to allow candidates to construct their own. The measurement of density is a good place to assess this skill so you are advised to use it. The tables candidates construct **mus**t have appropriate headings and units, where relevant. 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 criteria.
CPAC4(b) obtaining accurate, precise and sufficient data .... Please carefully check candidates' data. Is it recorded to appropriate precision? We still notice that some centres are too lenient on this. If mass and volume readings are not always consistently recorded by candidates, then do not award the criteria. Make sure that recordings are to the correct number of decimal places - this is not always done! 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 a criterion.

CPAC 5

This important higher-level skill should be assessed from early on 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.

CPAC5(a) There should be evidence of learners processing data using graphs and calculations. Centres should require candidates to use software (e.g. Excel) to draw graphs on a number of occasions. **SP19** and **SP20** are good places to use Excel to generate graphs.

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 etc.

Good quality graphical logs and rose diagrams also can be assessed under CPAC5(a).

Processing data also involves carrying out calculations. **SP19** is an example of an excellent place to assess this with the opportunities it gives to carry out statistical analysis.

CPAC5(a) also includes 'carry out research and report findings'. The report does not need to be long; it may simply the conclusion they draw from their data. However, neither is it is not appropriate to award this CPAC for a one-word answer. A conclusion requires a reasoned response to the data observed.

CPAC5(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 still the poorest 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 our 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 EDUQAS data sheet (e.g. a density value from an Eduqas sheet), map etc.

A few centres, and therefore candidates, still confuse referencing with a bibliography. There are important differences.

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.

Field trips are an ideal place to assess CPAC once candidates have some experience, but this does require some thought beforehand. Which CPAC statements can be assessed? Where is the evidence going to be generated? The field notebook is an obvious place e.g. for CPAC 3(a), 4 and, when assessed, CPAC 2. If it is evidence from observation (e.g. CPAC 1 or 3(b)) how are you going to record this? Will a checklist help? Don't be over ambitious but don't lose the opportunity.

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

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.

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

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 2240 4253
Email: geology@eduqas.co.uk
Qualification webpage: Eduqas AS/A level Geology

See other useful contacts here: Useful Contacts | Eduqas

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.eduqas.co.uk/home/professional-learning/

Regional Rep Team

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[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.***