

OCR Report to Centres

June 2012

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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.

OCR will not enter into any discussion or correspondence in connection with this report.

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Advanced GCE Geology (H487)

Advanced Subsidiary GCE Geology (H087)

OCR REPORT TO CENTRES

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Overview

General Comments

Overall, there was evidence of good geology on display, indicating that many candidates had been well prepared and had worked hard to understand basic principles and processes. The pattern of entry for the units was similar to the previous year though more candidates were entered for F795 in January rather than June. All the units discriminated well and candidates achieved a wide range of marks.

There are some common issues in the reports on individual papers.

- **Command words.** If a question asks for both description and explanation, candidates should expect the mark scheme to require both elements. Many candidates answer explanatory questions poorly often describing rather than providing reasons for the explanation. A question that refers to differences and/or similarities needs to give a point for both of the rocks or fossils being compared. Usually there will be equal mark allocation for both the similarities and differences so it is essential to do both. Where a question asks for two or more separate items the marks will be split between them so omitting one or giving a very brief answer will not allow candidates to gain high marks. A list is not sufficient for a description but is for a question that asks to *state*.
- **Stem or introductory sentence of a question.** Reading all parts of a question is essential. Often a valuable clue is given in the question such as telling candidates that the answer should be from a particular group of rocks or fossils. At A2 information may be provided in the question that is new to candidates so that they apply knowledge in a different context. Not all questions have answer lines below and candidates should be encouraged to read every word of the paper so that they do not miss these questions. The sentence in italics for the long questions on F792 and F795 is designed to help candidates structure the answers by giving them additional information, so should never be ignored.
- **Matching the length of the answers to the space provided.** Geology papers continue to have a rationale of lines allocated per question. The general rule used is two lines per mark unless part of the answer is a diagram or a single word or phrase. Candidates run the risk of wasting time and effort on a question that does not warrant it, if they are exceeding the line allocation. Conversely they are unlikely to gain full marks for a description that is just 2 or 3 words long. Occasionally candidates will find that the space supplied is insufficient, particularly if they have large writing or cross through part of their answer. As examiners initially see just the answer space when marking, it is very important that the location of answers that continue in blank areas of the page or on the additional answer pages should be clearly stated at the space allocated for the answer. It is also very important that the places where the additional answers are written are clearly labelled with the correct question number and part. Candidates can ensure that all of their answers are marked by indicating when and where a question is continued.
- **Diagrams** should be done in an HB pencil so that the lines are not too faint to scan. They should be clear and accurate with suitable scales. Labelling can be in pen or pencil but labels should be clearly joined to the feature drawn. If the questions require a labelled diagram then no marks may be awarded for unlabelled diagrams.
- **Technical geological terms** need to be used in their correct context and spelled correctly.

- **Quality of Written Communication** – On units F791 and F794, quality of written communication is assessed by the requirement for candidates to “use the appropriate technical terms, spelled correctly”. Candidates are advised to ensure their answers to these questions are neat and legible to avoid any ambiguity in their spelling. On units F792 and F795 this is assessed particularly on the long answers where both organisation and use of correctly spelled technical terms are needed. The sentence in italics for each long question aims to help structure these answers.

For **A2** examinations, there is a much greater emphasis on application of knowledge and understanding than in the AS and novel questions that require application of knowledge and understanding are used in these examinations.

Synoptic assessment –The A2 units are synoptic. The synoptic assessment is designed to test candidates’ understanding of connections between different elements of the subject. It involves the explicit drawing together of knowledge, understanding and skills learned in the different parts of the GCE course. Although any synoptic question can be asked, the most obvious links are with F791 *Global Tectonics*, particularly geological structures and many aspects of F792 *Rocks – Processes and Products*.

Stretch and Challenge – 10% of the questions on the A2 papers are high level questions designed to “stretch and challenge” and differentiate between A* and A grade candidates. These may appear as whole questions or as individual mark(s) within a question. Stretch and challenge questions may include material in a different context and candidates are expected to make links between different areas of the specification. These questions may use different command words such as *analyse* and *evaluate* both of which require thoughtful discussions often using the data supplied in the question.

Practical Assessment

Certain points relating to the practical assessments (units F793 and F796) are worth noting here:

The FAQs, most of which deal with aspects of the practical assessment, are to be found on Interchange. It is most important that a Science Coordinator has access to Interchange in order that periodic checks can be made and to receive vital course information. Where amendments are made to a mark scheme these will be posted on Interchange and teachers alerted if registered for updates.

Centres are required to supply trial data to the moderator when sending the samples of candidates’ work. It provides the moderator with the necessary evidence to support a centre’s decision on accepting unexpected data.

While candidates are expected to have developed the skills necessary for a particular task, they **must not** be prepared by carrying out a very similar task or by teaching to the mark scheme. Please see the individual Principal Moderators’ Reports for further detail.

Active Results (new for GCE Sciences)

Since June 2011, GCE Geology has been 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, please go to:

www.ocr.org.uk/activeresults

F791 Global Tectonics

General Comments

Candidates generally performed well with an average mark of 34/60. There were many excellent scripts including 59/60 and these candidates demonstrated a broad and consistent understanding of the module's contents. Candidates are improving in their understanding of the new elements in the specification such as the planetary geology. Seismic tomography proved to be an area that candidates were often unaware of. Both these part questions were omitted by some candidates. Diagrams were often detailed and annotated though some were not always clearly drawn. Performance was often excellent and generally candidates were well prepared. There was no evidence of candidates running out of time.

Candidates showed a sound understanding of hot spot formation linked to the Hawaiian island chain. Candidates were strong on the fit of continents linking it to specific rock types, and fold mountains. Candidates were less certain on the use of glacial striations when providing evidence for the joining of South America and Africa. The continued improvement in understanding of structural geology is impressive. Candidates showed a sound understanding of the formation of earthquakes at divergent and convergent plate margin settings in the long question with many long and detailed answers.

Unfortunately there was an error with question 4 b(ii), where candidates were required to measure the amount of displacement along a fault shown on the map, using a ruler and the scale provided. The scale had incorrect divisions which can lead to a range of values for the displacement. To be fair to all candidates, the tolerance on the expected answer in the mark scheme was broadened to encompass the use of all possible divisions of the scale when working out the displacement. With this amendment, a very high percentage of candidates gained the mark for this question part.

Comments on Individual Questions

- Q1** This question on plate movement and hot spots proved a good introduction to the paper for most candidates. It is clear that plate movement in general is well understood by most candidates.
- (a)**
- (i)** The majority of candidates were aware that the map showed a conservative plate margin. Candidates should use the term conservative which is listed in the specification and should be discouraged from using the terms “passive” or “transform” in this context.
 - (ii)** The majority of candidates knew the San Andreas was the major fault in this location, however, the spelling was variable. Others knew that the fault is a transform or tear fault.
 - (iii)** An equal number of candidates had the direction of plate movement correct as incorrect. A few knew that both plates were moving to the NW but the Pacific plate at a faster rate than the North American plate. The question asked for “relative” plate movement so the Pacific plate is moving NW and the North American SE.
 - (iv)** Most candidates knew the name of the plates. It is useful for candidates to be aware of the names and locations of the major plates.

- (b) (i)** Very few candidates knew that this technique is called “seismic tomography”. This is a small relatively new part of the specification but is an important new technique that candidates need to be familiar with.
- (ii)** Most candidates knew about hot rising and cold sinking convection currents. Many discussed moving magma in the mantle which is incorrect. It is slowly moving rheid rock that forms the convection currents. It is hoped that candidates are familiar with “ridge push” and “slab pull” as mechanisms of plate movement linked to convection currents. Alternatively candidates could discuss movement of the asthenosphere carrying the overlying lithospheric plate.
- (c) (i)** Descriptions of mantle plumes were variable. Many candidates had some idea of rising heat in the mantle. It was important that candidates knew that they are “stationary” areas of “hot rising rock” in the “mantle”. Many linked them to hotspots or volcanoes without discussing what was happening in the mantle.
- (ii)** Generally the answers were very impressive with almost every candidate understanding that the first stage involved the construction of a volcanic island. The next step was sometimes confused although most candidates knew that the hotspot is stationary and the plate moved across it. The best answers indicated the original volcano moved off the hotspot and became detached from the source of magma, became extinct and then a new volcano formed over the hot spot.
- (d) (i)** About half the candidates could work out the calculation. Many knew how to work out velocity but measured the distance incorrectly or had the wrong number of zeros. Most plates move between 3 and 10 cm/year and so answers outside these values are likely to be incorrect and should prompt students to check the calculation for errors.
- (ii)** Most candidates identified that the Pacific plate is moving NW.
- (iii)** Most candidates knew that basalt was the most common rock.
- Q2** Candidates appear to have a very sound knowledge of meteorites but are unclear about the two main regions of the Moon.
- (a) (i)** Most candidates were aware the rocks and dust/sediment were sampled and brought back to Earth. Fewer discussed how the composition and age of the rocks were deduced.
- (ii)** Candidates were unclear about the names of the two areas, the Maria and the Highlands. Some mentioned “light” and “dark” areas which gained some credit. Few knew about a cratered area with basalt lava flows and a highland area with anorthosite rocks. This is a relatively new part of the specification.
- (b) (i)** The asteroid belt was very well known as the source of meteorites and was generally spelled correctly.
- (ii)** This proved a simple task to link meteorite type with the description and was very well answered.
- (c)** Almost every candidate knew that iron meteorites have a similar composition to the core. Most candidates linked stony meteorites to the mantle with only a few linking them to the crust.

- Q3** Candidates showed a sound understanding of the evidence for the original joining of Africa and South America. Certain aspects did prove difficult in particular the evidence from glacial striations. Students coped well with the cumulative frequency graph.
- (a)** Many candidates knew about the role of erosion and deposition in changing the shape of the coastlines. Not all linked these processes to gaps and overlaps. Some mentioned the effect of sea level change. Others described the edge of the continental shelf as being the actual edge of the continental plate; however, fewer mentioned a particular water depth such as the 1000 m submarine contour.
 - (b)** Candidates struggled with this question although many gained a mark for discussing rocks of the same age and composition matching up across the join. Very few candidates discussed examples such as cratons or glacial deposits. Some adopted a different approach by discussing rock types such as desert sandstones forming in subequatorial locations but are now in higher latitudes due to continental drift. Others discussed coal or glacial deposits.
 - (c)** Most candidates could draw a fold mountain chain in an appropriate location across the join between Africa and South America although they were not always accurately located. Some candidates drew in the Andes but this mountain chain formed after the split between South America and Africa. Few discussed the alignment of structures such as faults and folds.
 - (d)** Very few candidates were aware that the striations radiate from a point in the south of South America and Africa and mainly point north or west. Many had a general idea that they form as glaciers move but did not make it clear that the striations form in the direction that the glaciers move (away from the centre of the ice cap).
 - (e)** Most candidates knew that Gondwanaland was the supercontinent involved even though the spelling was variable.
 - (f)**
 - (i)** Most candidates plotted the data correctly on the graph with many completing the cumulative frequency curve too.
 - (ii)** Some candidates were confused with the cumulative frequency nature of this graph. However, most could label an area below sea level up to 3 km for the continental slope. The majority realised that the abyssal plain was the flat area on the graph at 3 km.
- Q4** This question showed a continuing trend of general improvement in candidates' understanding of structural geology. Both fault and fold structures seem to be well understood, especially their morphology.
- (a)**
 - (i)** Candidates were able to recognise fold structures on the geological map, specifically being able to recognise that the synform was symmetrical. Fewer candidates were able to add much extra detail such as the amount and direction of dip or that it is an open fold. Where a question asks candidates to describe fully and gives four lines it is not acceptable to state using just two words.
 - (ii)** Most candidates recognised that folds are formed due to compression.
 - (b)**
 - (i)** Most candidates recognised that a strike slip or tear fault was shown. Extra detail included the fact that the sense of movement is sinistral.

- (ii) There was an error with the scale provided for the map, as described in the General Comments. Despite this, candidates had little difficulty in successfully measuring the amount of displacement along the fault.
 - (c) Candidates produced some excellent diagrams of horsts and grabens though some lacked detailed labels.
 - (d) (i) Almost every candidate knew the location of axial planes. Marks were lost where candidates failed to label the axes or only half completed the axes.
(ii) Most candidates could locate the crest, trough and limb of a fold. Candidates should make sure that the limb label is away from the crest or trough.
(iii) Candidates were unclear about where the maximum pressure is exerted on an overfold.
(iv) Most candidates knew it was an overfold but some identified it as recumbent. A recumbent fold will have the axial plane at a low angle.
 - (e) Candidates understood that the outcrops would be circular for both domes and basins. However, fewer knew that the dip arrows moved outwards for a dome and inwards for a basin. Even fewer were able to indicate where the oldest and youngest rocks were.
- Q5** Candidates showed a sound understanding of where earthquakes occur in both tectonic situations. In addition they also understood most of the processes that lead to the formation of earthquakes. Candidates tended to have a more in depth understanding of the convergent plate margin linking earthquakes to the subduction process. Labelled diagrams particularly showing subduction and Benioff zones were often very well done.

Understanding of the convergent plate margin was less secure. Few candidates discussed the types of stress involved or linked the earthquakes to the actual fault type that moved.

This question required candidates to both describe and explain the pattern and some candidates failed to do both aspects.

F792 Rocks – Processes and Products

General Comments

Many candidates were very well prepared for this examination and there were some outstanding scripts demonstrating extensive knowledge and understanding of the subject. Other candidates need to ensure they write their answers clearly using good geological terminology as correct spelling of key terms is an issue for some. Common incorrect spellings were: cyclotherm, andersite. To access the highest marks candidates need to ensure they distinguish between description and explanation and between describing and stating.

Some candidates would benefit from more practice of drawing accurate, fully labelled diagrams. There was no evidence that time was an issue as virtually all candidates attempted the final extended question on igneous intrusions.

Comments on Individual Questions

- Q1** This question on distinguishing the three rock groups and on metamorphism was answered well by many candidates. To improve their marks other candidates need to ensure they have learnt correct rock names and textures.
- (a)** **(i)** Virtually all candidates gained credit for this tick box question. A number did not tick both igneous and metamorphic for “is crystalline” and there was some confusion regarding which rock groups may contain sillimanite, phenocrysts and have an amygdaloidal texture.
- (b)** **(i)** The definition of foliation was well known by most candidates, but vague answers referring to layering in rock were not given credit. A few got confused with exfoliation, ignoring the statement that the rocks were metamorphic.
- (ii)** Candidates who had learnt metamorphic rock names and textures had no problem identifying the two metamorphic rocks as schist and gneiss. Some candidates could improve their responses to this type of question by ensuring they carefully consider both the texture and mineralogy when arriving at a rock name.
- (c)** Many candidates were able to name a metamorphic rock with no foliation correctly but were less secure in their description of the texture. Candidates should be reminded that a one word answer does not constitute a description and they must be careful not to confuse terminology used for describing sedimentary and igneous rocks with that used for metamorphic rocks. In particular, it is best to avoid use of the term *equigranular* when referring to metamorphic rocks as this is an igneous rock texture.
- (d)** Candidates who were familiar with paired metamorphic belts had no problem with this question but many struggled to answer the question completely.
- (i)** Most knew that Japan is at a convergent plate margin but only the strongest candidates stated ocean-ocean convergent plate margin.
- (ii)** The direction of plate movements were well known by most candidates but a small number only put arrows on the Pacific plate and others put arrows on either side of the metamorphic belts rather than on either side of the trench.

- (iii) The type of metamorphism at convergent plate margins was not well known, with many candidates stating *contact* or *burial* rather than *regional*.
 - (iv) Paired metamorphic belts seem poorly understood and candidates who knew metamorphic belt **C** was the high pressure, low temperature belt were in the minority.
 - (v) While there were some excellent answers to this question, many candidates struggled to gain any credit on this high level question asking for an explanation as to how the metamorphic belts formed. Those that gave a sound explanation of metamorphic processes at convergent plate margins without being specific as to which belt they were describing gained one mark. Some candidates could improve their answers by making it clear that partial melting is the process that leads to an elevated geothermal gradient rather than implying partial melting is involved in the metamorphic process itself.
- Q2** This question on volcanic processes and products proved to be a good discriminator. Candidates who read the questions carefully and wrote clear answers using good geological terminology scored highly. Other candidates would benefit from following the command words given in questions and ensuring they learn the key definitions listed in the specification.
- (a)
 - (i) Volcano feature **D** was least well known – many candidates seemed unaware that the correct technical name for a vent on the flanks of a volcano is parasitic or secondary. Although *vent* was accepted for **E**, given the depth, better answers were pipe, conduit or dyke. Most candidates knew **F** was the crater or vent of a volcano, but a few did not consider the scale and incorrectly identified **F** as a caldera.
 - (ii) Most candidates correctly describe the shape of the volcano as steep sided, with the best answers including a measurement of the slope angle (~35°). A significant number of candidates did not appreciate the command word *describe* and in consequence lost marks as one word answers such as *cone* or *steep* are insufficient for a description.
 - (iii) The vast majority of candidates correctly identified the volcano as a strato-volcano or composite cone volcano. A minority of candidates just gave *strata* on its own which was not accepted.
 - (iv) Most candidates knew the type of activity of a strato-volcano. In this case the command word was *state* so it was not necessary to give long descriptions. The term *viscosity* continues to cause problems – both its meaning and spelling. Candidates need to be clear that high viscosity lava does not flow. Use of non-technical terms such as *sticky* is best avoided.
 - (v) Although many candidates recognised the alternate layers of lava and pyroclastics, they were then unable to offer a convincing explanation for the pattern. There was a common misconception that the lava is erupted first followed by the pyroclastics that then settle on top of lava reversing the actual sequence.
 - (b)
 - (i) The definition of the term *pyroclast* for a solid, fragment (ash, lapilli, block or bomb) ejected from a volcano was not well known. There was confusion with pyroclastic flows and many candidates forgot to include the word *solid* in their definitions.

- (ii) Not all candidates could correctly name a pyroclastic rock. There were a number of “no responses” and many named unconsolidated pyroclastic material such as ash instead of the rock *tuff*.
 - (iii) Although most candidates were familiar with the term *lava*, some struggled to give a precise definition.
 - (iv) The igneous rock that would be likely to be found in a lava flow from a strato-volcano was not well known. Candidates who had learnt the igneous classification table were confident that the most likely rock would be andesite or rhyolite. One letter incorrect in spelling was allowed.
 - (v) Most candidates knew the plate tectonic setting for a strato-volcano, but continent-continent convergent plate margin did not attain the mark.
- (c) Most candidates gave a good description of the relationship between the time interval between eruptions of Hekla volcano and the silica percentage of the erupted materials. However, a small number did not seem to understand what was meant by time interval between eruptions. Many candidates wrote very detailed descriptions filling up all the answer lines but only a minority went on to explain the pattern in terms of magmatic differentiation and gravity settling.
- Q3** The quality of responses to this question on texture of sediments, environments of deposition and identification of sedimentary rocks was variable. Candidates who were secure in their knowledge of sedimentary textures and classification scored highly.
- (a) (i) It is pleasing that the definition of sorting was known by most candidates, who then went on to produce good labelled diagrams to show the difference between well and poorly sorted sediments. A small number of candidates continue to refer erroneously to grain shape as well as size in their definitions, and some were confused and referred to crystals or rocks rather than grains.
 - (ii) Many candidates were able to calculate the coefficient of sorting of the unknown sediment. Candidates should be encouraged to show their working for all calculations which then allows credit to be given for error carried forward if appropriate.
- (b) (i) Most candidates gained some credit for stating the environments of deposition of sediments **G**, **H** and **J**. The poor sorting of sediments in an alluvial fan was not well known.
- (ii) Responses to this question asking for the grain size of glacial boulder clay were variable. Common errors were shading only gravel (boulders) or only clay. In addition, many explanations merely repeated the diagram rather than giving an explanation relating to how sediment is transported or deposited by ice.
- (c) Candidates secure in their knowledge of sedimentary classification were able to correctly identify the three sedimentary rocks from their descriptions. Some did not take account of the term *sedimentary* and included igneous and metamorphic rock names or mineral names.
- Q4** This question on deltas, sedimentary structures and the geological timescale was not answered very well. The most successful answers included neatly drawn, accurate and fully labelled diagrams as poor quality diagrams limited the marks for some candidates.

- (a) (i) Most candidates knew that deltas form when a river enters a larger body of water such as the sea or a lake and that deposition occurs as a result of reduction in velocity of flow. However, not all candidates addressed the “where” and the “why” in the question.
- (b) (i) Candidates struggled to clearly label the bottomset, foreset and topset beds on the vertical sequence. The use of brackets to cover all the rocks for each unit would have improved some answers.
- (ii) Very few candidates attained all three marks for drawing a labelled cross section diagram of a delta. Most were aware of the correct sequence with bottomsets at the base, foresets in the middle and topsets at the top, but many drew the slope of the delta front at far too steep an angle to be realistic. Only a handful drew any type of internal structure such as cross bedding in the foreset beds to attain the third mark. A small number ignored the question and drew a plan view of a delta rather than a cross section.
- (c) The term *cyclothem* was known by most candidates but some inserted an “r” into the word.
- (d) (i) Some candidates drew excellent labelled diagrams to show how asymmetrical ripples form. Most appreciated the unidirectional nature of the current but some labelled *wind* forgetting the question related to deltaic deposition. A significant number of diagrams were poor – the drawing of vertical and overhanging ripples continues to be a problem that limits the marks for some candidates.
- (ii) The drawing of a labelled cross section diagram to show cross bedding in the sandstone proved difficult for many. Some candidates drew a diagram showing how cross bedding forms rather than what it looks like preserved in a sedimentary rock, but could still gain credit. Many ignored the prompts in the question and did not include a scale or dip angles. The foreset beds were often drawn straight and dipping far too steeply to be realistic. Candidates should be encouraged to label dip angles downwards from the horizontal rather than upwards.
- (e) Candidates that were familiar with the geological column and its division into eras and periods/systems found this fill in the missing words question straightforward. *Periodic Table* was a common incorrect answer for the first part of the question and some candidates muddled up eras and periods/systems.
- Q5** This question on diagenesis and coal formation was done well by most candidates, although some found the mathematical calculations challenging.
- (a) (i) This graph plotting question was well answered. Most candidates plotted the points neatly and accurately and only a small number forgot to join the points to make a line graph.
- (ii) The relationship between porosity and depth of the sediment was recognised by virtually all candidates. However, a few contradicted themselves by stating the lower the depth, the lower the porosity – in this case the mark was not awarded as it was not clear if lower meant shallower or deeper.
- (iii) Candidates were less able to explain the relationship. The use of technical terms such as *compaction* or stating the type of pressure as *load* or *confining* would have improved some answers.

- (iv) Most candidates had a good attempt at calculating the temperature at 1200 metres if the geothermal gradient was 30°C per kilometre. Those that arrived at 36°C forgot to add on the 10°C surface temperature. A few failed to convert the depth from metres to kilometres and came up with an impossibly hot 36010 or 36000°C!
- (b) (i) Most candidates were able to read correctly the value of 16 from the bar chart to estimate the thickness of peat required to produce one unit of anthracite. The fact that this is a ratio and does not require units led to some confusion, but candidates were not penalised if they put units such as metres after their answers.
- (ii) Most candidates were able to calculate the thickness of peat required to produce a layer of lignite 0.5 metres thick. Practising simple mathematical calculations could help to improve the confidence of some candidates in tackling this type of question as there were a number of “no responses”.
- (iii) There were some very good answers to this question on the diagenetic changes that occur when peat is changed to bituminous coal. The most successful responses stuck to describing the changes rather than digressing into the processes involved which had already been tested in Q5a.
- (c) Although most candidates were familiar with diagenesis and burial metamorphism, not all were able to explain the relationship between them. The inclusion of specific pressure and temperature values (2 kb/200 MPa and 200°C) as the boundary between the two processes would have improved some answers.
- (d) (i) Most candidates knew contact metamorphism would occur around a granite batholith.
- (ii) The most common correct answers were the formation of metaquartzite from sandstone and marble from limestone, but candidates were less sure of the contact metamorphic products of shale. A small number merely repeated the list of sedimentary rocks from the key on the map.
- (iii) Many candidates struggled to explain why the metamorphic aureole is greater in the east than in the west. There was confusion with the dip of the beds shown on the map and discussion of the dip of the aureole was not accepted. Only the strongest candidates clearly referred to differences in the dip of the contact on either side of the intrusion. Some helpfully included a diagram which made their meaning clearer.
- Q6** There were some excellent responses to this question on deposition in hot deserts. The best answers included correct descriptions of the rocks produced as well as the environmental conditions in which they formed. Diagrams were given credit if they were accurately drawn and showed features not described in the text. Wadi conglomerates proved the greatest challenge with some candidates leaving this section blank. A common error was to refer to desert sandstones as fine-grained rather than made of fine-grained sand and few candidates seemed to appreciate the large scale nature of dunes. Most candidates were well versed in the basics of evaporite formation in playa lakes but not all could recall the correct sequence of precipitation of salts – chlorite and K feldspar were given by some.

- Q7** Again some excellent full mark responses to this question on the main types of igneous intrusions with virtually all candidates gaining some credit. To attain the maximum mark, candidates had to take account of the quality of written communication icon and link the intrusions to the correct rock types. Not all remembered to describe the depth of cooling or crystal size and some need to ensure they differentiate between crystals and grains – coarse-grained was credited, but coarse grains was not. Only the best answers clearly described the location of chilled and baked margins and explained their origin. Some candidates could improve their diagrams by ensuring they show beds in the country rock when drawing concordant and discordant intrusions. Some candidates wasted time and effort with lengthy accounts of contact metamorphism and/or magmatic differentiation which were not relevant to this question. A few included descriptions of lava flows in their answers.

F793 Practical Skills in Geology 1

General Comments

This year there were again some very good pieces submitted and the general standard was high. 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, again showing that comments in last year's report were being acted on. There remain some issues with poor photograph and sketch labelling. No centres seemed to have candidates who were struggling to complete the Centre-based or Evaluative tasks within the suggested time of an hour.

The Moderating team in general found that in the Centre-based Tasks (CB) there was no clear pattern of one task being more popular than any other. All the moderators saw some fieldwork but the CB tasks are still more popular.

Although entry via ModMan is common, there still seems to be some confusion about the need to send the moderator a copy of the MS1 form. If centres can get access to Interchange then they are strongly encouraged to send to the moderator a copy of the Centre-based/Fieldwork and Evaluative summary form which is in Excel format downloadable from Interchange. Centres need to put in all of the marks achieved by each candidate; 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. Despite comments in the last two years' reports a few centres are still sending all their tasks, not just the best mark for CBT/FT and ET which moderators then have to find. 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.

Most centres are now clearly annotating candidates' work and indicating where marks are being awarded. This enabled moderators to follow clearly the centre's marking and attempt to agree with them. In a small number of cases the ticks and marks did not always seem to match up with the marks being awarded which caused moderators a few problems. These need to clearly match up for clarity and to avoid the need to refer a clerical error back to the centre.

Whilst moderating tasks, it became apparent that whilst marking normally followed the relevant mark schemes, some centres do not always take note of the additional guidance about what precisely is required in candidate answers. This can lead to over marking on some question components. In a few instances centres introduced new additional answers. Centres are reminded that they need to contact OCR if they wish to query any element of the mark scheme and to check Interchange to ensure they are using the most up to date version of the relevant mark scheme.

Fieldwork Tasks again 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. A major issue occurs where it is difficult 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 were too generous in awarding marks and crediting limited work, or failing to provide comments re circumstances which would explain why limited work was credited with maximum marks. See specific comments in the Fieldwork Task section.

Administration this year was usually completed to a high standard but clerical errors continue to be surprisingly high. This resulted in delays in the moderation of some centres whilst these were sorted out. Please do take care, especially if a candidate's marks have been changed, to check that the right 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. Most centres included an Authentication form; in a very small number of cases this was not sent on and had to be requested again 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, these results indicating the likely results that candidates should obtain. Where problems occur, teachers are encouraged to provide additional information to support the marks given. 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 others, moderators were able to accept the awarded marks on the basis of teacher's comments. If an obvious point appears to have been missed out from the mark scheme please contact science@ocr.org.uk.

Comments on Individual Tasks

CB1. This was a popular task. Most centres supplied trial data. Some problems with initial settling were reported otherwise the practical was done well and provided candidates of all abilities the opportunity to write good responses. In some instances, centres did not always follow the additional guidance in the mark scheme and sketches were a little overmarked.

CB2. This task was generally done well. Teachers are reminded to check for errors in calculating percentages and supply data on sediment properties. . 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.

CB3. There were a few reported issues with the practical task and getting consistent data – teacher comments and data were essential here. *Describing* a texture requires accurate measurements of crystal or grain sizes while *explaining* it refers to how it formed.

Field work

There was a lot of very good fieldwork in evidence here including logs and sketches. OCR now has a good bank of approved tasks displayed on 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 must check on Interchange that they are using the new revised versions.

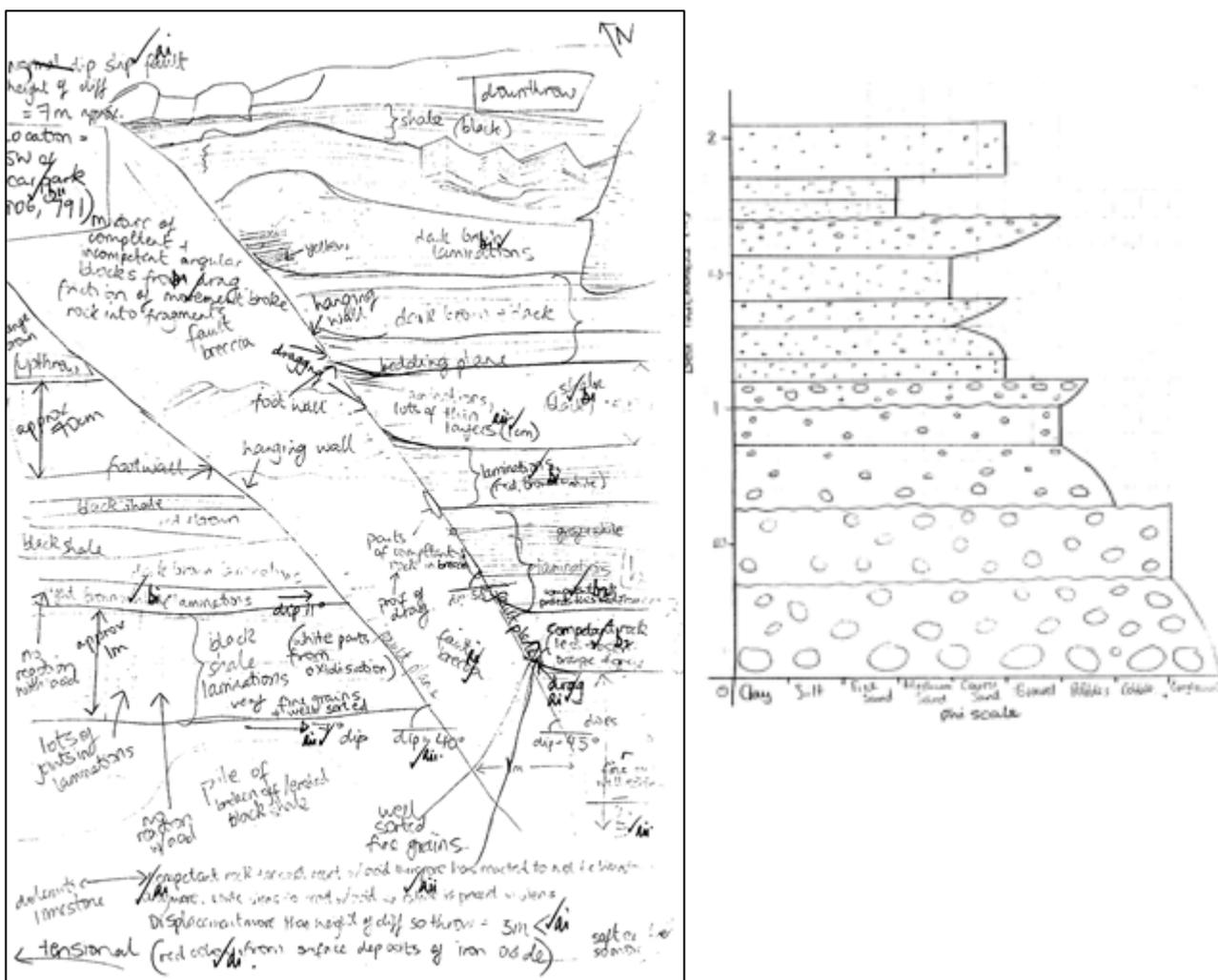
The fieldwork tasks caused the moderators the biggest problems this year. There are inconsistencies in application of marking, mark schemes, quality of work and guidance to students between centres which is being addressed. Some weak candidates were getting 6–8 marks for an evaluative task and 18–19 for their fieldwork. The main issues are :-

- Safe working (ai, aii) – maximum marks require written evidence in the submitted work *whilst in the field*. 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 or prevent the risk. This can be awarded either 1 or 2 marks depending on the level of detail. However a list such as hard hat/boots without reasons is not sufficient.
- Descriptions of rock types/measurements or orientations/pebble long axes often have 3 mark maximums 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 correctly producing large data sets for maximum marks. Rock type description should include reference to grain/crystal size, identifiable minerals/fragments, shape, sorting, texture, colour for each rock type being described.

Task sheets and work booklets are being used by some centres but the degree of guidance/instruction should be minimal. General headings and frames for sketches and logs are fine at AS. In a few cases, candidates were told what to write eg rock descriptions and what rocks were present. 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.

See below for an example of good practice for a detailed sketch and for a graphic log .



The best centres were those where the marks on the candidates’ work could be clearly matched up to specific parts on the mark schemes. It should be noted that field work must have been OCR approved and the T number should be clearly shown on the mark scheme. 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.

Comments on the Evaluative Tasks

Most of the work was clearly and accurately marked with close adherence to the mark schemes. If an obvious point appears to have been missed out from a mark scheme please contact science@ocr.org.uk.

Comments on Individual Tasks

ET 1. A new task which proved popular although some elements on mid-ocean ridges caused a few problems. The sketch element was sometimes overmarked. Other parts allowed candidates of all abilities to write good answers using relevant geological terms both describing and explaining them.

ET 2. This task was carried over from last year and was done well by most candidates. As a result it was largely well marked with few problems. Moderators saw some excellent 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 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.

ET 3. This was carried over from last year and was again a popular choice. A number of the question components were still 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 did not answer the *describe and explain* questions well. They either described or explained rather than both.

F794 Environmental Geology

General Comments

This examination paper produced a good range of marks.

There were very few incomplete scripts and many candidates used the additional page both for extensive diagrams of dams and reservoirs and to continue other answers. There is no indication that candidates ran out of time.

Well-prepared candidates with secure subject knowledge scored highly. Other candidates need to ensure their answers are clearly written with good use of geological terminology. Questions will cover synoptic material from other units particularly F792 *Rocks – Processes and Products*. A2 units are synoptic papers and candidates should be encouraged to take a holistic approach when answering the questions, making decisions about the most appropriate geological setting for their answers. The stretch and challenge questions may require information to be put in a new context and synthesised from different areas of the specification.

A clear understanding of the command words is essential and where questions have two command words the marks will be split between the two. A description can not just be a single word. Candidates who read and analysed the requirements of questions carefully were able to give full and relevant responses that accessed the highest marks. The three mark short questions on geophysical surveys, oil production and primary/secondary recovery rarely gained full marks.

At A2 level, candidates are expected to communicate clearly. This includes the correct use of geological terminology. Questions asking for definitions of geological terms listed in the specifications expect precise (though not necessarily formal) wording. In question 2 (hydrothermal ores), the use of the words 'metal', 'ore' and 'mineral' as if they all have the same meaning lost marks. 'Melting point' was a common replacement for 'temperature of formation'. When describing coal, *dark* or *dull* were used as a colour. There was confusion between the terms *porosity* and *permeability* which occurred in several answers. Candidates lost marks by treating the words 'dam' and 'reservoir' as synonymous, and by regarding the bed of the reservoir and the sides of the valley as being in the same position.

Comments on Individual Questions

Question 1

Q1 This question on coal was answered well by many candidates.

- (a) (i) Most candidates knew the meaning of the term 'rank'. As a definition was asked for, fairly precise wording was expected, referring to the percentage of carbon and many candidates were very accurate. It is important that candidates should be able to give accurate definitions for the technical terms listed in the specifications.
- (ii) Many very good answers as lignite and anthracite were well known but spelling particularly for anthracite was too different to be allowed in some cases.
- (iii) Most candidates had a general idea about the coalification process although relating this to an increase in rank was not always clearly expressed. The description of compaction or one of the other terms gave rise to varied answers that ranged from the single term *compaction* to detailed descriptions of the weight of overlying sediments causing compaction. Explanations of the removal of water and volatiles were often excellent showing a well-developed understanding of this

process. Where a question requires a description, a single word does not fulfil the requirements. Carbonisation is a fossil preservation process and not the same as coalification and some candidates were confused by these two very different terms.

- (iv) Most candidates used the black colour as a physical characteristic with the carbon % as the most popular chemical characteristic. Specimens of coal are perhaps not as widely available these days for candidates to handle and observe – descriptions showed wide variations in suggested properties. Unfortunately, a number of candidates gave general comparisons with lignite and anthracite rather than a description of bituminous coal. Common errors included: dark (which is not a colour), hard (more suited to minerals) and dense (which it is not).
 - (v) While some candidates did state that sulphur is the main impurity in coal many wrote incorrectly that various gases or water were impurities. Common errors included: methane (which is a by-product rather than an impurity) and carbon dioxide (which results from combustion).
- (b)
- (i) The spelling of overburden was generally correct but the identification of this technical term was weak. Terms that are used for metals like *gangue minerals* are not appropriate for an opencast coal mine.
 - (ii) This question proved difficult for most candidates. There were few good answers, particularly because the question asked for evaluation, not just description. Each geological factor needs to be assessed as to how it affects opencast mining either in terms of the detrimental effects such as flooding or disruption to production or economic viability. A factor is one such as depth to water table and the impact is that the mine could be flooded if the water table is high. A few candidates did not see the word other geological factor in the question and described the overburden or spoil heaps. Answers often described slope stability or quarrying in general, rather than opencast coal mining. A few answers seemed to be about deep mining. In opencast mining there is no danger of collapse, though the sides of the pit could slip unless correctly engineered. Opencast mining is much more flexible in terms of dip of the coal seam and seam displacement by faults but these factors can reduce the economic viability of a mine. The collapse of spoil heaps as in the Aberfan disaster is not related to opencast mining.
 - (iii) This was well answered and it was good to see that the majority of answers were good descriptions with very few brief answers. Visual pollution or blot on the landscape is too vague. Noise pollution requires the descriptor – *from machinery*. Many candidates thought that this was an easy question and gave short answers to a question which asked for a description. For example ‘dust pollution’ does not describe where the dust comes from or why it is a problem.
- (c)
- This question required knowledge of restoration and not the uses for old opencast mines. The best answers described the backfilling of the overburden and then the spreading of soil ready for planting of trees or grass seeding. In some mines other steps may be taken to resolve acid mine drainage or water pollution. Most answers included the idea of filling in the pit with the ‘waste material’. For the second mark, a little more detail was required, recognising that this material is made of unweathered rock, totally unsuitable for plants to grow on and therefore requiring a covering of soil. The question asked about restoration, not an alternative use, therefore excluding suggestions about landfill (without adding the overburden material) and a lake filling the old workings with water is not restoration.

Question 2

Q2 Many candidates found this to be a challenging question. Questions are often split into separate parts to help the candidates to work through a topic, such as hydrothermal ores. Reading through the whole question first will avoid putting the right answer in the wrong part question (for example 2(b)).

This question on intrusions and mineral ores needed to be able to make connections between different areas of the specification as the synoptic content covered jointing from F791 and chilled margins from F792.

- (a)
- (i) Many candidates did not use the correct term of *chilled margin* and referred to cooled margin. The correct spelling was not a problem for the candidates who correctly identified the feature. This is a synoptic question on F792.
 - (ii) The origin of the cooling joints was often well explained; however without the use of technical terms such as *contraction* and *tension*, it was difficult to gain full marks. A few candidates incorrectly thought that the mineral veins formed the joints by exerting pressure.
 - (iii) This was a challenging question for many candidates as it required linking ore minerals being carried in hydrothermal fluids to the movement of these fluids through the joints. Many answers were very general, so failed to gain marks.
- (b)
- (i) Many answers gained just one of the marks due to weak use of technical terms. While many answers related to the joints and other 'lines of weakness' as being involved in hosting the ores, few candidates went on to talk about reactions between the limestone (a base) and the hydrothermal fluids (acidic) and other processes which caused the ores to be deposited there. Ore minerals were not often emphasised – just 'minerals'.
 - (ii) Many very good answers showed well developed understanding. Most answers considered the sandstone and shale together as one unit with the result that many found it puzzling that two normally contrasted rocks can behave in the same way – impermeable and without joints. Many suggested that they are less permeable or jointed than the limestone. Few mentioned the unreactive nature of sandstone and shale.
 - (iii) There was a very good understanding of solubility controlling the order in which the minerals formed. The temperature relationship was less clear as some candidates wrote about melting points. The names of minerals are cassiterite and galena so stating the minerals as tin and lead is incorrect. While there was a little confusion about which mineral occurs at B and which at C, the explanations were generally good. Weaker answers referred to the names of metals rather than their ores, and to melting point rather than temperature of formation.
- (c)
- This question proved to be a good discriminator. Most candidates were able to give reasonable descriptions of how geophysical methods are used to identify ore deposits. Some candidates found it difficult to describe the methods. The names of the survey methods were well known but the ways in which they are carried out were not. How to interpret the results was not well known. Common errors included using seismic surveys, boreholes, soil sampling and other chemical methods.

Question 3

Q3 Most candidates showed a good understanding of oil and natural gas reserves.

- (a) (i) Candidates generally gave accurate and concise answers about the oil being less dense than the water in the pore spaces. The most common mistake was to write that oil was less dense than the rock.
- (ii) The quality of the diagrams was excellent with detailed annotations and descriptions that showed a good understanding of reservoir rocks.
- (b) (i) Some candidates found this depth calculation difficult but many successfully measured the depths and did the correct calculation. Along with the many correct answers there was a full range of other numbers, derived from measuring the depth to the gas-oil or to the oil-water boundary. Other incorrect answers were due to incorrect calculations. Candidates should be encouraged to check that their answers are realistic. A pressure of 4, instead of 400, atmospheres is clearly wrong.
- (ii) Candidates who were clear about the difference between primary and secondary recovery scored highly on this question. These candidates gave excellent descriptions which achieved the maximum 3 marks with ease. There is some confusion about what is included in primary recovery. It is both the natural flow of oil under its own pressure (gusher) and the pumping of oil using just a mechanical device. Secondary recovery requires the addition of another material being introduced into the reservoir ie water flooded below the oil or gas flooded above.
- (c) This high level question was challenging for many candidates. There were few good answers. Many answers were long, but confined to just one possible explanation, despite the allocation of three marks. The topic was unfamiliar to many candidates, who searched for possible explanations such as mass extinctions and plate movements. Some misinterpreted the graph as showing the Palaeozoic to be younger than the Cenozoic. Some answers described the same point for each of the three eras so gaining just one mark.

A minority of candidates confused the formation of oil with that of coal and hence wrote about changes in climate and vegetation on land. This is a fundamental point as oil is formed from marine plankton. Common errors: oil is formed from vegetation, or from any dead organism.

Question 4

Q4 This question on water supply proved to be a good discriminator, with candidates achieving the whole range of marks available.

- (a) Most candidates had a general idea of the differences between NW and SE particularly in terms of rainfall and 1 mark was therefore often attained. A clear distinction between the geology of the two areas was needed for a second mark. Population differences are not geological. This was a comparison question but the answers did not reflect this. There was little attempt to explain that surface water is stored in reservoirs and groundwater in aquifers, or to explain this in terms of rock type, permeability and porosity.
- (b) (i) Most candidates gave very accurate definitions of an aquifer.
- (ii) Most candidates knew that hydrostatic pressure is needed for artesian conditions, but did not always say how this was achieved with an overlying aquiclude. The idea of artesian aquifers being aquifers that are confined, was well known.

- (c) (i) The identification of situations where springs form was generally well known but some candidates repeated the question saying that springs formed where two different rocks meet.
- (ii) There were many excellent well drawn and annotated diagrams that fully explained how springs form. Candidates lost marks by incomplete labelling, or by assuming that the examiner knows that a dyke is impermeable.
- (d) (i) Many excellent answers with hydroelectric power being the most common. Recreational activity is not the reason for the dam and reservoir being built and although the reservoir may be used for this recreation it is not the main use.
- (ii) Some very good answers but some that did not give enough detail or gave just a single consequence. The command word asked candidates to describe two environmental consequences and that required more than simply stating *flooding*. Care is needed to distinguish between what happens upstream and downstream from the dam, and to distinguish between the consequences arising from the reservoir and those arising from the dam. Loss of habitat is a standard answer, but aquatic animals are not harmed by the formation of a lake; their habitat is extended. Land animals have time to move. Instead, farmland, forests and villages are affected. There were several references to 'problems with ecosystems' without any detail. This kind of question does not involve disasters such as the collapse of the dam.
- (iii) The concept of the water adding load pressure to the rocks below was well known but how that increases seismic activity was less accurate. The water will not create new faults but could lubricate old faults so that they reactivate. The rocks slipped rather than the faults. Again too many references to general seismic activity without any specifics.

Question 5

Q5 This question on dams and reservoirs was often answered well and gave good discrimination. The use of diagrams was often excellent and well integrated to help explain how the dip of beds affected the siting of dams. In many cases, without these helpful diagrams it would not have been possible to award marks, as vague and confusing descriptions of dipping away or towards were used. With the help of diagrams, the direction of dip became very clear. Descriptions of dip directions were often ambiguous: 'dip towards the dam' could be in any direction – upstream, downstream and from either side, depending on the location of the dipping beds. Similarly with vague terms such as 'tilted upstream' and 'dipping with the dam'.

The question asked candidates to describe *and* explain and many only described, so were not able to access all the marks. The first point in the mark scheme illustrates this clearly with the description being that the foundation rock must have a high load-bearing strength and then the explanation is to support the weight of dam and water. Explanations limited to 'beds dipping downstream are bad' and that 'rock should be high load-bearing' lost marks.

The confusing use of the terms dam, reservoir and valley sides led to some ambiguous answers. Factors for the dam and for the reservoir are quite different from each other. The spelling of both *dam* and *reservoir* was variable.

Some candidates wrote about the general conditions for reservoir siting of valley shape but the question was specific that only rock type and geological structures were required. Most answers concentrated more on the structures rather than rock type. Some responses caused candidates to lose out on top marks as although they had exceeded the maximum number of marks for the structures, they had not gained sufficient rock type marks.

A few candidates wrote about the Vaiont-style collapse of the reservoir sides or the purpose of dams and reservoirs rather than answering the question set.

F795 Evolution of Life, Earth and Climate

General Comments

The majority of candidates displayed sound subject knowledge and appeared well prepared for this examination. There was no evidence that insufficient time was an issue with virtually all candidates attempting both extended questions on echinoids and preservation of fossils. Many candidates had extended answers onto extra pages provided in the examination, in particular question 6.

The quality of diagrams and the ability for the candidates to label them accurately has improved. Some candidates did not annotate diagrams properly, failing to read the questions set, for example when two things were asked for they may have only labelled one.

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. Candidates should be encouraged to make use of the space allocated to write as full an answer as possible, even when a single mark is involved. If space is allocated for a diagram candidates should be encouraged to make full use of this and draw labelled diagrams.

Comments on Individual Questions

- Q1** Most candidates showed a good understanding of the classification elements and major and minor group functional morphology in this question.
- (a)**
- (i)** Almost all candidates recognised the brachiopod and bivalve and a majority identified the ostracod, which is a minor group. The answer 'microfossil' was considered too general at this level and gained no marks.
 - (ii)** The pedicle valve did cause some confusion in this view, but the pedicle foramen was almost always correctly identified, although with a variety of spellings. Umbo and growth line were familiar to most candidates.
 - (iii)** Most candidates knew the function of the pedicle and incorrectly assumed that the answer to this question was 'to attach to the substrate', missing the point that the pedicle foramen is an opening and not the structure.
 - (iv)** Many candidates described the mode of life of the ostracod as planktonic, perhaps incorrectly assuming all microfossils lived in this way.
 - (v)** Planes of symmetry were often well known and explained with the help of diagrams, that while correct, often lacked labels.
- (b)** The term 'derived fossil' was well known; however a number of candidates did not gain the second mark because they did not describe transport and deposition of the fossil into the younger sediments.
- (c)** This question caused considerable difficulties to all but the most able candidates. Despite the instructions, many used the same reasons for both groups. The answers needed to explain the difficulties rather than describe. There were some excellent explanations on the disarticulation of trilobites and the poor preservation of terrestrial fossils with loss of soft parts as a common correct answer to both parts.

- Q2** This question on a range of fossil fragments differentiated relatively well. The numeric fossil data required careful reading of the information in the question in order to analyse this high level question.
- (a) (i) The fossil fragments were recognised by almost all candidates and very well described in the limited space available (eg a crinoid stem fragment made up of 10 ossicles). A few candidates thought the trilobite was a tooth or conodont fossil.
- (ii) Candidates were generally uncertain of the environments in which these organisms lived, perhaps because there is a range of correct answers. Contradictory answers eg low energy littoral or high energy deep marine suggests that the general relationship between water depth and energy levels can be confused.
- (b) (i) Many candidates concentrated on discussing the animal that produced the coprolite, rather than the information about the palaeoenvironment.
- (c) A large number of candidates knew aragonite was unstable. A few candidates reversed the answer stating that calcite altered to aragonite. Some tended to repeat the question without explaining the change to the more stable form.
- (d) (i) Most candidates could add the two columns of numbers correctly. The calculation of percentages was less well done. Several answers gave readings well above 100%, but this did not alert the candidates to any problem with their mathematical skills.
- (ii) This question proved a good discriminator and was rarely fully answered as few candidates understood the implications of a 'convex up' valve. Most candidates used the coral evidence to good effect although there were few who realised that solitary corals are not generally found in the same conditions as reef building colonial corals. Most candidates discussed each bed well but some simply stated bed 3 as 'about the same as bed 1' and so missed the third mark. Fewer candidates used the numerical data to exemplify their answer for further credit.
- (iii) Candidates usually managed to describe palaeocurrent indicators or broken fossils. Some candidates simply repeated 'bivalves' or 'disarticulated' fossils. Some candidates did not understand the difference between disarticulated and broken and used these terms interchangeably.
- Q3** This question on cephalopods and particularly the differences between nautiloids and ammonoids was very well answered and showed a good depth of knowledge.
- (a) (i) This section was well known; some uncertainty seemed to be caused by the instruction that 'each fossil may be used more than once'. Some wrote multiple answers in each box, thereby giving contradictory answers.
- (ii) There were some marks lost due to misuse of terms eg *siphon* rather than *siphuncle* and there was a general lack of understanding about the effects of moving water in and out of the chambers. Some candidates offered no explanation of how gas and fluid were moved in and out of the chambers and some thought that the siphuncle held the water rather than the chambers. The control of cephalopod position in the water column was sometimes confused between horizontal using jet propulsion and vertical using buoyancy.

- (b) (i) Heteromorphs were known to have ‘uncoiled’ or to be coiled in more than one plane. There were many good answers to this question.
- (ii) Few candidates could suggest the mode of life for heteromorphs. Most incorrect answers were ‘nektonic’, without the understanding that these ammonites probably occupied different ecological niches on the sea floor. However they were not infaunal.
- (c) (i) Some candidates confused the protoconch with the umbilicus and so labelled incorrectly. Other candidates only labelled one feature, or only one of the cephalopods, thus gaining no credit.
- (ii) There was good knowledge of the septal necks and the directions in both cephalopods. The terms ‘backwards’ and ‘forwards’ should be avoided as this is open to misunderstanding. Towards the protoconch or towards the aperture are clearer directions. Some used the correct terms which are outside of the specification, retrosiphonate and prosiphonate.
- (iii) Around half of candidates correctly described the function of the septal necks. Incorrect answers commonly described the function of septa.
- (iv) Quite a few candidates missed out the mark for the siphuncle shading and labels, perhaps missing this second part of the question. A few labelled this structure only on one of the diagrams. Most candidates could describe the changes in the position of the siphuncle, but a minority described the length of the structure.
- (v) The sutures were drawn correctly by the majority of candidates. Many had good annotations and indicated the position of the aperture. A minority transposed the answers gaining no marks.
- (d) The question required an explanation rather than a list and the lack of explanation restricted the marks.

Q4 This correlation and time range question generated a good spread of marks. This was a challenging question that required longer answers for high level marks.

- (a) (i) Most correlations were excellent showing a good understanding of the principals underlying this method. A number of students correlated one bed from borehole K, with a multiple beds in borehole L.
- (ii) This part question discriminated really well. Some candidates displayed a basic lack of understanding of sedimentary processes which is synoptic on the AS unit F792. Incorrect answers included the common assumptions that all sandstone represented desert deposition and that rivers were the likely environments for the mudstone. The third marking point, explaining the difference in the logs, was seldom attempted which revealed the lack of confidence shown in this topic.

Teaching tip

Teachers should emphasise the range of environments in which a sandstone, mudstone or conglomerate can be deposited and the likely combination of such rocks to represent different environments. For example sandstone containing mica is likely to have been deposited by water, and is likely marine or fluvial. This coupled with conglomerate is likely to be a braided stream deposit or a beach. If there is evidence of slumping, then it could be a debris deposit and is usually associated with a wider range of grain sizes, including clay.

- (b) Many candidates produced excellent answers explaining how varves were formed as seasonal deposits and showing a good understanding of the process. Some added the information that the double layer could be counted giving information on the age of the deposits but few candidates discussed the correlation based on relative thickness of layers and as a result gained no marks for this part. A number of candidates mixed up varves with deposits of volcanic ash and a few discussed radiometric dating.
- (c) (i) Owing to the lack of agreement in published texts as to the exact first appearance and extinction of groups, the mark scheme included all possible variations. Most candidates appeared confident with naming the periods.
- (ii) ‘Describe and explain’ should be done in full sentences as they are more likely to provide the necessary explanation. It is not good enough to list – ‘Pangaea, volcanic eruptions, a meteorite and methane hydrates. This is a question where some students sensibly went on to use extra space in the additional pages, to ensure they had fully explained the possible causes. Some candidates often described and explained the mass extinction as the K-T, rather than the P-T event. The two mass extinctions studied were often mixed up in this answer, but given the similar mechanisms in operation these candidates gained some marks.

Q5 This question on evolution of graptolites and birds discriminated well and was both well known and well answered.

- (a) Candidates found it very difficult to explain the term *Darwinian evolution*. They often used the terms ‘survival of the fittest’ or ‘natural selection’, but did not explain how these processes operate.
- (b) (i) A large number of candidates incorrectly stated that calcium carbonate or calcium phosphate was the composition of graptolites. The spelling of scleroprotein varied enormously but the mark was available for recognisable spellings. Answers such as *carbon* suggested that candidates were considering preservation processes rather than the original skeleton.
- (ii) This part question posed no difficulty; most candidates selected the correct form for the fossil graptolite.
- (iii) Putting the fossils into the correct evolutionary sequence was correctly answered by most candidates.
- (iv) The graptolite mode of life has long been the subject of discussion and the traditional answer of pelagic or planktonic has been the preferred interpretation of this extinct organism. It has been compared to the extant *Rhabdopleura* to help with a possible mode of life. The nature of graptolites as colonial, filter feeders is a key part of the description.
- (c) (i) The answer was generally well known and there was a good level of detail by many candidates who were pleased to be writing about dinosaurs. Some of the incorrect answers included ‘beaks’ and many bones were not described as hollow. There were many incorrect descriptions based on the direction of the pubis which is backwards in birds so not something shared with the theropods.
- (ii) Most candidates who gained marks for part (i) also gained marks for part (ii). There were quite a few detailed answers here.

- (iii) Almost all candidates described feathers or hollow bones.
- (d) These distinctions between coelacanths and early amphibians were generally well known and accurately answered, the most common uncertainty being the reference to complex teeth.

Q6 This question was very accessible and a number of candidates knew the material very well, drawing accurate, well labelled diagrams. There was often a detailed comparison of the differences between irregular and regular echinoids. Some responses suffered by not making direct comparisons for each morphological feature. For example the regular echinoid could be described in superb detail but only gained marks where the following description of the irregular brought out differences or similarities. Candidates should be encouraged to make a direct comparison; if an irregular echinoid possessed one feature then was it present or absent on the regular echinoid. Both similarities and differences were needed to gain full marks.

Many incorrectly described the functions of tube feet and some described tube feet extending from tubercles, gaining no marks. Others described the environments or mode of life though the question stated morphology.

Q7 This question on preservation methods sometimes had answers that were detailed in two out of the three methods of fossil formation but with a lack of understanding about the third.

Carbonisation was well answered by most candidates who understood the process and gave good examples. Some described general coalification to less good effect and a minority described this as replacement by carbon.

Silicification was also well known and answered with some accuracy. There were some very good answers that brought out the difference between silica replacing material that had been dissolved away in (acid) groundwaters and the crystallisation of silica in pre-existing pores and voids such as in the petrification of wood and bone.

Replacement was less well answered as the subject is more general and includes silicification. Some candidates described cast and mould formation. Some discussed in detail the process of pyritisation and only gained one mark for detailed discussion. The memory of some candidates in quoting the text book was impressive but not always useful if the answers did not refer to the conditions needed for each process.

F796 Practical Skills in Geology 2

General Comments

There were some very good tasks submitted and many candidates demonstrated excellent subject knowledge. Most 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 an hour.

As in previous years, a large number of centres submitted their marks via Interchange often well before the deadline and as a result had very prompt replies requesting their sample of work. In many cases the sample was dispatched by centres extremely quickly. This greatly aids the moderation process immediately after standardisation. Where centres are unable to submit their marks via Interchange it is important to send the moderator a copy of the MS1 form as well as the top copy to OCR, so the sample can then be selected. This is now a computerised process and not selected by the moderator.

The Excel spreadsheet downloadable from Interchange is very helpful to input all of the marks achieved by each candidate. The form should automatically calculate the totals using the best marks, however there were a few cases this year where that did not happen. Centres are therefore advised to check this form upon completion for any errors. Only a few centres are completing a single task for all candidates, most centres gave candidates two or even three opportunities at Centre-based, Fieldwork and Evaluative Tasks.

Administration this year was generally good but moderators found some centres showed a significant increase in clerical errors. A large numbers of errors arose due to the wrong marks being put onto cover sheets and from there the MS1 or equivalent. In a small number of cases marks on the papers or fieldwork were added up incorrectly. Several centres managed to produce totals out of 21 or 22 marks! Another cause of error occurred when a candidate's mark had been changed during internal moderation – it is important to check that the right mark is clearly shown and 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, if one is used, 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.

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 Interchange.

Centres need to include a Centre Authentication form. Some moderators had a significant number of their centres not sending this document. If it is not included, centres will be contacted for it to be sent. This can delay the moderation of the centre involved.

In general marking was of a good standard, but where marks were awarded on the generous side, it was usually due to issues with the interpretation of the mark schemes. Most centres are applying the mark schemes as they appear. Most are also using the additional guidance about specific requirements for marks to be given. However a few are not, for example in some questions labels may be compulsory, so if no labels are added then marks cannot be awarded. A small but significant number of centres were giving credit to answers which were not on the mark scheme, and in some cases points which were definitely incorrect had been credited. If a centre feels strongly about a correct answer having been left off the mark scheme they should contact the Qualification Manager, using the science@ocr.org.uk e-mail address immediately. The issue can then be taken up and a response given. Several mark schemes over the year have had slight amendments made as a result. All centres should make sure that they sign up for Interchange updates to ensure that they know about any amendments to the mark schemes.

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 should reflect the likely range of results which should be expected. If 5 sets of specimens are being 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. By sending all of these results to the moderator it is easy to see if answers fall within the teacher's range. A small number of centres did not send teacher trial data for the Centre-based tasks. As the marking of the Centre-based task is dependent upon comparing the candidate results to the teacher's, it cannot be stressed enough how important it is that the teacher carries out the trial before the candidates do the task.

In experiments where the samples are destroyed, the data should show similar starting amounts so that the rates or trends can be compared. This helps with applying the tolerances quoted within the mark schemes. These tolerances do need to be applied. A small number of centres allowed answers well out of the stated tolerances.

Comments on individual tasks

CB1. This was a new task this year and proved to be a very popular one. In many cases, the results candidates were obtaining were in line with the results seen in the teacher trial runs. There does not appear to have been any issue with this practical component. Some issues arose with safety: in this case 2 points had been asked for and this was not always spotted. It should be noted that the safety points made should be specific to that experiment. The wearing of lab coats is a general expectation in any science laboratory and it is not a specific safety requirement for this experiment.

Most candidates coped well with the map question. The photograph produced some sound sketches; however the labelling was more of an issue. Dips, thicknesses or throws should be measured within the quoted tolerances. A few centres were crediting answers where two points are required for the mark (such as identification and description) but only one point was cited.

CB2. This is still a popular task. Candidates this year seemed to cope with the practical better than last year. When a later question requires interpretation of these results against a table, error carried forward (ecf) can be applied. Likewise if a calculation is incorrect, the mark cannot be given but the result obtained can then be used in a later question and gain credit using ecf again. The safety question again caused issues: the safety point has to be relevant to this experiment. "Lab coat" alone is not a valid point and was not on the mark scheme.

A small number of centres were giving credit for points that were very different to those on the mark scheme, sometimes crediting a one or two word response when clearly a lot more detail had been required. For differences between fossils to be fully described, a comment about what each fossil shows is expected. Just a comment about one fossil is not describing the differences. It is not possible to assume what a candidate meant in order to give credit, the candidate must have written it. Likewise where 2 points are required 2 distinctly different points need to be made.

Many candidates produced some good sketches but labelling was not always of a good quality. Labels for fossils often ask for a certain number of labels to be given from a list given in the mark scheme. It is not acceptable to give credit for labels not shown on the mark scheme. A small number of candidates did not draw the specimen shown but a different text book example. Labels must touch the feature for the mark to be awarded.

CB3. There is an issue here in that the shells are destroyed but most centres provided in the teacher trial results maximum and minimum shell sizes so results were within tolerance. The photo mark scheme had been amended this year but many centres were still crediting the same fossil part labelled twice. It had to be 2 different views such as cross and longitudinal sections.

Sketches of the photograph did vary in quality; most were very good and time had clearly been spent in learning the main features of fossil groups; a few candidates are still drawing text book examples though and not the specimen in the photo. Labelling was generally very good.

Fieldwork Tasks

Far fewer centres submitted Fieldwork than the Centre-based tasks. There was a lot of good fieldwork seen. OCR now has a bank of approved tasks displayed by region on Interchange. These are available for other centres to use if they do not wish to put in an original submission and centres are encouraged to check through Interchange when beginning to plan a field visit. They have all recently been overhauled to make sure that the full balance of 50% marks for A2 work, 50% qualitative and quantitative is achieved. They will be further updated over the summer and new improved versions for ease of marking will shortly be uploaded. So please download the new version for next year. It should be noted that fieldwork must have been OCR approved. A very small number of centres had their candidates doing work which had not been finally approved and was still awaiting changes; a few had fieldwork that had not been submitted for any feedback at all. The official task sheet with the OCR T number on it must be sent to the moderator to show that it is an approved task.

Most centres had the required 50% of marks awarded for A2 tasks, although a few did not and this has been highlighted on the centre report. One of the main weaknesses again this year was the lack of detail to the fossil work and in rock descriptions. Many centres submitted work with barely any detail in rock and fossil descriptions yet full marks had often been awarded for this aspect. Many centres need to ensure that candidates describe the rocks and fossils with detail of grain size, shape, composition, sorting, texture, colour or morphological detail. It can be useful to consider the type of detail required for a Centre-based task and aim for a comparable standard. If centres have never tried these tasks, it is worth looking at the papers and mark schemes uploaded onto interchange for the next year, as a guide to the amount of detail required. For rock descriptions look at the requirements for a Centre-based task: often a mineral name with a reason for identification could be 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 Ss and 3 Cs, an easy way to train candidates in detailed rock descriptions. Likewise the fossil descriptions need more detail especially for brachiopods and bivalves; a clear distinction needs to be made to show how each was identified as they can have many similarities when viewed in a rock.

A fossil sketch should be a field original of what is seen even if the specimen is incomplete, not a text book standard drawing. Labelling of diagrams for A2 needs to be both clear and detailed. If a feature cannot be seen or is not present it should not be labelled. Some centres included sketches of a crinoid taken from the textbook. It was instantly recognisable as it is highly unlikely that candidates will find a whole crinoid. Another issue this year was with the quality of field sketches and “detailed” annotations or labels. If compared to the Centre-based task a question which asks for a sketch with labels will often carry marks for labels independently of the sketch. 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 sketch task is involved.

A2 content for fieldwork besides using fossils, is economic uses of rocks. Here candidates should be encouraged to identify properties of the rocks visible or testable in the field and link this to possible economic uses. Alternatively if the site is coastal, issues to do with coastal defences could be explored. Field evidence for relative dating using way up structures and cross-cutting relationships also work well.

Many centres used graphic logs to cover some of the quantitative requirements. There were some excellent graphic logs evident, and most centres are using acceptable versions. A few candidates are drawing them as simple diagrams of 2 or 3 beds not drawn to scale and without clear grain sizes. If a sequence only contains limestone beds then a graphic log will not show any variation in the beds and as a result a different technique might be more suitable. Graphic logs are fine for about 4 marks – similar to the marks in a Centre-based task.

Sometimes, it was difficult to match up what the candidate wrote with the application of the Fieldwork mark scheme used. In a few cases where teachers wrote nothing on the candidates' work, it was sometimes very difficult to work out where the marks fitted and to see how the marks were awarded. It would also be helpful to have some background information on what the sketches should look like, what to expect from a log, what rocks, fossils were present, if the exposure was particularly good or maybe bad this year etc. OCR asked this year for fieldwork submission to include the above points but also photos or sketches of the site with some ideas of what the field data should be in order to help the moderator.

A small number of candidates wrote about lessons they had had on the task before they visited the site. Some candidates had descriptions almost word for word suggesting that they were taken around en masse and shown the same features. This is a concern as the fieldwork is meant to test field observation skills. It is perfectly acceptable, however, 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 equivalent to the "grey box" information for the Centre-based tasks. Candidates **MUST** work independently for fieldwork in the same way as they do for Centre-based tasks.

A very small number of centres are still giving candidates too much guidance; eg using guidance sheets of A4/A5 booklets or paper with specific task boxes drawn in for candidates to sketch or write in. There were some examples where candidates were told which rocks to describe making it a low level skill and unacceptable at A2.

Evaluative tasks

In general these were completed to a higher standard than previously and the mark scheme was often clearly applied. However there were centres where marking was generous.

Comments on individual tasks

EV 1. This was a new task this year and proved to be very popular with many candidates obtaining good marks. Some incorrect responses or responses not on the mark scheme were credited. It is worth reiterating that if centres feel that an alternative answer should be allowed they should contact OCR to discuss concerns over answers which may be considered to be correct. For several questions, more than a single point was needed to gain the mark. Some points are particularly flagged up in the additional guidance as being insufficient without an explanation.

EV2. This was the most popular task. Most of the issues were from just a couple of questions. Directions of currents need to be translated into compass directions, rather than bearings. If a question asks specifically for "another" feature that could be used, the same one cannot be credited. Care needs to be taken on longer questions which require detailed content such as environment of deposition and water depth. Full marks cannot be awarded if only one of these factors is covered.

EV3. 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. Geological maps are showing that some really good skills are being developed. A few centres though are still struggling to apply the mark scheme here. It is vital to read the additional guidance column to see how much detail is required for this task. In order to earn four marks, considerable detail is required: reference should be made to the *types* of intrusions and faults;

the fold also needs significantly more detail than map questions when fewer marks are available. 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. These answers will not agree with the mark scheme tolerances.

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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Facsimile: 01223 552553

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