OCR
RECOGNISING ACHIEVEMENT

GCE

Geology

Advanced GCE **A2 H487**

Advanced Subsidiary GCE **AS H087**

Examiners' Reports

June 2011

HX87/R/11

Oxford Cambridge and RSA Examinations

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This report on the Examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the Examination.

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EXAMINERS' REPORTS

Chief Examiner Report

General Comments

The overall standard was similar to previous years with many excellent scripts, indicating that many candidates had been well prepared and had worked hard to understand basic principles and processes.

Centres should continue to stress the importance of using specific geological terms in their correct context. General terms will rarely gain the marks and candidates need to have a good knowledge of the full range of terms and definitions given in the specification. Some candidates write in vague or imprecise terms, often not using the appropriate technical terms (or using them incorrectly). This resulted in some answers that were not of the standard required for AS or A2. It is also important that candidates realise that they are unlikely to gain credit for using information that had been given in the question. While this information can be a useful prompt, candidates are expected to perform some higher level processing and to analyse the information and explain it using their own knowledge.

All candidates need to have a better understanding of the command terms, especially *explain*, *analyse*, *evaluate* and *define*. Some candidates fail to act on the command words for their answers and will then lose marks. If a question asks for both description **and** explanation, candidates will be rewarded for demonstrating **both** skills. There is a clear distinction between a description of the physical characteristics such as *rounded grains* and an explanation which gives the reason *why* the grains are rounded as a result of long transport. In some cases candidates give a one word answer when asked for a description and this cannot gain marks. The use of *state* or *name* or *identify* would require only a single word. Candidates should be prepared to take full advantage of accumulating marks from the more straightforward questions. There are many key terms and definitions on the specification that can be learned often using lesson starters, plenaries, quick tests and card sorts.

The A2 papers contain some part questions that include *Stretch and Challenge* marks. *Stretch and Challenge* is not identified within the question paper and does not involve whole questions and only involves parts of questions.

Stretch and Challenge includes four areas:

- Demonstrating a deeper knowledge and understanding of the subject material within the specification and so will cover some difficult content and concepts.
- Bringing together associated parts of the specification without prompting.
- Showing ability to think through the question and presenting a clear, logical development of ideas.
- Demonstrating understanding by applying geological knowledge to unfamiliar contexts.

Synoptic and *Stretch and Challenge* material is assessed using a variety of question types and command words.

Questions and tasks may also contain information relating to an unfamiliar context, including environmental aspects. Candidates can be presented with fossils and/or contexts where they must use their knowledge of common fossils and geological principles to interpret the mode of life or environment of fossils that they are unlikely to have encountered previously.

Most candidates were aware of the one mark per minute guide for all the Geology papers and the general rule of using two lines per mark unless part of the answer is a diagram or it is a single word or phrase. For most candidates there are adequate answer lines for each question, but some candidates may use more space than that provided and continue answers on other

parts of the page or paper. This is not a problem, as examiners will mark all answers but candidates run the risk of wasting time and effort on a question if they are exceeding the line allocation. It is most important that the location of any continued answer is indicated in the allocated space for the answer or as close as possible to the lines provided for the answer. This is particularly important as these papers are scanned and marked electronically so the Examiner can then look for the remainder of the answer in the appropriate place. So if additional material needs to be considered, it should be very clear where it is.

The legibility of candidates remains a concern with untidy written answers and too many technical terms spelled incorrectly. There are two marks available on both the 60 mark papers for including two technical words and spelling them correctly. Candidates need to focus on spellings when answering questions signposted by the pencil icon.

Diagrams should be done in an HB pencil so that the lines are not too faint to scan. Labelling can be in pen or pencil but labels should be clearly joined to the feature drawn. Making diagrams clear and accurate with suitable scales is an important skill.

Centres need to be aware that guidance for the administration of practical tasks and fieldwork is updated and published on the OCR website. It is the responsibility of centres to use the most up to date version of both the Practical Skills Handbook and Fieldwork Guidance. The latest version is always the version which is published on the website and *OCR Interchange*, and they should be checked periodically. Materials which are on *OCR Interchange* are dated so it is possible to see where, if any, changes have been made. By registering with *OCR Interchange*, an e-mail alert is automatically sent to inform of any changes made. Many teachers find this a useful 'prompt' and this service is free. To be notified by e-mail when changes are made to GCE Geology pages, please e-mail GCEsciencetasks@ocr.org.uk including your centre number, centre name, a contact name and Geology in the subject line. It is strongly recommended that all centres register for this service.

Where there are amendments made to tasks during the year it is essential that centres use the most up to date version by downloading the tasks just before they are used. Amendments were made to mark schemes during the year after feedback from centres so it is worth checking that the mark scheme used is the most recent. Geology tasks often take place very close to the end of the year with a concentration in April and May. Amendments may well have been put in place in the spring. By signing up to the email alerts, Centres can be informed of such notifications.

Resit candidates must submit at least one new Task type which must be selected from those available in the current year. The other type of tasks could either be new from the current year or carried over from the previous year (although remarked according to the original mark scheme and in the light of any comments from the Moderator). Under no circumstances should a candidate 're-do' a Task they have already done – whether it was submitted as part of their final mark in a previous session or not.

Moderators are instructed that they are not permitted to put any mark or annotation on the candidates' work, so annotations will not appear on the candidates' work. The information accompanying the returned work in conjunction with the mark schemes will help Centres to identify any areas that need improvements.

Initiatives

This year has seen the introduction of several initiatives to help both teachers and their students:

- **Active Results (new for GCE Sciences)**
  GCE Geology is now included in Active Results, a free results analysis service helping you review the performance of individual candidates or your whole centre. Active Results provides access to detailed results data, enabling more comprehensive analysis of results

in order to give a more accurate measure of the achievements of your centre and individual candidates. For more information, including a demonstration, go to www.ocr.org.uk/activeresults. Although geology does not feature in the demonstration, it will be available on *OCR Interchange* for this session.

- **Continuing Professional Development**
  In June 2011, a new type of CPD event was offered to teachers as a practical field visit. Feedback from the session has been very positive. Suggestions for future visits are welcomed. Perhaps we can exchange ideas on the new OCR Community.

- **The OCR Community (www.social.ocr.org.uk)**
  A place to collaborate with colleagues and to share best practice and resources.

F791 Global Tectonics

General Comments

There was a full range of marks achieved by candidates. The paper was accessible with very few part questions omitted and it differentiated well with marks ranging from 5 to 60. There were some excellent scripts and these candidates demonstrated thorough subject knowledge and were able to express themselves clearly and concisely using good technical terminology. Candidates are in general improving in their ability to draw detailed well labelled diagrams but there are still some concerns. Performance at the top end was outstanding with a number of candidates gaining more than 50 marks out of 60. Very few candidates gained less than 18 out of 60 which indicates that they were well prepared.

In addition:

- Candidates showed a sound understanding of the characteristics of oceanic crust and were clear in their understanding of the recycling of oceanic crust. Most candidates had a good knowledge of the evidence for sea floor spreading.
- Labels on plate margin diagrams are improving although work still needs to be done by some candidates to improve the quality of the diagrams.
- Candidates coped well with the structural questions, in particular the angular unconformity, although joint formation proved difficult for some.
- Candidates had few problems with interpreting seismogram readings and thus locating the epicentre.
- Understanding of space exploration was in need of extra detail for this new section of the specification.
- The extended prose responses were often excellent and even the weaker candidates tended to know three pieces of evidence for continental drift although detail was lacking in some answers.

Comments on Individual Questions

Question 1

Q1 Candidates were unclear about the detail of direct observations of the crust and mantle but know the characteristics of oceanic crust.

(a) **(i)** The majority of candidates knew that crust could be sampled directly via mines or boreholes. Fewer knew how far deep mines and boreholes could reach or described the type of rocks found.

Teaching Tip
The deepest mines are the Tau Tona Mponeng gold mines in South Africa which have reached 3.9 km. The deepest borehole is the Sakhalin – 1 Odoptu OP-11 well drilled in 2011 which reached 12,345 meters near the Russian island of Sakhalin.

(ii) Many candidates described mantle material brought up in volcanic eruptions but did not discuss the xenoliths or the material that they were made of (peridotite). Fewer candidates are aware of the importance of Kimberlite pipes bringing up xenoliths of mantle material including diamonds. A few indirect methods were given such as meteorites and also P and S waves which gained no credit.

(b) **(i)** Candidates are generally well versed in the properties of oceanic and continental crust with many gaining at least 3 marks. In this question candidates were most confident with the composition and age of the crust.

Teaching Tip
Candidates should be aware that if the questions asks for an average (average thickness) then one number is expected and not a range. Most candidates did seem to understand that this was the case.

(ii) Most candidates knew that basalt is found at or close to the top of the oceanic crust. Many candidates knew the structure in detail and produced superbly detailed diagrams. A significant number though missed out one or more layers or mixed up the relative positions.

Question 2

Q2 This is the first time that a question specifically on space exploration has been asked and it was clear that candidates had a vague idea of satellites and telescopes but lacked detailed knowledge of particular missions.

(a) **(i)** The majority of candidates knew about satellite images, telescopes or probes being used. Relatively few knew any specific examples such as the Mariner spacecraft or the Hubble telescope.

Teaching Tip
Some students mentioned the use of infra red imagery but candidates should remember that the only active volcanoes in the Solar system are 1) Io, a moon of Jupiter; 2) Triton, a moon of Neptune; and, 3) Enceladus, a moon of Saturn. Infra red imagery would not show up the numerous extinct volcanoes. If students mention such technology they must indicate an example where it would work.

(ii) Approximately 30% of candidates knew Io had active volcanoes but many candidates had no idea or mentioned Triton the volcanic moon of Neptune or Olympic Mons. Many left the answer blank.

(b) The majority of candidates knew the Asteroid Belt as being the source of most asteroids and in general the spelling was accurate too.

Question 3

Q3 Candidates knew vaguely how ridge push and slab pull operate but few in detail. Most candidates understood the concept of recycling of oceanic crust. Candidates have a sound understanding of the evidence for sea floor spreading. A gradual improvement in the standard of plate margin diagrams is occurring especially regarding the labels.

(a) **(i)** A good number of candidates were able to describe ridge push involving the forceful intrusion of magma at a MOR pushing crust apart. Fewer actually used the phrase "ridge push". Candidates needed to discuss more than just convection currents. Detailed understanding of ridge push and slab pull were lacking.

(ii) Fewer candidates were familiar with the details of slab pull although many did discuss subduction. Candidates should mention the sinking dense oceanic plate pulling the rest of the plate behind which causes plates to be pulled apart at an MOR. Again few candidates used the term "slab pull".

(iii) Many candidates could not think of appropriate evidence for rising convection currents. The answer mainly linked to evidence at MORs which could include high heat flow, the volcanic activity, gravity or shape of the MOR. A number of candidates discussed hotspots which being associated with rising mantle plumes are not appropriate in this case.

(iv) Many candidates knew that oceanic crust is destroyed by melting at subduction zones or knew the more general idea that it was recycled. A few candidates referred to the Wilson cycle.

(b) Many candidates were familiar with at least 2 pieces of evidence for sea floor spreading although sometimes the detail was lacking restricting the candidate to half marks. Candidates were most confident about the age and thickness of oceanic crust linked to the MOR and the "magnetic stripes". A key piece of the evidence is that the ocean floor features are both parallel to the MOR and symmetrical about the MOR which is key in examination answers. Candidates were less familiar with using the MOR's features of heat flow, gravity anomalies, faults and patterns of earthquakes as evidence. A few candidates incorrectly discussed evidence for continental drift such as jigsaw fit, candidates need to be clear that evidence for sea floor spreading is different and linked to the ocean floor and MOR.

(c) **(i)** Many candidates gained at least half marks with most being able to draw the converging arrows and the fold mountains. Many candidates drew a subduction zone when the question asked for a convergent plate margin involving two continental plates. Drawing a subduction zone restricted the candidate to half marks. Those candidates who drew the correct margin tended to know where the partial melting, metamorphism and batholiths occurred. A number of candidates sensibly labelled metamorphism around the batholiths. The main area of improvement is in the standard of the cross section drawings.

Teaching Tip
It is a good idea for candidates to construct an A3 revision sheet with labelled diagrams of every type of plate margin to include characteristic features, processes and rock types.

(ii) Most candidates correctly answered the Himalayas although spellings were very variable.

(iii) The candidates were unsure about the correct type of fault associated with thickening of the crust (reverse/thrust) with an equal distribution of every fault type.

(iv) Many candidates knew the correct answer of ophiolite although the spelling was variable.

Question 4

Q4 Candidates were well versed in interpreting seismograms and locating epicentres.

(a) The majority of candidates were able to read off the arrival times accurately. However, a number of candidates did not follow the instructions asking for the readings to be to the nearest half minute.

(b) The vast majority of candidates were able to convert arrival times into distances from the epicentre. If candidates had incorrect answers to 4a then this answer was carried forward and used when marking 4b.

(c) The majority of candidates were able to use a set of compasses to use the correct radii to construct the 3 overlapping circles. Most had the epicentre in the correct place. Errors from 4a and 4b were carried forward and used when marking 4c. A number of candidates clearly did not have a pair of compasses so produced rough circles or roughly guessed the epicentre.

Teaching Tip
All candidates should come to geology examinations with black pens, a ruler, a pair of compasses, a protractor and a calculator as they could use them in any of the examinations.

Question 5

Q5 Often candidates struggle with structural geology but the style of this question appeared accessible and candidates showed a good knowledge of fold structures and the formation of angular unconformities. Recognition of joints was also good although understanding their formation was more variable.

(a) Candidates tend to like this format of question matching definitions to terms rather than coming up with their own definitions. Many candidates matched all of the definitions correctly. The most common error was confusing overfold and recumbent fold.

(b) Many candidates had a clear understanding of the processes involved with the formation of an unconformity and were able to illustrate the stages. Some candidates just drew an angular unconformity and explained its formation while others drew a sequence of diagrams. A significant number of candidates had no idea what an angular unconformity was so just guessed or left the question blank.

(c) **(i)** A clear improvement in candidates' knowledge of the features of a normal fault. In particular more candidates are now able to draw on and label the fault dip which was rarely the case in the past. The fault plane was usually correct.

(ii) In a similar way to question 3ciii candidates seemed spread in their answers with an equal number naming the fault as being reverse instead of normal. A number also just called it a dip-slip fault which is not precise enough.

(d) **(i)** Many candidates knew the correct location of the joints within the sandstone and at the hinge/crest. A significant number located the joints at the hinge/crest but within the shale.

(ii) It was impressive how many candidates were aware that it was the competence of sandstone which allowed the formation of joints. Very few candidates successfully explained why the joints formed in the hinge or crest area due to tensional forces as this part of the fold is stretched.

(iii) The majority of candidates recognized the structures as being cooling/columnar/hexagonal joints although the explanation of their formation was more varied. Many though did link the formation to the cooling and contraction of the magma. It is worth encouraging candidates to draw diagrams whenever they feel that it will help with their explanation even if the question does not specifically ask for a diagram. In this case candidates could have added labelled arrows to the printed diagram of columnar joints to show the contraction (which some candidates did do).

Teaching Tip
Use strips of plasticine and *Playdough* ™ to simulate rock types of different competencies. Apply pressure from both sides to form an anticlinal fold structure. The plasticine will crack at the crest of the anticline.

Question 6

Q6 Candidates generally had a sound understanding of the main pieces of evidence linked to proving continental drift. The majority discussed the "jigsaw" fit of Africa and South America and knew that it is not perfect at coastlines due to erosion and deposition. Relatively few discussed the better fit at the edge of the continental shelf.

Many candidates had a good understanding of the fossil evidence and most knew at least one example of an appropriate fossil. Most understood that these organisms could not have crossed the Atlantic Ocean as it is today.

Other lines of evidence were less well known with discussions of fold mountains being vague with little indication that the same rocks, structures, trends and ages matched up. Many candidates did gain marks for talking about similar rock types matching up but these tended to be vague. Candidates need to give one or two specific examples. Few candidates mentioned polar wandering using palaeomagnetism.

A few candidates did discuss the evidence from sedimentary rocks in Great Britain indicating a northward drift through time such as Devonian desert sandstones, Carboniferous limestones and coal followed by the Permian/Triassic desert sandstones.

F792 Rocks – Processes and Products

General Comments

Many candidates were very well prepared for this examination and there were some outstanding scripts gaining 99 marks and demonstrating excellent subject knowledge and understanding. However, other candidates had not learnt basic definitions and struggled to attain marks even on low demand questions. A recurrent problem of confusion between mineral and rock names was apparent in several questions.

The drawing of accurate, labelled diagrams continues to be a weakness for some and others penalised themselves with poor writing and spelling making their scripts very difficult to decipher. Candidates should be encouraged to learn the correct spelling and use of key geological words and terms. In addition, one word answers are insufficient for questions that ask for descriptions or explanations.

There was no evidence that time was an issue with virtually all candidates attempting the final extended questions on contact metamorphism of shale and prediction of volcanic eruptions.

Comments on Individual Questions

Question 1

Q1 Most candidates showed a good understanding of dykes and sills, but the thin section diagram of a poorly sorted sandstone was not done very well and others found the sections on diagenesis and metamorphism difficult. This was the question where candidates scored highest on the paper.

(a) **(i)** The vast majority of candidates correctly labelled the discordant dyke and the concordant sill on the cross section diagram, although a small number appeared to have missed the question entirely.

(ii) The position of baked margins and chilled margins was less well known. Common errors included getting them the wrong way round, marking the chilled margin outside the intrusion and then marking the baked margin beyond that, or marking the chilled margin outside the baked margin. Some penalised themselves with inaccurate shading that went across the contact, while others only labelled a point rather than shading an area, which did not gain credit. A small number gave no response.

(iii) This match the rock to its position on the cross section diagram was done reasonably well with most candidates getting rock 2 (D – limestone) and rock 3 (C – marble) right. One error was to get rock 1 (B – chilled margin) and rock 4 (A – centre of intrusion) the wrong way round suggesting some candidates are not confident using scales. A minority did not read the question carefully enough and thought they had to identify the rocks in the thin section diagrams – correct answers were given credit but few gained full marks this way.

(b) This question asking candidates to draw a thin section diagram of a poorly sorted sandstone with subangular grains was not done very well. Despite being prompted to give a suitable scale many did not, while others struggled to show the poor sorting or the subangular grain shape with sufficient accuracy. A common error was to draw the grains as interlocking.

(c) **(i)** Many candidates were able to interpret the graph correctly to name the deep burial rock as mudstone or shale and the metamorphic rock as slate. However, there were also some very poor answers with what appeared to be a random selection of rock names, some of which were not even sedimentary or metamorphic!

(ii) Most candidates were able to correctly read off numbers from the graph to state the reduction in water content between mud and rock E as 53% (+/-1), but others made careless errors with the most common incorrect answers being 57% or 7%. Some candidates carried out a more complex calculation to show the percentage reduction in water (53/60x100) as 88.3%, and provided the correct working was shown this also gained credit.

(iii) Although there were some excellent descriptions and explanations of the diagenetic processes that cause a reduction in water, some candidates left the answer blank and others lost marks by not using correct terminology. Many candidates did not make it clear in their descriptions *where* the water was being lost from. Just stating it was 'squeezed out' was insufficient – they needed to show a clear understanding that it is lost from the pore space *between* the grains. The most common correct explanations discussed compaction caused by load pressure from the overburden, but candidates who wrote vaguely about pressure without specifying its origin were not given credit.

(iv) A significant number of candidates were not able to give the additional factor such as ***increased*** temperature required for metamorphism.

(d) As expected, candidates found this high demand question asking for a description of the temperature and pressure relationship between diagenesis and metamorphism difficult. All that was required for 1 mark was a statement that metamorphism occurs at higher temperatures and pressures than diagenesis. A quantitative answer that diagenesis occurs below 200°C and 2 kbars, whereas metamorphism occurs above 200°C and 2 kbars, was required for the full 2 marks. A common misconception was that diagenesis does not require heat and that it occurs at higher pressures than metamorphism.

Question 2

Q2 This question on magma crystallisation proved to be a good discriminator, with many high marks. Strong candidates gave comprehensive well-reasoned answers, but weaker candidates were confused about gravity settling and a significant number appeared to have no knowledge of the process of filter pressing.

(a) **(i)** Most candidates were able to plot the mineral density and settling velocity graph correctly. A small number ignored the labelled axes and plotted the data the wrong way round. Some made careless errors plotting points, while others were unable to draw an accurate line of best fit because they did not use a ruler – all of which lost easy marks.

(ii) This question asking for an explanation as to how gravity settling operates in a mafic magma was not answered very well. Many simply described the pattern shown on the graph that denser minerals have higher settling velocities and sink faster for 1 mark but few were able to expand on this. There was a lot of repetition – some candidates gave the statement 'denser minerals sink faster', and then gave the opposite answer 'lighter minerals sink slower', thus stating the same point twice. Only the strongest candidates attained maximum marks for good explanations that the minerals involved must crystallise first and due to their high density settle downwards to be concentrated in a cumulate layer at the base of the intrusion. A

minority misunderstood the term settling velocity and thought it was the settling time, thus suggesting magnetite would sink the slowest! Poorer answers confused minerals with magmas or rocks.

(iii) Most candidates were able to use their graph to correctly predict the settling rate for hornblende. Error carried forward from an incorrect graph was credited.

(b) Filter pressing was poorly known despite being listed in the specification. Many candidates resorted to imaginative but incorrect answers about putting the minerals through a sieve which would allow the small ones through and not the large ones! Others merely repeated an answer about gravity settling or seemed to think the process occurs in rocks rather than magmas. Only the strongest candidates gained both marks for showing a clear understanding that the process occurs when a mixture of *crystals and liquid* are put under pressure resulting in the liquid being expelled. Once again, there was confusion between the terms *rock* and *mineral*.

(c) **(i)** The majority of candidates gained full marks for the minerals in Bowens' Reaction Series.

(ii) Candidates were less sure as to which pair of minerals is unlikely to be found in the same rock. Most who correctly stated *quartz and olivine* were also able to attain the second mark for giving a correct reason. The most common incorrect response was Ca plagioclase and olivine followed by an incorrect explanation that olivine is in the discontinuous reaction series whereas Ca plagioclase is in the continuous reaction series.

Question 3

Q3 This question on a graphic log, depositional environments and structures was not answered very well and was one of the most difficult questions. Many candidates struggled to identify the glacial sedimentary environment shown on the graphic log, which then made it hard for them to attain marks on some of the other parts of the question.

(a) The key word *striation* that gave the environment away as glacial was missed by many candidates. Candidates had to show a clear understanding that striations were of glacial origin and formed by ice movement for one mark and were formed by clasts (embedded in the ice) scratching the underlying bedrock for the second mark. A small number of candidates confused striations with slickensides.

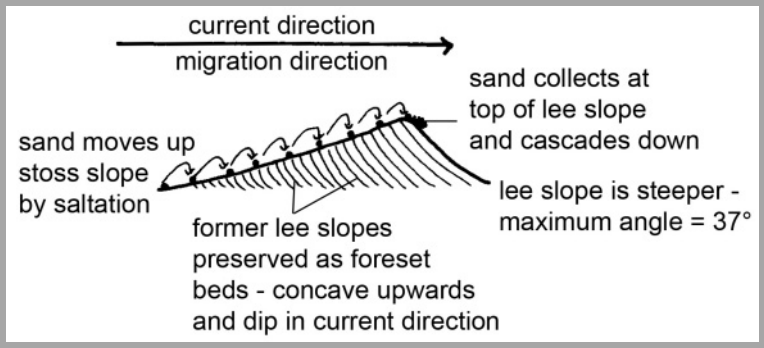
(b) Candidates who did not recognise striations as glacial in origin, struggled with this question asking for a description of the environments of deposition of units X (varves in a glacial lake), Y (fluvio-glacial melt water streams) and Z (till deposited by melting ice). Nevertheless, there were some excellent answers that fully described each of the environments using correct terminology which scored the maximum 6 marks with ease. Many candidates failed to use a holistic approach to consider the relationships between the units on the graphic log. Those that did not interpret the graphic log as glacial could still attain a maximum of 3 marks for descriptions of other suitable environments for each individual unit.

Teaching tip
Candidates may struggle to identify the key characteristics of each of the sedimentary environments listed in the specification. A plenary could be done to summarise the rock types and sedimentary structures in each sub-environment.

ice melt out	fluvio-glacial deposits	glacial lakes
boulder clay / till (a type of breccia)	immature sands and gravels	varves (clays and silts)
no internal structure, may overlie striated bedrock	poorly developed cross bedding +/- graded bedding	annual laminated deposits with occasional coarser drop stones

(c) For a straightforward question on sedimentary structures, the diagrams and descriptions of how cross bedding forms were surprisingly poor, with few candidates attaining the maximum 3 marks available. Many candidates appear to be unable to describe the formation of cross bedding in any context other than aeolian, but as they had already been penalised for incorrect environments in part (b), a description and diagram of how cross bedding forms in a dune environment could have attained maximum marks. A number of candidates merely copied the cross bedded sandstone from the graphic log on the question paper and others ignored the prompt for labels on their diagram. Of the better answers, some lost a mark because they did not show the cross beds as asymmetrical and steeper on the down current side, while others drew the lee slope at far too steep an angle to be realistic.

Teaching tip



(d) Many, but not all, candidates knew that *cyclothem* is the term used to describe any repetition of sedimentary units.

(e) Well prepared candidates were able to identify and name all three rocks correctly, but others used mineral rather than rock names. Common mistakes were:

- For G (basalt) – not considering the crystal size (fine = volcanic) or silica content (49% = mafic);
- For H (quartzite) – 'sandstone' was insufficient;
- For J (schist) – not appreciating the presence of garnet (= medium grade) or aligned crystals (= foliation, therefore regional).

Question 4

Q4 The identification of sedimentary structures was well known, but some candidates lost easy marks by not fully naming them and parts (c) and (d) were done poorly.

(a) **(i)** Although most candidates were able to correctly identify K as graded bedding, L as desiccation cracks and M as asymmetrical ripple marks, some candidates gave answers which were not sedimentary structures. Many candidates struggled to spell *desiccation* correctly, while others failed to specify the type of ripple marks thus losing a mark.

(ii) Most candidates who correctly identified K as graded bedding had no problem describing how graded bedding forms. However, candidates should be encouraged to use correct terminology – *coarse* rather than large, and *fine* rather than small for

grain size; and *grains* or *sediment* rather than rocks or minerals.

(iii) The vast majority of candidates were also able to correctly label the palaeocurrent direction on the ripple mark diagram.

(b) (i) Many candidates did not appear to be familiar with the term *inverted* when referring to sedimentary structures that have been turned upside down. Candidates who stated the cracks had been infilled gained a mark provided they stated with *sand / sandstone* – thus showing a clear understanding of the order of deposition.

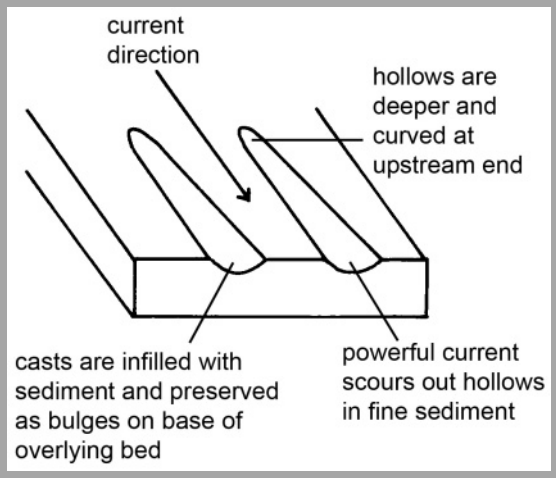
(ii) Some candidates did not read this question carefully enough and instead of describing the *environment* in which desiccation cracks form, they described *how* desiccation cracks form. Just 'stating in a desert' was not precise enough – a more specific environment such as a *playa lake* was required.

(c) (i) Only the strongest candidates were able to correctly extend the strata above and below the land surface on the diagram to show the likely *geological* structures. Sadly, many candidates thought they had to draw *sedimentary* structures and wasted time filling in the diagram with all manner of cross section pictures of cross bedding, desiccation cracks, etc. Of the candidates who did realise that they were required to draw folds, many drew the syncline and anticline the wrong way round, resulting in both limbs of the anticline being inverted – which is impossible. A number of candidates gave no response at all.

(ii) Although error carried forward was allowed in the naming of the folds, very few candidates were able to attain the mark for correctly labelling the structures they had drawn on the diagram.

(d) Few candidates attained all 4 marks available for drawing labelled diagram(s) and correctly describing how flute casts form. Many diagrams had no labels and there was some confusion with the formation of tool marks. Of those who knew that flute casts are formed by powerful currents scouring out hollows in the underlying sediment, not many attained the extra marks for stating the casts are preserved when infilled with sediment or that they are found on the base of the overlying bed. The correct shape of flute casts was also poorly known – they are curved and deeper at the upstream end.

Teaching tip



Question 5

Q5 Responses to this question on sedimentary rock classification and weathering were often good but often just for part of the question. Some candidates showed a very good understanding of sedimentary rock classification and how it relates to identifying rocks.

(a) **(i)** Most candidates attained at least half marks for this 'tick the correct classification' for each rock question. Greywacke, mudstone and oolitic limestone were least known whilst many candidates ticked *biologically formed* for oolitic limestone.

(ii) The answers to this 'identify the rocks from their written descriptions' question were variable. Common mistakes were:

- naming the chalk as oolitic limestone – suggesting some candidates were not familiar with the term coccoliths;
- naming the breccia as greywacke – suggesting a lack of awareness that a greywacke is a type of sandstone and consequently is medium grained;

Although the third description was for an arkose, greywacke was also accepted as, other than the percentage matrix, they are very similar.

(iii) The ways in which clastic sedimentary rocks are sub-divided for classification was not well known. *Grain* size and *grain* shape were the most common correct answers, but some general answers just stated 'size' and 'shape' and very few candidates suggested *grain composition* or *percentage matrix*. *Sorting* is not used in classification.

(b) **(i)** The majority of candidates were able to attain at least one mark describing how frost shattering weathers granite. A few omitted the idea that water *expands* when frozen, and did not include the idea of many repetitions of the process.

(ii) Although most candidates were aware that frost shattering is a mechanical weathering process, many did not pay attention to the command word *describe* the material produced. As a result, one word answers such as 'scree' could not be awarded the mark. In addition, some candidates hedged their bets by giving multiple answers which contradicted each other.

(iii) Although there were some good descriptions of hydrolysis, many candidates used vague terminology confusing *weathering* and *erosion*. Candidates who knew that K feldspar is the most reactive mineral were in a small minority. Many incorrectly stated 'mica' because of its softness or cleavage, suggesting confusion with erosion processes.

(iv) Candidates found this question asking for a description of the material produced by hydrolysis very demanding. There were many 'no responses' and incorrect answers. As the command word in the question was *describe*, one word answers such as 'clay' could not be awarded the mark.

Question 6

Q6 There were some excellent answers to the extended answer question on contact metamorphism of a shale, which included full and detailed descriptions of spotted rock, andalusite rock and hornfels. However, many candidates lost most of the marks because they wrote about rocks produced by *regional* metamorphism. There was also confusion between rock and mineral names – andesite instead of andalusite, and hornblende instead of hornfels. Candidates could gain a maximum of three for correct general points such as 'the rocks are unfoliated due to a lack of directed pressure' or 'the crystal size increases with grade'. A considerable number

of candidates appeared to have misconceptions about the increase of crystal size with grade, with many candidates erroneously attributing this to differences in cooling rates suggesting confusion with igneous processes. Although most candidates were aware of the increase in temperature with grade, many did not appreciate that, irrespective of grade, the pressure is always low for contact metamorphism. It was pleasing that most candidates correctly referred to partial recrystallisation at low grade.

Question 7

Q7 While most candidates were familiar with the use of historic patterns of activity, changes in ground level, changes in gases, and seismic activity for the prediction of volcanic activity, this question was not answered particularly well. Issues included:

- Vague and imprecise responses with no technical terminology.
- Answers that merely repeated the question – stating that the ground level changes or the gases change, but not describing how they change prior to an eruption. Some hedged their bets by stating the volume of gases emitted could increase or decrease but did not explain why.
- Candidates should not use chemical formulae unless they are sure they are correct – a number used SiO_2 instead of SO_2 and so could not be awarded this mark.
- Very few candidates included correct details as to how the changes are monitored. Those who described the use of tiltmeters, laser beams and satellites for measuring changes in ground level, or even seismometers for monitoring seismic activity, were in the minority. There was also confusion between the terms *seismometer*/*seismograph* and *seismogram* with some candidates erroneously suggesting earthquake activity could be monitored with seismograms.
- Some of the weaker answers were confused with *earthquake* prediction using radon gas and seismic gap theory.
- For seismic activity, some suggested that earthquakes and movement of tectonic plates would trigger volcanic activity, rather than describing the occurrence of small precursor earthquakes triggered by the pressure of the rising magma. "Harmonious tremors" was particularly memorable!

F793 Practical Skills in Geology 1

General Comments

This year there were again some very good tasks and fieldwork submitted and the general standard was good. Candidates demonstrated excellent subject knowledge and were able to express themselves clearly and concisely using a sound range of geological terminology. The preparation of candidates for the tasks was evident in the quality of many answers showing that comments in last year's report were being acted on. There remain some issues with poor labelling of photographs and sketches. No centres seemed to have candidates who were struggling to complete the tasks within the suggested time of about an hour.

The Centre-based Tasks (CB) Task 2 was by far the most popular. All the moderators saw some fieldwork, but in general the CB tasks are still the most popular for the first part of the assessment.

Many centres now submit their marks via *OCR Interchange* before the deadline, but some samples did not arrive until early June. With entry via *OCR Interchange,* centres should send the moderator a copy of the MS1 form with the candidates' work. If centres use *OCR Interchange,* then they are strongly encouraged to send to the moderator a copy of the Centre Based / Fieldwork and Evaluative Tasks summary form which is in Excel format downloadable from *OCR Interchange*. Centres need to put in all of the marks achieved by each candidate, and the form will then automatically fill in the totals using the best marks. Some centres did a single task for all candidates so that just one mark was submitted, but most centres gave candidates two or even three opportunities at CB, Fieldwork and EV Tasks. This can therefore be a really useful document to show quickly and easily the marks obtained, and can prove of interest to teachers in looking at mark distributions.

In general centres clearly annotated the CB, Fieldwork and EV Tasks to show where marks had been achieved, using ticks and crosses as requested in the previous year's report. This enabled moderators to see clearly where marks had been awarded. In a small number of cases, the ticks and marks did not always seem to match up with the marks being awarded which caused a few problems. Only a few centres are still sending all their tasks instead of just the best mark for CBT/FT and EV. It would be appreciated if centres could ensure that each candidate's work is fastened together in some way to prevent work becoming mixed up.

It was still difficult, however, with some of the fieldwork to ascertain where marks had been given, especially when candidates had tackled their field tasks in a different sequence to that shown on the mark scheme. Some centres developed a scheme of placing a number next to each of the marks to be awarded on the cover sheet/copy of the mark scheme, from 1-20, then annotating on the script where the mark for tick no 1 had been awarded etc. For example; if a task carried 3 marks and was part way through the mark scheme this may equate to marks 5,6 and 7 on the mark scheme, if only 2 of the 3 marks were to be awarded then ticks annotated with 5 and 6 would be shown but there would be no tick for mark 7. This does make it a lot easier to see where each part of the work related to the mark scheme. Fieldwork Tasks provided the main area of concern this summer. Moderators saw some very good examples of high standard work, with supporting annotation and thorough marking clearly linked to mark schemes. However, some centres were too generous in awarding marks and crediting limited work or failing to provide comments re circumstance which would explain why limited work was credited with maximum marks.

Administration this year was generally completed to a high standard, but clerical errors still remain surprisingly high. This resulted in delays in the moderation of some centres. Please do take care, especially if a candidate's marks have been changed, to check that the correct mark is clearly shown and is recognisable on the script, and that the correct total is shown. In a few cases, internal moderation had been carried out and marks had been changed on the script but totals had not been amended. Centres still need to include an Authentication Form. In a small number of cases this form was not sent and had to be requested, at times resulting in a delay in moderation.

Comments on the Centre-based Tasks;

Centre-based tasks must always be accompanied by a copy of the results obtained by the teacher in their trial run of the practical, and these results should reflect the likely results that candidates should gain. Where problems occur, teachers are encouraged to provide additional information to support the marks given. This is important as a small number of centres gave marks for results which clearly conflicted with the trial data but as the student results were consistent with each other, moderators were able to accept the awarded marks. Accurate application of the mark scheme is essential in order to ensure parity across all centres. Where two items of information are required for a single mark then no mark can be awarded for just one.

The cover sheet directs teachers to 'use their professional judgement to decide if the answer is worthy of credit. If it is then the script should be annotated accordingly'. This might apply to some questions where a range of responses is given in the mark scheme and an obvious point appears to have been missed out.

Changes should be notified to OCR. If teachers are unable to obtain any of the marking points themselves having trialled the task, their observations should be submitted by e-mail to GCEScienceTasks@ocr.org.uk at OCR for a decision as to whether the alternative responses can be credited. Once approval has been granted by OCR, these observations become the observations by which all candidates in the centre must be judged. It is essential that copies of any correspondence must then be included with the work for moderation when submitted. Centres must ensure that marks are awarded in line with the marking points and marks should not be awarded for just part of a required answer.

Comments on Individual Tasks

CB1 This was the least popular of the tasks. A number of calculations were inaccurate but not commented on by teachers and it was rare to see teacher trial data for the *sediment description*. Most centres did supply experimental data, though it often did not tally with the student work. Quite a few centres blamed inaccurate results on poor equipment. A number of candidates did not read the question stem and neglected to label a feature on the photograph and so lost the mark although they correctly identified the feature. Answers must include numerical evidence or specific directions as required by the question.

CB2 was carried forward from last year and was the most popular task. It was generally done well with few problems and the supplied teacher data helped to support the marks given. Some centres credited 'sandstone' for rock B or allowed 'sub rounded' for A as a label. A few centres were overgenerous with marks without the correct technical terms being used.

CB3 This task had been carried over from the previous year. There were some issues with the practical task and getting consistent data – teacher comments and data were essential here and clear trialling beforehand was essential. Few problems were found if the task answers were supported by teacher data and comments – there were some issues where variation in depth/width was linked to the nature of the compacted flour, but teacher comments helped to

explain these. Some poor diagrams were given credit and there were instances of incorrect or missing labels. Plan views where the question asks for a cross section should not be awarded marks. A clear distinction between *describe* and *explain* is essential. *Describing* a texture requires accurate measurements of crystal or grain sizes while *explaining* it refers to how it formed.

Fieldwork Tasks

The moderators' samples showed a decrease in centres submitting fieldwork this year. There was, however, a lot of very good fieldwork in evidence including logs and sketches and OCR now has a good bank of approved tasks displayed on *OCR Interchange* which are available for other centres to use if they do not wish to put in an original submission. All of these tasks have been reviewed and amended so centres should check on *OCR Interchange* that they are using the new revised versions – denoted by the letter F before the unique number. *It should be noted that Fieldwork Tasks **must** have been OCR approved.*

The Fieldwork Tasks caused the moderators the biggest problems this year. There were inconsistencies in marking, in the application of mark schemes, quality of work and guidance to students. Some weak candidates were gaining 6-8 marks for an Evaluative Task and 18-19 for the Fieldwork Task. The wide variation between centres in terms of the quality and standard for high marks was noticeable. The Fieldwork Task is an alternative to the Centre-based tasks and therefore requires the same level of detail.

For the safe working practice element, centres are recommended to get candidates to identify and write down potential risks/hazards present at the fieldwork site and then comment on strategies to reduce/prevent the risk.

Descriptions of rock types/ measurements or orientations/ pebble long axis sometimes have 3 marks on the task mark schemes. Some centres credited maximum marks with as little as 2 measurements, or basic descriptions evident within the submitted work whilst other centres were producing large data sets for maximum marks.

Task sheets and work booklets were used by some centres but the degree of guidance/instruction varied. In some cases students were given detailed instructions on what to write e.g. rock descriptions and what rocks were present. Headings are often acceptable but *not* 'detail to complete'. There should be no more guidance for a Fieldwork Task than for a Centre-based Task. Moderators were concerned that some booklets constituted too much help. Rather than stating *describe the limestone, sandstone and siltstone* it could be re worded to ask candidates to describe the different sedimentary rocks found at the site thus leaving it up to the candidate to identify the rocks and give the evidence they used in formed their conclusions.

Tasks would also benefit from being organised in the order they appear on the approved task mark sheet. The best centres did this but in many cases the evidence is scattered through the submitted work making moderation harder work than it should be. In some centres it was difficult to match what the candidates wrote to the mark schemes. Background information on what the sketches should look like and what to expect from a graphic log etc would be useful.

Evaluative Tasks

There were some excellent examples of work submitted by the most able candidates. There were a few areas in the marking of the Evaluative Tasks which were of concern to the Moderators, particularly where mark schemes were interpreted leniently.

ET1 This was a popular choice but it caused problems during moderation due to a number of the question components being answered in vague general terms rather than the detailed use of subject terminology and detail. These responses often lacked the detail that a comparable

answer on F791 would require. A few centres used over-generous interpretations of the mark scheme on this task without referring their mark scheme changes to OCR *which is a requirement*.

Many candidates simply stated *tsunami* as an effect of the earthquake without any supporting description, meaning that a high percentage of the candidates who did this task lost a mark. Many candidates did not answer the 'describe and explain' questions well. They either described or explained rather than both. A lot of candidates failed to include angles for the shadow zones.

ET2 was carried over from last year and done well by most candidates. Where the mark scheme requires a scale, then full marks cannot be given without a scale being given. The explanation of a divergent plate boundary was often poor. There was weak use of technical terms such as *mafic* and poor identification of minerals.

ET3 This task was carried over from last year and the mark scheme adjusted in the light of last year's experience. As a result it was largely well marked with few problems. Moderators saw some excellent graphic logs as answers to this question – a sign of good preparation by teachers. A few weak candidates still lacked a clear idea of what a graphic log was or how to draw one. Answers to this question were variable in precision and detail. Weaker students failed to use the clues in the accompanying description to identify the environments. This Task was done well by most candidates but there was some very hazy and inaccurate knowledge about weathering processes e.g. acid rain as a process rather than an agent.

F794 Environmental Geology

General Comments

The paper was accessible to all candidates with few scripts with unanswered part questions. There was no indication that candidates were unable to complete the paper and brief answers to question 5 were due to lack of knowledge rather than time.

Marks ranged from 12 to 57 out of 60 giving a wide range with some excellent answers. On all but one question there were candidates who achieved full marks. Weaker candidates were able to answer questions based on the more popular topics such as underground water. Those who did not write their answers in full, clear English, or who depended on generalisations instead of detail to explain their answers, lost marks. Bullet points are good for notes and revision, but lack the capacity to develop a discussion or to give a full explanation.

Diagrams ranged from really excellent to untidy or lacking in detail. Question 5 invited the use of diagrams, and these are best used to illustrate an idea which is difficult to describe in words such as a leachate plume, or as a summary, rather than included just for the sake of it. Diagrams need not be complicated, but they should be neat and well-labelled. A sketch diagram does not mean a poor diagram.

The weakest topic involved the residual deposits of bauxite and mining. Many candidates did not know the basic technical terms such as *overburden, grade, concentration factor* and *reserves*. There was difficulty in differentiating between metal, metal ore, metalliferous mineral and metalliferous ore body.

Comments on Individual Questions

Question 1

This question on the Carboniferous Coal Measures produced a range of answers which partly depended on the candidate's ability to select relevant geological facts for the specific questions asked.

(a) (i) A common misconception that a large number of candidates made was to refer to a climate zone, rather than giving a climate type. Thus, *tropical* is incorrect, particularly as the world's major deserts lie within the tropics so that a tropical climate can be hot and dry. Similarly, *hot and humid* is not a climate type. *Equatorial* was taken as the same as *hot wet tropical*. Some candidates described the climate in part (ii) and this was marked as correct.

(ii) The formation of coal was generally well known and there were many well-prepared and detailed answers which would have scored more marks had they been available. Very few, however, referred to the Coal Measures in which the coal seams are found, and did not refer to the sandstone and shale which also make up the Coal Measure cyclothems. A common misconception is that the plant material undergoes high temperatures in diagenesis to form all coals.

Teaching Tip
Use cards to put the main events in the correct order:
growth – death – accumulation – partial decomposition – burial – compaction – loss of volatiles – gentle heating – low-grade metamorphism
Then insert the products in the correct places: peat, lignite, bituminous coal, anthracite

(b) **(i)** Many candidates were unable to interpret the geological cross section fully. The Permo-Triassic is overlying the Carboniferous unconformably. The term unconformity is synoptic on F791 and the majority of candidates had not remembered this from the AS unit. An appreciation of the vertical scale shown on the diagram would have avoided answers such as sedimentary structures like cross-bedding or wash-out or cyclothem.

(ii) Approximately half of the answers correctly referred to uplift and erosion of the anticline as the cause for the absence of Coal Measures, although there was careless use of the term *weathering* instead of *erosion*. Other explanations included non-deposition in the cold climate at the top of the Pennines.

(c) Most candidates accurately identified the possible locations of a concealed coalfield and opencast mining.

(d) There were many general answers with no reason or explanation for the difficulty caused by the faults and dipping strata. Many implied that the miners would be unaware of the presence of a fault and would allow the shearer to be damaged by harder rock. A proportion of answers claimed that the Millstone Grit would be brought into contact with the coal seam by the fault while in practice, it would be more likely to be the sandstones from the Coal Measures itself.

(e) **(i)** There were some good answers, but many candidates could only give a generalised account. Few candidates described the overburden of rocks above a coal seam or the importance of reclaiming the site by returning the overburden material to its original location. Many answers referred to the steps or benches used for stability in the side of the pit and suggested that the angle of slope depended on the nature of the rock.

(ii) Most answers were general statements, many without the explanation asked for. Common ambiguous answers suggested that opencast mining uses cheaper or less machinery, or is more accessible, or has easier transport, or involves less digging.

Teaching Tip
There are excellent video clips and animations of mining techniques on internet sites which make it easier for candidates to visualise these complex 3D processes. Images that show the size of the machinery and scale and depth of opencast pits are very useful.

Question 2

This question on oil covers one of the most popular topics and marks ranged from 3 to full marks of 13.

(a) There was a lot of confusion about the nature of a source rock for oil. Typical answers suggested permeable and porous, the properties of a *reservoir* rock not a *source* rock. Few answers recognised that the oil is held in the fine pores of a clay which can be compacted so as to squeeze out the oil/water mix. Weaker answers described the environment of deposition of the source rock instead of its characteristics.

(b) **(i)** Almost every candidate correctly completed the table and the points for the graph.

(ii) The line itself was drawn with varying degrees of care and accuracy.

(iii) The question asked for a *range* of depths. Candidates commonly lost the mark by giving only one depth. Having plotted the graph correctly, a minority of candidates made careless mistakes in reading the scale.

(iv) The denaturing of oil is well known.

(c) The concept of migration is well understood but many answers failed to get marks by inaccurate descriptions of the process. This question required an explanation but many answers did not give reasons. The idea that oil traps are found higher than the source rock because oil rises upwards was generally recognised, but was not always explained in terms of the pressure gradient. A careless error was to say that the oil rises because it is less dense than the rocks it is found in. Some candidates implied that an oil trap is a rock type, rather than an arrangement of rocks which would stop the oil from rising further, omitting any reference to an impermeable cap rock.

(d) While there were some excellent, well-labelled diagrams of the traps, there were some poorly constructed attempts. Most diagrams showed the correct labelling of permeable reservoir rock and impermeable cap rock which are essential for any trap. Diagrams for the fault trap were weak geologically, while the salt dome trap was often very well done. A fault trap needs to have impermeable beds on both sides in order to seal the fault. About half of the fault traps were shown with horizontal beds so that the base of the oil had to be drawn at a steep angle to make it fit. The oil must be drawn with a horizontal base.

Teaching Tip
Half fill a length of flexible, transparent plastic tubing with water. Add another quarter length with (yellow) cooking oil, leaving the rest with air to represent natural gas. Seal both ends. No matter how you twist and turn the tubing, the boundary between the oil and water is always horizontal. Or simply quarter fill a 250ml beaker with water and add a 1 cm layer of oil on top. Tilt the beaker and observe the horizontal base of the oil.

Question 3

This question about the economics of mineral extraction using a case study of mining bauxite was the weakest question in the paper and marks ranged from 0 to 12. It was evident that the topic of residual deposits of bauxite had not been well covered by a small number of centres. The case study includes a large amount of information which is essential for many of the answers. Some candidates did not use all of the data provided on the map and in text.

(a) **(i)** Candidates are expected to know standard definitions. *Reserves* was known by a minority of candidates who correctly referred to an *amount* rather than a general idea of an area or other accumulation.

(ii) Almost all answers were correct but a few were wrong by a factor of 10 and a few with numbers that had no relation to the question. Looking at the final answer to see if it is sensible would eliminate the careless errors which gave 18 million years as the answer.

(iii) This was a challenging question for many candidates as there was confusion between the two terms of *grade* and *concentration factor*. Few candidates appreciated that grade is applied to minerals that are mined for the <u>metal</u> element that they contain and that it is important to know how much of that *metal* can be obtained from the mineral or the mineral ore, or the mineral deposit. Answers

often referred just to the amount of the *mineral* which was not allowed. *Concentration factor* was better known, although it too was usually defined in terms of a mineral rather than its metal.

(iv) Many candidates did not know that bauxite is extracted by opencast methods and were not able to suggest why mining causes such a large impact. Answers were vague and without detail and did not answer the question that required an explanation.

(v) The processing of the bauxite and the production of tailings was not well-known and most answers were vague, suggesting just 'damage to the environment'. Although the 'effects of dust' was commonly suggested, the fact that tailings were wet and needed to dry out first was not.

(b) This proved to be a difficult question, both in knowledge and clarity of expression. Typically, answers discussed cut-off grades, supply and demand, the rate of extraction and environmental issues, but often in general terms that did not discuss why. As a discussion question, the answer is expected to show whether the grade goes up or down as a consequence of improved exploration, extraction etc.

(c) (i) The chemical weathering of feldspars in granite was sometimes described instead of this limestone and very few candidates realised that the 5 – 15% clay content provided the aluminium-rich, iron-poor source they alluded to. While there were many full answers, it was not always clear that the soluble ions came from the reaction between the acidic rain and the clay, and other sources such as hydrothermal veins were suggested instead. Some candidates attributed the wavy surface of the limestone to folding, others to valleys which were filled up by the bauxite.

(ii) The more observant answers noticed the thicker bauxite where the joint density is greater, but very few candidates correctly recognised the effect of the clay in the limestone.

Question 4

This question about groundwater was well answered and candidates found it the easiest question with marks from 2 to full marks.

(a) (i) Nearly all answers were correct.

(ii) A minority of candidates omitted the all important letter E and just stated *sandstone* which could not be allowed as there is also a sandstone D on the graph.

(iii) Nearly all answers were correct.

(iv) Answers ranged from well-labelled, neat diagrams with concise descriptions, to unlabelled diagrams and descriptions which failed to relate the textures to porosity and permeability. Some candidates tried to show too many variables including grain size which does not affect porosity. Cement has the largest single effect on both porosity and permeability.

(v) Some candidates attributed the rate of flow to high porosity and suggested chalk as the answer. A few candidates did not read the question and suggested limestone which was not shown on the graph.

(b) Well answered, with most answers scoring 2 marks. Illegible handwriting risks losing marks for the spelling of technical terms; *cone of depression* was sometimes given as core of depression.

(c) Most candidates knew the collective effects of renewable and sustainable resources but were confused about which was which, fortunately not asked for in the question. Answers suggesting the need to avoid over-pumping or using good management were not credited.

Question 5

Many candidates had a good factual knowledge of waste disposal sites and the marks ranged from 0 to 8. Only the very best answers scored full marks as each point required a description and not just a simple list that appears in the mark schemes.

Although some good answers relied on writing down the salient points, the better essays provided more structure, beginning with a recognition that the problem comes not just from dumping waste, but from the potentially harmful leachate, giving a clear definition of the term. A common error included using the terms *leaching* and *leachate* synonymously. Diagrams such as one showing the leachate plume are very helpful and it is easier to explain with a diagram rather than text. Better candidates then followed with an explanation about how geology is used to prevent the leachate from reaching the water table, finishing with the solutions needed for sites which are less than ideally situated.

Candidates who took the opposite route and described the problem sites first soon ran out of ideas. Engineering geology questions often have a common issue of groundwater being polluted or water leaking. Hence the need for clarity on suitable rock types for each engineering application and the importance of porosity and permeability.

F795 Evolution of Life, Earth and Climate

General Comments

The marks attained by candidates were generally high, but did give a good spread from 10 to 98 marks out of 100. There was a high mean mark which reflects the general improvement in the teaching of this part of the specification and particularly the fossil topics. The effect of a specific text book tailored to OCR A level Geology is clear with some answers directly from the book.

The majority of candidates displayed sound subject knowledge and appeared well prepared for this examination. There was no evidence that time was an issue with virtually all candidates attempting the extended questions on radiometric dating and exceptional preservation of fossils – the latter being particularly well answered as it is a popular topic with candidates. The published mark schemes are inevitably brief – they are not sample answers and the main role is to ensure that the marking is accurate. Candidates need to give full explanations and descriptions rather than just the list of acceptable ideas that are given in the mark schemes. In general, explanation questions are less well answered than description, as the reasons are not always given. Similarly comparisons require *both* of the items to be discussed not just one and the second implied.

The quality of diagrams and the ability for the candidates to label them accurately have improved, supported by publication of helpful recent texts. Very few candidates did not label diagrams properly.

The synoptic assessment was embedded into the questions. This is designed to test the candidates' understanding and enable them to make links between the AS and A2 content and these questions differentiated well.

Comments on Individual Questions

Question 1

Q1 Most candidates showed a good understanding of the elements of classification and understood the major and minor group functional morphology in this question. As a result, there was little differentiation between candidates with a significant number gaining between 13 and 17 marks.

(a) **(i)** The majority of the candidates were skilled at recognising fossil groups from their description. A minority of candidates identified fossil C as an echinoid, rather than a microfossil, omitting to appreciate the small size of the fossil shown by the scale. This little known fossil was identified as a variety of different microfossils, and where reasonable, the benefit of the doubt was given and the mark awarded.

(ii) Most candidates were able to identify the morphological features of the fossil groups. There were various spellings of the word *aperture* and candidates should understand that correct spellings are important for technical terms.

(iii) Candidates were mostly able to describe the mode of life for fossil A. The most common incorrect answer described A as sessile and attached to the substrate. Most candidates were able to gain marks for the description of filter feeding.

(iv) Almost two thirds of candidates stated B was either helically coiled or dextral. Incorrect answers included ammonite terms of planispiral, evolute or involute which gained no marks.

(v) There were many mistakes here, with some candidates discussing land snails or describing the gastropod as a burrower.

(b) (i) This part question provided good differentiation. Some candidates stated *replacement* without describing the type – by silica or calcite.

(c) (i) This was generally well done by candidates and there were many excellent diagrams. Most candidates were skilled at drawing the morphological parts of a crinoid. A few incorrect answers included drawing a belemnite or a gastropod but almost all candidates gained full marks for this question, reflecting an improvement in the teaching of the lesser known fossil groups.

(ii) Around two thirds of candidates answered this question correctly. Incorrect answers included discussion of soft tissues, such as tube feet or the water vascular system, thus gaining no marks as the questions referred to the fossil record rather than modern organisms.

(iii) This part question was generally well answered with over 75% of candidates gaining the mark.

Question 2

Q2 This question differentiated relatively well, with the majority of candidates gaining 12 or 13 out of the maximum 16. The subject matter of vertebrates in part (d) was least well known, being a new addition to this specification, but some candidates showed a deep understanding of the concepts.

(a) Matching the descriptions to the mode of life was generally well done. Most candidates gained full marks for this section.

(b) (i) This was usually well answered, but quite often did not specifically mention younger sediments.

(ii) The majority of candidates gained this mark but others did not state that the derived fossil was older than the rock in which it was included which is an essential characteristic.

(c) (i) This part question differentiated very well. Common mistakes included candidates simply providing a list of descriptions without any explanation or writing contradictory statements. Incorrect answers included that the fossils had a short life span, not that they existed over a short time period.

Teaching Tip

The command words of *describe* or *explain* often elicit responses that have the correct ideas but do not answer the question directly. *Describe* is a series of characteristic descriptors such as "a zone fossil has a short evolutionary time span" while the *explanation* is that "the rate of evolution was rapid so that new forms appeared in rapid succession and died out rapidly allowing a specific time zone to be dated." Encourage candidates to write descriptions linked to explanations. This is exam technique – encouraging them to read the question thoroughly and use the command words. Mark scheme answers are inevitably brief – they are not sample answers and candidates need to give full explanations.

(ii) Just over half of the candidates could name a Lower Palaeozoic macrofossil. The most common incorrect answers included naming *microfossils*.

(d) (i) This part question was a stretch and challenge question and it discriminated well. The idea was to analyse the data given in the drawings of a fish and an amphibian limb. Most candidates gained 2 marks only, as a result of not answering the question. The most common mistake was for candidates to not read the question properly, and only describe similarities *OR* differences, not both. Only the best answers treated similarities with the same depth as differences. There were some very good descriptions of other morphological features, such as the skull, belonging to fish and amphibians, but these could not be seen in the diagram and hence marks could not be awarded.

(ii) There were some excellent descriptions of anatomical differences, the most common being lungs and eyelids. This was reflected by the wide range of acceptable marks in the mark scheme.

Question 3

Q3 This question was well answered by the majority of candidates, with the spread of marks spanning 3 to 18.

(a) Most candidates gained full marks for this question. The most common error was to confuse the terms *era* and *system*.

(b) This question was done very well by the best candidates, but many others gained two out of the three marks due to not fully labelling the diagrams. There were some excellent diagrams of cross cutting relationships, some very complex. Sadly, some omitted the oldest or youngest bed labels which are essential for an answer on dating.

(c) (i) Most candidates could identify the morphological features of fossils K, L and M. One common mistake was to label feature 1 as the umbilicus instead of the protoconch.

(ii) Almost all candidates were able to state or describe a function of the sutures, even if it was incorrectly labelled in (i).

(iii) There were some very poor descriptions of vertical movement in the water column, and candidates sometimes forgot to discuss the horizontal movement (or vice versa). Common incorrect answers omitted a discussion of the siphuncle and/or the hyponome. Some confused the horizontal and vertical movement, showing a lack of understanding of the language of the question rather than an understanding of how this movement occurs. Most candidates had a general idea of how movement occurred in these species. The discussion of how tentacles facilitate slow horizontal movement on the sea floor was often poor. Jet propulsion is a term rather than a description and the answer needed detail of how the jet propulsion works.

(iv) Some candidates completed this question very well, with full descriptions of the position of both the siphuncle and septal necks, accompanied by labelled diagrams. However, it is difficult to describe the difference without a diagram, although some attempted this. Some diagrams were unlabelled. The commonest mistake was to transpose either one or both components in nautiloids and ammonoids, thus losing marks.

Question 4

Q4 This short question generated a good spread of marks from 1 to 11 marks out of 11, with most candidates gaining well above half marks. *Trilobites* is a topic that is generally well liked, and it was pleasing to see some very good descriptions in these answers.

(a) **(i)** The glabella was generally correctly labelled. The genal spine was often labelled as any spine and even on the pygidium. Spelling of genal spine as genial spine was very common even though the correct spelling is given in the question! The difficulty with labelling the facial suture was that many candidates did not recognise that fossil Q had two curved shaped compound eyes and confused these with the suture.

(ii) Candidates either knew this or they did not. Incorrect answers bracketed the thorax or the cephalon. Some did not use brackets and so did not follow the instructions, gaining no marks. The pygidium was accepted either including the pygidial spine or not.

(iii) The question asked for morphological evidence but this did not always elicit the responses required in this question. Again the question asked for description and explanation. Some candidates gave a list of features correctly but failed to explain how this indicated a specific mode of life, only giving the features as a list. Some transposed the answers describing Q as blind and N as possessing large eyes and many pleural segments. Again it is important that candidates read the question thoroughly to avoid this silly mistake. There were also many excellent answers.

(b) Around 50% of candidates answered this question correctly. The level of descriptions was often poor and there were many bland discussions of 360^{o} vision without alluding to the lenses in a compound eye. The nature of the compound eye required knowledge of the structure / composition of the eye as many calcite plates forming lenses. The word *nature* may have been misunderstood by some candidates. There were some useful discussions about modern day analogues to help the descriptions. Some simply discussed reasons why some animals had compound eyes, gaining no marks.

(c) Only 20% of candidates gained full marks in this difficult question. Most answers included general statements that trilobites have more than one mode of life, but few used the analogy of living horseshoe crabs to infer the mode of life. It is doubtful that all candidates understood the word *infer*, as it is used less frequently in current science teaching.

Question 5

Q5 This relatively new subject matter had not been well absorbed by candidates with few good and detailed responses evident, although most attempted all the questions.

(a) **(i)** Generally answered correctly.

(ii) Many answers had the basic ideas in place, but lacked any detail to gain all three marks, such as the length of the cycles involved. Many described the changes in orbit without linking it to the climate and the change in temperature as a result of variation in solar radiation.

(iii) There were some good descriptions of Jurassic clays and limestones from many candidates. Some gave vague descriptions of environmental change without linking this to the Milankovitch cycles. Varves are on too short a time-scale cycle for Milankovitch cycles. An alarming minority of candidates thought that this had something to do with measuring radioactivity in rocks.

(b) **(i)** There were many excellent answers showing an advanced understanding of how oxygen is incorporated into the shell. There were some detailed biological answers to this question.

(ii) Many candidates knew that increased ^{18}O in rocks was in colder or icehouse conditions.

(iii) Many answers did not refer to the data in the table – a clue was in the wording of the question *describe and account for*. Answers that could not be credited simply stated the answer to question (ii) in more detail. Some simply thought that the increase in oxygen isotopes was to do with more oxygen in the water due to environmental conditions or differing palaeoenvironments. Some candidates made a series of general statements that linked isotopes and climate without using the data provided.

Question 6

Q6 This question was well answered with the majority of candidates gaining 3 or 4 marks out of 6.

(a) **(i)** There were good clear correlations between boreholes in many answers. Incorrect answers included correlating centres of beds, rather than boundaries and drawing multiple lines to different beds from the same boundary. The conglomerate misled many candidates as they could not find a way of including this using lithostratigraphic correlation, perhaps not understanding the lateral changes in sediment type and environment.

(ii) *Lithostratigraphy* was not given by more than 40% of candidates; they simply described drawing lines, matching rocks or variations. There were many misspellings of the technical term.

(b) There were many good descriptions of diachronous beds or lateral variation but explanations as to why the environment changed were rare.

Question 7

Q7 This long answer on radiometric dating was often well known, and although only a few candidates gained full marks, many gained 5 or 6 marks overall. Most answers were well organised so they had four clear sections laid out and completed coherently. Most candidates were able to write about radioactive decay and give correct examples and half-lives in millions of years. Many chose to draw half-life graphs and explained how these could be used to gain an absolute date. Some incorrectly described half-lives in thousands of years or had half-lives out by a factor of 10. A number of candidates wrote very general responses that did not explain the method of dating or the problems of dating different types of rocks.

Omitting detail of half-life dates, isotope numbers or the names of minerals that contain the radioactive isotopes or referring to radioactive rocks rather than minerals all lost marks. ^{14}C is not used by geologists as the half-life is too short. Mention of fossils is not relevant to this type of dating. A few worrying incorrect ideas were seen such as *heating speeds up decay* and that there are *changes in composition as an igneous rock cools*. The lack of accuracy in radiometric dating was rarely described.

Teaching Tip
Use up to date data about half-lives and mineral examples as shown below:
^{238}U decays to ^{206}Pb in 4,500Ma – found in zircon and uraninite
^{235}U decays to ^{207}Pb in 710Ma – found in zircon and uraninite
^{40}K decays to ^{40}Ar in 1,260 Ma – found in muscovite, biotite, hornblende and glauconite
^{87}Rb decays to ^{87}Sr in 50,000Ma – found in muscovite, biotite and feldspar

Question 8

Q8 This question on exceptional preservation techniques was very well answered with many very detailed responses which gained full marks. There were a lot of repeated general ideas between each section, which could not be credited twice. These included points such as anaerobic conditions to reduce decay, rapid burial to preserve from scavengers and low energy conditions apply to all these methods.

Knowledge of preservation in tar pits was excellent though there was some confusion regarding what was preserved – **soft tissue is not preserved although the bones retain their original composition.** Bones, teeth, shells, the exoskeletons of insects, and plant seeds have been found in the tar pits but skin and fur usually decay.

Preservation in amber is also well known though the term *sap* is often incorrectly used. Sap runs internally in the tree while material that is extruded through the bark is *resin*. It is therefore always resin that traps insects for preservation. Few mentioned chitin or exoskeletons of insects but usually talked about wings and body cases.

The Solenhofen Limestone was least well known although some candidates were able to gain high marks by quoting the general conditions for preservation. The idea of burial in a fine lime mud now a limestone that formed in very saline water was rarely mentioned. Many candidates knew about the preservation of fine detail such as feathers on *Archaeopteryx*.

F796 Practical Skills in Geology 2

General Comments

For this second year of the A2 specification, there were some very good tasks submitted and many candidates demonstrated excellent subject knowledge. Many were able to express themselves clearly and concisely using a sound range of geological terminology. There was no evidence of candidates struggling to complete the Centre-based and Evaluative Tasks within the suggested time of one hour.

As in the previous year, a large number of centres submitted their marks via *OCR Interchange* before the deadline and as a result had very prompt replies requesting their sample of work. Many centres dispatched their sample extremely quickly, enabling the moderation process to get under way promptly after standardisation – thank you!
Where centres are unable to submit their marks via *OCR Interchange* it is important to send the moderator a copy of the MS1 form *as well as* the top copy to OCR.
In both cases, the sample for moderation is computer-selected.

The Excel spreadsheet downloadable from *OCR Interchange* is helpful to input all marks achieved by each candidate. The form will automatically calculate the total using the best marks. Some centres did a single task for all candidates but most centres gave candidates two or even three opportunities at Centre-based, Fieldwork and Evaluative Tasks.
Please bear in mind that undertaking all three of the Tasks of one type automatically limits the retake opportunity to just one Task.

Regrettably, administration this year was generally completed to a lower standard than in previous session, with all moderators finding a significant increase in clerical errors. Please take care, especially if candidates' marks have been changed during internal moderation, to check that the correct mark is clearly shown, is recognisable on the script and that the correct total is given. It should be checked that this mark agrees with the mark given on the cover sheet, as well as on the MS1. In a few cases, internal moderation had been carried out and marks had been changed on the script but totals had not been amended.

Centres still need to include a Centre Authentication form. Having to request the form delays moderation.

Teacher trial data for the Centre-based Tasks *must* be included.

The internally assessed work cover sheet is not compulsory but can be very useful for summarising the candidate's performance and showing which tasks are being submitted. This can be downloaded from *OCR Interchange*.

In general, centres were clearly annotating the Centre-based and Evaluative tasks to show where marks had been achieved, using ticks and crosses as requested in the previous year's report. This enabled moderators to clearly see where marks had been awarded.

In many cases, however, it was much more difficult with the Fieldwork to ascertain where marks had been awarded, especially when candidates had tackled their field tasks in a different sequence to that shown on the mark scheme. Using the approved fieldwork mark scheme as a cover sheet and annotating it can help the moderator. One idea of using numbers as a code is shown below. Where the fieldwork is completed in the same sequence as the mark scheme then subtotals and headings for each mark scheme section written on the fieldwork make the marking clear for moderators.

Student mark sheet for Sannox A2 Geology Fieldwork

Student name;			
Tick no.on work	**Mark Scheme**	**Mark**	**Comment & mark awarded**
1 **2**	Description of the 2 sedimentary rocks; e.g. numeric grain size, sorting, shape, colour, composition and if relevant cement Good detail, most included= 2marks Tick no 1and 2 Less detail/poor quality=1 mark Tick no 1 only	**2**	
3	Sketch of imbrication within the breccio-conglomerate with appropriate labels and measurements Tick no 3	**1**	
4 **5**	Description of the Igneous rocks with an awareness of numeric crystal size and mineralogy (difficult with the basalt dyke but easier with the dolerite),colour Coherent detail, both dykes covered with comments on crystal size and mineralogy = 2 marks Tick no 4 and 5 Less detail, maybe only 1 dyke discussed or both done partially = 1mark Tick no 4 only	**2**	
6,7	Measurements of the Igneous rocks; Widths of the dykes/margins; 1 mark Tick no 6 Bearings;1 mark Tick no 7	**2**	
8,9	Describe the fault and take suitable measurements Description= 1mark Tick no. 8 Measurements e.g. bearing/displacement = 1mark Tick no. 9	**2**	
10, 11	Dip and strike readings to be taken for both sedimentary rocks. Accurate;2 Tick no 10 and 11 Less accurate or some help needed;1 Tick no 10 only	**2**	
12	Annotated field sketches to show a variety of features; clast variation in the Breccio-conglomerate; Sedimentary structures in the Flagstone. Tick no 12	**1**	
13, 14, 15	*Identification of rocks which have economic potential and recognition of the characteristics which make them potentially useful* *Comment on uses of the Basalt; 1 mark Tick no 13* *Comment on uses of the Breccio-conglomerate ;1 mark Tick 14* *Comment on uses of the Flagstone; 1 mark Tick no 15*	**3**	
16,17	*Description of the types of relative dating techniques that could be used from an observation of the features found in the rocks here.* *Good detail/ more than 1 technique considered ;2 marks Tick no 16 &17* *Less detail/only 1 method considered ;1 mark Tick no 16 only*	**2**	

Comments on the Centre-based Tasks;

Centre-based tasks must always be accompanied by the trial results obtained by the teacher in their trial run of the practical. These results must show the likely range of results which should be expected. If five sets of specimens have been used and not destroyed each set can be numbered and the results for all sets can then be easily compared with the results of the candidates.

In experiments where the samples such as shells are destroyed, the data should show similar starting amounts so that the rates/trends of break up can be compared. This helps with applying the tolerances quoted within the mark schemes. *These tolerances do need to be applied.*

When marking the script, if a possibly credit-worthy response is not included in the range of responses given on the mark scheme, please contact OCR. If the comment is acceptable the mark scheme may be amended. *Alternative answers not given in the mark scheme cannot be credited without an agreed amendment.*

Comments on individual tasks

CB1 Many centres commented on issues with the experimental part of this investigation for this popular task. In many cases, candidates were obtaining results that were in line with those seen in the teacher trial runs, and so marks could be awarded. When a later question required interpretation of these results against a table, error carried forward (ecf) was applied. Likewise, a mark cannot be given for an inaccurate calculation, but the result obtained can then be used in a later question and gain credit (ecf again).

A small number of centres were giving credit for points that were very different to those on the mark scheme, sometimes crediting a one word response when a lot more detail was required. *These marks cannot be given.* If a candidate is 'on the right lines' but does not give the complete answer, it is not possible to assume what they actually meant and give the mark.

Many candidates produced some good sketches, but labelling was not always of comparable quality. *It is not acceptable to give credit for labels not shown on the mark scheme.*
Of concern is the small number of candidates who did not draw the specimen shown but a different text book example.

CB2 was a popular task. Most candidates had starting masses very similar to the teacher's sample which showed that a good range of similar sized shells had been supplied. These candidates had results which then showed similar trends to the teacher's for the rest of the experiment. However, some centres did still credit results which were clearly more than +/- 0.5 or 10% out from the teacher's results. In these latter cases, marks should not be awarded. Labelling of photographs was generally good, but care should be taken that sufficient features are labelled with the correct orientations.

Again some very good sketching skills were evident, but for many candidates, more attention does need to be paid to the requirements of measuring to be annotated on the sketch. Candidates must use the scale provided, and not one they make up with their sketch.

CB3 Most candidates had their experimental results within the required tolerance as shown by the teacher trial data, but again a significant minority were still being awarded marks when their results were beyond the acceptable range. It is very important to review these figures during marking and apply the mark scheme accordingly. If a question asks for *geological* factors then *experimental* ones should *not* be credited.

Sketches of the photograph did vary in quality and labelling was quite good, but measuring was often not sufficiently accurate. The mark scheme does quote acceptable tolerances for photograph interpretation.

Fieldwork Tasks

Fewer centres submitted fieldwork than any of the tasks. There was a lot of good fieldwork in evidence and OCR has a bank of approved tasks displayed by region on *OCR Interchange*. These are available for other centres to use if they do not wish to put in an original submission. They have all recently been reviewed and amended to make sure that the full balance of about

50% of marks are awarded for A2 work and that the work is equally split between qualitative and quantitative. Please download the revised versions – denoted by the letter F before the unique number – for next year. *It should be noted that field work must have been approved by OCR.*

Most centres had the required 50% of marks awarded for A2 tasks, although some interpretations of a mark scheme resulted in a few that failed to meet this requirement, and this has been highlighted on the centre report. One of the main weaknesses this year was the lack of detail in the fossil work and in rock descriptions. Centres need to ensure that candidates describe the fossils in more detail and label diagrams very clearly for A2. It can be useful to consider the type of detail required for a Centre-based Task and aim for a comparable standard. If centres do not undertake any CB task, it is worth looking at the papers and particularly the mark schemes that are available on *OCR Interchange* as a comparison.

A small number of candidates wrote about lessons/Power Points they had had on the task before they visited the site. This is a serious concern as the Fieldwork Task is meant to test **field skills** rather than implicit geological knowledge: e.g. a fossil exercise should show sketches with descriptions of *what is seen*, not text book standard specimens. If a feature cannot be seen or is not present it should not be labelled. However, it is perfectly acceptable to go over the general geology of the area to put the site into context. The type of information given prior to the task should be consistent with the "grey box" information which is published on *OCR Interchange* for the Centre-based tasks.

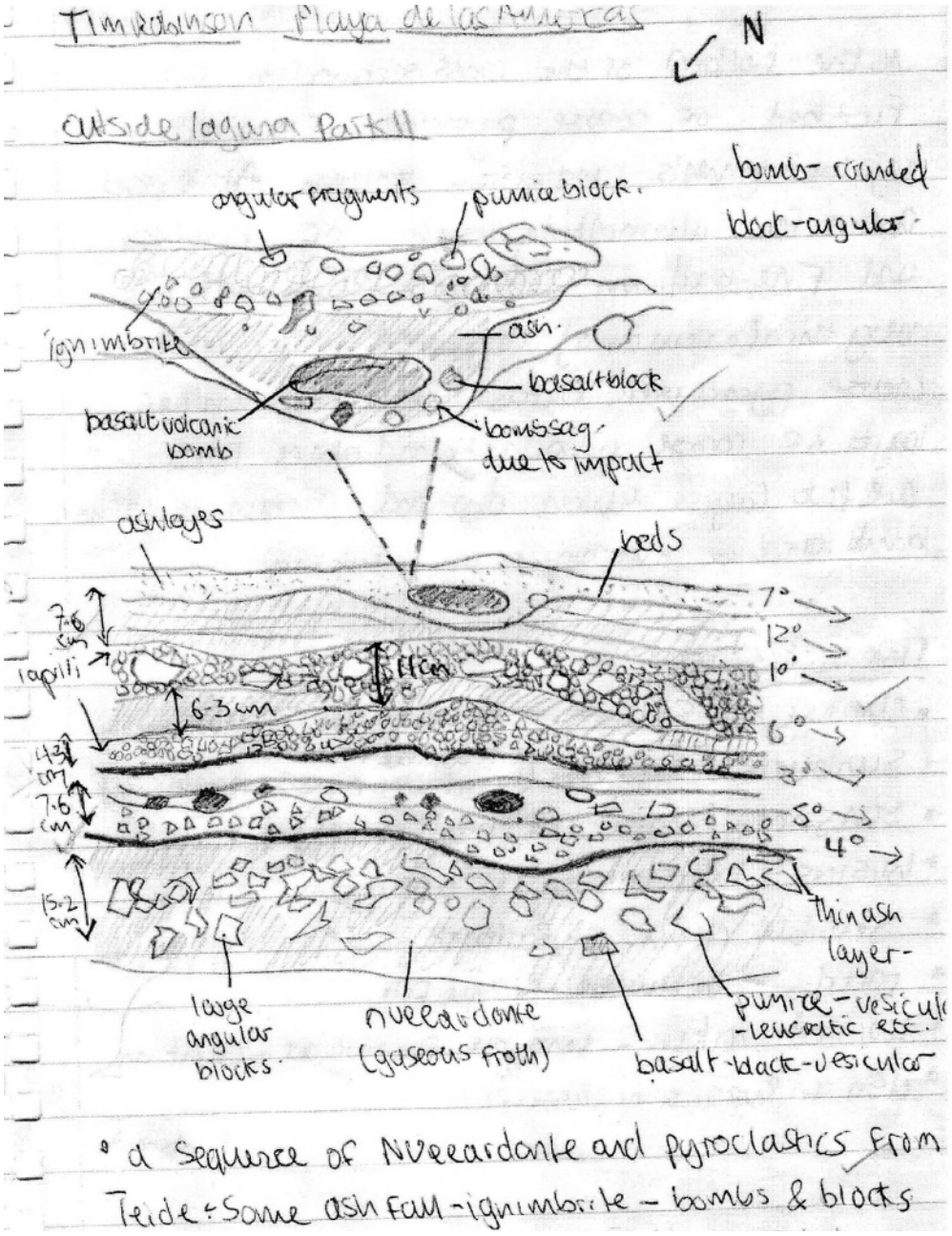
A very small number of centres are still giving candidates too much guidance: e.g. using guidance sheets of A4 paper with specific task boxes drawn in for candidates to sketch or write in. There was concern that this constituted too much help especially as there were some leading suggestions. Rather than stating *describe the limestone, sandstone and siltstone* it should be re-worded to ask candidates to describe the different sedimentary rocks found at the site thus leaving it up to the candidate to identify the rocks.

For rock descriptions the requirements should be similar as for a Centre-based task; often a mineral name and a reason for identification are required for 1 mark. If sandstone is described, it would be reasonable to expect a comment to explain the presence of quartz in the rock with a reason to show how the quartz was identified e.g. hardness testing. Comment on grain/clast size (numeric for the quantitative component) shape and sorting would be a reasonable expectation. As would comments on colour, cement and composition of the whole rock, in order to fulfil a "detailed" requirement. Many candidates are very familiar with the 3 S's (size, shape and sorting) and 3 C's (colour, cement and composition) – easy ways to train candidates in detailed rock descriptions.

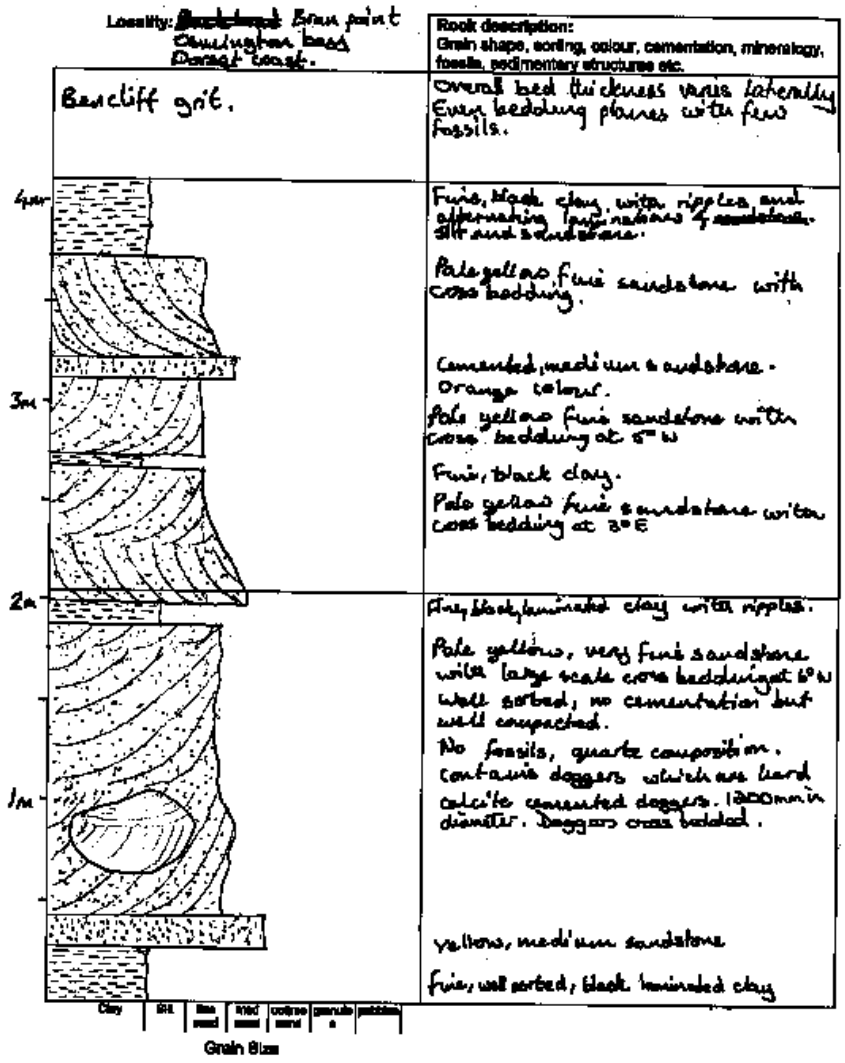
Another issue this year was the quality of field sketches and 'detailed annotations' or labels. Again the mark scheme should be comparable to that for the photograph sketches for a Centre-based Task. One mark might be for the sketch and a scale whilst further marks can be for labelling. If detailed annotations are required on the mark scheme then labels alone will not be acceptable.

Titles are vital for sketches as they help the moderator to work out which sketch they are viewing, especially useful if the site is unknown or more than one sketching task is involved. It would be helpful to have some background information on what the sketches should look like, what to expect from a log etc.

OCR is asking for fieldwork submission next year to include photos/sketches of the site with some ideas of what the results/findings should be in order to help the moderator. Below is an example of what would be considered to be a good labelled rather than annotated sketch.



Many centres used graphic logs to cover some of the quantitative requirements. There were some excellent graphic logs evident, and most centres are now using standard printed versions. A few though are still drawing them as simple diagrams of 2 or 3 beds not to scale and without clear grain sizes. It should be remembered that if a sequence only contains limestone beds, that a graphic log is not going to show any variation in the beds and as a result a different technique is more suitable. Below is an example of an acceptable graphic log.



Evaluative tasks

In general these were completed to a higher standard than previously and the mark scheme was usually clearly applied. However, there were still many cases where marking was on the generous side, for example; if 2 points are required for one mark, this must be adhered to.

Comments on individual tasks

Evaluative 1

This was a popular task. Plotting graphs will always have a comment on the mark scheme about how many points are allowed to be 'inaccurate'. If more points are not accurate then full marks *cannot* be awarded. Full marks cannot be awarded for graphs if the axes are not correctly labelled. Candidates should use small crosses on the paper rather than large – some of the graphs would not have been accepted on a theory paper.

Geological maps were still a challenge for many, with a lack of evidence or description to back up points. Care must be taken to apply the mark scheme accurately. For the sketching of photographs, the scale used should be the one printed on the page. Several candidates created their own scale then measured from this, resulting in answers that were not within the mark scheme tolerances

Evaluative 2
This was the least popular task and many of the errors evident last year are still applicable, including not following instructions on how to draw boxes and complete isolines. The mark scheme is clear on how to mark these if errors occur, and states what is allowable as a tolerance.

Many clerical errors occurred on this paper when a question had two parts to it. Marks should be written next to the printed mark as a check as one question had a few candidates given 3 out of 2 possible marks! For maps which require evidence, technical terms and values *must* be used, and full marks cannot be awarded if this is not done.

Evaluative 3
This was the most popular task by far. Most of the issues were from just a couple of questions. Directions of currents need to be translated into compass directions, rather than bearings lifted from a graph. If a question asks specifically for *another* feature that could be used, repetition of the same one cannot be credited.

Care needs to be taken on longer questions which require detailed content such as two areas to be discussed in the answer. Full marks cannot be awarded if only one of these factors is covered.

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