RECOGNISING ACHIEVEMENT

GCE

Geology

Advanced GCE **A2 H487**

Advanced Subsidiary GCE **AS H087**

OCR Report to Centres

June 2013

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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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OCR REPORT TO CENTRES

Overview

General Comments

Generally candidates seem to be well prepared and found most parts all the papers very accessible. Few part questions were not answered by nearly all candidates. The papers all discriminated well with no sign that candidates could not complete them. The answers to the continuous prose questions were generally well written.

Careful reading of the question would help many candidates to improve their answers. Some candidates see keywords and rush into an answer without taking into account the command words whether it is *describe* or *explain* or *state* or *identify*. Others do not read the stem of the question which frequently gives information which would help in the answer. The stem can include essential data or it could include a statement that guides the answer in a particular way. One example is where the stem states that all the specimens are igneous rocks but candidates give answers of sedimentary rocks. Highlighting or underlining key words or phrases in the question can help provide focus for the answer and this was seen in an increased number of answers.

Centres should continue to stress the importance of using specific geological terms in their correct context. General terms will rarely gain the marks and candidates need to have a good knowledge of the full range of terms and definitions given in the specification. Some candidates write in vague or imprecise terms, often not using the appropriate technical terms, or using them incorrectly or in the wrong context. e.g. *Porphyroblast* as an igneous term, *reservoir rock* instead of *aquifer* for underground water. This lack of precision resulted in some answers that were not of the standard required for AS or A2.

Questions assessing the AO1 assessment objectives on knowledge and understanding are generally well done. AO2 is on the application of knowledge and understanding and requires candidates to analyse and evaluate scientific knowledge and processes, to apply the scientific knowledge to unfamiliar situations and to assess the validity, reliability and credibility of scientific information. The percentage of AO2 marks is higher on the long papers F792 and F795, and candidates find this element the most difficult on both these papers.

While past papers can be a useful resource in preparing for examinations, candidates should be aware that it is unlikely that a learning outcome will be tested in the same way in a subsequent paper. Rote learning of previous mark schemes will not be appropriate for answering all questions on a topic. Candidates are expected to apply knowledge in different contexts – something that they do not always recognise.

For most candidates there are adequate answer lines for each question, but some candidates may use more space than that provided and continue answers on other parts of the page or paper. As noted in previous reports, it is very important for candidates to indicate clearly if their answer to a question extends beyond the boundary of the lines or space allocated for the response, and also to indicate where the rest of their answer is to be found. Guidance from the candidate will ensure that any extension of their answer is found. Candidates should also use the additional lined pages at the end of the question paper for their extended answers and not use separate answer sheets or answer booklets.

F791 Global Tectonics

General Comments

Candidates were generally well prepared and so performed well. They still find the newer aspects of the specification difficult and in this case the use of kimberlite pipes as evidence of the composition of the mantle indicated that very few candidates are familiar with what kimberlite pipes are and how they form.

Candidates continue to show that they are confident with most aspects of folds and faults except fault plane structures such as slickensides and fault breccia. They showed a sound understanding of earthquake monitoring and effects. Hot spot island chains are well understood.

There was little evidence of candidates running out of time. Very few candidates missed out part questions, which is encouraging. Some technical terms are often misspelled with syncline as "sincline" or "synclyne" and tectonic as "techtonic" or "tektonic" common.

Comments on Individual Questions

Q1 Candidates showed an impressive knowledge of earthquake measurement and the various impacts including tsunamis and liquefaction. This was the easiest question on the paper and discriminated well.

(a) Most candidates were aware that the Japan area is at a convergent plate margin. Not all candidates were aware that Japan is an island arc and so involves two converging oceanic plates.

(b) **(i)** The majority of candidates know that the Richter scale is a measure of magnitude or the (strain) energy released. A few candidates gave *amplitude* as the answer; this is incorrect, although amplitude and distance from the epicentre of the seismometer are key parts of the magnitude calculation.

(i)i Again, the majority of candidates know that the Mercalli scale measures intensity or the amount of damage caused by the earthquake. A few candidates just wrote "effects" of the earthquake or "damage", which is too vague rather than the full answer.

(iii) Fewer than half the candidates knew the answer was "isoseismal lines" and some misspelled it. Many know the word begins with "iso" but could not remember the remainder of the word. A number of candidates omitted this question.

(c) **(i)** Most candidates had an idea of how earthquakes can generate tsunamis. A key point is that the earthquake is in the ocean, a point missed by many. Another key point is that the seabed moves and displaces a *large* volume of water. Few candidates indicated the amount of water displaced. Many discussed plates moving, whereas it is the *smaller scale* movement of shallow focus faults that is the key.

(ii) For the **social** consequence, just reiterating the death toll that was stated in the question was not sufficient, unless linked to the effect on families. Better answers discussed injuries, loss of housing, displacement, evacuation and the distress caused.

Many **economic** effects were linked to the social but centred on rebuilding costs or the loss of income/taxes as businesses fail and people/jobs move away.

(d) **(i)** Candidates had a good idea of what liquefaction is, although not all linked it to the ground vibrating or shaking as the explanation. It is the vibration which triggers the separation of the unconsolidated grains and the upward movement of the water.

(ii) Most candidates knew that liquefaction would cause buildings to sink, collapse or subside as the foundations are on ground that behaves like a liquid and so cannot support the structures.

Q2 This question included some relatively new and untested parts of the specification such as seismic tomography and kimberlite pipes, which candidates found difficult. Candidates coped very well with locating the hot spots but were not confident in their knowledge of how seismic tomography works. Equally, they were unsure about how kimberlite pipes form, although many knew about the peridotite or diamonds being brought up from the mantle.

(a) **(i)** The vast majority of candidates were able to locate the hotspot. However, it was important that the hotspot is at the surface and a few candidates located the hotspot below the surface.

(ii) This is a relatively new topic and it was hoped that candidates are aware that seismologists use seismic waves to produce a 3D image of the mantle. A number of candidates thought that S waves would stop or slow down as the rocks were molten. This is not the case; they *do* change velocity, but the rocks are still solid but hot and rheid.

(iii) Candidates showed an impressive understanding of how island chains form at hot spots. Most could draw an appropriate diagram with the four labels in the appropriate locations. Candidates found it more challenging to write an explanation of how it forms. It is important that candidates indicate that the hotspot that forms the volcanic islands is stationary, and the plate moves over it.

(b) **(i)** Candidates have not been asked about kimberlite pipes before, and therefore this did prove a challenging question for many. Few candidates were aware that peridotite xenoliths and diamonds are brought towards the surface because of explosive volcanic activity that rips off upper mantle rocks from the sides of the vent.

(ii) Approximately 50% of candidates knew the technical term was *xenoliths*.

Q3 Candidates have a sound understanding of the features and processes operating at mid-ocean ridges, with excellent answers for some part questions.

(a) **(i)** Nearly all candidates successfully located the axial rift in the central area of the diagram where the ocean floor forms a deep valley. Some candidates extended the rift a bit too far from the centre. The rift is the lower area in the centre only.

(ii) Most candidates drew a positive heat flow over the axial rift. Some rushed this diagram a little so that the highest point was not directly over the centre of the axial rift but skewed to one side. Many candidates could benefit from taking a little more care and time when drawing diagrams.

(iii) The majority of candidates could explain why the heat flow was high, linking it to rising magma, volcanic activity or hot rising convection currents.

(iv) Candidates had a general idea about transform faults and drew them at 90° to the mid-ocean ridge (MOR). Labelling was not always clear and relatively few drew arrows to show the movement of crust away from the MOR that emphasised the changing relative movement along the faults. Transform faults was the hardest part of this question. Some diagrams were attempts at complex 3D block diagrams rather than the simple plan view asked for in the question.

(v) Candidates were a little vague regarding the use of satellites to provide evidence for sea floor spreading. Some did mention that fixed points either side of the MOR were monitored using GPS. However, fewer candidates indicated that measurements need to be taken at different times to show an increased distance between these two points and so prove that the sea floor is spreading.

(b) The majority of candidates used the correct formula distance/time and so gained the mark. Approximately 50% of the candidates calculated the rate correctly; but many had the decimal point in the wrong place, giving the answer as 3.0 or 0.3. Candidates should know that sea floor spreading rates range from 1 to 12 cm/year and so their answer should be within that range.

(c) Most candidates knew that earthquakes only occur at plate margins or fault zones and knew that this area is away from such features resulting in rare earthquakes. A few stated that earthquakes were rare as the area is aseismic, which is not a correct answer to the question.

(d) Most candidates had an idea of at least one method of obtaining direct evidence for the structure and composition of the ocean crust, with most opting for ophiolites. Few candidates gained the second mark for extra detail making this a low scoring question. The best answers discussed both the structure and composition shown by the method, such as the layers of ooze/chert, basalt, dolerite and gabbro shown in a typical ophiolite suite.

Q4 Candidates continue to show that structural geology is becoming a strength, with a high average mark on this question.

(a) **(i)** It is clear that candidates are confident in the use of dip arrows on maps and so most identified the fold as being a synform or syncline.

(ii) The majority of candidates were aware that as the rocks are the right way up (as stated in the stem of the question) then the youngest rocks will be in the core of a synform (C) and the oldest will be on the outside (B).

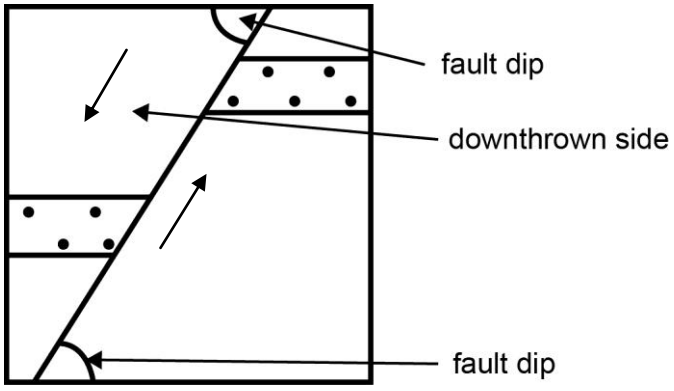
(b) **(i)** Candidates showed a clear understanding of the fold structures shown. The main difficulty was misidentifying E (the overfold) as a recumbent fold (F). Candidates need to remember that an overfold needs to have one overturned limb. F could be interpreted as a recumbent or isoclinal fold.

(ii) Nearly all candidates recognised that the interlimb angle of F was the smallest and so had experienced the highest compressive stress.

(iii) Candidates showed that they knew where the axial plane of a fold is, and most could draw them accurately. Fewer candidates were confident in locating the inverted limb. When labelling limbs, candidates should be encouraged to have a label arrow in the middle of the limb so that there is no ambiguity, or bracket the whole limb. A number of candidates had the label close to the hinge and so it is unclear what they were labelling.

(c) Most candidates know what a normal fault is; however, the quality of diagrams was variable. Candidates need to take time and care when drawing faults and should always:

- Label the fault
- Show the sense of movement with arrows
- Draw a marker bed to emphasise the sense of movement.



Most candidates located the downthrown side and many could label the angle of dip of the fault. This is a skill that has improved over recent years.

(d) **(i)** Most candidates know that slickensides are grooves or striations on a fault plane; however, the question asked for characteristics in the plural so more than one was required. Relatively few candidates could describe a second characteristic such as the striations being parallel to fault movement or with mineral growth along the slickensides. Careful reading of the question would have allowed many more candidates to gain the mark.

(ii) More candidates could explain how slickensides form as movement of the fault plane caused gouging/scratching to take place parallel to the direction of movement.

(e) **(i)** There were mixed responses to drawing the characteristics of a fault breccia. The two key components were that there was a fault zone drawn with angular fragments shown between the fault planes. Many candidates drew one of these but not both.

(ii) Many candidates knew that movement of the fault caused fracturing or breaking of the rocks to form the angular fragments. This was less well known than slickensides.

Q5 Candidates have a good general understanding of meteorite impacts and the properties of the lithosphere and asthenosphere.

(a) **(i)** Candidates had a vague idea what a meteorite is, but only a few gave a sufficiently precise definition to gain a mark: - a rocky body, from space, that has landed on the Earth's surface.

(ii) Candidates had an impressive knowledge of the evidence for meteorite impacts, most candidates knowing about craters, reversed strata, meteorite fragments or shocked quartz. The iridium layer and spherules were less frequently given in answers.

(b) **(i)** Most candidates knew that the lithosphere was solid although fewer gave a second property. Many knew it is the crust plus part of the mantle but they were unclear that it includes part of the upper mantle. A number of candidates knew that it is the lithosphere that forms the plates.

(ii) Candidates had a much better understanding of the asthenosphere than the lithosphere. Many knew that it is rheid and partly molten. Many also knew that it is made of peridotite.

(iii) Most candidates described the movement of convection currents in the asthenosphere as being the driving force that carried the lithospheric plates above.

Q6 The extended prose question provided a broad spread of marks with quite a few candidates gaining full marks.

It was clear that almost every candidate had at least a general understanding of the features to be found at a convergent plate margin involving oceanic and continental plates. Candidates had a particularly clear understanding of the subducting plate with the consequent earthquakes (Benioff zone) and partial melting. Most also could describe the rising magma and subsequent volcanic activity.

Diagrams were of a reasonable standard often having a large number of appropriate labels. The stronger candidates added extra detail about the nature of the volcanic activity, how fold mountains formed, folding, faulting and metamorphism. Only the strongest candidates discussed the types of folds, faults and metamorphism.

Candidates do need to know every plate margin type in some detail both in terms of the features that can be found there but also the various processes that occur. Types of folds, faults, forces involved, detail of the type of eruption and metamorphism in particular need to be looked at in more detail.

F792 Rocks – Processes and Products

General Comments

The paper proved accessible to most candidates with relatively few candidates leaving questions unanswered. There was no evidence that candidates did not have time to attempt all the questions. The paper as a whole proved very challenging to candidates and as a result the average mark is lower than in previous years. This was due to a combination of questions on topics that candidates find difficult/confusing. The most obvious example of this is question 7 where a large minority of candidates wrote about contact rather than regional metamorphism. Deposition in deep seas of both turbidites and oozes has always been a difficult topic. Candidates did very well on the topics that they enjoy, such as volcanoes and sandstones.

A major issue for some candidates is when descriptions are given rather than the explanation required. To access the highest marks, candidates need to ensure that they distinguish between *description* and *explanation* where a reason is given. Repeating information given in tables and diagrams within the question will not gain marks without using the data as part of an explanation or description. A description cannot be just one or two words and is normally a whole sentence. Where an answer of one or two words is required, the question command word is *identify* or *state*. Candidates need to read the question carefully and ensure their answer is relevant. Spelling remains an issue. Commonly used geological words were frequently spelt incorrectly; both difficult words such as *porphyritic* but also straightforward words such as *granite*.

It is important that candidates are encouraged to use appropriate terminology – crystal size or crystal grain size for igneous and metamorphic rocks rather than grain size is an obvious example. Confusion between rocks and minerals persists so that some candidates gave the name of a mineral when asked for a rock type. Diagrams were often poorly drawn and must be clearly labelled with lines that are linked to the correct area.

Comments on Individual Questions

Question 1

Candidates did very well on this question on sandstones with a high average mark, making it one of the easier questions on the paper. A large amount of information was given in the question - a table, bar charts, and a thin section diagram. Careful use of this data provided candidates with several of the answers. A good example of this is where in (a)(iii) the data for the reasons were all given in the table. Where the data provided was ignored, candidates were unable to score highly.

Q1

(a) (i) This was a well answered question with the vast majority of candidates correctly stating that quartz is the main mineral in sandstone. The most common incorrect responses were mica or sand.

(ii) Drawings of the grain shape were usually excellent, with clear single grains that accurately showed well rounded and sub rounded grains. A number of candidates did not read the instruction to draw a single grain and where many grains had been drawn, the variation in grain shape sometimes meant that marks could not be awarded. On some diagrams, there was little obvious difference between the well rounded and sub rounded grains drawn. Sub rounded grains cannot have angular edges.

(iii) The identification of the environments for each of the sandstones was well answered. The desert environment was the best identified. Shallow sea and fluvial environments were sometimes confused. The reason required sufficient information, using the technical terms, from the table, to identify the specific environment. Just the round

shape does not identify a specific environment, whereas well sorted and well rounded does identify a desert environment, and rounded and moderately sorted identifies the shallow sea. A small number of candidates incorrectly identified environments such as *glacial* that were not stated within the question which suggests that the stem of the question had not been read carefully.

(b) **(i)** The degree of sorting was well answered with the correct use of technical terms for sorting. An incorrect answer tended to be a description of the graphs or very general comments like "E is better sorted than D" which did not give sufficient detail or general statements of "good" and "bad" sorting. A minority of candidates interpreted an even distribution of grain sizes as being well sorted.

(ii) This proved to be an accessible question with most candidates able to correctly identify a possible environment of deposition. Few candidates, however, were able to justify their choice clearly, together with a diagnostic reason. The desert or aeolian environment was well known. Answers to the environment for D were less well known. The mark scheme allowed a wide range of environments and all variations - glacial, fluvial, alluvial fan and wadi were seen. The reasons for naming these environments sometimes lacked technical terms or detail, or simply repeated the previous answer on sorting.

(c) The description of arkose was challenging for many candidates mainly because of the lack of correct technical terms. The identification of the rock was varied, with answers ranging from a conglomerate to desert sandstone to greywacke and even a few igneous rocks. Much of the information required in the answers was available on the thin section drawing, but some candidates ignored the scale and the descriptive terms on the diagram. Using the scale would have excluded coarse-grained rocks such as breccia or conglomerate. Grain size either as arenaceous, or a specific measured size was quoted only by the strongest candidates. Candidates should be aware that grain size is based on the average for the rock rather than the maximum. A comprehensive description shows focus on the three Ss (size, shape, sorting) and two Cs (composition, colour).

Q2 This question on igneous rocks was divided into two parts, both in terms of the content and the difficulty. The first part focused on igneous classification and candidates found much of it quite difficult. Confusion between minerals and rocks, although clearly laid out in the table at the beginning of the question, reduced the marks for a number of candidates. The second part of the question on the differences between sills and lava flows was much better done with some excellent detailed responses.

(a) **(i)** The identification of the three igneous rock groups as mafic, silicic and intermediate was fairly well done. Most candidates were able to correctly identify G as silicic, however, the other the two rock groups was less accurate. A few candidates identified them as sedimentary or metamorphic or as igneous textures or minerals, indicating a weak understanding. The most common errors were identifying rock F as ultramafic and rock H as mafic.

(ii) Most candidates correctly identified the rock as basalt and some identified porphyritic texture. The term porphyritic was marked even if it had been used as part of the answer for part (iii). The spelling of porphyritic was varied with some spellings that were close to unrecognisable. The question stated the average crystal size was only 0.5mm but some candidates gave dolerite or even gabbro as their answer. A wide range of other igneous rocks was also given.

(iii) The explanation of porphyritic texture was very well done by a minority of candidates. Strong candidates were able to see the link between rate of cooling, crystal size, environment of formation and the order of crystallisation. Many candidates attained only one mark by referring to the two stages of cooling without the detail of each crystal size. Some answers ignored the fact that they had identified the rock as basalt, and did not link the cooling to a magma chamber for the phenocrysts and the surface for the groundmass.

(iv) The identification of granites as rock G was very good. A few answers named minerals or other igneous rocks that did not correspond to the identification of the rock group in part (i).

(v) Some good explanations of the composition of plagioclase feldspars linked to temperature or the continuous reaction series. Some answers did not refer to the difference in composition or explain the change in chemical composition between F and G. The question specifically referred to Bowen's Reaction Series, so answers that did not refer to the continuous reaction series or temperature did not score marks.

(b) Some of the drawings of amygdaloidal texture were of a high standard. Drawing of a single amygdale with crystals infilling would be better than drawings of many amygdales without any detail. The labelling was in some cases imprecise with *amygdale* rarely labelled. The vesicles are infilled by crystals often of calcite or quartz, but not sediment. A few drawings were incredibly detailed with large areas of crystalline groundmass drawn, which was not necessary.

(c) **(i)** Most candidates correctly identified J as a lava flow and K as a sill. A minority of candidates identified the features as a dyke and sill and a few identified them as igneous textures.

(ii) Many excellent answers attaining full marks that show a really good understanding of the differences between sills and lava flows. Some candidates however, missed the marks by not giving sufficient detail. The most common mistake was to state that there is only one baked margin without making it clear that it occurs below. Similarly listing that there are xenoliths or a reddened top contributes no additional information to what is shown on the diagram and therefore could not attain marks. The command word in the question is *describe,* so a *list* of vesicles, baked margin, xenoliths could not gain any marks.

(iii) Again many very good answers giving lots of detail. Where candidates had identified the feature as a dyke or referred to baked margins either side rather than top and bottom, marks were not awarded. A few candidates explained the origin of the xenoliths and discussed stoping and assimilation which went well beyond the required response.

Q3 Most candidates found this a straightforward question and there was a high average mark on this with the full range of marks seen. An entire question on weathering is unusual and perhaps because this has not been asked in this way before, there was some confusion between the types of physical weathering.

(a) **(i)** The definition of weathering was well known and precise definitions were commonly given. Some answers were definitions of erosion rather than weathering and a clear distinction between these two processes is essential.

(ii) The main weathering process affecting granite is hydrolysis and this was correctly given by a large number of candidates. The most common incorrect response was carbonation or even acid rain, neither of which is relevant to granite. The spelling of hydrolysis was varied.

(iii) The formation of clay was very poorly known. Few candidates were able to describe the breakdown of feldspars, the removal of the soluble elements, and the insoluble clay residue being left behind. Some candidates simply repeated the question. Others described how clay was deposited in low energy conditions rather than how it is produced by chemical weathering.

(iv) Many very good answers explaining why quartz does not weather. The high hardness of quartz and its chemically inert nature were well known. Few answers recognised and explained the importance of no cleavage planes. A few candidates considered quartz to be a rock rather than a mineral.

(b) The majority of candidates knew that because granite 2 has more joints it will be more susceptible to weathering. However the explanation was often weak, lacking a real understanding of how the joints provide a greater surface area of rocks to be weathered, or the deep penetration of water into the rock along joints allowing chemical weathering to take place.

(c) Most of the diagrams to show frost shattering were detailed and well labelled in a clear sequence. It is interesting that some candidates correctly explained this process in just two diagrams while others used as many as seven. Some drawings included unnecessary detail such as the Sun, clouds or thermometers. Similarly most candidates fully understood that when water in a joint or fracture freezes and forms ice, expansion takes place. However the third mark required an understanding of the repeated nature of both freezing and thawing and it was the melting of the ice and the contraction from ice to water that was frequently omitted. A number of candidates referred to frost shattering as occurring on a daily basis which is perhaps confused with exfoliation. Ice in a rock may remain frozen for weeks or even months over the winter in cold areas and fresh shattering takes place over very long periods of time.

(d) Descriptions of exfoliation were generally very good. The extreme temperature changes between day and night in places like deserts were well understood and the effect this has on the expansion and contraction of the outer part of the rock. Some candidates stated that cooling caused contraction perhaps getting confused with water freezing in frost shattering. The effect of the rock breaking up into thin layers parallel to the surface was less well described.

(e) Biological methods of weathering were very well known with many excellent answers.

Q4 *Volcanoes* is always a popular topic and this question was no exception. Candidates found it the easiest question on the paper with a high mean mark. The effects of volcanic activity on climate however, were far less well known than the characteristics of volcanoes. An explanation of the methods of predicting volcanic activity was poorly answered mainly because candidates described rather than explained the methods.

(a) Knowledge of the definitions of volcanic products was generally good. Tuff was very well known, and agglomerate common. The two types of lava pahoehoe and aa were often confused. Ignimbrite was not always known.

(b) **(i)** The identification of the types of volcano was generally very accurate with the majority of candidates understanding these diagrams very well.

(ii) The identification of both crater and vent was excellent. Care needs to be taken with the positioning of label lines. Where marks were lost, it was frequently due to the inaccuracy of the labelling, with the vent needing to be clearly the area below the surface.

(iii) Identification of the plate tectonic setting for these volcanoes was very good. Some candidates lost marks for volcano S by stating that it was found at a continental-continental plate margin where volcanoes are not found. A minority of candidates are using the terms *constructive* and *destructive* which were allowed, but are not used on this specification.

(iv) Many candidates had a good understanding of the relationship between the viscosity of lava and the shape of the volcano. A small minority of candidates had this relationship the wrong way round so that they wrote silicic volcanoes had shallow sides. The term *viscosity* was sometimes confused so that answers were the wrong way round. Viscosity can be illustrated with simple experiments for example comparing toothpaste which will not flow and runny honey which will flow slowly. A wide range of products can be used to illustrate viscosity.

(c) A few candidates wrote excellent answers full of detail of how ash enters the atmosphere, reflects sunlight and causes cooling. Other answers cited sulfur dioxide gas forming sulfate particles, and these aerosols reflecting the heat, again causing global cooling. Weak answers referred to pyroclasts rather than ash. Many candidates found it difficult to make the correct links between the products of volcanic activity i.e. the gases/ash and the effects of climatic warming or cooling. There is a lack of understanding of the difference between climate and weather. When ash blocks the sun making it dark, this is a short-term effect which lasts for just a few days or weeks so is weather, while climate is the average weather over a period of time in excess of 30 years. The impact of large quantities of carbon dioxide can cause global warming, so the impact of carbon dioxide needs to be treated separately from the impact of sulfur dioxide.

(d) **(i)** The command word of this question is *explain* and many candidates described the changes in gas emissions or ground level without the explanation. This question requires knowledge of the upward movement of magma in order to generate an increase in gases and/or the upward movement of the land. Confusion with earthquakes meant that some candidates wrote about radon gas. Very few candidates knew about the change in the ratio of carbon dioxide to sulfur dioxide as an alternative to the increase in gas emissions.

(ii) An explanation of the swelling of the volcano or a rise in ground level must be linked to the magma moving up, and this was omitted by many candidates.

(iii) This was a challenging question for many candidates as few knew the specific names of earthquakes or harmonic tremors. Some excellent answers gave the harmonic tremors linked to vibration of the magma in the vent to gain full marks. However some candidates wrote about seismic activity without naming specific earthquakes or long period earthquakes or earthquake swarms and did not link to how the magma caused this activity. Many candidates repeated the wording of the question of seismic activity without stating that earthquakes were caused by the magma moving up. Movement of the magma can cause fracturing of the rocks which in turn causes earthquakes.

Q5 This was the most challenging question of the short answer questions. Candidates find deep sea turbidity currents and the associated sedimentary structures difficult and it is one of the few sedimentary environments where it is difficult to show videos or many photographs of deposition in the environment. Turbidity currents do operate on a regular basis as seen by the impact on the Internet when submarine cables are cut but visual images of these events do not exist. Similarly the deposition of deep sea ooze is difficult to visualise, despite being well researched through the deep sea drilling project.

(a) **(i)** The description of a turbidity current was often known with some very good answers that referred to the sediments that flow down the continental slope. Where the currents were described as being only of water, marks could not be awarded - incorrect responses generally failed to refer to sediment and the continental slope.

(ii) The calculations were generally correct, although answers needed to be given to 2 decimal places to match the data in the table.

(iii) This calculation was less well done with candidates finding it difficult to determine how to carry it out. Some candidates carried out additional unnecessary steps involving calculation of distance or velocity from the previous cable.

(iv) Some excellent explanations of the current slowing as the gradients change from the continental slope to the abyssal plain. Many candidates explained the reduction in velocity with distance from the epicentre. Some candidates *described* without giving an *explanation*, or failed to mention that velocity had decreased so were unable to gain full marks.

(b) **(i)** Many candidates clearly bracketed the turbidity current deposit on the diagram. A number of candidates appear to have missed this part question giving no response at all. Incorrect responses often included the shale as part of the turbidity current sequence. The shale is laid down on the abyssal plain by normal sedimentation and not the turbidity current.

(ii) The identification of the greywacke was varied. The most common incorrect response was *breccia* but the scale on the diagram clearly shows that the grain size is arenaceous. Greywacke is defined by the clay matrix and the presence of rock fragments, few answers gave sufficient detail to identify the rock as a greywacke.

(iii) Graded bedding was very well identified by the majority of candidates. However the explanation sometimes lacked the correct terms or described the sequence as a fining up sequence which is a term used to describe the sequence of beds rather than the structure within one bed.

(iv) This was a challenging question for most candidates who struggled to include the correct energy levels and matching rock type. A significant number of candidates gained a mark from providing a general statement about energy levels. This question required information on both energy levels and rock type and few candidates were able to gain full marks. However many answers correctly described the turbidity currents as high energy forming the greywacke and the shale deposition occurring in low energy conditions.

(v) A minority of candidates produced good drawings that clearly show the direction of currents and the shape of the flute casts. Diagrams could be drawn as a plan view showing the "U" shape or as a cross-section showing a hollow with a steeper side and a shallow side. Candidates must be aware of the correct current direction in relation to the flute casts. The idea of the turbidity current scouring out the pre-existing sediments in order to form hollows, which are then infilled by later sediments deposited from the turbidity current, is poorly known. Confusions occur where candidates believe that a rock creates the hollow or with the idea of potholes in rivers. Some candidates confused flute casts with tool marks and therefore wrote and drew individual rocks creating a hollow.

(c) **(i)** A minority of candidates knew about this topic of deep sea ooze. The idea of dead organisms falling to the sea floor from the surface layers of the ocean to make the ooze, requires the organisms to be described as plankton or small organisms or specific named organisms such as a foraminifera or diatoms. Large marine organisms such as fish or whales will die and sink to the sea floor but their skeletons do not make deep sea ooze.

(ii) The rate of the accumulation of oozes was not well known, with a number of candidates not suggesting a value as asked for in the question, but simply stating that the rate was slow. A wide range of values was accepted but many candidates were outside of the range by a factor of 1000. Some candidates made no response to this question.

Q6 There were a number of excellent full mark answers that were very well organised and clearly distinguished between the three rock groups. Most candidates structured answers by dividing them into igneous, sedimentary and metamorphic and showed a very good knowledge of the different rock groups. A minority of candidates structured their answers very differently, though equally well, by describing each of the characteristics such as mineral composition, crystal /grain, or presence of foliation for each of the rock groups. Good answers could be relatively concise if they focused on descriptions of distinguishing features. As written communication is being assessed in this question, it is inappropriate to make use of tables or lists at the expense of continuous prose. Some candidates' lack of specialist technical terms and ability to distinguish between characteristics, limited their marks on this question.

A number of candidates started the answer with drawings or a description of the rock cycle which was not needed for this answer. Others described the origin of each of the three groups of rock which was again not relevant. Others went into detailed descriptions of the classification of igneous or sedimentary rocks, which could not gain marks. Descriptions of grain sizes were common but as all three groups of rocks have all sizes of grains / crystals this cannot be used to distinguish between them.

The most common omissions were:

- A failure to include diagnostic minerals for each of the rock groups, particularly for sedimentary rocks.
- Confusion between rocks and minerals shown by statements like "In igneous rocks like olivine and granite…"
- Relict fossils and bedding can be seen in some metamorphic rocks.

Q7 Regional metamorphism is regarded as a difficult topic by many candidates and this proved to be the most challenging question on the paper. Where candidates knew this topic on regional metamorphism, answers tended to be excellent and very high-scoring. The best answers displayed a thorough understanding of regional metamorphism and included detailed descriptions of the rocks produced with their mineralogy and textures.

A large minority of candidates confused regional metamorphism with contact metamorphism which meant that few marks could be gained. Some candidates wrote about contact metamorphism in the metamorphic aureole but named the rocks as slate, schist and gneiss. Others wrote about all types of metamorphism with some confusion between contact and regional. Some candidates who did write about regional metamorphism ignored the word *shale* in the question and wasted time and effort in describing marble and metaquartzite.

Each metamorphic grade needed to be clearly stated for the correct range of temperatures and pressures. Many answers lacked detail on the specifics of regional metamorphism which should include knowledge of the index minerals for each grade of metamorphism. Some candidates used helpful pressure/temperature diagrams to illustrate their answer, although axes needed to be labelled, and some then repeated the content of the diagram in the text. A few candidates drew the pressure/temperature diagram for the polymorph index minerals.

As this is an extended prose answer that asks for descriptions, it required more than just a statement such as, slate shows slaty cleavage or schist shows schistosity. The best description of texture was generally gneissose banding where the light and dark bands were described. Some candidates were able to gain an additional mark by naming the minerals in each of the bands - dark bands rich in biotite and light bands rich in quartz and feldspars. Each texture needed to have a one sentence description, or possibly a labelled diagram though this was not required. There is some confusion between flow banding in igneous rocks and gneissose banding in metamorphic rocks.

F793 Practical Skills in Geology 1

General Comments

The general standard of work submitted this year was as good as or better than previous years, with some excellent responses seen by Moderators. Candidates demonstrated excellent subject knowledge and were able to express themselves clearly and concisely using a sound range of geological terminology. The tasks which had been used last year were particularly popular and candidates had clearly been well prepared for the tasks. Some issues remain with poor photograph and sketch labelling and associated over generous marking.

The Moderating team in general found that the Centre-based Tasks CB2 and CB3 were more popular than the new task CB1.The Centre-based Tasks remain more popular than the alternative fieldwork and there were fewer centres submitting fieldwork this year.

Clerical Issues

A small number of centres are still sending all their tasks, not just the best mark for the Centre-based or fieldwork and evaluative tasks which Moderators then have to find. In a few instances, Moderators were asked to select from two CB or Eval tasks with the same mark. It is not the Moderator's role to select the make-up of the sample. Centres submitting samples which do not follow guidelines in this way will have them returned for correct resubmission. 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.

Whilst administration was again completed to a high standard by most centres, clerical errors were common. 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 correct mark is clearly shown and is recognisable on the script, and that the correct total is shown. In a few cases, internal moderation had been carried out and marks had been changed on the script but totals had not been amended. Most centres included an Authentication form; in a very small number of cases this was not sent and had to be requested, again resulting in a delay in moderation.

Marking Issues

Clear annotation of candidates' work and a clear indication of where marks are being awarded is now the norm for most centres. This enabled Moderators to follow the centre's marking. 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.

A small number of centres are still not taking note of the additional guidance about what precisely is required in candidate answers. This can lead to over marking on some part questions. 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 remain the area which caused Moderators the most problems. Moderators saw some very good examples of high standard work, with supporting annotation and thorough marking clearly linked to mark schemes. It is vital that marks are clearly linked to the mark scheme and ideally follow the sequence in the scheme. Some centres are still 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.

Comments on the Centre-based Tasks

Centres are reminded that 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 additional problems occur, teachers are encouraged to provide additional information to support the marks given or sign to verify they were carried out correctly. 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 new task and was slightly less popular than the other two. Most centres supplied trial data. The practical element provided few problems. There was an error on the map resource for Q3 in the original upload on Interchange which was subsequently identified and corrected. Centres should always check on Interchange to ensure that they use the most up to date version of the task. In some instances, centres did not always follow the additional guidance in the mark scheme and sketches were overmarked.

CB2; This task was popular and generally done well. Teachers are reminded to check for errors in calculating percentages and to supply data on sediment properties. The inclusion of a photo of the sediment sample used by a centre would be useful as part of the trial data .In Q3, a small number of candidates did not read the question stem and neglected to *label* a feature on the photograph. Some ignored the reference to fault planes and referred to cleavage and so lost the mark although they correctly identified the feature. The sketch in Q4 was over marked by some centres.

CB3; There were a few reported issues with the practical task and in obtaining consistent data – teacher comments and data were essential here. Some problems with initial settling were reported but the practical was generally done well and provided candidates of all abilities the opportunity to write good responses. *Describing* a texture requires accurate measurements of crystal or grain sizes while *explaining* it refers to how it formed.

Field work

This element was submitted by slightly fewer centres this year. Moderators saw some very good fieldwork, including graphic logs and sketches. As in the previous year, the fieldwork tasks caused the Moderators the biggest problems. There remain 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. Centres are reminded again that this must be work carried out in the field and then collected in immediately. There can be no alterations or additions to work on returning to the centre. Fieldwork must be carried out in the same way as the comparable Centre-based tasks.

OCR are now reviewing all fieldwork tasks before putting them on Interchange and information is being sent to centres with the returned samples. Any centre wishing to carry out a fieldwork task should read these carefully.

The main issues remain :-
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. Whilst other centres were correctly producing large data sets for maximum marks. Rock type description should include reference to grain / crystal size, shape, sorting, identifiable minerals/fragments, 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. The marks awarded for individual elements of the task should not be indicated on any sheet or booklet. General headings and frames for sketches and logs are only acceptable at AS level. In a few cases, candidates were still being told what to write e.g. 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.

The best assessment practice by centres was where the marks on the candidates' work could be clearly matched to specific marking points on the mark schemes. This year some centres also submitted photos of exposures which were being studied which greatly assisted moderation.

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. The photo was often poorly labelled and weaker answers often used grain size/shape as evidence when it could not be seen in the photo. The stratigraphic log was often drawn well – candidates are clearly being well prepared in this skill. Despite the information provided, many responses failed to explain the significance of the siltstone as a seat earth or describe all the elements of the deltaic sequence. 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 although some elements on mid-ocean ridges caused a few problems. The sketch element was sometimes over marked otherwise it was generally well marked with few problems. Many candidates were able to write good, detailed responses on this task

ET 3; This task 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 e.g, amplitude, wavelength. These responses often lacked the detail that a comparable answer on F791 would require. Moderators again found 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. In some instances, centres did not always follow the additional guidance in the mark scheme and sketches were over marked.

F794 Environmental Geology

General Comments

Most candidates were able to demonstrate knowledge and understanding of the key ideas and concepts of the Environmental Geology unit. Candidates who could apply their knowledge and understanding of the unit content to unfamiliar situations scored highly, as did those having a sound grasp of the synoptic content from AS-level.

To improve their answers, some candidates need to ensure that they distinguish between the command words *state* and *describe* and between *describe* and *explain*. There is some evidence that candidates are limiting their responses to some questions because they are making incorrect assumptions about how the marks will be awarded. For example, where questions ask for both description and explanation, marks may be allocated either separately for description and explanation or each marking point may require both a description and a linked explanation.

A small number of scripts were difficult to decipher due to poor handwriting and candidates should pay particular attention to writing clear answers to the questions that test the quality of written communication and spelling. Some candidates struggled to complete the final extended question on springs within the allotted time.

Comments on Individual Questions

Q1 The requirements for the accumulation of oil in reservoir rocks were well known, but candidates found the parts of the question dealing with oil exploration and blowouts more difficult. Some candidates struggled to use appropriate scientific terminology when describing the environmental consequences of offshore oil spills.

(a) **(i)** The properties of sandstone that make it a suitable reservoir rock for oil were well known. The vast majority of candidates did take note of the command word *describe* and candidates who merely stated porous and permeable were in the minority. Some candidates continue to use the terms *porosity* and *permeability* as if they are synonymous and not all candidates gave precise descriptions of porosity in relation to oil storage or permeability in relation to oil movement.

(ii) The technical term *impermeable* or *impermeability* was well known. Most answers were spelled correctly, but illegible answers were not given the benefit of the doubt.

(iii) The use of gravity surveys to locate evaporite cap rocks and salt dome traps was not as well known and there was confusion with magnetic and seismic surveys. Some candidates digressed and gave descriptions of how gravity surveys are carried out which did not answer the question, while others referred to low gravity readings rather than using the technical term *negative gravity anomaly*. Only the best answers related the results of gravity surveys to the low density of evaporites compared to other rocks or stated the density of evaporites as 2.2-2.3 g/cm^3.

(b) **(i)** Many candidates were able to correctly describe a blowout but some failed to appreciate that oil always rises to the surface when a production well is drilled and didn't clearly convey the idea of an uncontrolled gush. A blowout is not an explosion - which occurs when the oil and gases that have gushed to the surface then ignite. Explanations were variable in quality – not all candidates understood the origin of the high pressure and some of the explanations relating to failure of the cement lining or well cap were vague and confused.

(ii) The vast majority of candidates were able to correctly calculate the amount of oil spilled.

(iii) Fewer candidates could correctly calculate the percentage of oil captured by containment methods and some failed to give their answer correct to one decimal place as specified in the question.

(c) Although most candidates were aware of the environmental consequences of an offshore oil spill, many answers failed to include appropriate scientific terminology thus limiting the marks awarded. Some candidates did not distinguish between the problems related to the light and heavy fractions of oil. While candidates stated oil would be washed ashore, some did not describe the environmental effects of this. Others stated the light fraction would catch fire, but did not describe atmospheric pollution as the environmental consequence. Answers that referred to the effects on marine ecosystems could have been improved by including more specific information, such as the light fraction floating on the surface being harmful to birds, marine mammals or plankton, or the heavy fraction causing the oiling of birds, harming fish or sinking to the seabed and smothering benthonic organisms.

Q2 Candidates with good synoptic knowledge scored highly on the parts of this question requiring rock identification and assessment of rock properties for economic uses. Some candidates could improve their answers by ensuring they give full explanations when required.

(a) **(i)** Candidates who correctly identified all three rocks were in the minority, but most were able to get at least one correct. Slate was best known, granite was the most common incorrect answer given for dolerite, and many omitted oolitic (or equivalent) when identifying the limestone. This synoptic question used thin section diagrams similar to those used for F792 but candidates found it challenging to recall the detail on rock types.

(ii) This question relating the properties of the rocks to their uses proved to be a good discriminator. The question clearly required candidates to assess the properties of the rocks shown in the thin section diagram and not all the uses suggested by candidates were applicable to these rocks. Those that considered the specific rocks given rather than reciting general properties required for particular uses were most successful. A significant number of candidates hedged their bets by listing a number of possible uses – in which case only the first use given was considered. Candidates who assumed one mark was for the rock use and one for a reason lost marks as the question paper clearly stated reasons – marks were awarded for each correct reason to match the correct stated use. The properties required for building stone and roadstone were well known, but cement less so. Many erroneously stated oolitic limestone would be hard or impermeable or resistant to chemical weathering.

(iii) There were some excellent answers to this question asking why slate is suitable for roof tiles, but many candidates could have improved their answers by ensuring they linked description of a correct characteristic of slate to an explanation of why it would be suitable. For example, slate is impermeable was not sufficient to gain a mark, but slate is impermeable so is waterproof was.

(b) **(i)** The method of extracting of industrial rocks and minerals by quarrying was well known but some candidates' answers would have benefitted from the inclusion of technical terms such as the use of dragline excavators or dump trucks or benches cut for stability. Not all candidates showed a clear understanding of the use of blasting to break up rocks.

(ii) Most candidates were able to correctly name a loose, unconsolidated geological material that could be extracted by dredging.

(c) The factors affecting land slips were well known but some candidates limited their marks by stating factors without giving explanations. Not all candidates were able to give a clear description of the direction of dip of beds "into a valley" and many failed to go on to explain that this situation would increase the likelihood of landslips. Water in rock was a well known factor, but candidates often failed to include geological explanations of rock permeability or the effect of the water adding weight to rocks or acting as a lubricant along bedding planes. A number of candidates erroneously referred to non geological factors such as slope angle, rainfall, removal of vegetation and human activity, while others assumed the slope was in a road cutting.

Q3 The quality of responses to this question on metallic mineral deposits was variable and some candidates continue to find this section of the specification challenging. The geological requirements for an underground repository for nuclear waste disposal were well known in general but not all candidates were able to apply their general knowledge to the specific situation of granite and others did not include an evaluation.

(a) The correct definition of a gangue mineral was known by virtually all candidates. However, those that gave the correct definition of an ore mineral were in the minority, with many giving the definition of a resource – a material that is economically feasible to extract or that can be extracted at a profit – without specifically referring to a mineral that contains valuable metal(s).

(b) Most candidates attained some credit for their answer to this question on the formation of ore deposits of iron by gravity settling, but many lost the explanation marks. For example, those who discussed low viscosity magma needed to add an explanation that this facilitates gravity settling. Few candidates knew the correct spelling of cumulate. Answers that referred to gravity settling of iron rather than magnetite or iron ore were limited to a maximum of 2 marks. A small number of candidates confused gravity settling with hydrothermal ore deposits and referred to the solubility of iron, while others confused gravity settling with placer deposits and referred to deposition of iron minerals due to high density.

(c) **(i)** Just over half the candidates were able to correctly label an area where the grade of copper ore would be < 0.5% copper and an area where it would be > 0.5% copper. A significant number mixed up the < (less than) and > (greater than) symbols. Some were not precise enough with where they put their "marks". Those who put the < 0.5% copper at the base of the vein no doubt knew that there was no enrichment there, but forgot that the primary ore grade was 0.5% copper.

(ii) The process of secondary enrichment of copper was well known. There were many excellent answers that fully described the changes in conditions from oxidising above to reducing below the water table with an impressive knowledge of soluble "ates" above and insoluble "ides" below, with only a minority getting them the wrong way round. However, not all candidates applied their knowledge of secondary enrichment to this specific question about oxidation and reduction. The use of correct technical terms such as the precipitation of copper rather than the deposition of copper should be encouraged.

(d) Again there were some excellent responses to this question asking for a description and explanation of how uranium deposits form in sandstones, but a number of candidates gave no response at all and this question had the highest omission rate on the paper. A common error was to omit the requirement for oxidising conditions when stating that uranium is very soluble and many answers did not refer to the dissolving or leaching of uranium from rocks. Incorrect use of the terms porosity rather than permeability of sandstones and of deposition rather than precipitation of uranium was also prevalent in some answers.

(e) **(i)** Despite the prompt that the source of energy is uranium, less than half of the candidates gave a correct response to this question asking why nuclear energy is non-renewable. Many answers were very simplistic, stating it can only be used once, while others gave a definition of unsustainable rather than non-renewable. As expected, candidates found this stretch and challenge question demanding.

(ii) Although the geological requirements for an underground repository for nuclear waste disposal were well known, only the strongest candidates applied their knowledge to the specific situation of storage in granite. Not many answers gave a clear evaluation. To attain the marks, each marking point needed to describe a correct characteristic of granite and explain why this would make granite suitable or unsuitable. Characteristics such as "granite is strong" or "radioactive" were often stated without any discussion of the significance of the characteristic in relation to nuclear waste disposal.

Q4 Coal proved to be a well known area of the specification but some candidates struggled with the synoptic parts of the question. The stretch and challenge parts of the question about coalfields proved to be good discriminators.

(a) Most candidates were well versed in the characteristics of the different ranks of coal and scored highly on this question. There were some guesses for the colour of lignite such as grey and black/brown, while others thought anthracite was dull or "dull and shiny".

(b) **(i)** The majority of candidates were able to plot correct line graphs to show the changes in carbon content and total volatile content of the different ranks of carbonaceous deposits. Most graphs were drawn neatly and accurately with only a few candidates making careless plotting errors. The most common mistakes were to draw 3 separate lines for the volatile content and other candidates ignored the requirement to draw lines and drew bar charts instead.

(ii) The diagenetic processes responsible for the changes in composition from peat to anthracite were well known, but some candidates limited their marks by not giving both a description and an explanation of the processes. Others did not give full descriptions and only described the loss of volatiles or the increase in carbon content, not both.

(c) **(i)** Candidates struggled to explain the difference between an exposed and a concealed coalfield. Most incorrect answers described depth/proximity to the surface and whether open cast or underground mining would be used. Only the best answers showed a clear understanding of the term coalfield and many merely referred to the coal or a coal seam being at the surface or below ground, rather than the Coal Measures or coal-bearing strata. Many answers would be improved with the inclusion of technical terms such as outcrop or overburden or cover rocks.

(ii) The term *cyclothem* for repeated sedimentary sequences was well known and usually spelled correctly.

(iii) This stretch and challenge question on the broad structure of the South Wales coalfield had the lowest average mark for the entire paper, although most candidates did attempt an answer. The key to the map clearly shows the ages of the rocks so that interpretation of the synclinal structure could be based on the data provided rather than recall. The most common incorrect responses were sketches of a map view repeating the map given in the question or units of rocks drawn vertically. Those candidates that drew the correct synclinal structure could have improved their answer by labelling it, and not all candidates labelled the correct vertical succession using unit names or rock symbols taken from the map. A few candidates labelled a syncline but drew an anticline and this shows a lack of synoptic knowledge.

(iv) Most candidates were able to draw a reasonable diagram of a fault displacing a coal seam, but almost half drew a normal rather than a reverse fault. In many cases candidates lost marks due to nonexistent or poor labelling – labels showing both the fault type (arrows showing correct movement were sufficient) and how it causes disruption to coal production (coal seam displaced was sufficient) were required to gain the marks.

Q5 This extended prose question on the geological conditions leading to the formation of springs as a result of lithology, faults and unconformities proved to be a good discriminator and produced the full range of responses. It should be noted that although diagrams were an essential component of the required answer, it was essential that answers would contain some continuous prose to satisfy the describe part of the question. Few candidates attained the general mark for describing that groundwater flows in response to pressure or springs require high hydrostatic pressure.

While there were some excellent, accurate, fully labelled diagrams that easily attained both the diagram and description mark for each geological situation, other diagrams were very untidy, inaccurate, with poor or no labels and were not worthy of any credit at all. Common errors were:

- drawing the water table horizontal, sloping downwards away from the spring or cutting through impermeable rocks.
- not labelling the permeable and impermeable rocks (the terms aquifer, aquiclude, any correct named rock type, any correct rock symbol were allowed as alternatives to permeable and impermeable).
- not labelling the spring correctly where the water table intersects the surface or not drawing the water table intersecting the surface at the boundary between the permeable and impermeable rocks types.
- not showing the land surface clearly or showing it as flat.

Common errors in the descriptions were:

- unconformity described as an intrusion particularly by less able candidates.
- rocks described as cap rock or reservoir rock, which are oil and gas terms rather than water where the term *aquifer* is used.

The fault scenario caused most problems. Some candidates stated the water table was faulted; others drew a fault but did not label an outcrop of permeable rock on one side and impermeable rock on the other; and quite a few responses showed water flowing up the fault.

F795 Evolution of Life, Earth and Climate

General Comments

Candidates found this paper challenging and the mean mark is lower than in previous years, but the paper differentiated well. Additional sheets were commonly used in this examination to extend individual part questions and there was no evidence that time was an issue as virtually all candidates attempted both extended questions on trilobites and dinosaurs. The paper provided a good opportunity for candidates to demonstrate their knowledge and, more importantly, understanding.

The mark scheme was constructed so that technical terms were integral and links needed to be made between descriptions and explanations for maximum marks. General answers that lacked any specificity were only awarded marks for the answers which were aimed at the lowest grades.

Question 6, the extended answer on trilobites, historically has been answered very well, with many candidates gaining full marks. The change in the mark scheme to explicitly link morphological function with descriptions and explanations, and not awarding general points, resulted in lower marks.

Although question 7 was often brief, it appeared to be the result of a lack of knowledge rather than time. There has never been a long answer question set on dinosaurs in the past, and the detail required seemed only accessible to the most able.

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 features were required, they may have only labelled one.

The synoptic assessment was embedded into the questions. This was designed to test the candidates' understanding and enable them to make links between the AS and A2 content. Although these questions differentiated well, they were generally poorly done, suggesting insufficient examination preparation or a lack of understanding of the synoptic elements

Comments on Individual Questions

Q1 Most candidates showed a reasonable understanding of the classification elements and good understanding of major and minor group functional morphology in this question. There was good differentiation between candidates, and this was one of the easiest questions on the paper with many high marks.

(a) **(i)** Both the phylum and group were required for each mark. Surprisingly there were many candidates unsure of the phylum for trilobites and also certain that Mollusca could not appear twice and so were forced to make up a new phylum for the ammonite. Cephalopod was a common mistake whilst others chose brachiopod.

(ii) Trilobite morphology was well known by almost all candidates. Few candidates incorrectly suggested that the eyes were antennae. There was some uncertainty over the ammonite features, which were mistaken for growth lines or septa although most candidates could label the protoconch.

(iii) Most candidates knew very well which features helped a nektonic trilobite fossil A to swim and were able to explain how that feature functioned. Fossils B and C included many references to soft parts and their uses in a nektonic lifestyle, but these were sometimes not linked to the fossil hard parts. The term

'morphological features' should be taken to apply only to fossilised hard parts. For example in B, the adductor muscle used in rapid closure of the valves is **not** a feature but the scar it left on the valves is. Similarly, answers involving the funnel and tentacles of C could not be given credit.

(iv) This question was poorly answered. Many incorrectly stated that C had a longer stratigraphic range, was better preserved, or was more numerous in life. These candidates missed the point that fossil C, the ammonite, was able to move about the open ocean and could therefore die over, and be preserved in, a greater variety of environments than those restricted to life in the shallow shelf seas.

(v) This was predominantly answered correctly, with a few candidates incorrectly stating chitin or calcium phosphate or even just calcium.

(vi) This part was not well answered with many general and brief statements such as 'replacement'. A large number of candidates assumed this was the change of aragonite to calcite which does not change the composition.

(b) **(i)** The labelled diagrams of an Ordovician graptolite were mostly of poor quality and were not awarded this diagram mark. There were some good diagrams of Monograptus but this is not typically Ordovician. Candidates should be made aware that the 'stick' diagram of graptolites makes it difficult to label and loses them chances of showing their knowledge. For example, poor diagrams cannot show the aperture or the difference between sicula and nema. Incorrect diagrams of other genera were drawn, including trilobites and gastropods.

(ii) The differences between Ordovician and Silurian graptolites were well known and clear comparative responses were in the majority. Some candidates did not give a comparative answer, as the question required, so gained no marks.

(iii) There were many excellent answers giving evidence for a planktonic mode of life in graptolites. Some suggested that a wide distribution implied a planktonic lifestyle, but this could have equally meant a nektonic mode of life.

Q2 This question on brachiopods and bivalves differentiated relatively well, with the majority of candidates gaining over half marks and some full marks.

(a) This part question differentiated well, with just occasional uncertainties remaining in particular with brachiopods. Bivalve morphology was obviously well known and understood. Gills caused some confusion, and were assigned to both or none in some instances. Leaving blanks instead of crosses, as asked, resulted in loss of marks. Occasionally there were crosses and ticks in the same box.

(b) Most candidates answered this question well; they found ways to compare the symmetry of the two organisms and often illustrated them clearly (note that lines of symmetry should also be labelled). Some candidates misunderstood the question or omitted the answer on equivalve or inequivalve. A number guessed at relative sizes of bivalves and brachiopods.

(c) **(i)** This was a stretching question, aimed at the strongest students and as a result detailed answers were required to gain marks. However those who answered showed a much improved understanding of the feeding mechanism in brachiopods and many were able to gain one mark with a mention of lophophore and some description of the cilia and how they function. The mechanics of the process proved harder to explain and candidates generally lost the second mark for the explanation. Only a few mentioned the brachidium for the lophophore support. Some confused the feeding mechanisms of brachiopods and bivalves, gaining no credit.

(ii) Most candidates were able to recall that a foot was involved in burrowing although it should be referred to as the 'muscular foot'. Comparatively few knew how the foot functioned in creating a burrow. Incorrect answers included the opening and closing of the valves to dig the burrow or siphons digging the burrow. There should be a greater depth of knowledge for an A2 answer and many answers were too general.

(iii) A good number of candidates successfully responded in terms of sediment exclusion; fewer attempted to explain the increase in surface area for valve separation. Some candidates assumed that this part of the question still referred to bivalves, a caution to read the question carefully.

(d) The question on bivalve and brachiopod attachment asked for a discussion, implying that some details of form and function were expected. Without such detail, only the first mark was available. There were some excellent answers that described the makeup of the attachments and their responses to different energy in the environment. Some candidates described the pedicle as a 'pedicle foramen', or used the term pedicle and pedicle foramen interchangeably showing little understanding. Incorrect answers for attachment were siphons or cement.

Q3 Candidates generally found this question one of the most difficult although it differentiated relatively well and some candidates gained full marks. Corals is one of the less popular fossil groups but this question produced some good answers. The synoptic content on sedimentary environments was less well known.

(a) **(i)** Many candidates correctly spelled the technical term *Cnidaria*, which was impressive. Incorrect spellings were credited where the word was recognisable. Some incorrect answers included Anthozoa, *Arthropleura* and Echinodermata, and a few made up their own phyla, such as coralapoda. .

(ii) Most candidates correctly identified the scleractinian coral from the arrangement of the septa.

(iii) Most candidates also knew what the septum was and what function it fulfilled. There is a tendency to guess that *all* features of the skeleton have a strengthening function and in this instance it was correct. A few candidates described this function in some detail, but omitted the term 'septum' or 'septa' from the answer. A few candidates incorrectly described dissepiments.

(b) **(i)** This question was not generally well answered and the majority of candidates gained only one mark out of the possible three. In particular, the second part of the question asks for reasons, which were often omitted. It should be made clear that, at this level, some demonstration of a clear understanding is expected and marks are not awarded for general comments. It should also be apparent that stating the latitudes of vigorous coral growth is not an environmental condition. Many lower scoring answers did not make clear that it was *not* the polyps that were in need of light to photosynthesise. Some higher level answers still failed to explain why waters should be oxygenated. Poorer incorrect answers described the coral as plants or that corals needed light for respiration.

(ii) Many better answers described or named uniformitarianism, or described the similarity in morphologies. A number of candidates were confused by the question and answered in terms of the rock types and latitudes in which the fossils and their modern equivalents are found. The question as to whether ancient corals depended on symbiosis was rarely raised.

(c) **(i)** Many candidates showed a good understanding of the processes involved in creating an atoll – impressive, as this has not been asked before. There were some excellent diagrams from many students. There was a requirement to draw annotated diagrams to illustrate the description and those who missed this opportunity could not gain maximum marks. Many candidates did not grasp that

the atoll depends on the volcanic island sinking and therefore is restricted to formation over a hotspot. References to erosion confirmed this misunderstanding. Some candidates did not mention volcanoes at all. Stronger candidates knew the difference between fringing and barrier reef formation.

(ii) The answers here were extremely varied and many failed to select an 'ex hot spot' position for their atolls. The Great Barrier Reef was a common incorrect answer.

(d) **(i)** This question on fossil assemblages contained synoptic content about the understanding of environments, and was variably answered, although almost all candidates gave the idea of high energy. Many were able to explain the energy levels, citing good reasons, whilst others gave the reason for high energy simply by shells being thick, without further explanation. Some candidates omitted the depth of water and did not provide the evidence for shallow waters. Some candidates described waves in the open seas damaging organisms.

(ii) This question on lithological differences was designed to stretch candidates and was very poorly answered. The question asks what a geologist would look for in the field, which may be unfamiliar to some candidates. Candidates should also be expecting a synoptic element to the A2 exams and yet there were very few who could write sensibly on the rock types and characteristics associated with high energy environments. Many gave general answers and gained no credit. Examples included references to fine grained sediments. Very few managed to link a high energy rock type and the required explanation of its formation. More than three quarters of the candidates did not score any marks for this part question.

(iii) This should have been a straightforward calculation but either the term *benthonic* was not properly understood, or the addition of several numbers was a problem. In some cases the writing was so poor as to be difficult to distinguish a 9 from a 4.

(iv) This question was well answered with most candidates giving relevant details in their explanation of *why* low energy environments preserved whole fossils.

Q4 This question on echinoids and crinoids was one of the easiest questions with candidates gaining marks up to the maximum of 15. There is very good knowledge of this phylum. Knowledge of correlation methods for part (c) was weak.

(a) **(i)** Most candidates were successful in answering this question. Some had difficulties with spines for defence which are not useful in the irregular echinoid but otherwise there was evidence of a good knowledge of the morphology of the echinoids.

(ii) There were many excellent explanations of the function of the plastron including that the short spines were used in digging and movement in the subsurface. A large number of candidates failed to explain the function of the pore pairs opting instead to give interesting details on the functions of the tube feet. There are still some candidates unable to distinguish between tube feet and tubercles and some thought that only regular echinoids had tube feet.

(iii) A well-answered question.

(b) **(i)** Almost all candidates were able to label the crinoid morphology successfully. It would be better to encourage labelled brackets for large features such as the calyx rather than points on the fossil, but full marks were given for points on this occasion.

(ii) Almost all candidates were able to indicate the position of an ossicle; but a few did not follow the instruction to shade and label.

(iii) There were many very good answers to the morphological similarities between the two organisms, mostly mentioning 5-fold symmetry or being composed of calcite plates.

(iv) Most candidates were able to explain that the soft connective tissues broke down or decayed after death of the organism. The term 'dissolved' should be avoided in this context.

(c) **(i)** This part question was poorly answered by many candidates although most appreciated that beds had to be matched up. Some used the terms *zone fossil* or *biostratigraphy*, but these were generally not well explained.

(ii) There were very few acceptable answers to this question. A number of candidates described the formation and nature of varves and described counting them to work out the age in years. Questions on varves have been asked before, but not in this context. Candidates appeared to write everything they knew, rather than answer the question, with only a few explaining how the pattern of relative thicknesses could be used in correlation.

Q5 This question differentiated well, with candidates able to access the whole range of marks. The northward drift section was weak, while fossil time ranges were excellent and ammonites intermediate.

(a) **(i)** It was clear that most candidates are unfamiliar with the geological history of the British Isles. The most certain knowledge was of the Carboniferous, presumably because of the coal-bearing deltas. Some knew that the Permian involved desert conditions but few did more than guess at the Cretaceous and Jurassic. A background understanding of the stratigraphy would form an invaluable structure on which to base the changes that have occurred in the geological history of the UK.

(ii) There was a general understanding of the proof of northward drift that rock types provided, but answers lacked any detail of these environments and in some cases 'rocks' were not stated, just environments.

(b) **(i)** Nearly all candidates were able to interpret the graph and answer this question correctly.

(ii) There were very good answers to explain why ammonites and trilobites could not be found in the same stratum. Some candidates went further and explained which extinction event caused the disappearance of each group.

(iii) There were very good responses to the effects of the Permo-Triassic extinction event on rugose corals. The skill lay in distilling the available information and choosing the changes that would be most damaging to shallow water marine organisms. Only a few candidates thought that the corals were exterminated at the end of the Cretaceous period. It is preferable to use more than the acronym 'P-T' in order to be precise in defining the age of the event.

(c) **(i)** There were many good answers to this question and it is clear that the knowledge of cephalopod evolution is well retained. It is important that terms such as 'ceratitic' are correct; this is the suture type, and not 'ceratite' which is the group that has them. Drawings of sutures have to be carefully executed or it will not be clear which type is being offered as an answer.

(ii) Most candidates cited an increase in strength for increase in complexity, but many failed to give an adequate reason for this development. Good answers suggested that a greater range of depths could be exploited.

(iii) Most candidates were able to answer this correctly. A few incorrectly described the septal neck direction the wrong way round.

(iv) There were many descriptions of the septal necks, rather than suggestions as to their function. Describing the function of the gap in the septum does not explain the reason for an extension into a neck to support the siphuncle. Some candidates simply stated that it controlled gas levels in the chambers, which is the function of the siphuncle not the septal neck.

Q6 The trilobite essay was well answered and is clearly an area of interest and understanding across the range of abilities. However, marks were not given for general statements, and morphological features had to be clearly linked to a functional reason to gain credit. There were many good answers describing eyes but they often lacked any inclusion of the advantages of binocular vision.
Some candidates described the number of legs and discussed them in some detail, but did not say that these were underneath the pleura or thorax. A few candidates mixed up the terms 'infaunal' and 'epifaunal'. There were many answers which featured morphology that would not be seen in a benthonic example; for example, 'there is no need for an inflated glabella as *Calymene* walks on the surface'. Such points are unlikely to gain marks as there are infinite features that are not present. The infaunal adaptations were better presented than the epifaunal – as if the epifaunal were not an adaptation but the 'standard' trilobite.

Q7 This is the first time that an extended prose question has been asked on dinosaurs, and it was not well answered. The majority of candidates gained 5 marks or less indicating this to be the most difficult question on the paper, reflecting lack of knowledge. There was no evidence that time was an issue as there were often lengthy descriptions with diagrams, often gaining no marks. Some extended their answers onto additional pages. There was an overall tendency to blur the distinctions between different dinosaurs and to attribute adaptations of any dinosaur to this particular group. Incorrect answers implied that *Iguanodon* was able to fly, based on their pelvic arrangements. Many thought *Iguanodon* to be carnivorous and a good many described the pubis bone pointing forwards. There were lengthy expositions based on: the advantages of the amniotic egg; the type of skin; the noises the animal could make and a great deal of information presented on *Tyrannosaurus*. Some candidates drew comical diagrams of dinosaurs. The special features of *Iguanodon* such as its adaptation for macerating vegetation and the advantages of a quadrupedal as well as bipedal lifestyle, were not properly presented in most candidates' answers.

F796 Practical Skills in Geology 2

General Comments

Many very good tasks were submitted and a large percentage of candidates demonstrated excellent subject knowledge. Many candidates were able to express themselves clearly and concisely using a good 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, many 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, once requested, the sample was dispatched by centres extremely quickly which greatly aids the moderation process. 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 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. There was, however, a notable increase in clerical errors, some of which could be traced back to addition errors with this form. Centres are therefore advised to check this form upon completion for any mathematical 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

Administration this year was a problem, and it was the worst year yet for clerical errors. A large numbers of errors arose due to the wrong marks being put onto cover sheets and then transferred from there to the MS1 or equivalent. In a large number of cases, marks on the papers or fieldwork were added up wrongly; frequently where sections were being subtotalled. Actual marks and sub-totalled marks were then added together giving an incorrect total, and as a result, several centres managed to produce totals of 21 or 22 marks for a twenty mark task! Another cause of error occurred when candidates' marks had been changed due to internal moderation, and marks had been altered on the script but the total had not been amended. 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, as well as on the MS1. *All of the paperwork should be carefully checked for accuracy before submission*.

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 cover sheet can be downloaded from Interchange.

Centres should ensure that all of the work for each candidate is securely packaged; many are still putting a lot of loose un-named sheets into the post.

Centres need to include a Centre Authentification form. Several Moderators had to contact their centres and request this document. This can delay the moderation of the centre involved.

Marking Issues

Marking was generally of a good standard, with most centres applying the mark schemes accurately. Where marks were too generous, it was usually a result of issues over the interpretation of the mark schemes. Most teachers read the additional guidance about specific requirements for marks to be given and used this to direct their marking. However, a small but significant number are ignored this column, and did not apply the mark scheme. For example in some questions, *three* labels may be required, so if only *two* labels are added then marks cannot be awarded. Again, a similar number of centres gave credit to answers, which were not on the mark scheme, and in some cases points, answers 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 science@ocr.org.uk. Several mark schemes have had slight amendments made as a result of queries raised by centres. All centres should make sure that they sign up for Interchange updates.

It is important for centres to be using the most up to date mark schemes and papers. Whilst many centres will check on Interchange for tasks as soon as they are published, it is advisable to only print off papers, instructions and mark schemes as close to the completion of the task as possible. In this way if there have been any additions to the mark schemes, centres will be aware of them.

Comments on the Centre-based Tasks

Centre-based tasks must always be accompanied by the 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. For example, if five sets of specimens are being used and not destroyed, each set can be numbered and the results for all sets can then easily be 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 whole range.

In experiments where the samples are destroyed, the data should show similar starting amounts so that the rates/trends of break up can be compared. This helps with applying the tolerances quoted within the mark schemes. *These tolerances must be applied.* A small number of centres allowed answers out of the stated tolerances and this will have been resulted in moderation mark changes.

Comments on individual tasks

CB 1: This was the new task and involved shell orientation. It was the least popular in terms of submission. Candidates in general struggled to gain full marks with questions 1(b) and 1(c).

Some issues arose with safety. In this case two 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. Thus the wearing of lab. coats is a general expectation of any science laboratory and therefore not wearing one will never be acceptable as a *specific* risk. It is not a specific safety requirement for this experiment.

In 2(a)(iii) the mark scheme clearly stated there was little variation in trilobite size. The majority of centres sampled were crediting quite the opposite. It was not a growth assemblage and there was no sign of ecdysis. The map question was generally done well.

CB 2: This task on the purity of limestone was similar in popularity to CB3. Most candidates had reasonably accurate results. When a later question required interpretation of these results against a table, error carried forward could 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 to gain credit (ecf).

The same comment from CB1 regarding safety can also be applied to this paper; most candidates wrote about the wearing of lab coats and most were incorrectly credited with this answer. The mark scheme was quite clear in outlining that the only acceptable responses were; glassware issues, wiping up spills and slips hazards and goggles for the eyes.

For question (b)(ii), *aperture* was not allowed as it cannot be seen in this photograph. This year, there was a specific point in the additional guidance column to confirm this. 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 was required. For example, for differences between fossils to be fully described, a comment about what each fossil shows is expected. It is not possible to assume what a candidate meant in order to give credit; the candidate must have written it to gain the mark. Where two points are required, two *distinctly different* points need to be made.

CB 3: *Water* was a popular task. A few centres did send comments about difficulties in standardising drop size and a few found that their samples did produce quite a range of results. In cases where the teacher trial data appears to vary it is a good idea to carry out two or three trial runs. This allows a greater range of results to be obtained which can make it easier to see which results are within tolerance. The lab coats safety issue was again a problem.

Some good answers to the map work question were seen and it is evident that candidates are making a good effort to qualify the detail in their geological histories. Likewise, photograph sketching was also much improved this year with excellent labelling and annotation of measurements. It should be noted that candidates should label features and mark measurements *onto their sketch* not onto the photograph. The term *fault* is not sufficient, as the mark scheme refers to a *normal fault*.

The final question was variable in quality. Although many candidates had no problems, a significant number failed to explain fully how the hardness is worked out. It was not enough just to state a hardness value; an explanation to show *how* the value could be ascertained was also needed. It was worrying that a very small number of centres were crediting candidates who stated that a nail would scratch quartz!

Field work Tasks

Far fewer centres submitted fieldwork this year. There was much evidence of good fieldwork and OCR has a bank of approved tasks displayed by region on Interchange. All fieldwork tasks are being revised in order to make skills such as drawing graphic logs more compatible with those in the Centre-based tasks. This will enable fairer comparisons to be drawn between the two options. All centres, if considering fieldwork for 2014 submission, must download new versions of their tasks, even tasks they have originally submitted. OCR will contact centres with their revised Fieldwork Task. Centres planning on undertaking fieldwork in the autumn term should contact OCR as soon as possible, in order for their task to be prioritised. The balance of 50% marks for A2 work as well as 50% qualitative and quantitative is essential. It should be noted that field work **must** have OCR approval. A very small number of centres had not had their fieldwork task finally approved and were still awaiting changes; a few had used fieldwork tasks that had not been submitted for approval. Marks on the candidates' work must be clearly matched to specific parts on the mark schemes.

For 2014 submission of field work centres are also being required to send written information of the rock types candidates will be describing as well as photographic evidence and copies of base maps etc. This will play a similar role to the teacher trial data in Centre-based tasks and will create a benchmark for comparison. Please ensure this information is sent to the Moderator with the work at the time of submission. Failure to do so will result in a request for it and this may slow down the moderation of your centre's work.

One of the main weaknesses this year was the lack of detail to the fossil work and in rock descriptions. Many centres did submit work with little detail for rock/fossil descriptions yet full marks had often been awarded.

For rock descriptions, consider 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. If all is in order this could then 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.

Fossil descriptions need more detail especially for brachiopods and bivalves, when a clear distinction needs to be made to show how each was identified. Fossil sketches should not be of text book versions. Some centres included sketches of a crinoid taken from the textbook, which was instantly recognisable.

A good way of getting A2 marks into fieldwork, besides using fossils, is to focus on 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 concerning coastal erosion could be explored. Field evidence for relative dating using features such as way-up structures and cross-cutting relationships also work well. In general, these topics were seen on fewer occasions than fossils, but were usually completed to a high standard.

Many centres used graphic logs to cover some of the quantitative requirements. There were some excellent graphic logs evident, and most centres are now using acceptable versions. A few, however, are still drawing them as a simple diagram of two or three beds, not to scale, and without clear grain sizes. It should be remembered that 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 will usually have no more than four marks to be comparable to Centre-based tasks.

Field sketches were much improved this year and some excellent ones were seen with plenty of detailed labelling and appropriate scales. Fossil sketches were usually less satisfactory in quality.

For a very small number of centres, some candidates had almost word for word the same description for every site, 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 skills rather than implicit geological knowledge. However it is perfectly acceptable to go over the general geology of the area to put the site into context. The type of information given prior to the task should be consistent with the "grey box" information which is published on Interchange for the Centre-based tasks. Candidates must work independently as they do for the Centre-based tasks. The only time they could work together is if, for example, two ends of a measuring tape need securing.

A very small number of centres are still giving candidates too much guidance; e.g. using guidance sheets of A4/A5 booklets or paper with specific task boxes drawn in for candidates to sketch or write in, instead of using notebooks which was favoured by most centres. Some centres are telling candidates the names of rocks and structures they will see which is unacceptable and has led to a reduction of marks.

Evaluative tasks

In general, these were completed to a higher standard than previously and the mark scheme was often clearly applied. There were some cases where incorrect responses or responses not on the mark scheme were credited. Science@ocr.org.uk should be contacted to discuss concerns over answers.

Comments on individual tasks

EV 1: This was a new task this year and proved to be the least popular. In general the mathematical questions were carried out correctly, although care was not always taken over figures being rounded up correctly. (1)(c) caused problems as many candidates did not read the question carefully, and tried to link their answers to oil in the rocks, rather than describing the rock properties as asked. The question requiring the oil traps to be marked on the cross section did cause problems; the acceptable answers were given in the mark scheme and additional guidance column. Many candidates were aware of differing density values in the salt and dolerite but not all candidates gave full detailed explanations as to why these variations occurred. The geological map was generally done in very good detail, although it should be noted that virtually no candidates identified the salt layer as occurring first. As a result, the first point on the mark scheme could not be awarded, as the sequence of sedimentary rocks was incorrect.

EV 2: This task was as popular as EV3. Most of the issues were the same as last year. The question on brachiopod morphology gave detail as to which answers were acceptable. A few centres credited other points not on the mark scheme.
Candidates found the question on graptolite preservation quite difficult to gain the mark. Most candidates gave one good reason but not the second, or repeated the same point. Similarly the question on the creation of cruziana tended to have candidates just referring to walking and not how the trace fossils are made. The photograph showing ripples marks was much better identified this year.

EV 3: This evaluative task produced the highest marks and had the fewest problems. Plotting graphs will always have a comment on the mark scheme about how many points are allowed to be “inaccurate”; if more points than this number are not accurate, then full marks cannot be awarded. Labels for the axes usually carry a mark, so full marks cannot be awarded if they are absent. The additional guidance column makes it clear that candidates can be credited whichever way round they draw the axes. The geological map showed that some really good skills are being developed and many candidates wrote in exceptional detail here. It is vital to read the additional guidance column of the mark scheme to see how much detail is required for this task. In order to earn four marks, reference should be made to the types of intrusions and faults. The fold also requires significantly more detail than map questions, where fewer marks are available.

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