RECOGNISING ACHIEVEMENT

GCE

Geology

Advanced GCE **A2 H487**

Advanced Subsidiary GCE **AS H087**

Report on the Units

June 2010

HX87/R/10

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

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

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CONTENTS

Advanced GCE Geology (H487)

Advanced Subsidiary GCE Geology (H087)

REPORT ON THE UNITS

Chief Examiner Report

General Comments

Overall, there was evidence of good geology on display, indicating that many candidates had been well prepared and had worked hard to understand basic principles and processes. Centres should continue to stress the importance of using specific geological terms in their correct context. This June saw the second sitting for the new specification A2 unit F794 and the first for F795.

The A2 papers contain some part questions that include *Stretch and Challenge* marks. *Stretch and Challenge* is:

- demonstrating a deeper knowledge and understanding of the subject material within the specification
- bringing together associated parts of the specification without prompting
- showing ability to think through the question and presenting a clear, logical development of ideas
- demonstrating understanding by applying geological knowledge to unfamiliar contexts

Stretch and Challenge is not identified within the question paper and is not whole questions. Synoptic and *Stretch and Challenge* material is assessed using a variety of question types and command words. Candidates, therefore, should not assume that a particular command word is indicative of a *Stretch and Challenge* question. *All* candidates need to have a better understanding of the command terms, especially *explain*, *analyse*, *evaluate* and *define*. Some candidates fail to use the command words for their answers and will then lose marks. If a question asks for both description **and** explanation, candidates will be rewarded for demonstrating **both** skills.

Most candidates were aware of the one mark per minute guide for all the Geology papers and the general rule of using two lines per mark unless part of the answer is a diagram or it is a single word or phrase. For most candidates, there are adequate answer lines for each question, but some candidates may use more space than that provided and continue answers on other parts of the page or paper. This is not a problem, as examiners will mark all answers but candidates run the risk of wasting time and effort on a question if they are exceeding the line allocation. It is most important that the location of any continued answer is indicated in the allocated space for the answer or as close as possible to the lines provided for the answer. This is particularly important as these papers are scanned and marked electronically so the Examiner can then look for the remainder of the answer in the appropriate place. So if additional material needs to be considered, it should be very clear where it is.

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

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

Centres need to be aware that guidance for the administration of practical tasks and fieldwork is updated and published on the OCR website. It is the responsibility of centres to use the most up to date version of both the Practical Skills Handbook and Fieldwork Guidance. The latest version is always the version which is published on the website and Interchange, and they should be

checked periodically. Materials which are on Interchange are dated so it is possible to see where, if any, changes have been made. By registering with Interchange, an e-mail alert is automatically sent to inform of any changes made. Many teachers find this a useful 'prompt' and this service is free. To be notified by e-mail when changes are made to GCE Geology pages, please e-mail GCEsciencetasks@ocr.org.uk including your centre number, centre name, a contact name and Geology in the subject line. It is strongly recommended that all centres register for this service.

Where there are amendments made to tasks during the year it is essential that centres use the most up to date version by downloading the tasks just before they are used.

Note regarding Stretch & Challenge (A*) for June 2010

June 2010 sees the first award of the A* grade for new GCEs (see page 70 of the specification). To achieve an A* grade in their Advanced GCE, candidates must achieve 480 *uniform* marks (UMS) in their Advanced GCE, *ie* grade A, and also gain at least 270 *uniform* marks in their three A2 units. Two candidates with 480 UMS could have different grades depending on their AS and A2 performance, for example:

Candidate 1 – 211 UMS at AS, 269 UMS at A2, 480 UMS overall, grade A

Candidate 2 – 210 UMS at AS, 270 UMS at A2, 480 UMS overall, grade A*

A good explanation is given in the open letter to centres from OfQual, see www.ofqual.gov.uk/files/2010-02-11-open-letter-a-star-grade.pdf

Upcoming INSET events in 2010/2011

OCR AS/A Level Geology(H087/H487): *Get ahead – raising standards through exam feedback (Course code OSCN4)*

Friday October 15th at BGS, Keyworth, Nottingham

This **full day** course will:

- Consider post-summer results documentation, such as question papers, reports and mark schemes
- Consider the step up from AS to A2
- Discuss approaches for preparing candidates for the external examination
- Demonstrate standards for the internal assessment of coursework and externally assessed components especially fieldwork
- Allow delegates to share good practice and ideas on new approaches.

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Fee – £182 including refreshments, lunch and course materials. £215 if you book within 7 days of the course date.

OCR AS/A Level Geology(H087/H487): *Get Started – successful first delivery (Course code OSCN3)*

This **full day course** will:

- Answer questions from teachers linked to the teaching of the standards
- Review the support and resources we offer
- Explain the administration procedures
- Enable delegates to network and share ideas for best practice.

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Note: this course is an updated version of the sessions that ran in previous years.

To book a course

Online: you can view and book your training event online by visiting our new EventBooker service at **www.ocr.org.uk/eventbooker**
By e-mail: use the booking form on **www.ocr.org.uk** and e-mail it to: **training@ocr.org.uk**
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Please note: training programmes are correct at time of going to print. Please visit EventBooker at **www.ocr.org.uk/eventbooker** to search for the most up-to-date event details.

F791 Global Tectonics

General Comments

There were some excellent scripts, demonstrating good subject knowledge in almost all areas of the examination paper, using the correct terminology where appropriate. The top 8% of candidates gained 50 marks or more overall and the top mark was a stunning 59 out of 60 marks. Candidates were well prepared for the exam and showed a good level of knowledge. There was no evidence that time was an issue as most scripts were complete, including question 5, the extended answer.

One general point that should be made is that many candidates gave responses that were rather vague in places. Responses need more specific detail to gain full credit. Candidates would also benefit from greater use of suitable technical terms rather than statements that are often vague and difficult to understand.

Some candidates need to pay far more care and attention to the quality of their diagrams, especially those in question 5. Poor handwriting and spelling continue to be issues for some candidates and they should be encouraged to learn the correct spelling of key geological words and terms.

Comments on Individual Questions

Question 1

This question gave a wide range of marks, although no candidate gained maximum marks for this question. The majority of candidates gained between 8 and 10 marks out of 14.

a) (i) As this was the opening question it was expected that most candidates would know and be able to define the term *focus*. However, around a third of candidates gained zero marks for this part question. Most answers that did not gain the mark did not indicate that the focus was a specific 'point' instead giving vague descriptions suggesting that it was an area or zone.

(ii) The deep sea trench was even less well understood than the term *focus*. Most incorrect answers did not describe the deep sea trench, but related it to the cause of its existence, a plate margin. Some incorrectly gave erroneous depths. Only the best candidates described it as a narrow feature with steep sides.

Teaching Tip
Create dominoes to match terms in the specification to descriptions of the terms. A useful guide of suggested terminology can be found in various dictionaries or specific A level text books.

Teaching Tip
A definition usually involves a straightforward description of the feature and does not include its origin. This should be stressed with candidates to ensure that they answer the question rather than give a description.

b) (i) Many candidates gained 2 out of the 3 marks available for this question. The graph proved too detailed for many candidates, and this was not helped by the wide spacing of the grid. Few candidates gained full marks, as most failed to draw the line through the origin. With such a wide scatter of points, the line of best fit could be anywhere within a wide range. A little geological thought, however, shows that the earthquake foci will occur very close to the surface (0 km depth), very close to the trench (0 km distance), so the graph 'goes through the origin'. As this reasoning uses geology, this plot must be the most accurate one on the graph and the line of best fit can go through the origin with confidence. It is difficult for a candidate to correct a mistake in a graph or a diagram which has been drawn in pen. Candidates should be encouraged to use a pencil for plotting graphs.

Teaching Tip

In effect, a graph is a ruler (in two dimensions). The widely spaced grid on this graph could be thought of as showing the centimetres on the ruler. The candidates can do this for themselves by using an actual ruler, when deciding where the plots should be placed.

(ii) Most candidates were able to give the Benioff zone as an answer with only a few spelling this incorrectly. Incorrect answers included the term *epicentre*.

(iii) Many candidates did not describe adequately the origin of the friction which caused the earthquakes in this zone. Error carried forward was allowed from part (ii) for a maximum of one mark, ensuring that candidates were only penalised once for an incorrect answer.

c) i) Most candidates gained one mark for this part question. Very few answers gave the full description required. Most incorrect answers did not identify what the geological problem was. Candidates should note that tsunamis are not caused directly by earthquakes but by the displacement of the crust which in turn displaces the water.

ii) Most candidates had a general idea about how to earthquake-proof a building but there was lack of clarity about how each measure actually works. There was confusion between strength and flexibility, and between strength and stability. Some answers were vague; an answer that explains the method 'absorbs the energy of the earthquake' is better than 'it reduces the impact of the earthquake'. Two methods were asked for, but candidates often gave more.

Other common errors for this part question are as follows:

base isolation

error	the building is able to move with the ground;
correct	the building stays motionless due to its inertial mass;

additional steel girders

error	the building is able to sway
correct	the building has more rigidity/strength

counterweight

error	the building sways in the opposite direction
correct	the mass of the counterweight dampens the sway.

Question 2

This question generated a good spread of marks, with the majority of candidates gaining between 9 and 11 marks in total. This was a wholly accessible question as some candidates gained all 16 marks.

a) (i) Many candidates had some idea about the flipping of the poles, although the possible explanations for the mechanism were often vague. As a result only the most able candidates' response gained the maximum 2 marks.

(ii) Candidates lost marks by vague naming of the material which lines up in the magnetic field. Many chose to discuss *iron* unqualified, rather than stating that it was an *iron mineral*. Alternative answers included iron particles, metallic minerals, metallic ions, elements, or even iron filings. A large number of candidates did not gain any marks for this question while the A or B grade candidates did well.

b) Calculations continue to be weak. The majority of candidates did not gain a mark at all for this calculation. Many answers were orders of magnitude out from the actual calculation. Less than a third of candidates gained full marks.

Teaching Tip
In a calculation, candidates should be advised to check to see if their answer is sensible. The oldest reversal given was 2.14 million years; the average of the ten reversals must therefore be considerably less than one million years old.

c) Many candidates found it difficult to explain this key evidence for sea floor spreading in just a few lines. Magnetic reversals were taken as being the same as magnetic stripes by many candidates, thus gaining few marks.

d) (i) Most candidates could label the transform fault and rift valley.

(ii) Only about half the candidates gained the mark for drawing on the magnetic anomalies. Incorrect attempts were often drawn non-parallel to the ridge. There was often overlap of the labels from part (i) in part (ii). Some candidates missed this part of the question entirely and it is likely that they did not see it.

Teaching Tip
Choosing the best position to add a label to detailed diagrams is a necessary skill for a geologist. The tip of any arrows or pointers used should actually touch the feature it is labelling. The candidates need to practise the skill of drawing in three dimensions as well as two, in this case drawing on the magnetic stripes parallel to the ridge.

(iii) There was a range of responses for the causes of the earthquakes. Weaker answers failed to mention the movement along either the transform or normal faults.

e) (i) Most candidates gained two marks for this part question - labelling the parts of the ocean crust. Incorrect answers included the inversion of the layers or failing to spot the question at all, thus giving no response. There was some difficulty if candidates had written or drawn over the space on the diagram that was available for the response.

(ii) A minority of candidates knew how the sediment forms on the abyssal plain. Many incorrectly discussed the sediments being derived from rivers. Only the very best candidates knew the role of plankton in the formation of deep sea ooze.

Question 3

This question produced a range of diagrams which were of variable quality. The range of marks was from 0 to full marks. Most candidates gained around 7 or 8 marks for this question.

a) The standard of sketching was generally poor. There were a number of overfolds included in the diagrams produced and a surprisingly large number of anticlines. The axial surface was erroneously drawn as a vertical line in many sketches of this asymmetric fold, thus gaining no marks.

b) Around one third of candidates could not name a fault produced by compressive stress, and normal fault was often given as a default incorrect answer.

c) (i) The majority of answers only gave a general idea about the formation of cleavage. There were many unlabelled and poor diagrams that did not answer the question at all. The distribution of marks attained was poor, with around a quarter of candidates gaining no marks at all for this section. Only the best candidates produced well labelled diagrams and description of cleavage formation.

(ii) Few candidates related the idea of incompetence to the ability of the shale to flow. Quite a few candidates mixed up the terms completely, describing shale as competent and sandstone as incompetent. The three dimensional nature of the sand grains was addressed only by the best candidates.

Teaching Tip
The question required knowledge of how platy minerals reorientate. The flakes cannot just turn around to be at right angles to the pressure. The idea that incompetent rocks flow when they are folded leads to the idea that the platy minerals move in the direction of least stress, becoming aligned.

Most candidates stated that the platy minerals in shale are randomly arranged. The fact that they are already aligned at right angles to the force of gravity was missed by most candidates. They settle horizontally, giving the shale the ability to be split in the direction of weaknesses - fissility. This is one difference between shale and slate: slate splits along cleavage planes while shale splits along bedding planes.

Question 4

This whole question was generally well answered, with marks between 3 and 12 out of 12.

a) Most candidates were able to label the layers of the Earth in the correct order.

b) (i) Most of the candidates were able to name and spell the term seismograph or seismometer. Incorrect answers included the term ‘seismogram’.

(ii) The question asked for lines to be drawn to show the paths of the earthquake waves. Those who used the standard shaded shadow zone diagram and did not label the parts of the Earth that could receive P, S or L waves were penalised as it was not clear that they understood the diagram that they had produced. Keys were sometimes used for the labels which were unclear or constructed using different colours.

c) (i) Around two thirds of the candidates knew the P wave shadow zone in degrees. Incorrect guesses did not follow any obvious pattern.

(ii) This part question was generally answered well, as most candidates gained either one or two marks as credit.

(iii) Most candidates knew the reason why the S wave shadow zone exists.

Question 5

This question provided a wide range of responses and marks with full marks seen. The average was about 5/8. This topic may be taught within other areas of the specification such as sea floor spreading and hotspots. Candidates had not always put together these earth features so that most answers were very generalised. It is expected that detail such as the depths of these earth features, gradients where relevant, and descriptions of the materials deposited, or composition of the feature is needed. There are a number of possible marking points for each feature which need to be described for this continuous prose answer and not just listed.

Candidates who did not use diagrams lost 'easy' marks. A sketch diagram does need to be accurately and carefully drawn but some diagrams were of very poor quality. A labelled sketch showing the profile across an ocean should be drawn at approximately the right scale.

The most common error was that the continental slope was described as a steep slope, when in reality it is only around 4^{o}. This misconception probably arises from diagrams which are produced with exaggerated vertical scales. The depths of the abyssal plain were also greatly exaggerated, with a large number of candidates quoting completely unrealistic numbers as depths.

A number of candidates confused the continental slope and the continental shelf.

Seamounts were often discussed last. It was known that they were caused by rising magma, but fewer made the link between this and the eruption of the magma as lava.

Many answers seem to suggest that the sea floor does not start until the abyssal plain is reached.

F792 Rocks – Processes and Products

General Comments

There were some excellent scripts demonstrating an in-depth knowledge of the subject, but some candidates seemed poorly prepared for the examination and struggled to attain marks even on low demand questions. For example, questions asking for diagrams and descriptions of how the various sedimentary structures form, regularly appear on this paper, and yet in this session, many candidates struggled to do justice to these questions. There was no evidence that time was an issue, with virtually all candidates attempting the final extended questions on deposition in sediment-rich shallow seas and the rock cycle.

Some candidates appeared to have great difficulty applying their knowledge to unfamiliar situations. Furthermore, many struggled to do the questions asking for explanations of differences, and some compounded their errors throughout a particular question.

Although the majority of candidates wrote clear, legible answers that used correct specialist terminology, some candidates penalised themselves by writing answers that were poorly spelled and extremely hard to read and decipher. Candidates should be encouraged to learn the correct spelling and use of key geological words and terms. In addition, lists should not be used to answer questions that ask for descriptions or explanations.

The drawing and labelling of diagrams is also a key skill in Geology, and candidates should be encouraged to practise this skill at every opportunity. Some candidates lost marks due to inaccurate diagrams, with poor or no labelling. This was particularly the case in the questions that asked for diagrams showing the formation of sedimentary structures.

Comments on Individual Questions

Question 1

Most candidates showed a good understanding of the various types of volcanic activity and hazards, but they were less sure of location and plate tectonic setting of volcanoes. Calderas and geysers were well known.

a) (i) About half the candidates were able to correctly shade the “Pacific ring of fire”. Some lost marks due to inaccurate shading that went too far inland or out to sea, or they did not include island arcs in their shading. Others shaded Hawaii - which was ignored - or attempted to shade the mid ocean ridge for a maximum of one mark if the rest was correct. A significant minority didn’t shade anything at all.

(ii) This straightforward question was not done particularly well. Although the majority of candidates correctly stated Unzen is at a convergent plate margin many failed to identify it as an ocean-ocean margin. Although they still attained the mark, candidates should be encouraged to learn which convergent plate margins are ocean-ocean and which are ocean-continent. They should also be encouraged to use terminology from the specification, ie *convergent* rather than *destructive*. For Kilauea, most candidates identified it is at a hot spot, but a significant number stated it is at a divergent or convergent plate margin.

b) There were some excellent, detailed descriptions of the type of volcanic activity and products at Katmai in Alaska and Kilauea in Hawaii. Some candidates, however, didn’t gain any credit because they didn’t read the question carefully enough and wrote about the

origin of the magma rather then the type of activity. Others limited their marks by only describing the type of volcanic activity or the products. Others ignored the word *describe* and wrote lists which also limited the marks awarded. Candidates should be encouraged to use correct descriptive terminology such as *low viscosity* or *fluid* rather than *runny* for mafic magma.

c) There were many very thorough descriptions of the volcanic hazards that are likely to affect people living within 10 km of Unzen in Japan, but again some candidates penalised themselves by ignoring the word *describe* and wrote lists for a maximum of one mark

d) Calderas were well known and the vast majority of candidates were able to draw accurate labelled diagram(s) and describe how a caldera forms. Only a few candidates gave no response or didn't attain any credit. However, a large number of candidates lost one or two marks of the four marks available by failing to label the caldera on their diagram or repeating the diagram labels in the text with no additional information.

e) Most candidates were able to describe correctly that a geyser is an explosive eruption of water or steam. A few penalised themselves by not stating that the gas produced is water vapour (or steam), thus confusing a geyser with a fumarole.

Question 2

Metamorphic rocks were well known but candidates struggled with the part questions that required explanations of differences rather than descriptions.

a) (i) Most candidates were able to shade the diagram correctly to show the field for regional metamorphism including slate, schist and gneiss.

(ii) While only the strongest candidates attained all 4 marks for correctly identifying 5 or 6 of the metamorphic rocks from their descriptions, most candidates attained some marks.

b) (i) As expected, candidates found this high level question asking for an explanation of the difference between the processes that form cleavage and schistosity very demanding. Very few candidates attained the maximum 3 marks. Many didn't even achieve one or two marks for suggesting cleavage forms at low grade or in a slate, whereas schistosity forms at medium grade in a schist; or partial recrystallisation forms cleavage, whereas total recrystallisation is required to form schistosity. A common misconception was that only pressure is required for cleavage to form, but schistosity requires heat. Others confused schistosity with gneissose banding.

(ii) Even though candidates would probably know in isolation what phenocrysts and porphyroblasts are, many struggled to explain the difference. Unfortunately, a significant number of candidates got them the wrong way round and some thought they both formed by a variety of - incorrect - igneous processes.

c) (i) The position of spotted rock within a metamorphic aureole was well known and many candidates correctly labelled where it would be found on the map. However, some labelled it too close to the contact – a maximum of half the distance from the edge of the aureole to the contact was allowed.

(ii) Candidates were less confident about explaining how a spotted rock forms with only the strongest attaining both marks available.

(iii) Reasons why the width of the metamorphic aureole may vary were well known and there were some excellent answers discussing in detail the effect of conductivity or water content of the country rocks. Rather than explaining them, however, many candidates simply listed a number of factors for a maximum of one mark. The effect of the *dip* of the contact was well known but some candidates failed to use the word *dip* and discussed the slope or angle for a maximum of one mark. There was also confusion with candidates incorrectly discussing the dip of the country rocks or the dip of the aureole rather than the dip of the contact.

Question 3

This question on graphic logs and sedimentary environments was not answered very well. Many candidates struggled to identify the sedimentary environment as deltaic which then made it hard for them to attain marks on other parts of the question. In addition, many of the diagrams showing how cross bedding and asymmetrical ripple marks form, were quite poor.

a) (i) Many candidates omitted the word *sand* when describing the grain size of unit A on the graphic log.

(ii) The position of a complete cyclothem was also poorly known with less than half of the candidates attaining the mark. Many incorrectly labelled the pebbly sandstone unit. From the base or top of any unit to the base or top of the same unit was acceptable. If candidates chose the top of the lower coal unit as their starting point they were awarded the mark if their label went to the top of the second coal unit, the top of the pebbly sandstone or the top of the upper coal unit, as these are all part of one topset unit.

(iii) Most candidates attained the mark for correctly continuing the graphic log to show an 80 cm thick coarse sandstone bed.

(iv) Descriptions of how the beds of coal and the seat earth with roots formed were variable in quality. Most candidates were aware that coal is the remains of plants or trees, but only the strongest candidates recognised that the seat earth is the *soil* in which the trees grew. Many just repeated the question saying it was ‘earth’ and a small minority erroneously thought coal is made from animal remains.

(v) The reason why the base of the pebbly sandstone was drawn at an angle was poorly understood. Very few realised the pebbly sandstone represented a river channel that would be migrating on the delta top and eroding the surrounding swamp deposits to form a wash out. Many incorrectly suggested it was the result of sediment settling out in size order to form graded bedding.

b) Unfortunately, most candidates did not realise the whole graphic log was of a deltaic sequence. The question prompting candidates to label a cyclothem should have helped them realise the log represented one sedimentary environment. Consequently, many candidates tried to identify a suitable environment for each unit on the log rather than using a holistic approach to consider the relationships between the units. These candidates were still able to attain a maximum of two marks if they correctly interpreted suitable environments for two or more units (for example the cross bedded sandstone formed in a desert). Many candidates described the climate rather than the environment of deposition. For example, stating the seat earth and coal were deposited in hot, wet tropical conditions (climate) rather than on a swampy delta top (environment). Another difficulty was that some candidates gave a list of environments but did not make it clear which of the rocks they thought were deposited in each of their suggested environments.

Teaching Tip
A starter or plenary can be done to summarise the rock types, sedimentary structures and fossils in each sub-environment – it could be done as a card sort activity.

prodelta (bottomset beds)	delta front (foreset beds)	delta top (topset beds)	distributary channels
shale	sandstone	coal & seat earth	conglomerate
marine fossils bioturbation	cross bedding	rootlets	imbricate structure

c) (i) There were some excellent, accurate, fully labelled diagrams showing how cross bedded sandstones are formed which scored the maximum 3 marks with ease. Some candidates included all their description on diagram(s) which was acceptable for maximum marks. Sadly, there were also many very poor diagrams that did not attain any marks at all. Many did not show the cross beds as asymmetrical and steeper on the down current side, while others merely copied the cross-bedded sandstone diagram from the graphic log. If they had labelled the dipping beds as foreset beds or the lee slope of the cross bed they could have attained a mark for this. A small minority erroneously described and drew diagrams to show how graded bedding forms.

(ii) Most candidates correctly calculated the average dip of the cross bedding. A few made careless errors and some did not appear to have used a calculator to obtain their answer. It clearly states on the front page of the examination paper that an electronic calculator is required. Candidates should be encouraged to be properly equipped for their examinations.

(iii) The reason why the angle of dip would never be greater than 35° was well known with most candidates stating this is the maximum angle of rest for dry sand or that above this angle the sand would collapse down the slope. A minority, however, didn't have a clue and suggested this was the maximum angle bedding could be at or that above this angle it would be inverted!

d) This question asking for a labelled diagram and description of how ripple marks are formed in a river was not done very well. Diagrams were very poor and most failed to show that the ripple marks would be asymmetrical and steeper on the down-current side. Many lost the diagram mark because they drew vertical or overhanging down-current slopes – clearly impossible.

Question 4

The formation of evaporites was well known, but some candidates struggled to apply their knowledge to the, in some cases, unfamiliar context of the Zechstein Sea. There was confusion between the terms *climate* and *environment*.

a) (i) This question asking for the type of climate that existed in north west Europe during the Permian was not done very well. Although most candidates gained the mark for their explanation, many incorrectly stated the *environment* (a desert or shallow sea) rather than the *climate* (hot and arid).

Teaching Tip
In common with the graphic log question, this question emphasises the need for candidates to understand the difference between climate and environment.
Climate is the long term weather conditions affecting an area.
Environment is a distinct area on the Earth's surface characterised by particular rock types, sedimentary structures and fossils.

(ii) Most candidates were able to explain how the salts formed in the Zechstein Sea and the barred basin model of evaporite formation was well understood. The most common correct answers were that due to the evaporation of water, the salts in *solution* become more *concentrated*, and once *saturated, precipitate* or *crystallise* out. It is pleasing that many candidates demonstrated a good understanding of the correct scientific terminology. A common error, however, was to suggest that the *salts* are evaporated (rather than the water) and some used imprecise terminology and stated the salts are deposited rather than precipitated.

(iii) Candidates struggled to attain both the marks available for explaining how the salts formed four separate sequences. Only the strongest candidates invoked the barred basin model to suggest the sea had dried out and then refilled over the bar four times. Many suggested the climate had changed four times and others vaguely used the idea of marine regressions and transgressions but without specific details.

b) (i) It was a bit hit and miss as to which candidates correctly identified the three evaporite minerals on the basis of the descriptions given in the data table.

(ii) Most candidates were familiar with hardness testing, but few attained both marks for giving descriptions as to how a finger nail with hardness 2.5 and a copper coin with hardness 3.5 could be used to differentiate between these relatively soft evaporite minerals. Many suggested the use of an iron nail, clearly not appreciating that, with a hardness of 5.5, this would scratch all the minerals in question and consequently would not help to distinguish between them.

(iii) Many candidates correctly stated that the order of crystallisation of evaporite minerals from sea water depends on their solubility, with the least soluble (calcite) precipitating out of solution first and the most soluble (potassium salts) precipitating out last. Some candidates appeared confused by the data table and stated that the minerals would crystallise out in order of density or specific gravity – suggesting confusion with gravity settling processes in igneous intrusions.

c) This question asking for diagrams and a description of how desiccation cracks form in shallow seas, was generally done better than the questions asking about cross bedding and ripple marks. While there were many excellent, accurate well labelled diagrams and descriptions, once again, others were very poor suggesting that candidates either had no knowledge of desiccation cracks or, more likely, were struggling to describe their formation in the context of a shallow sea rather than a playa lake, even though there is no difference!

Question 5

Responses to question 5 on igneous classification, rocks and minerals were variable in quality. While some candidates showed a very good understanding of igneous rock classification and how it relates to identifying rocks, others had not learnt the classification table and consequently found the whole of this question very difficult. Many candidates compounded their errors on the part questions asking for rock and rock group identification.

a) (i) Most candidates were able to correctly define plutonic rocks as igneous rocks that form deep below the surface through slow cooling. However, some did not specify the correct depth and, surprisingly, there were a number of "no responses" to this question. The most memorable response was "a rock made in cold temperatures derived from the planet Pluto"!

(ii) Candidates who had learnt their silica percentage classification had no problem with this question asking for the compositional groups of the four rocks. Others seemed to guess randomly and many were still using acid and basic terminology rather than *silicic* and *mafic*. This was acceptable for the marks but, as stated previously, candidates should also be encouraged to use the terminology in the current specification.

b) (i) This question was not done as well as the previous one. A number of candidates failed to notice the term *igneous rocks* in the question and suggested one rock was igneous, one sedimentary and one metamorphic. Those that realised they needed to write an igneous group for the rocks still struggled with the mineralogy. The most common error was to state J was mafic, K ultramafic and L intermediate, i.e. one compositional group for each. The fact that all the rocks contained plagioclase feldspar should have ruled out ultramafic rocks.

(ii) Most candidates were familiar with the term *mafic minerals* as being dark coloured magnesium and iron rich minerals, but some were confused with mafic rocks and stated they have a silica content between 45 and 52%.

(iii) Many struggled to explain the difference between the percentage of quartz and the percentage of silica in a rock. All they needed to say was quartz is a mineral made of SiO_2 whereas silica is the total amount of SiO_2 which is found in all the rock forming minerals including quartz. Bizarrely, a common error was to state that there was an inverse relationship between the two.

(iv) Many candidates correctly suggested it would be easier to use the percentage of quartz in a hand specimen of a rock as it would be easier to see, but then struggled to attain the second mark as they omitted to say silica content has to be determined in a laboratory by chemical analysis. Candidates that argued silica content is better because rocks with a high silica content are light coloured could gain a maximum of 1 mark.

c) Candidates who had learnt their igneous classification were able to identify correctly most, if not all, of the six rocks from the descriptions and diagrams. However, some that were incorrect on the first pair, then got the rest wrong as they didn't use the same rock name twice.

Teaching Tip
Candidates often struggle with rock identification questions. For igneous rocks, first they need to identify the compositional group from the silica content or mineralogy and then use the crystal grain size or scale to decide if it's volcanic, hypabyssal or plutonic and, hence, name the rock. For questions that ask for the matching of names to descriptions, the best approach is to use a process of elimination – do the obvious ones first, which may not always be at the top of the list, and then see what is left.
Matching cards of rock names and characteristics as dominoes or look cards or pairs, works very well with this factual material.

Question 6

There were a number of excellent answers to the 10 mark extended question on the deposition and characteristics of conglomerates, sandstones and mudstones on beaches and in sediment-rich shallow seas. It was encouraging that there were very few “no responses” and virtually all candidates gained some credit for their answers. Some candidates, however, ignored the context of the question asking for descriptions of the three rocks in beach and shallow sea environments and wrote generally about conglomerates, sandstones and mudstones for a maximum of 2 each. Others wrote about how the three rocks form in other environments such as glacial or deserts, again, for a maximum of 2 each. Those that did correctly discuss deposition on beaches and in shallow seas, sometimes didn’t attain easy marks for giving descriptions of the three rocks, for example conglomerates are coarse grained and made of rounded pebbles. Some wasted time describing post-depositional processes which weren’t required and gained no extra marks. Candidates need to learn and be confident about the rocks and sedimentary structures they would expect to find in each of the sedimentary environments listed on the specification.

Question 7

Most candidates were familiar with the processes in the rock cycle that form the three rock groups: sedimentary, metamorphic and igneous. It was surprising that many didn’t score any better on this question than they did on the previous one. While there were many excellent responses that attained the maximum 10 marks with ease, some candidates lost marks by simply listing rather than defining the processes, while others failed to name the processes specifically. A surprising issue was that a significant number of candidates incorrectly thought that the process of partial melting was involved in the formation of metamorphic rocks rather than *igneous* rocks. Some also confused diagenesis with metamorphism and placed diagenesis after the formation of sedimentary rocks on rock cycle diagrams.

F793 Practical Skills in Geology 1

General Comments

This year there were some very good pieces of work submitted. Many candidates demonstrated excellent subject knowledge and were able to express themselves clearly and concisely using a sound range of geological terminology. It did seem that, on the whole, candidates were better prepared than in the previous year. Many of the comments in the previous report about poor photograph labelling and a greater need for use of terminology are being addressed. Centres are thanked for the valuable contribution that they have made in making this unit of assessment successful. It was pleasing to see that comparatively few centres needed their marks to be adjusted. When mark adjustments were required, these were mainly reductions.

One of the purposes of the moderation process is to confirm the marks awarded by a Centre. It is thus very helpful where a Centre has annotated the script either to justify the award of a mark or to indicate why a mark has not been awarded. It was clear from the moderation process that the majority of Centres marked the tasks carefully and most centres were clearly annotating the CB and EV tasks to show where marks had been achieved, using ticks and crosses as requested in the previous year's report. However it was often much more difficult with the field work to ascertain where marks had been given, especially when candidates had tackled their field tasks in a different sequence to that shown on the mark scheme. Some centres developed a scheme of placing a number next to each of the marks to be awarded on the cover sheet/copy of the mark scheme, from 1-20, then annotating on the script where the mark for tick no 1 had been awarded etc. This does make it a lot easier to see where on the mark scheme the work was related.

Another purpose of the moderation process is to ensure consistency between Centres and thus it is essential that the mark schemes provided are followed exactly. Where internal moderation does occur, it is important that the final agreed mark is indicated clearly in red.

In general, candidates should be encouraged to include greater detail in their answers to descriptive type questions, giving reasons where required, and Centres should not credit trivial answers.

Administration

The majority of Centres met the relevant deadlines and the samples were well organised. Moderators did find a number of arithmetic errors. It is good practice that Centres should check the adding up of the individual tasks and preferably find another person to check this process. There is a spreadsheet available on *OCR Interchange* to assist the process.
Small Centres should also submit all their candidates' work directly to the moderator and not wait to hear from him/her, in line with the moderation instructions. Larger Centres should wait for the automated email from OCR.

Many centres did submit their marks via *Interchange* before the deadline and as a result had very prompt responses requesting their sample of work. In many cases the sample was dispatched extremely quickly, allowing the moderation process to get into full swing immediately after standardisation.

It is important to remember to send the moderator a copy of the MS1 form.

Fieldwork Tasks provided the main area of concern this summer. Moderators saw some very good examples of high standard work, with supporting annotation and thorough marking clearly linked to mark schemes. However some centres were too generous in awarding marks and

credited limited work or failed to provide comments regarding circumstance which would explain why limited work was credited with maximum marks.

Centres need to include an Authentication form.

In a small number of cases this was not included with the coursework sample and had to be requested, sometimes resulting in a delay in moderation.

As Centres are aware, the Tasks for 2010/11 were published in June 2010. Two tasks have been replaced for 2010/11. The tasks that have been replaced may well be used again in future years so must remain confidential and *not used for practice purposes*. There are some changes to the tasks and mark schemes that are being used again.

Centres are reminded that the only help to be given to candidates is clearly indicated in the *Instructions for Teachers*. Any help given must be recorded on the front of the appropriate task.

Comments on the Centre Based Tasks

On the whole, the work of candidates was completed to a very high standard and it was clear that many candidates were proficient in both the practical element and the use of photographs and diagrams.

Centre Based tasks must always be accompanied by a copy of the results obtained by the teacher in their trial run of the practical.

These results should reflect the likely results that candidates should obtain. Where problems occur, teachers are encouraged to provide additional information to support the marks given.

The cover sheet directs teachers to *use their professional judgement to decide if the answer is worthy of credit. If it is, then the script should be annotated accordingly*. This might apply to some questions where a range of responses is given in the mark scheme and an obvious point appears to have been missed out. Centres must ensure that marks are awarded in line with the marking points and *marks should not be awarded for just part of a required answer.*

Having trialled the task, if teachers are unable to obtain any of the marking points themselves, their observations should be submitted by e-mail to GCEScienceTasks@ocr.org.uk at OCR for a decision as to whether the alternative responses can be credited. Once approval has been granted by OCR, these observations become the observations by which all candidates in the centre must be judged. It is essential that copies of any correspondence must then be included with the work for moderation when submitted.

Comments on Individual Tasks

CB1 –This was a popular choice with nearly a third of centres submitting work for it. There were few problems if the work was supported by teacher data and comments. There was some variation in practical results but teacher comments helped to explain these. It is essential that all practical tasks are trialled by the teacher in advance and that this data is sent to the moderator.

Sketches which lacked a clear scale and more importantly, resembled sedimentary textures as the crystal grains did not interlock, can not be credited with full marks. Most students had the geological map history sequence the correct way round but lacked the use of geological terms such as *intruded, folded, deposited* etc, needed for maximum marks. Some centres over-credited as a result.

CB2 – Was generally done well with few problems, and was submitted for a quarter of candidates, the teacher data supplied helping to support the marks given. Where the mark scheme states that *all* the information must be correct, then marks can not be awarded for just *most* of the information being correct i.e. the descriptors for each rock type may be correct but an error with one of the rock types means that no marks can be awarded.

CB3 – There were some issues with the practical task and the obtaining of consistent data. Teacher comments and data were essential here and clear trialling beforehand very important. A fifth of the work submitted was for this task. Teachers need to provide clear details of the characteristics of the sediment sample used. The photo labelling was often unclear, with few providing accurate measurements. A few centres over marked this for basic labels – there must be measurement *and* technical terms on the drawing for maximum marks as set out in the mark scheme.

Fieldwork Tasks
Moderators saw slightly more centres submitting fieldwork this year – over a quarter. There was a lot of very good fieldwork in evidence here including logs and sketches and OCR now has a good bank of approved tasks displayed on *Interchange* which are available for other centres to use if they do not wish to put in an original submission.

The fieldwork, however, caused the moderators the biggest problems this year. There were inconsistencies in application of marking, mark schemes, quality of work and guidance to students between centres which needs addressing .Some weak candidates were getting 6-8 marks for an evaluative task and 18-19 for their FT. Between some centres the standards for higher marks was noticeably different.

The main issues are:

- Safe working (ai, aii): – maximum marks require written evidence in the submitted work whilst in the field but some candidates were getting maximum marks without this being evident and no supporting comments from the teacher.
- Descriptions of rock types/measurements or orientations/pebble long axis recordings often have 3 mark maxima on the task mark schemes. Some centres credited maximum marks with as little as 2 readings evident within the submitted work whilst other centres were correctly producing large data sets for maximum marks.
- The degree of guidance/instruction on handouts and worksheets varied. In some cases students were basically told what to write for example rock descriptions. *This is not acceptable.*

A few centres did not submit the task mark scheme to OCR for approval in advance of the fieldwork being carried out. The best centres were those where the marks on the candidates' work could be clearly matched up to specific parts of the mark schemes.

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

Comments on Individual Tasks

ET1 – Was submitted for a fifth of candidates. Diagrams must have a scale to gain the maximum 2 marks. A common feature was that candidates had a tendency to write in vague or imprecise terms, often not using the appropriate technical terms (or using them incorrectly). This resulted in some answers that were not focussed and were not of the standard required.

ET2 – Was done well by most of the third of candidates who submitted this task. Some answers lacked reference to the graph and data provided, which cannot be credited with full marks. Moderators saw some excellent graphic logs, but there was some over-marking of features, and symbols as answers were variable in precision and detail.

ET3 – This task was generally done well and was the most popular at nearly a half of the ETs. Again, precise marking of scales on diagrams and accurate drawing must correspond to the mark scheme.

F794 Environmental Geology

General Comments

The paper was accessible to all candidates with few papers with gaps and no sign that it could not be finished in the time. Marks ranged from 9 to 58 out of 60 giving a wide range with some excellent answers. Weak candidates were able to find sufficient sections to attempt an answer to every question. However, a significant number of candidates failed to score some of the easier marks. Most candidates drew diagrams to illustrate their answers where required, but many descriptive responses lacked structure and careful argument. The standard of grammar, spelling, and punctuation was sometimes poor.

It is noticeable that question 2 which contained material new to the specification had the lowest average mark. Some candidates seemed poorly prepared for the synoptic element of the question paper. For example, the basic sedimentary processes involved in the formation of placer deposits, the difference between weathering and erosion of granite and the lack of correct terminology when describing faults in coal seams.

Most candidates wrote clear answers but a few wrote in note form, with abbreviated sentences or by using lists, and so risked losing marks by lack of clarity and detail. One word answers for a question that is *describe* seldom gains credit even for questions worth one mark. Candidates are expected to use the technical terms as shown in the specifications, such as *dip, overburden, percolating* and metal *ore* (instead of metal). Several questions asked for **one** source, method etc but it was not unusual for two or three to be given, losing marks if incorrect answers were included. Illegible handwriting risks the loss of marks for the spelling of technical terms.

Comments on Individual Questions

Question 1

This question on underground water supply was very well answered with marks between 2 and full marks of 14 and was the highest performing question on the paper.

a) (i) Porosity and permeability were generally well defined, although many candidates gave general descriptions without using precise terms. References to the amount of water which can be held by the rock are too vague for a definition of porosity. Similarly for permeability, references to the *ease* of flow, rather than the *rate* of flow did not gain marks.

> **Teaching Tip**
> Using cards to match terms with definitions as a lesson starter or revision aid is always useful. Using diagrams to match to the description also works well. Variations on this are the '1 minute labelled diagram' on mini whiteboards to get students used to drawing standard diagrams like those in this question.

b) Most candidates scored well, despite the poor standard of the diagrams of which there was a very wide range, with very few taken from text books. Some labelling was minimal. The two aquifers are defined according to the rock types which are exposed at the surface, so it is a good idea to label the surface. Some diagrams failed to identify which of the beds was the aquifer. The extent of the aquifer was commonly unclear.

c) (i) Almost all answers were correct. Poor hand writing was a problem at times as the correct spelling was essential.

(ii) Generally well answered, although a few candidates misunderstood the question and wrote about cones of depression. Occasionally candidates failed to refer to hydrostatic pressure which is key to the water rising up the well under its own pressure.

d) This was a straight forward diagram to draw that was generally well answered with many well labelled cones of depression around the well. The water table does need to be labelled.

e) (i) Most answers suggested that rain falls on the recharge zone, and quite a few also suggested pumping, but the details of how the water reached the aquifer were seldom given. Use of technical terms such as *infiltration* and *percolation* was essential. Some candidates were aware of artificial recharge schemes - an excellent alternative answer.

(ii) The source was not the nature of the pollutant but the place from which it came. A one or two word answer is seldom enough at A2, for example just *leachates* or *landfill* given as a one word answer was not credited.

(iii) Most candidates satisfactorily explained the higher risk of pollution for unconfined aquifers, although some mistakenly wrote about pollution being filtered out as water passed through the aquiclude, showing a lack of understanding.

Question 2

This question had marks between 1 and 13 out of a maximum of 14. The average mark was the lowest on the paper with most candidates gaining around half marks. Knowledge of building materials and extraction is poorly known in comparison to other topics.

a) (i) Candidates often wrote long lists of properties of granite, mentioning that it is tough, hard, stable, durable and even well-cemented (!) with a few candidates mentioning beds and believing that granite is easy to cut. Using the correct geological terms is essential.

(ii) Descriptions of quarrying were usually in general terms, involving some kind of explosion. Few mentioned the drilling of shot holes, the stabilising of faces or the use of joints. Overburden stripping was not often used as a technical term. There were occasional references to high pressure hoses, as used in granite quarries to extract kaolin and a few candidates wrote about opencast mining of coal with dragline excavators.

(iii) Most gave a suitable suggestion but sometimes in general terms. A one word answer like *dust* is not sufficient at A2.

(iv) Very few candidates – about a quarter - gave a correct, precise definition of aggregate. Many just gave *crushed rock* or *mixture* of *rock* or *roadstone* or even vaguer non technical terms like *chunks*.

b) The manufacture of bricks appeared not to have been covered by some centres. There was confusion between the manufacture of cement and concrete. The most common suggestion was clay, but combined with a wide variety of other materials, with clay not always as the main component. A few answers suggested the fuel required and a small minority correctly mentioned Oxford Clay as the main source of brick clay, although some

candidates stated Kimmeridge Clay. Some candidates described the process of brick making rather than the materials used.

Teaching Tip
Making a small brick out of modelling clay in the lab is a good way of demonstrating these materials. Similarly making small amounts of cement and concrete may help to stop the confusion. Small quantities can be made in disposable cups or ice cube trays. Mixing up cement and concrete will help to make the point that liquid cement is used as a grout but not concrete, which contains coarse aggregate.

c) This question asked for an evaluation of the two sites. Answers which did not mention both of them could not score full marks. The third mark was earned by a minority of candidates who understood the implications of all the aspects of each site, as appropriate for this 'stretch and challenge' question. Most candidates scored the two marks available for a discussion of permeability.

d) (i) About a quarter of candidates gave a correct, precise definition of leachate. Many failed to refer to the interaction of water and waste which produces the leachate at landfill sites.

(ii) Most answers gained credit for an impermeable lining of a suitable material, although some suggested a "concrete base or container" which was not given credit. Of those who suggested grouting not all suggested liquid cement. The concepts of lining and grouting were sometimes confused.

Question 3

This question on the formation of mineral deposits was generally well answered with marks ranging from 3 to the maximum of 16. Candidates were provided with data in the form of a diagram and mineral characteristics which were not always used.

a) Almost all candidates correctly spelled the term *hydrothermal* somewhere within the answer and had a general idea of water, heat and dissolved minerals being involved. The first problem area was the use of general terms cracks and fractures rather than joints or faults. The idea that the hydrothermal fluids created the joints was also fairly common. Some candidates wrote about river or groundwater being heated rather than the water being magmatic. There was a lot of confusion about solubility, melting point, temperature of formation, and density being involved in the order of crystallisation. A few candidates wrongly suggested gravity settling or magmatic differentiation as the process

b) (i) A lot of correct answers, even when part (ii) was not understood, although some candidates had the formation of the minerals in reverse order.

(ii) Very few correct answers. Most candidates continued to explain the origin of the mineral veins rather than to explain the pattern across part of the vein. Very few candidates gave precise answers that used correct terms – general statements that did not use the pattern of symmetrical/edge of vein/centre of vein rarely gained marks .There was little recognition of the part played by the cold country rock causing the hot fluid to be cooled so that the minerals formed first at the outside of the vein. Where solubility was used as the explanation, it needed to be linked to the outer or inner part of the vein.

(iii) Most answers correctly explained the meaning of gangue. Some answers, however, suggested that candidates do not realise that gangue minerals occur together with the ore minerals in the same ore body and often have to be mined at the same time.

A few suggested that gangue minerals are “not needed” or confused terms by referring to them as invaluable!

Teaching Tip
Common sense suggests that crystallisation must start at the edges of the vein or crystals would have no where to grow! Old central heating or water pipes can sometimes show minerals precipitated on the inside restricting the space for water to flow. Even the inside of a kettle in a hard water area demonstrates the fact that the limescale forms on the sides and bottom – never in the centre.

c) (i) Most candidates correctly located two sites for placer minerals. In some wrong answers, it was not clear whether the cross was drawn incorrectly, or carelessly. Occasionally two sites on the inside of meander bends were drawn, which did not gain full marks.

(ii) This question is a synoptic question based on weathering, erosion and deposition, but from the angle of placer deposits. Many candidates ignored the position of the mineral veins high on the hillside and discussed their erosion by the river. Other descriptions were vague, for example by confusing erosion and weathering, and saying that the minerals make their way down the hill. Some candidates wrote that the minerals would be dissolved by weathering and then precipitated out in the river where the river current slackened. Perhaps they did not see that the mineral vein was high above the river on the hillside.

d) (i) Almost all graphs were completed correctly. Gold was the most common incorrect plot. One or two candidates attempted the impossible by adding a line of best fit, not required for a scatter graph.

(ii) This question required an analysis of data provided. This means the all the data should be considered. The best answers used all the information provided on cleavage, density and hardness for each mineral individually. Only the best answers fully explained the implications of these properties for the occurrence of placer deposits. Some weaker answers showed no understanding of the connection between cleavage, hardness and placer deposits. Common errors included not using all four minerals and hedging their bets for example “galena will be found because it is dense but may not be much of it as it is soft”.

Question 4

This question on coal mining and the problems faced in exploiting a coal seam was well answered with marks between 1 and the maximum of 8.

a) (i) Many of the answers were given in general terms, particularly when describing the dip of the fold, for example by stating that the coal seam had been “moved” instead of “displaced” by the fault, or that the “shearer cannot cope with the seam bending down”. This lack of clarity often lost marks.

(ii) Most candidates gained the two marks though some diagrams were untidy and poorly labelled. The weaker diagrams made no attempt to confine the washout to within the coal seam. A few candidates incorrectly referred to modern rivers eroding the coal seam.

b) While there were some full descriptions of long-wall retreat mining – a difficult operation to describe – most candidates had only a general idea about machines slicing away a wall of coal. There was confusion between shafts which are vertical and tunnels or roadways

which are horizontal. The process of hydraulic rams supporting the roof whilst mining takes place followed by permitted collapse after mining was sometimes confused with pillar and stall method where the idea of leaving pillars of coal is to prevent collapse. Blasting is not a usual part of this method of coal mining.

Teaching Tip
There are excellent film clips and animations of mining techniques on internet sites like Youtube which would make it easier for candidates to visualise these complex 3D processes.

c) Collapse or the build-up of methane causing explosions were the most common answers, although flooding and poor ventilation were also offered by a minority of candidates.

Question 5

This question performed well with every mark accessible to candidates and many excellent answers. The question asked for both the formation of oil and gas and their accumulation in economic amounts. Some candidates answered only part of the question so limiting their marks.

Some answers were very detailed and worth many more than the eight marks available. Many were generalised, lacking enough detail. Quite a number of candidates included the summary diagram from the textbook. In almost every case this contributed nothing to the text, which repeated everything on the diagram.

The formation of oil was sometimes confused with coal and deltas were described. The source rock was not always mentioned and occasionally was described as porous and permeable. The organic rich clay is porous, but compaction forces the oil to move into the porous and permeable reservoir rock.

Few candidates gained full credit on maturation with many failing to identify the temperatures involved or the intermediate stages of sapropel and kerogen.

Migration was occasionally done well, although often the reason for migration was stated as the oil is less dense than the *rock* rather than the *pore water*. Few identified the need for a migration pathway through porous and permeable rock.

Most answers showed several traps while some showed no traps at all, or a list of traps was given with no explanation which therefore did not gain credit. Some trap diagrams were very well drawn and fully labelled while others lacked the essential labels for the reservoir and cap rocks. There were some surprising errors for traps such as confusing anticlines with synclines, (although it was always anticlines drawn), and stating that salt domes were igneous intrusions.

F795 Evolution of Life, Earth and Climate

General Comments

This was the first time that this A2 unit had been examined and although it was similar to the old 2834 Palaeontology it was good to see that the new material was reasonably well known.

There were some outstanding scripts and these candidates demonstrated excellent subject knowledge and were able to express themselves clearly and concisely using good technical terminology. Even the weaker candidates had a sound understanding of much of the content. There was no evidence that time was an issue with all candidates attempting the final extended questions. Very few candidates gave no responses to questions. Diagrams were generally of a high standard especially the rugose coral. Question 5 on climate was generally well answered despite being newly assessed material, particularly impressive were the definitions of *climate* and *Icehouse Earth* and the understanding of the link between spreading rates and sea level.

Question 6, the extended prose question on the Permian extinction, was very well answered with many candidates writing in great detail especially about the possible causes. The effects were less well known. Question 7, the extended prose question on relative dating methods, was less well done many knew a little and could draw simple diagrams, but few could add much detail.

Comments on Individual Questions

Question 1

Candidates generally performed very well on this question showing a broad understanding of cephalopods. This was one of the highest scoring questions on the paper with a range of marks from 3 to the maximum 19.

a) (i) Well answered by candidates with only a few not knowing the protoconch (often covering too wide an area) or being too vague with the location of the aperture.

(ii) Many knew that this was evolute/planispiral. A significant number identified it incorrectly, calling it *involute* and some described it as having right/left or sinistral/dextral coiling which are characteristics of *gastropod* coiling.

b) (i) Many candidates knew about the different suture lines and could add labels such as lobes, saddles and the aperture direction. The diagrams were occasionally poor making it difficult to award full marks.

> **Teaching Tip**
> Get candidates to practise drawing the different sutures and labelling them. Candidates should use a landscape A3 sheet and show all the evolutionary changes experienced by ammonoids (suture complexity, siphuncle position, septal neck orientation, size of living chamber, ornamentation). Something similar can be carried out for graptolite evolution.

(ii) The majority of candidates knew that nautiloids had the simplest suture.

(iii) Most candidates knew that the soft tissue/body of the cephalopod lived in the body chamber. A significant number of candidates were not clear that the septa acted as chamber walls and added strength and rigidity).

(iv) Many candidates used either the shifting position of the siphuncle or the change in direction of the septal necks. Fewer candidates discussed ornamentation or heteromorphs. Some candidates were vague or did not make a distinction between the earlier form and the later form either in the text or on the diagram. Diagrams were often good but a lack of labels was an issue.

c) Candidates had a good understanding of how cephalopods moved. A number of otherwise excellent answers were completely the wrong way round - (horizontal/vertical). Candidates were very clear on the role of gas/fluid exchange in the chambers but less clear about the role of the tentacles and "jet propulsion".

Teaching Tip
Make sure that candidates are absolutely clear on how cephalopods moved:
Vertical:
Gas/fluid exchange in the chambers via the siphuncle
Horizontal:
Gentle movement of the tentacles
More rapid movement by jet propulsion using water (not gas) forced out of the funnel/hyponome which forces the animal backwards.

d) Many candidates knew that modern cephalopods are active hunters or scavengers and discussed the capture of prey using the tentacles. Fewer knew that the tentacles could move the food to a beak that tore the food apart. A common error was to think that cephalopods are filter feeders and perhaps used their tentacles to create water currents.

Question 2

Candidates clearly have an excellent understanding of most aspects of trilobite morphology and modes of life. This was the highest scoring question with marks between 6 and 16 out of 16. The adaptations to various modes of life proved the most challenging aspect.

a) (i) The majority of candidates were able to recognise the fossils as trilobites. A small number identified the phylum as arthropods whilst the question asked for the group.

Teaching Tip
Candidates should be able to name the group and phylum for all the fossil groups in the specification. Test an increasingly long list as you work through the fossil groups.

(ii) Most candidates successfully identified all four morphological features. The main errors were in locating the facial suture and the genal spine.

(iii) The vast majority of candidates correctly shaded the pygidium. A few misread the rubric and filled in the pygidium for fossil C and a few only partly shaded the pygidium.

b) (i) Almost every candidate correctly located the gill and jointed appendage.

(ii) The majority of candidates were aware that this trilobite would have walked on the seabed using its legs/jointed appendages.

c) Many candidates were aware of the general adaptations of trilobites to their modes of life although some did not connect the feature to its way of life, as was asked in the question. Most knew the mode of life terms and so did discuss the correct modes of life.
Nektonic: Many candidates described Deiphon. Many candidates knew about the adapted eyes and separated pleura. Some mentioned small size which was not always the case.

Infaunal: Many candidates described Trinucleus. Most knew about the adapted cephalon, genal spines, lack of eyes and pitted fringe.
Planktonic: Many candidates described Agnostus. Most knew about the small size, inflated glabella, lack of eyes and restricted pleura.

Question 3

Candidates found this question relatively difficult but marks ranged from 4 to full marks of 16. Recognising the free-swimming organisms and the environment from the fossil assemblage was more challenging than recognising the brachiopod and bivalve features.

a) (i) Although the calculation was straightforward, it relied on candidates recognising which were free-swimming and a third could not do this.

(ii) Almost all candidates successfully completed at least 3 of the 4 bars on the graph. A number were untidy and it was clear that candidates did not have a ruler. Candidates should be encouraged to be as neat as possible with graphs and make sure that the lines are clear. In this case shading helped.

(iii) Most candidates were aware that the assemblage indicated low energy conditions, but did not realise that it was also shallow water. Many linked low energy with deep water which was logical enough. Most recognised that the smooth bivalves and higher number of unbroken fossils provided the best evidence. Fewer discussed the belemnites and ammonites being able to settle to the sea floor in low energy conditions.

Teaching Tip
It is worth candidates focussing on fossil assemblages for all the main environments as this is often a weak area for candidates. Perhaps groups of students could produce revision posters/podcasts for each environment that could be on display in class/VLE.

b) (i) Candidates found it difficult to gain full marks when comparing the morphological features of bivalves and brachiopods. Candidates mainly knew about the lophophore and ligament but were less sure about the gape, muscle scars, commisure and composition of the valves. Comparing bivalve and brachiopod morphology is a common question either as part of a short question or potentially an extended prose question.

(ii) Most candidates could draw the general elongated shape of a deep burrowing bivalve such as Solen. Most candidates also drew the foot and siphon. Fewer candidates labelled the growth lines or mentioned the lack of ornamentation. Drawings were of a reasonable standard with plenty of labels.

(iii) A large number of candidates discussed the byssus of Mytilus with a smaller number mentioning the use of cement by Ostrea. A number discussed ribs and ornamentation which are not appropriate, but strengthened, thicker valves which is. A few candidates discussed strong adductor muscles, inequivalve designs and the periostracum.

Question 4

Candidates had an excellent knowledge of the environmental controls on the location and growth of reef building corals. Marks for this question ranged from 2 to full marks of 14. Candidates were generally good at recognising the plants and realising the conditions required for their preservation.

a) (i) Most candidates were aware from the map and their own knowledge that modern day coral reefs form within the tropics. Many realised that continental drift had moved the Carboniferous corals but relatively few also made it clear that they had formed in a tropical situation. The most common mark was 2 out of 3..

(ii) It is good to see that most students have moved away from vague answers about warm and shallow conditions and now give detailed conditions often with appropriate reasons. A common error was to give salinity in ppm rather than 35 parts per thousand.

(iii) The standard of rugose coral diagrams was generally impressive with most being both recognisable and having at least 4 appropriate labels.

b) (i) Most candidates recognised the drawings as plants or more specifically ferns and Lepidodendron. A good number of candidates were able to suggest another appropriate organism, usually insects and other plants. Candidates had to be careful to only mention organisms alive in the Carboniferous.

(ii) Candidates had a thorough knowledge of the conditions required for the preservation of plant fossils.

Question 5

This proved to be the most difficult question for candidates partly because it was testing topics new to the specification. The marks ranged from 2 to 14 out of 15. The climate definition needed to be precise and few candidates were aware of the role of ice in the isostatic rebound of Scotland.

a) (i) Many candidates were aware that climate linked to long-term weather patterns but relatively few linked this to temperature, wind pressure etc. patterns. Quite good though, considering that this is the first time that questions on this topic have been asked.

Teaching Tip
There are many terms that could be defined in examinations and candidates must be confident with this. Candidates must be encouraged to give as much detail as possible and knowing specific examples is often a good way of helping candidates remember detail. A glossary of terms and definitions should be built up as the course progresses and perhaps tested on a regular basis.

(ii) Many candidates were aware of the drop in temperature but candidates must remember that this is a global effect. Many also discussed growing ice sheets and glaciers with many mentioning the positive feedback linked to increased albedo.

b) (i) Many could talk generally about raised beaches linked to sea level change, but few related this to isostatic rebound linked to the removal of the weight of ice at the end of the last ice age.

(ii) An impressive number of candidates were able to link increasing ridge activity with rising sea floor and displacement of water leading to rising sea levels. Common errors included not making it clear whether they were talking about increasing or decreasing activity. A common misconception was that increasing ridge activity makes the ocean wider and so sea level drops due to the increased volume available.

(iii) Most candidates could link the formation of ice caps and glaciers with a drop in sea level and vice versa, although few candidates knew about the influence of temperature on the expansion of the surface layer of ocean water.

c) (i) About half the candidates were able to interpret the graph and correctly locate the lowest sea level where most land was exposed (at the bottom of the graph).

(ii) Students found this an easy question and correctly noted the direct correlation between species diversity and sea level.

(iii) Many candidates were able to work out that this was the K/T boundary and so discussed the possible meteorite (asteroid) impact. Others did mention the Deccan traps (occasionally confused with the Siberian traps) and climate change. Candidates must remember that the climate change was global and that mentioning increased volcanic activity is too vague.

d) A majority of candidates knew that microfossils can help with dating and so used as zone fossils. Few candidates knew that they were particularly useful in oil exploration partly due to their small size. Many candidates gave extra information relating to their use as index fossils.

Question 6

Many candidates showed very detailed knowledge of the Permian extinction going well beyond the requirements of the specification and the mark scheme. Candidates tended to be stronger on the causes than the impacts. The marks ranged from 0 to 10 with a high average.

Approximately 20% of candidates gained full marks. Many candidates had a very detailed understanding of the possible causes of the extinction often retelling it as a story. Most knew about the formation of Pangaea limiting the shallow shelf area and causing desert conditions in the interior. More impressive was their knowledge of the Siberian traps. Very few candidates misidentified the Deccan traps as being the cause. There was little evidence of confusion with the K/T extinction. Many candidates discussed the gas and ash emissions causing cooling and then warming with the subsequent release of methane hydrates. Relatively few discussed meteorite impact which although a possible cause has less evidence.

There was little scope for diagrams although some illustrated the difference in coastline of a supercontinent compared to 4 smaller continents. Candidates were less strong on the effects of the extinction although many knew the correct date and at least one fossil group that became extinct. Few knew details of the terrestrial creatures affected or the gradual nature of the extinction. Overall though, the responses were excellent.

Question 7

Candidates found it hard to gain full marks although many knew something about each of the three methods. The marks ranged from 0 to 10 with a mean around 6. There was not much evidence of candidates having run out of time and most clearly had enough time to answer the

question fully. The question asked for methods used to date rocks and referred to age relationships which were not always answered directly. Candidates were keen to write about these features but did not focus their answers directly to the question set.

A way up structure: many candidates spent too much time on giving several way-up features where only one was requested. Several candidates did not really say how the features were used to date rocks and just described them. There were many diagrams although many had unsatisfactory labels to the rocks, the features and most importantly, the relative ages. Desiccation cracks and graded bedding proved the most successful answers. Some candidates just discussed the principle of superposition without discussing way up structures.

Included fragments: most candidates knew the general principle and discussed either clasts or xenoliths although often not in much detail. Diagrams were mixed with the best having clear indications of the relative ages and some even had a series of diagrams showing the formation of the included fragment over time.

Cross cutting relationship: almost all candidates knew the general theory although many had difficulty putting it into words. Many drew complicated cross sections or maps showing a number of events - often had poor labelling but good explanations. Statements giving relative ages were essential.

It therefore proved difficult for candidates to gain full marks with many gaining a mark for a general explanation and a reasonable diagram but lacked the detail to gain the third or fourth mark.

F796 Practical Skills in Geology 2

General Comments

This is the first year for this unit with some very good tasks being submitted and many candidates demonstrating excellent subject knowledge. Many were able to express themselves clearly and concisely using a sound range of geological terminology.

Many centres submitted their marks via *Interchange* before the deadline and as a result had a very prompt response for their sample of work. In many cases the sample was dispatched by centres extremely quickly. This greatly aids the moderation process immediately after standardisation. Where centres are unable to submit their marks via *Interchange,* it is important to then send the moderator a copy of the MS1 form.

The Excel spreadsheet downloadable from *Interchange* is helpful to input all of the marks achieved by each candidate. The form will then automatically calculate the totals using the best marks. Some centres did a single task for all candidates but most centres gave candidates two or even three opportunities at Centre Based, fieldwork and Evaluative Tasks.

In general, centres were clearly annotating the Centre Based and Evaluative tasks to show where marks had been achieved, using ticks and crosses as requested in the previous year's report. This enabled moderators to see clearly where marks had been awarded. It was often much more difficult with the field work to ascertain where marks had been awarded, especially when candidates had tackled their field tasks in a different sequence to that shown on the mark scheme.

Administration this year was generally completed to a high standard with fewer clerical errors, although there were still a significant number of these. Please do take care, especially if a candidate's marks have been changed, to check that the right mark is clearly shown and is recognisable on the script, and that the correct total is shown. In a few cases, internal moderation had been carried out and marks had been changed on the script but totals had not been amended.

Centres still need to include a Centre Authentification form. In a small number of cases this was not sent in and had to be requested possibly resulting in a delay in moderation.

Comments on the Centre Based Tasks

Centre Based tasks must always be accompanied by a copy of the results obtained by the teacher in their trial run of the practical. These results should reflect the likely results that candidates should obtain. In experiments where the samples are destroyed, the data should show similar starting amounts so that the rate of disintegration can be compared.
The cover sheet directs teacher to "use their professional judgement to decide if the answer is worthy of credit. If it is, then the script should be annotated accordingly". This might apply to some questions where a range of responses is given in the mark scheme and an obvious point appears to have been omitted.

Comments on Individual Tasks

CB1 was the most popular task forming over half of the tasks submitted. In general, data was accurately marked by teachers and the calculations were within the acceptable tolerances. It should be noted, however, that answers must be within the tolerance shown in the mark scheme. It also should be noted that if a candidate did record data incorrectly initially, the *calculation* can be awarded using error carried forward (ecf). A small number of centres were

giving credit for points that were very different to the mark scheme and then not annotating the script to explain their reasoning. As such, these marks cannot be given. If a candidate is on the right lines but does not actually give the answer, it is not acceptable to assume what they thought and give the mark. Similarly where there are 2 marks, candidates must give two distinctly different points.

Many candidates produced good sketches, but there was some poor labelling, and measurements of dips are required for all beds. Centres should be aware of the error ranges given, and values which fall outside these should not be allowed - a small number of centres were awarding marks incorrectly. Labelling and observations of fossils must be accurate and detailed.

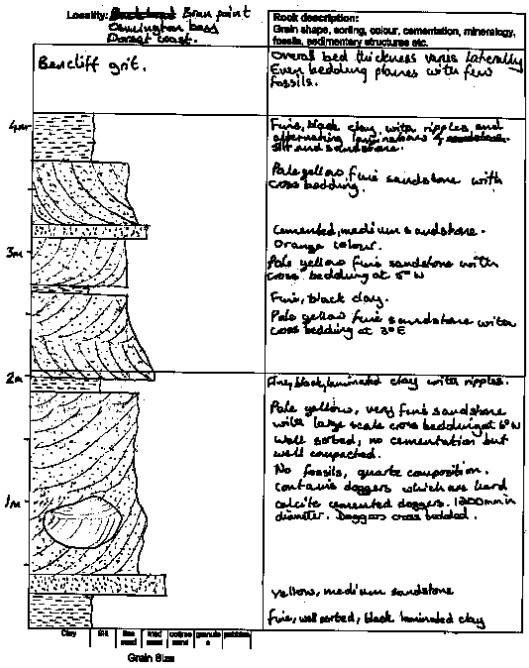
CB 2 was the least popular task - about a tenth of the tasks submitted, but performed very well. The key issue was the tolerance stated in the mark scheme at +/- 0.5 or 10% from the teacher's results. In some cases marks were incorrectly awarded when candidates' results were far more than 10% out. Marks should not be awarded for discussions focussing solely on experimental error, rather than geological reasons. For questions with an element of observing differences, candidates often gave a sound geological answer but lacked the comparison. Diagrams were generally of a high standard - many candidates have developed good skills in sketching photographs. The main area for further focus is on the labelling, including the measurements.

CB 3 was submitted by nearly a fifth of centres. Some centres experienced problems with this experiment and found that they obtained different results to what were expected. Most had either contacted or put in a note to explain the moderator, which greatly aided the moderation process. In situations like this it is beyond the control of the centre, so candidates must be credited for carrying out the experiment correctly.
The sketch of this photograph varied in quality.

Field work Tasks

A fifth of centres submitted fieldwork. There was a lot of very good fieldwork in evidence here and OCR now has a good bank of approved tasks displayed by region on *Interchange*. These are available for other centres to use if they do not wish to put in an original submission. Most centres had the required 50% of marks for A2 specification content ie based on F794 economic geology and F795 fossils. One of the main weaknesses was the lack of detail in the fossil work, as candidates need to describe and label the fossils *in detail* for A2.

Many centres used rock descriptions and graphic logs to cover the remaining synoptic 50% of the marks. There were some excellent graphic logs evident, although a small number of centres do have problems producing a viable graphic log: the x axis should equate to grain size, the coarser the grains the wider the plot. The y axis relates to the thickness of the beds, which should be plotted. Below is a good example, and some submitted were more detailed than this with excellent measurements.



For some centres it was difficult to work out the mark scheme used and sometimes what the candidates wrote was not easy to match up with the mark schemes. It would be helpful to have some background information on what the sketches should look like, what to expect from a log etc. The best centres were those where the marks on the candidates' work could be clearly matched up to specific parts on the mark schemes. It should be noted that field work must have been OCR approved.

A small number of candidates wrote about lessons they had had on the task before they visited the site. 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.

Some centres gave candidates too much guidance; for example using guidance sheets of A4 paper with specific task boxes drawn in for candidates to sketch or write in, instead of using notebooks which was favoured by most centres. There was concern that this constituted too much help especially as there were some leading suggestions. Rather than stating *describe the limestone, sandstone and siltstone* it could be reworded to ask candidates to describe the *different sedimentary rocks* found at the site, thus leaving it up to the candidate to identify the rocks.

Evaluative Tasks

In general, there were more issues with the application of the mark schemes with these papers, with more tasks showing signs of over marking.

Evaluative 1 was the least popular task submitted by a tenth of centres. Most candidates had a good awareness of the ideas, but struggled to provide the precision required in the mark scheme. Surprisingly, the geological map was a challenge for some, especially drawing additional items on the map. There were some really good accounts of the sequence of events. A significant number of candidates did not use the numeric data from the map in sufficient detail thus limiting their marks.

Evaluative 2 was the most popular task with over half of centres submitting this. *Both* axes do need to be labelled on graphs correctly in order for the axes mark to be awarded. Some centres used an old version of the data in the table*. Centres should always check on Interchange for any task updates before a task is used.* Better still, sign up for updates alerts – you will not be inundated!

Evaluative tasks expect candidates to be able to interpret a graph and link it to additional data and give valid reasons. This includes converting into a compass direction, as a more demanding A2 question. Most candidates did show a strong awareness of safety precautions, although a small number described the potential hazard rather than the precaution which should be taken. Where a question gives guidance on what was needed then the mark scheme will reflect this and must be applied accurately.

Evaluative 3 formed over a third of the work submitted to moderators, and most candidates answered to a consistently high standard. It should be remembered that if the mark scheme requires two points such as an identification and a reason, the mark *cannot* be awarded for *part* of the answer. Graph marking needs to be accurate, and using an overlay which can be placed over the points is helpful to assess the accuracy. Some centres commented on clarity issues with one of the photographs. It can be easier for candidates to see the features if an image is projected onto a screen, especially if photocopying has reduced the quality.

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