WJEC
CBAC

GENERAL CERTIFICATE OF EDUCATION
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EXAMINERS' REPORTS

GEOLOGY

SUMMER 2008

Statistical Information

This booklet contains summary details for each unit: number entered; maximum mark available; mean mark achieved; grade ranges. *N.B. These refer to 'raw marks' used in the initial assessment, rather than to the uniform marks reported when results are issued.*

Annual Statistical Report

The annual *Statistical Report* (issued in the second half of the Autumn Term) gives overall outcomes of all examinations administered by WJEC.

GEOLOGY

General Certificate of Education 2008

Advanced Subsidiary/Advanced

GL1 Foundation Geology

Principal Examiner: Mr David Evans

Unit Statistics

The following statistics include all candidates entered for the unit, whether or not they 'cashed in' for an AS award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this paper and that differences will undoubtedly occur between one year and the next and also between subjects in the same year.

Unit	Entry	Max Mark	Mean Mark
GL1	1520	60	33.3

Grade Boundaries

A	42
B	36
C	30
D	25
E	20

N.B. The marks given above are raw marks and not uniform marks.

GL1 Foundation Geology

This proved to be a paper which discriminated well and once again, gave the more able candidates a chance to demonstrate their geological knowledge and problem solving skills. As on previous occasions, the range of stimulus material was broad, including maps, diagrams, a geological cross section and a graphic log. Each question was regarded as equally accessible, with no one particular question causing bringing about significant underachievement.

Q.1 (a) This introductory question was slightly more complicated than usual and so was worth 2 marks. Not too many candidates were able to correctly note movement to the west of both plates relative to the South Sandwich Plate.

(b) In section (i) most candidates correctly noted and explained the fact that locality A was closer to the oceanic spreading centre and hence younger than position where the rocks were 5 million years old. In section (ii) the best candidates provided two absolute dating techniques involving the use of paleomagnetism and radiometric dating, although the use of carbon dating was a common error.

(c) In section (i) examiners were simply looking for the use of the scale in Figure 1a to give a measurement of size, of either width or length. Students should also have used Figure 1a or Figure 1c, to give a simple description of shape. In c (ii) few students could correctly link the andesitic magmatism to partial melting of the subducted oceanic lithosphere. A number of candidates mis-read the phrase “magmatism”and wrote about details related to“magnetism”.
In section (iii) the most common error was to describe rather than to explain the distribution of the foci. In this way many five line answers gained no marks. Examiners were looking for answers related to process at subduction zones and within volcanic islands, rather than one or the other.

Q.2 (a) Students should have combined background knowledge and the use of the mineral data sheet to name quartz and feldspar as the two most abundant minerals in an arkose. Use of the data sheet without knowledge allowed the incorrect naming of barite as a substitute for feldspar. In section (ii) there were many ways to gain two marks, by commenting correctly on issues of size, shape, sorting and orientation of the grains in the arkose. Weaker students used igneous terminology. The best candidates even noted the variation in shape of the feldspar compared to the quartz grains.

(b) This was intended to be a straightforward observation of dip angle and direction (to the east). A number of candidates incorrectly commented on the dip direction to the south-east, having confused the cross sectional nature of Figure 2a with that of a map. The better students also noted the steepening of the dip towards the granite pluton.

(c) In part (i) students were expected to simply note that granite also contains quartz and feldspar and could therefore, on the basis of mineralogy alone, have been the parent material of the arkose. Some students failed to answer the question set and involved themselves in explaining why this could not have happened based on the age relationships, thereby straying into section c (ii). In the second section, the many indicators of the incorrect age relationship (granite younger than arkose and therefore the inability of this granite pluton as the parent material for the arkose) were noted and explained. This included the cross cutting nature of the granite, the contact metamorphism by the granite, the steepened dip due to the intrusion, and the included fragments of the conglomerate in the granite.

(d) Most students were unable to comment on three differences between the shale and its contact metamorphosed equivalent. Examiners expected answers related to the crystalline/granular texture, the difference in grain/crystal size, and the presence of andalusite rather than clay minerals. More candidates could explain the role of contact metamorphism due to the heat form the granite intrusion which the latter part of the question demanded

Q.3 (a) Examiners were surprised to note how many candidates struggled to correctly identify the only two parts of a graptolite named in the specification. It was also disappointing to read such a wide variety of incorrect spelling, with one candidate having 4 attempts before opting for "theeky", the closest of his choices!

(b) This was intended to be an easy question to test the simple understanding of time of appearance and extinction, using data response. This was done well except for a minority of candidates who wrote about what the graptolites "looked like" ie their "appearance", rather than the "timing of their appearance" which the stem of the question clearly demands.

(c) Students should have used their knowledge to note the fact that most graptolites floated in the oceans, had unique features which showed rapid evolution and had fragile skeletons, in order to gain the three marks here. Many candidates gained at least two of the marks for this section.

(d) The best candidates made use of the information in the passage and applied it correctly to conclude that *Didymograptus* is a better zone fossil than the graptolite of genus A. The key aspects being the shorter time-span and hence more precise dating ability of *Didymograptus*, and its lack of a rooting structure enabling a wider distribution compared to genus A. Weaker candidates either noted the greater value of genus A, or simply did not compare the value of the two graptolites, and thus could only achieve a maximum of two marks. Some candidates irrelevantly commented on the value of these graptolites in determining the past environment of deposition of the rocks.

(e) Candidates should have noted the fine grained nature of shale, indicative of low energy conditions during its deposition and therefore the greater likelihood of preservation of fragile graptolites. The better answers also commented on the anoxic environment of deposition of black shales and hence the lack of decomposition of the graptolites.

(f) Few candidates picked up on the comment in the passage regarding the fact that the graptolites are an extinct group, and hence our inability to apply uniformitarianism to the group. Other correct answers included the lack of preservation of the soft tissue and the implications of this.

Q.4 (a) The graphic log was usually correctly interpreted so that most students gained both marks for noting the fact that bed 4 is 80cm thick and has a silt, or fine, gain size.

(b) It was commonly known that the bed at the base of a sequence which has not been overturned is the oldest. Most candidates gained two marks, but many could not argue that the sole structure evidence demonstrates that the sequence is the correct way up. In part (ii) many candidates could identify bed 3 correctly but could not explain why upward fining indicates a decrease in energy level.

(c) A wide variety of relevant sedimentary structures were covered in this section, with the best offering detailed diagram(s), with written descriptions of how the structures form and explanations of how these can indicate the environment of deposition. A significant minority of candidates did not understand the meaning of the term sedimentary structure, and wrote about rock types, erosional features or fossils. It was pleasing to note the use of specific and relevant examples from students' fieldwork.

GEOLOGY

General Certificate of Education 2008

Advanced Subsidiary/Advanced

GL2a Investigative Geology

Principal Examiner: Mr Craig Wall

Unit Statistics

The following statistics include all candidates entered for the unit, whether or not they 'cashed in' for an AS award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this paper and that differences will undoubtedly occur between one year and the next and also between subjects in the same year.

Unit	**Entry**	**Max Mark**	**Mean Mark**
GL2a	1457	60	35.3

Grade Boundaries

A	43
B	38
C	33
D	29
E	25

N.B. The marks given above are raw marks and not uniform marks.

GL2a Investigative Geology

The paper tested the range of skills and techniques flagged up in Unit GL1 of the specification. The demands made by the paper on candidates were designed to be broadly comparable with previous years, but an increase in the mean mark compared to previous years suggested that it was more accessible. This was seen over the full ability range but differentiation was still achieved.

Q.1 Many candidates accurately read the question stem and wrote about both the composition and texture of Specimen A in part (a)(i), but some answers were solely about one of the two. Credit was given in part (ii) for the recognition of a lava surface, which showed initial cooling to form a crust, which was then deformed by internal movement of flowing liquid. Better candidates described it accurately as ropy/pahoehoe, but “pillow lava” was an answer often encountered and in these cases candidates were given a reduced mark, but one which still credited the cooling and flowing processes. Some names were way off the mark and these included flutes, load casts and nappes. Some candidates failed to follow instructions and evaluated the two statements from the wrong source in (b)(i), but on the whole, the intrusion of Rock Unit B into Rock Unit A was noticed in Photograph 2. Map 1 showed that Rock Unit B formed cone sheets, but this response was not asked for – sills are concordant whereas these structures are not. Part (b)(ii) required field evidence to show that Rock Unit B was younger than Rock Unit A such as included fragments or chilled margins. Weaker candidates attempted to show the relative age of these rocks to the others on Map 1.

The stem to Question 2 stated that this was a plant fossil in a sandstone, but this didn’t stop some candidates from describing the preservation of corals and crinoids in limestone, or identifying the tree stem as a trilobite or graptolite! Candidates must draw what they see. Credit was not given to labels in part (a)(i). Some very confusing responses were encountered in (ii) with several possible methods of preservation being muddled together. Part (b) was about planning, implementing and analysing. The equipment *“specified by the Supervisor”* simply means that – no credit was given for hammers or microscopes, and especially, the steel scratching needle! Candidates were asked to confirm “cementation” i.e. a mineral binding grains together rather than compaction of grains into a finer matrix; the degree of cementation could then be established. A wide range of responses were credited including observations of texture with a hand lens would have gave information of sorting, pore spaces and mineral precipitation, while water dropped onto the surface indicated porosity (or lack of it due to a total cement). Acid use eliminated calcite as the mineral cement. “Crumbling” the rock on a streak plate or between fingers indicated the degree of cement.

Q.3 Although there was some variation in the nature of the gneiss sent to centers as Specimen D, use of these and Photograph 4 allowed the responses to part (a)(i) to make a correct identification in (ii). Only the very best candidates realized the link between the rocks in Unit D. The gneiss is a high grade regional metamorphic rock which has partially melted to allow the small veins of granite to form. Many candidates responded to the term “granite” and immediately wrote of subducting plates and batholith scale plutons. Despite being wide of the mark in terms of scale, credit was still given here for “processes”. Part (b)(i) tested strike of beds, but this concept appears to be poorly understood in many candidates. A better response was met in (ii), but boundary U – U in part (iii) was rarely described in terms of field evidence. Included fragments of Rock Unit D within Rock Unit E or cross-cutting of the granite vein were the most popular responses. Very few commented that a weathered upper surface may be found at the top of the gneiss, or that the bedding in E may mismatch the dips and trends of the foliations in D. No credit was given for fossils within rock unit D!

Q.4 Previous reports have stated that candidates must be accurate when drawing axial plane traces across the surface outcrop – as usual, the unconformity truncates it on this map (part (a)(i)). Section (ii) was answered correctly by many candidates. Use of Map 1 gave the Rock Units required in (b)(i) but weaker scripts gave the answer to (ii) as a bearing after apparently mistaking the section for a map. Many candidates guessed the dip rather than measuring it with a protractor. Full credit was awarded in (iii) when the age relations between the two rock units was established from map evidence (Rock Unit E in the west is older), and then indicating that the west side (hanging wall) had moved up.

Q.5 The very flexible mark scheme traditionally used in questions of the type in part (a) continues to allow credit to be given for any good interpretation of the information given on Map 1. There are some centers who obviously spend considerable time and effort on mapwork and here candidates’ scores on this question are of a much higher standard than the of the rest of their responses within the paper, as well of other centres. The innovation of having a small volcano on the map didn’t cause any obvious difficulty (or perhaps candidates simply didn’t realise!). The geological history in part (b) was partially completed this year and was subsequently reduced in weighting, but it still achieved a wide range of responses.

GEOLOGY

General Certificate of Education 2008

Advanced Subsidiary/Advanced

GL2b Investigative Assessment

Principal Examiner *Dr Alan Seago*

Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
GL2b	195	60	36.3

Grade Boundaries

A	44
B	39
C	34
D	29
E	24

N.B. The marks given above are raw marks and not uniform marks.

GL 2 (b) INTERNAL ASESSMENT

Twenty one centres submitted field investigations for moderation with a significant number of centres trying out the experience for the first time. It is pleasing to report that centres are taking note of comments made in individual centre reports in previous years so that there is a continuing improvement in the suitability of tasks being undertaken and the quality of candidates' work. There has been a reduction in the number of centres where scaling is required and the amount of scaling that has to be applied. For some centres scaling had to be applied to raise the marks of their candidates. There are two main reasons why scaling has to be applied;

- reliable rank order but marks generous or severe
- failure to show how criteria have been achieved by annotation of candidates' work

Centres are not now creating difficulties for themselves and for the moderators by submitting field investigations from outside the context of GL1 skills. Centres should be aware of the required context of the investigation at all times as described in the specifications.

The centres are to be congratulated on;

- the standard of work produced by the candidates
- the opportunities given to the candidates to study geology in such suitable areas
- and in most cases the accuracy of the assessment.

The enthusiasm for geology and expertise of the teaching staff in centres is obvious from the quality and effort put into coursework submissions.

There were one or two examples of errors in administration particularly by new centres such as using the incorrect forms, not doubling the marks to a mark out of 60, discrepancies between marks on the work and on the forms and not authenticating the work of the candidates.

The better investigations include the demonstration of basic field skills such as rock identification and textures, identification of field structures using dip and strike/field sketches, sedimentary logging and fossil identification. The data collected can be manipulated and presented in cartographical or graphical form. Some excellent field investigations are now being seen which are well suited to the assessment framework. It is good to see geological field skills being demonstrated with a high degree of competence. There were however a minority of investigations which would have been more suited to GCSE lacking, as they did, any scope for advanced analytical skills and any degree of complexity. It was disappointing to see the 'gravestones' investigation appear once again after a welcome absence for a number of years now. The basic field skills of measuring dip and strike, drawing field sketches of geological features, constructing logs and mapping of relatively straightforward structures cannot be demonstrated in this investigation. Moderators, whilst appreciating that large numbers may be difficult to accommodate, would hope to see candidates given greater opportunity to demonstrate a wider range of geological skills, particularly if suitable geological locations are within easy reach of the centre.

In some cases there was no risk assessment although the number of instances is decreasing. It was pleasing to see the extensive use of the Planning Tracking sheet. Some thought has to be given at the planning stage as to whether the data being collected is suitable for processing and analysis e.g. histograms, cross-sections, logs, rose diagrams maps and geological histories. A number of centres are now making preliminary visits to sites in order to allow some forward planning by candidates, which often results in better Planning marks. Some candidates devoted insufficient time on the retrieval and evaluation of relevant material from different sources.

Some field notes consisted entirely of tables of data and it would be an improvement to see a variety of data collection including field sketches and rock descriptions etc. In a number of cases, opportunities for the collection of basic field data have been missed. Observations such as rock identification, grain size, sorting, direction of cross- bedding, clast roundness/orientation, field sketches, dip and strike measurements should normally be part of every investigation where appropriate. There is no need for candidates to repeat observations made in the field notebook within a report unless it contributes significantly to the analysis. It is more advantageous for candidates to concentrate their efforts on the analysis and evaluation. In a minority of cases it was difficult to distinguish between field data and secondary data or individual work and collective work. Centres and candidates should ensure that nature of the work is clearly identified for moderation.

A mixture of tasks was undertaken, with a rough break down being investigations into;
interpretation of sedimentary environments (sedimentary logs, fossils and rock description)
mapping exercises (leading to drawing up of geological sections and history)
analysis of fossil assemblages
joint orientation related to faulting (rose diagrams and stereonets)
structural analysis (faulting and folding styles related to compression or tension or to specific orogenies)
textures of Quaternary coarse grained sediment
nature and relative age of igneous intrusions
evidence for contact metamorphism around a granite intrusion

Centres are to be congratulated on the variety of opportunities given to candidates in areas of outstanding geology such as, North Wales, Isle of Arran, Pembrokeshire, Ogmore, Yorkshire coast, Alderley Edge, Gower Peninsula, Dorset, Black Mountain, Lake District, Devon and Cornwall. Other centres made good use of suitable local geological locations.

Centres should be aware that there is help available from the WJEC. Published exemplars of coursework investigations can be obtained from the WJEC offices and INSET activities are provided. Moderators' reports on the current moderation process are sent out to centres. Centres are urged to act on any recommendations in the Moderators Reports, The Moderators do not enjoy moderating work which achieves low marks as this is going to be disappointing for the centre and the candidates, especially when there is often so much suitable geology on the centre's doorstep which with a little help and guidance can result in a successful submission. There are guidelines in the specification such as Planning Aid p62 and suggested investigations p22. Alternatively the centre could discuss suitable investigations with me through email/ telephone as several centres do. This can include advice on the suitability of coursework investigations prior to carrying them out and examination of candidate's draft field investigations. My contact details can be obtained from the WJEC Geology officer in Cardiff. Any centre having a problem with applying the assessment framework should contact the WJEC well in advance of the submission date.

GEOLOGY

General Certificate of Education 2008

Advanced

GL3 Geology and the Human Environment

Principal Examiner: Mr Peter Loader

Unit Statistics
The following statistics include all candidates entered for the unit, whether or not they 'cashed in' for an AS award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this paper and that differences will undoubtedly occur between one year and the next and also between subjects in the same year.

Unit	Entry	Max Mark	Mean Mark
GL3	1254	50	30.1

Grade Boundaries

A	35
B	30
C	26
D	22
E	18

N.B. The marks given above are raw marks and not uniform marks.

GL 3 Geology and the Human Environment

General comment

All questions were accessible and produced some excellent responses. In Section A, Question 1 was answered better than Question 2 in most cases whilst, in Section B, Question 5 was the most popular choice.

SECTION A

Q.1 (a) (i) Andesite was by far the most common acceptable answer although other relevant answers were accepted. The most common unacceptable answer was basalt.

(ii) "Subduction" and "destructive plate margin" were both common but a surprising number of candidates interpreted this as a constructive plate margin. It tended to be the better able candidates who mentioned partial melting (of the subducting plate.)

(b) (i) Most candidates scored at least one mark for the distance and velocity. The "working out" was sometimes difficult to follow although an improvement on previous years. This meant that credit could be given for adopting a correct method even if an incorrect answer resulted.

(ii) Though well done by most, some confusion as to the meaning of the submarine contours resulted in candidates basing their analysis on incorrect evidence.

(iii) This was very well done with very few candidates not securing at least one mark though the shallow depth of the seafloor was only least considered.

(c) This posed few problems and many correct suggestions were put forward. Most of the candidates who did not secure both marks put forward a correct method but were unable to explain it sufficiently well. For example: "Vegetation such as trees may be planted on the coast and these will stop the tsunami."

Q.2 (a) Most candidates correctly pointed to the higher density.

(b) (i) There was significant confusion here as many candidates considered the cone of depression as surface subsidence. Thus there were many good descriptions of how subsidence occurs (an answer that would have received full marks for part (d)). Candidates only needed to compare the rate of abstraction with that of recharge to gain both marks. Vague use of terms such as "sucking" (water from the surrounding sediment) were accepted if this was part of an explanation that was comparing the rates of extraction and recharge.

(ii) This data response question achieved a very good response although the data was not always used in part (iii)

(iii) Very few candidates attempted to draw a cone in the saline interface to mirror the cone of depression (but rise to 60m depth). Better candidates attempted to use the 60m depth obtained in (ii) but the most common response was to draw the interface as in the diagram but passing through 60m, either below the borehole or even at the y axis.

(c) (i) Most correct answers gave porosity and permeability although bedding planes, joints and faults were also common acceptable responses.

(ii) The response to this was variable. The vast majority of candidates went for saline incursion but very significant numbers of these were not able to give a satisfactory explanation. e.g. "the cone of depression might get so low that salt water is pumped out of borehole A." Few considered the effect of overpumping at A on exhaustion of the nearby boreholes.

(d) Generally well done although only more able candidates mentioned the significance of pore-water pressure. A significant number used the term "collapse" when describing subsidence and it was not always clear whether the usage was correct. Some used the term correctly at the textural level e.g. "the removal of pore water from a sedimentary rock may cause the pores to collapse and produce subsidence at the surface." However, many suggested that holes are produced and the rocks collapse with a few suggesting that the aquifer collapses.

SECTION B

Q.3 Although not the most popular essay candidates tended to score well, particularly on part (b) where some excellent annotated diagrams supported the script. The latter was very well known and all of the common methods covered.

Part (a) was generally well done and there were regular trade offs between depth and breadth. A few very good essays discussed weathering in some detail. A significant number of candidates chose to discuss the collapse of the Vaiont Dam as an example. These candidates also tended to score highly as the case study involved consideration of angle of slope, lithology, groundwater and rainfall.

Q.4 (a) Not a popular essay and weaker candidates considered mainly not geological factors (visual impact, environmental concerns relating to traffic etc). Many candidates further penalised themselves to some degree by NOT referring to investigations. They chose to list factors such as porosity, permeability and groundwater flow but made no reference as to how they might be investigated.

(b) This part was generally well done with methane and leachate being regularly discussed in some detail. Subsidence was often overlooked. Many candidates mentioned specific examples and these were credited.

Q.5 (a) (i) Generally very well done. The vast majority of candidates chose ash as one of their choices. Mount St Helens was by far the most popular case study followed by Montserrat and Vesuvius. Many candidates do not seem to be able to distinguish between changes in the weather and changes in the climate. The latter was the most popular description of the probable effects of large outpourings of ash.

(ii) Lake Nyos was by far the most common case study cited. Carbon dioxide was frequently described as being "(very) poisonous." There were varying claims as to the speed at which gas moves and also its temperature. Radon gas was cited by some candidates rather than $S0_2$ or other relevant volcanic gases.

(iii) Nevado del Ruiz was usually the preferred case study along with Mt. St. Helens. The claimed speed of lahars tended to be somewhere in between 20km/hr and 200km/hr. The temperatures given also had a wide variation, ranging from 50 to1500 degrees.

(b) Generally well done with a significant trade off between depth and breadth. The depth was usually regarding seismic studies. Some accounts even went as far as discussing in some detail the possible significance of harmonic tremors. A few candidates considered magnetic and gravity variations though these were not always understood. This question asked candidates to "explain" while many of the weaker responses just described.

GEOLOGY

General Certificate of Education 2008

Advanced

GL4 Interpreting the Geological Record

Team Leader: Miss Jo Conway

Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
GL4	904	96	61.6

Grade Boundaries

A	71
B	64
C	57
D	51
E	45

N.B. The marks given above are raw marks and not uniform marks.

GL 4 Interpreting the Geological Record

The paper worked well this year, and the mean mark 61.6 was above last year (59.5). Questions discriminated between candidates, and a wide range of marks were seen. Question 3 on Section A showed that candidates have a very good understanding of dinosaurs and scored particularly highly. Section B showed a continuing improvement on previous years.

SECTION A

Q.1 The question focussed on a igneous rock crystallisation.

Candidates scored well on this question, with candidates demonstrating good levels of knowledge.

(a) Majority of candidates gained full credit in parts (i) and (ii). Good candidates were able to use data in figure 1a to account for the early formed, high density, olivine crystals settling.

(b) (i) and (ii) although candidates were able to order the crystallisation of minerals, explanations were often a little vague in their explanations and repeated the same point more than once, candidates were often hampered by not using mineral names. In (i) examiners were looking for candidates to use figures 1a and 1b to comment on pyroxene being the next mineral (between olivine and amphibole) to crystalise and it being wrapped around the olivine. In (ii) examiners were looking for an explanation for the order of crystallisation, lowering temperatures and the reaction not being complete. Surprising names suggested for mineral X were gneiss and marble!

(c) This last part of the question tested the critical evaluation skills, many candidates gained credit for large crystals and slow cooling but did not comment on the cooling being too rapid to allow the olivine to react back completely.

Q.2 The question examined chemical weathering of an igneous rock in the tropics.

The question was well answered and differentiated well amongst the candidates.

(a) Majority of candidates gained full credit in this part of the question, a very small number of candidates confused chemical weathering and described physical weathering processes. Considering (i) asked for an igneous rock as a parent material, some incorrect suggestions were ferruginous conglomerate, metamorphosed rock and gnice!

(b) This part of the question differentiated well. Although some candidates had obviously not studied flocculation, they were able to gain a good number of credits in part (b) and maximum credit could be achieved without the specific use of the term. In (ii) it was disappointing that many candidates gave simplistic answers to describe the relationship, simply negative correlation (or equivalent). Higher level candidates were able to describe the rate of change (eg. as being exponential) to gain the full credit. In (iii), the weaker candidates simply talked of energy strength of the current and an estuary being a place of still water. Some candidates wrongly talked of the salt particles binding to the clay to make it heavy and hence deposition occurring. Good candidates talked of the saline water reducing the repulsion of electrostatic charges on the clay particles and them forming floccs.

Q.3 This question examined the fossil part of the specification, and even the weaker candidates scored well on this question. The majority of candidates were able to score very highly here.

(a) well answered by the majority.

(b) To gain full credit candidates had to describe and account in their answer. The description was focussed towards the total number of plant species, and some candidates went into minute detail about each of the groups represented on the graph. Good answers used numbers from the graph to good effect. Surprisingly many candidates did not gain credit for describing the anomalies as drops or decreases in numbers, but immediately focussed on the account part (correctly) discussing mass extinctions.

(c) Very well answered.

(d) Some candidates answered this essentially as nothing more than a list of why the fossil record was biased, and examiners were stricter here looking for explanations.

(e) Candidates showed very good knowledge here of evolution of an oxygen rich atmosphere derived from plants and development of food chains.

Q.4 The question examined deformation and representation of structural data in the form of a geological map. The question differentiated well, and candidates demonstrated the whole range of marks available.

(a) Many candidates gained full credit in this part of the question and showed how all their geological knowledge was brought together to order the events and complete the geological map, demonstrating a good understanding. Examiners were looking at trends and cross cutting relationships, and saw a number of candidates writing notes to themselves (eg. a geological column) to order the events before they started drawing, examiners were aware of the geological column on figure 3a in Question 3 which could have been used to aid candidates. Some candidates penalised themselves by choosing to draw in pen and hence were unable to correct their mistakes. A number of candidates did not use the markers correctly, eg. Exposure B the marker showed the eastern contact, some candidates used the marker as the mid-point of the dyke.

(b) Weaker candidates used a shot gun approach in naming the fault type and gave a complete list of all possible fault names they knew! This did not gain credit. Many candidates struggled to use basic fault terminology here (eg. hanging wall and footwall) to describe why the fault was identified as a thrust (hanging wall upthrown/footwall downthrown, low angle).

(c) Candidates gave some excellent responses here demonstrating their critical evaluation skills.

SECTION B

The 1:25,000 map extract of Matlock was clearly reproduced, accompanied by a cross section and a small (greatly) enlarged part of the map containing mineral veins.

Q.5 This question was generally well done, with many candidates scoring highly.

(a) Well answered, although in part (i) a common incorrect response was Millstone Grit showing some candidates did not understand the difference between solid and drift (as has been seen in previous years) and despite the generalised geological column clearly labelling the Superficial (Drift) Deposits.

(b) The majority of candidates gained full credit here describing the fold structure fully.

(c) In part (i) a surprisingly common incorrect answer was A, when candidates were asked to chose X, Y or Z! A small number of candidates failed to comment on the 'tick' indicating the downthrow side in (ii), and some candidates were unable to explain the V-ing pattern in the valley in (iii).

Q.6 This question differentiated well, although some candidates left part (b) (i) and (ii) completely unattempted.

(a) Generally well answered. Incorrect responses included coal and limestone.

(b) A very small number of candidates appeared to be put off by the use of a rose diagram, and it was very surprising how many candidates were unable to complete tally marks and transfer the data to the rose diagram. This section utilised the enlarged part of the map, which examiners had enlarged to make the question easier. Surprising was the number (small) of candidates who got answers of more than 25 (the outer circle of the rose diagram) and who tried to plot this outside of the rose diagram. In (ii) some candidates had correctly gained totals of 25 and 17 but either drew 25 as being halfway between the 20 and 25 mark. Part (iii) showed very good answers describing the most veins being NE-SW, in the limestone and accounting for them as being linked to the folding or joint patterns.

(c) Again assessing the higher levels skills of critical assessment, this part of the question was well answered. In part (ii) some candidates gave a list of field evidence rather than explaining one piece and could not gain full credit.

Q.7 Candidates performed well on this question and examiners saw the whole mark range being used. The question uses real data from the area of the map.

(a) Majority of candidates were able to draw a high area over Cw, peaking at 150 and a low area over CwSh, although some candidates lost credit for inaccurate plotting.

(b) Examiners saw a wide range of answers here. At the weaker end of the spectrum, candidates giving very basic answers which simply regurgitate or list points but without any discussion eg. “there are pollutants, there is radon, there is limestone, it is permeable, there are faults”, examiners saw these as ‘token’ mention of points and gave little credit as candidates had been asked to discuss. This area of the examination is building on the information candidates study for GL3, and with that, there is a development of their level of answering required for A2 level. Higher end candidates gave more evaluative answers and assessed problems, linking back to the map and individualising their answers to be specific to the map extract provided, eg. the Matlock Lower Lava could be responsible for the radon, although this has a very short half life the levels in the valley need to be monitored. Credit was reserved for investigation, site suitability and potential pollution to be discussed.

GEOLOGY

General Certificate of Education 2008

Advanced

GL5 Geological Themes

Principal Examiner: Mr Elliott Hughes

Unit Statistics

The following statistics include all candidates entered for the unit, whether or not they 'cashed in' for an AS award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this paper and that differences will undoubtedly occur between one year and the next and also between subjects in the same year.

Unit	Max Mark
GL5 (all options)	100

Grade Ranges

Option	01	02	03	04	05	06
A	67	66	66	69	69	68
B	61	59	60	62	63	62
C	55	53	54	56	57	56
D	49	47	48	50	51	50
E	43	41	43	44	46	44
Entry	213	129	141	133	165	125
Mean	59.5	50.5	58.6	58.8	61.8	62.1

N.B. The marks given above are raw marks and not uniform marks.

GL5 Geological Themes

General Comments:

In what is hoped will be a useful development, the mark scheme this year differentiates between description and evaluation. Weaker candidates invariably find evaluation too difficult. Thus evaluation is intended to identify the most able candidates. However, most are able to describe. Thus, as in essay questions such as Unit 1 Q.3. most candidates are able to describe isostatic and eustatic changes but are unable to evaluate it adequately. In such cases the candidate is able to obtain high marks for their descriptions but will not be awarded the highest marks, which demand an evaluation.

A liberal approach is taken by examiners towards evaluation. Examiners do NOT assume that there are “correct” answers. What they are looking for is the higher skill of being able to select and interpret relevant information. If this is done logically and is valid then it is rewarded.

Many questions needed an holistic approach. So marks indicated in the mark scheme must be given in context.

Breadth versus depth was employed by candidates and examiners in many essays. However, care has to be taken with some essays. For example, Unit 3 Q.4. Candidates cannot (say) write an excellent account for the Caledonian and then almost ignore the other two orogenies and still expect very high marks.

There was a significant improvement in the use of field locations this year. Candidates are obviously becoming fully aware that this is a convenient way to improve their marks.

The better candidates continue to make greater use of numerical data in their answers.

There was better use of labelled diagrams but there is still a long way to go.

Candidates should be encouraged to quote field locations; make quantitative descriptions, and use labelled diagrams whenever possible.

A large proportion of candidates do not appreciate the difference between metre and meter.

Unit 1 Quaternary

SECTION A

Q.1 (a) (i) This caused few problems.

(ii) Few convincing arguments. Examiners were prepared to credit any response that argued that it takes more energy to pick up a grain in the place than it does to keep it in suspension. Inertia or momentum were rarely considered.

(b) Also caused difficulties but discriminated well. Many do not appreciate that clay particles have a small electrical charge and so ‘flocculate’

(c) (i) Well done.

(ii) Well done by those candidates who kept to the rubric. However, there was a significant number that chose to discuss things other than sorting. The better candidates used measurements to describe the latter.

(d) Well done. A pleasing number of candidates pointed out the significance of grain orientation (imbrication) especially as it was done here rather than in (c).

Q.2 (a) (i) Generally well done.

(ii) Candidates tended to have little difficulty suggesting why clay might produce a dendritic pattern but limestone posed more of a problem. This was in spite of the fact that examiners accepted the liberal definition of the term “lithology”. Thus, apart from such as porosity and permeability, they also credited bedding and jointing in the correct context.

(b) Very poorly done. Although there were some faultless answers a large proportion of candidates found it difficult to add more than one acceptable annotation to the figure. One of the most common claims was that the depressions in the profile were dry valleys.

(c) Some excellent responses and the question also discriminated well. A significant minority of candidates said that the dry valleys were formed by freeze thaw or by pure glacial action.

SECTION B

Q.3 A popular choice with some very good answers. It was pleasing to note that there is not as much confusion between isostatic and eustatic changes as has been apparent in the past. In fact, many good candidates made it clear what the difference was and then went on to say how it might prove very difficult to do so in the field. Some candidates correctly stated that melting sea ice would not effect sea level. Many field examples were given, and credited.

^{16}O-^{18}O discussions were common, many of high quality, especially when related to microfossils. Discussions were not so good when referring to ice cores. A significant number of candidates tried to use corals as indicators of sea-level changes. Often the accounts were quite good but were discussed in conjunction with, for example, fjords. Thus they did not make it fully clear where these corals are actually located.

Q.4 (a) Not too well answered. Most candidates tended to write their own essay, namely “All I know about turbidity currents.” This meant that examiners had to pick and chose what was relevant. This was difficult as many candidates covered most of the processes **and** the products but usually did not link the two in a coherent way. Thus many essays were very hit and miss.

(b) Disappointing. Many candidates tried, and failed, to describe convincingly what flute casts are and how they might be used. A significant number had either the current, or the tapering of the casts in the wrong direction.

Q.5 (a) By far the most surprising aspect of responses to this question was the significant number of candidates who started off suggesting that plant fossils are important but made no mention of pollen. Although examiners were expecting to be essentially marking essays on pollen analysis, these turned out to be in a minority. Coverage of mammoths and beetles was as good, if not better, than in the past. Oxygen isotope analysis was commonly discussed although many candidates did not mention how this related to fossils. Some candidates discussed the isotopes but only in relation to ice cores.

(b) Generally well done. Candidates appear to be well versed in the use of ^{14}C. The only consistent disagreement is in how old a specimen has to be before ^{14}C dating is of little use. Most claims fall in the range of 10,000y to 100,000y. Around 30,000y and 50,000y being the most common.. Examiners take a fairly liberal view on this as it is the principle that they are more interested in, rather than a specific age, provided the age is not something like 10y or 10Ma. Unfortunately, a significant minority claimed that a disadvantage of the method was that the amount of ^{14}C in a sample will vary with climate/temperature

Unit 2 Natural Resources

SECTION A

Q.1 (a) (i) Well done.

(ii) Although there were certain definite features of the distribution, examiners marked this holistically and so were prepared to accept any two accurate observations. Thus "most veins in the Land's End granite are to the west" was credited.

(iii) Well done.

(b) (i) Most candidates correctly suggested the granite and the country rocks.

(ii) Most candidates correctly suggested either the granite or the country rocks. Some also gave "ground water" or "the water table". both of these were accepted.

(iii) This was generally well done. Some accounts were excellent and gave the heat source (granite) and how the heating of ground water would lower its density causing it to rise. Gradually it would lose heat to the cooler country rocks and so increase in density and sink again. There were some candidates who claimed that "heat rises" rather than "hot water rises".

(c) This was generally not well done but did discriminate. A large percentage of candidates talked in terms of igneous processes such as differentiation; crystal settling; melting points etc. Only the better candidates discussed crystallisation from cooling hydrothermal fluids. More thought there was crystallisation from magma.
A small number also saw this as something to do with folding, the feature being an anticline.

Q.2 (a) (i) Most candidates identified the fault traps but the unconformity posed more of a problem. Some suggested "cap rocks" and "stratigraphic traps."

(ii) Generally well done. Again, candidates usually identified the faults as a possible route but the bedding planes were not so common. Some candidates suggested that the unconformity might facilitate movement and also that there might be jointing in the rocks. Both of these were accepted.

(iii) Many candidates ignored the rubric (namely that **one** characteristic was asked for) and a common first line was "the rock will have a high porosity and a high permeability." Having said that, most candidates scored two or three marks by default if they then gave relevant information on **one** of these. The best candidates tended to select something such as grain shape or sorting and then went on to make two valid points. There was a noticeable number of candidates who discussed "pourous" rocks.

(b) (i) Caused few problems.

(ii) This discriminated well. Weaker candidates suggested that the oil might "boil"; "evaporate" or "get too hot." Another suggestion was that the oil would be "burnt off." Many candidates thought that the pressure was the dominant factor and gave answers such as "the pressure will compress the gas to form carbon." Only the better candidates appear to be aware of the concept of hydrocarbon chains being broken as the temperature rises.

SECTION B

Q.3 (a) A popular choice and reasonably well done. The better the case study undertaken by candidates the better their response. However, many answers were bland showing little flair. In order to get into the higher bands of marks for this question, candidates should have attempted <u>serious</u> evaluation of the environmental problems **and** discussed case studies which showed how national and local environmental legislation has influenced the planning of such mining/quarrying operations.

Some candidates talked about one type of deposit in (a) and then focussed on more general environmental concerns, or concerns related to extraction of a completely different type of extraction, in (b).

It was noticeable that the higher scoring candidates made particularly good use of diagrams. Limestone and coal continue to be the most popular choices. Unfortunately, with the latter, pillar and stall mining is still considered, sometimes in great detail. Bauxite was evident and, to a lesser extent, uranium ores. A common error made by candidates was to spend often considerable time unnecessarily discussing the **processing** of ores when only the **extraction** was asked for.

(b) The **evaluation** tested all candidates. Most candidates ignored it (almost) completely and just **described** the problems. The best essays put the environmental problems into context and were rewarded accordingly.

Q.4 A variable response.
Drilling and downhole logging is generally not well understood and answers tended to be very superficial.
Geophysical techniques were well done. Seismic, gravity and magnetic surveying is well understood and there were some excellent descriptions.
Geochemical prospecting was discussed better than in previous years but still leaves something to be desired. Again, most answers were very superficial.
Satellite remote sensing was well done. Accounts of these techniques are almost on a par with geophysical ones.
As with all essays, it was the evaluation that proved the most demanding although it has to be said that some of the best evaluations in any of the essays set in any of the units appeared here. The better candidates appeared to be well versed in the time and cost involved in these surveys and were able to make some comparisons.

Q.5 Not a popular choice.

(a) Diamond and sand and gravel were evident and quite well answered.

(b) This was reasonably well done.

Unit 3 Evolution of Britain

SECTION A

Q.1 (a) (i) Generally well answered.

(ii) The vast majority of candidates who scored highly chose to interpret the conglomerates.

(iii) Disappointing. Especially the standard of the diagrams. Most candidates attempted current bedding but drew truncated bottoms as well as truncated tops.

(b) (i) Caused few problems.

(ii) Generally well done but many candidates did not refer to a sedimentary structure.

(iii) Most candidates suggested a fluvial or deltaic environment. The most common unacceptable answer was a desert environment.

Q.2 (a) (i) Most candidates answered this correctly but there were significant numbers who gave a distribution or made statements such as “because it has a high viscosity and is very runny.” Neither of these were credited.

(ii) The distributions were very well described.

(b) (i) This proved beyond the vast majority of candidates.

(ii) Generally well done although the conflicting radiometric dates confused many. The most disappointing aspect was the number who claimed that the the granite was “deposited”; “erupted” or “overlies the gabbro.”

(iii) This was very well done.

(c) A mixed response. Some were excellent although often such candidates wrote mini essays. A significant number thought that subduction was a factor. Many still refer to magma plumes instead of mantle plumes.

SECTION B

Q.3 This essay discriminated well. A very small number of candidates chose to build their essays around the consideration of ophiolite suites and obduction. One of these essays was particularly outstanding and received full marks.

Q.4 A majority of candidates did not read the question carefully and wasted a great deal of time and effort discussing plate tectonics, environmental changes and some the geology of central and southern Europe (relevant only in the evaluation).

As a general rule, the Caledonian was discussed more fully than the other two. A few candidates obtained all of their marks from discussing the Caledonian. Many of the weaker candidates became very confused. A significant number discussed the BTIP with relation to the Alpine Orogeny but it was only the better candidates who attempted to qualify the relationship. Only the better candidates made full use of negative statements such as “the Alpine Orogeny in Britain shows no igneous or metamorphic effects.”

As noted earlier in the General Comments, candidates must be careful with the breadth versus depth allowance which examiners apply to essays. In essays such as this where three things (orogenies) are given for discussion, candidates must realise that if they write outstanding accounts for only one of them, they cannot expect the highest marks. Many candidates with this essay would have scored near to full marks if it had been solely on the Caledonian Orogeny. However, their efforts with the other two orogenies were so weak that they ended up with just respectable marks for the whole essay.

Q.5 (a) Generally well done although a significant number wasted effort by NOT confining their discussions to the Carboniferous and Permian. Reference to oolitic limestones in the Carboniferous was often vague, especially as some candidates claimed that they contained ammonites. This meant that they did not make it clear whether they were considering the Carboniferous or the Jurassic. The better candidate actually gave field locations for oolitic (Carboniferous) limestone which removed the doubt.

(b) Most candidates did not discuss the limitations of the method or how the magnetic signature of rocks might be re-set. Virtually no candidates mentioned the fact that an accurate radiometric age is required for palaeomagnetic work.

(No script has been brought to the attention of the Principal Examiner which claims that remanent magnetism is of use in metamorphic or folded rocks. However, there are many claims to the contrary. Having said that, such a discussion is considered beyond A level standard.)

Unit 4 Lithosphere

SECTION A

Section A was well done. The questions proved to be very accessible. Section B proved to be much more demanding.

Q.1. (a) Generally well done. The vast majority had little difficulty with σ_{max} but the other two were often misplaced.

(b) Most managed to calculate an acceptable geothermal gradient and to indicate clearly how they had arrived at their answers. Many also clearly showed on the graph how they had obtained their results.

(c) (i) Well done.

(ii) Well done.

(d) A variable response. Many candidates more or less gave the same answer for (d) and (e) and did not use the information given in Figure 1a, as instructed in the rubric. The key point here was that the plutons were associated with metamorphosed sediments. The sort of answer that was awarded full marks was “the plutons are a result of extreme metamorphism of the sediments to the point that they melt” or; “the sediments will partially melt at the base of the crust to give granitic magmas.” The key point that was looked for was the association with the metamorphosed sediments.

(e) This question discriminated well. Candidates were encouraged to show their knowledge and understanding of such things as subduction; partial melting of oceanic crust / upper mantle; diapirism; contamination; stoping; xenoliths etc etc. Many obtained full marks but far too many also discussed these in (c) to the exclusion of any mention of the metamorphosed sediments.

Q.2 (a) (i) Most correctly answered normal or tensional. A smaller number gave transform. This was also accepted.

(ii) Tension or extension was correctly given as a mechanism for normal faults but was NOT accepted as the correct answer if the candidate gave transform for (i).

(b) This was very well done with a wide range of acceptable answers.

(c) (i) This discriminated quite well. Most candidates were able to make a reasonable attempt at the calculations. What was slightly disappointing was the number who gave the same answer for both (the same as for the rate at X).

(ii) Some candidates did not heed the emphasising of **relative** movement.

These candidates simply gave arrows pointing away from the ridge axis.

(iii) A variable response. Very few of those who produced correct answers for (i) failed to get the 2 marks here.

SECTION B

Q.3 It had been hoped that many candidates would attempt this question using the headings conduction; convection and radiation. However, as expected, most chose to use volcanism; mantle convection and plate tectonics. Weaker candidates often used this as an opportunity to write an essay on plate tectonics or the Wilson Cycle. There were however some excellent answers with many exhibiting their ability to synthesise their knowledge and understanding. Thus many accounts considered, and evaluated, the importance of the different types of plate boundary and various expressions of volcanic activity (geysers; black smokers; fumaroles etc etc). A few outstanding attempts also (indirectly) made great play of the Law of Conservation of Energy. The basic claim was that the thermal; kinetic and seismic energy that is lost during plate movement all originates as heat energy in the mantle / core. Some even suggested that the origin of the heat energy was heat energy acquired due to the "kinetic energy of accretion when the Earth was forming" and "the radioactive decay of isotopes within the core." Examiners were suitably impressed. Radiation (of heat from the surface) was often ignored, even by good candidates.

Q.4 Not a popular choice.

(a) This was quite disappointing. Essays on this topic have been set in the past and examiners have been pleased by the production of stress-strain curve together with suitable discussion. This has the potential to produce full marks. This year the curves were noticeable by their scarcity. Some essays, often from candidates who had scored highly in Section A, basically claimed that rocks under stress either behave elastically or or in a ductile manner. The result will be faulting or folding. They appeared unable to really add much to that. The average essay added descriptions of different types of folding and/or faulting. The higher scoring candidates were able to discuss the relationship between the principle stresses and types of deformation. However, it tended to be only the highest scoring candidates who used stress-strain curves to any appreciable extent.

(b) This was very discriminating. Many candidates could only vaguely repeat points they had made in (a). It was only the most able who discussed the geothermal gradient and how the type of deformation might vary. The very best showed how stress-strain curves are affected by temperature and suggested how the principle stresses might vary with depth.

Q.5 A popular question but it posed greater problems than similar questions in the past. The most outstanding omission by candidates was how distance is measured. Frequently this aspect was completely ignored. At the same time there was a great deal of confusion between how spreading is recognised and how its rate is measured. Far too many essays described sea-floor spreading and the formation of magnetic striping but then failed to explain how this might be used to determine the rate of spreading. The dating of the sea floor was poorly explained. Magnetostratigraphy was often referred to but its use not satisfactorily explained. Radiometric dating was often not referred to or poorly discussed. The use of fossils and sediment thickness were sometimes covered but again, rarely fitted into a coherent argument. Generally speaking, essays were at best very hit and miss.

(Although it is accepted at this level, teachers may care to note that K-Ar dating is very rarely used these days as it is widely regarded as being very inaccurate particularly for MOR basalts which may have interacted with seawater. The modern methods for dating ocean floor basalts are ^{40}Ar-^{39}Ar dating (if the rocks are older than ~2Ma) or U-Th-series disequilibria dating (using short lived intermediate isotopes in the U-Th decay series) for more recent eruptions. (NB this is not to be confused with U-Pb dating which is only suitable for very old rocks). Having said that, it is an excellent one for candidates to quote, and then comment on its unsuitability as part of their evaluation.)

GEOLOGY

General Certificate of Education 2008

Advanced

GL6 Geological Investigation

Principal Examiner: Ian G. Kenyon (Principal Moderator)

Unit Statistics

The following statistics include all candidates entered for the unit, whether or not they 'cashed in' for an AS award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this paper and that differences will undoubtedly occur between one year and the next and also between subjects in the same year.

Unit	Entry	Max Mark	Mean Mark
GL6	902	60	42.8

Grade Ranges

A	48
B	42
C	36
D	30
E	24

N.B. The marks given above are raw marks and not uniform marks.

GL6 Geological Investigation

Administration

The administration and moderation of the coursework samples ran smoothly once again this year. The Principal Moderator is very grateful for the efficient organisation and punctuality of the majority of centres. Only a small number of centres submitted materials after the May 2nd deadline.

Packaging Coursework

When packing the coursework samples please try to reduce bulk and weight as far as possible. A4 hardback ringbinders should not be used. It is helpful (and cheaper for centres) to use slim plastic folders that can be packed efficiently. The use of large and heavy field notebooks containing only a few pages of assessed material is to be discouraged. Please consider detaching the relevant pages of field notes and inserting them in the front of the report with a paper clip. Alternatively photocopy the relevant pages and include in the front of the report. All materials for moderation should be included in just one modest sized package.

Please note that the coursework samples for GL6 and GL2B should not be sent together in the same package as they are moderated by different examiners. If centres are unsure about the address for despatch, they should contact WJEC for clarification.

Fieldwork and Laboratory based Investigations

Please note that the requirements for GL6 are a minimum of two investigations. The assessment must be a minimum of 50% field based work and a minimum of 25% laboratory based work. Therefore only two possible combinations are available. Field 50%, Lab 50% or Field 75%, Lab 25%. Please state clearly on the GLF1 form whether Lab (L) or Field (F) is being assessed. It is not appropriate to write F/L.

GLF 1 Forms

A completed GLF 1 form should be included with the coursework sample. This is used by the moderator to make any recommendations for mark adjustments. Please note it is not necessary to write out the details of the investigations undertaken in the space allocated on the right hand side of the form. The GLF1 form should list **<u>all</u>** candidates and their marks from the centre, not just those selected as a sample for moderation. It is helpful to mark with an asterisk on the left hand side those which are included in the sample.

GLF 2 Forms – The Tracking/Planning Sheet

A completed GLF 2 form should be included for each investigation undertaken, i.e. two for each candidate in the sample. This is used primarily to assess the planning of the investigation. The quality of the planning sheets varied from exceptional, exhaustive and comprehensive to inadequate, over-brief and quite vague. The best marks for planning were achieved where students carried out a pilot study to test their planning, then modified the original plan in the light of this. A significant number of centres were over-generous on awarding marks for planning. It is not possible to score full marks on this section when candidates have failed to make any predictions about possible outcomes and anticipated sources of error.

These sheets can be enlarged to A3 where space is insufficient. Additional planning information can be included at the beginning of the written report under a clear ‘planning (GLF2) continued’ heading.
Students should be encouraged to plan in detail and should be discouraged from using simplistic bullet point statements on the planning sheet.

GLF 3 Forms

A completed GLF 3 form should be submitted for each candidate in the sample. Please make full use of the opportunity to comment on the work of individual candidates on the GLF 3 form. Ideally the use of 4 ‘post-it’ notes should be used to locate within the work, where and why the marks have been awarded. A few centres still fail to comply with this request each year and possibly disadvantage their candidates as a result.

Please ensure that the centre has the updated GLF3 form which has the candidate declaration on the reverse. This must be signed by the candidate and teacher to confirm the authenticity of the work being submitted.

Downloads from WJEC

Copies of the forms GLF1, GLF2 and GLF3 can be downloaded directly from the WJEC website www.wjec.co.uk by following the GCE/AS subjects and then Geology links from their home page.

C Forms

Please note that the C forms (red/pink) for recording candidates’ marks should be sent directly to WJEC and not the moderator of coursework.

Implementation

In order to provide evidence for implementation, it is vital that the appropriate field and laboratory notes are included with the report.
A small number of centres failed to include the laboratory notes again this year.

It should also be noted that laboratory work must yield some raw data that could not be collected in the field. Bringing back rock samples then describing them as in a ‘traditional’ practical is not really in the spirit of the new assessment.

Good examples of lab work included:
Making thin sections of rock samples followed by microscope analysis
Sieving sediments and calculating sorting, skewness and kurtosis
Establishing composition of sediment samples using point counts
Testing rock samples for resistance to abrasion, impact and polishing
Modelling rock deformation using plasticine and mars bars
Simulating mass movements and tsunami generation in a wave tank
Porosity and permeability of rocks related to their utilization potential
Testing the resistance of various mollusc shells to abrasion/attrition and linking to preservation potential

The overall quality and quantity of the lab and field notes were a little disappointing again this year and could easily be improved upon. Field sketches were particularly poor.

Ideally each field location should have a six-figure grid reference. If sites are close together, then the same reference should be given with '12 metres west of site 4'. It was pleasing to note some very accurate fieldwork locations were given by a few centres using GPS.

All field sketches should have grid reference, scale, compass orientation and detailed annotations. Simplistic labelling of sketches should be discouraged.

Information from secondary sources such as bed ages or detailed palaeogeographies should not appear in the field notes. Photographs are also inappropriate in the field notes. The field notes should be used to interpret the photographs in the report.

Field notes should consist of detailed observations, measurements and records made individually by each candidate. Identical notes obviously dictated in the field are to be strongly discouraged.

It is strongly recommended to practise field sketching from photographs or slides prior to fieldwork being carried out. The field and lab notes provide the basis for the report and should be considered the most important part of the investigation.

Analysis

This involves some synthesis and interpretation of the primary data collected in the lab or field. There must be some development from the field or lab notes, rather than simply copying out the same information in a neater form.

The use of photographs is to be strongly encouraged but these should be used selectively and integrated within the text. Transparent overlays or outline diagrams adjacent to photographs may be used to highlight important features or annotated digitally. Grid reference, compass orientation and scale should be included as a matter of course.

Please discourage the indiscriminate use of photographs, which lack location and annotations. Only include photographs, which are directly relevant to the investigation. As a general guide no more than 8 to 10 photographs should be included. Less than half the candidates included photographs this year and the majority were poorly annotated.

Statistical analysis is recommended if it is appropriate to the data collected. Excellent investigations on sedimentary environments included work on sorting, skewness and kurtosis. Particle size and shape was assessed using Zinng's, Krumbein's and Cailleux's indices. Spearman's Rank, Chi Square and Vector analysis were also used by some centres. Point counts were used to assess the mineralogical composition of rock and sediment samples.

Spreadsheets were used by a number of centres, but not always to the best effect. Printouts of cumulative frequency graphs, Zinng diagrams and histograms were rarely annotated to show evidence of thorough analysis and interpretation.

Evaluation

Evaluation must be included as a separate section within the report. It is an opportunity for students to reflect objectively on the work they have carried out. The quality of evaluations varied from sophisticated and thorough to simplistic and inappropriate. It may be worthwhile suggesting to students to break up the evaluation into a number of distinct components:

Evaluating the planning sheet they completed. How appropriate were the techniques and methods they selected? This may refer to methods of sampling, sample size and sample number.

What problems or limitations were encountered during implementation? This could involve reference to confusion between true and apparent dip or problems between the base map geology and actual rock outcrops.

An outline of the way in which the investigation could be improved, given more time and/or resources and with the benefit of hindsight.

An overview of the investigation based on the likely reliability/validity of the data collected in the available time frame. Which part(s) of the investigation(s) yielded the most/least reliable data and why? Are the conclusions made concrete, tentative or partial? How do these findings compare with published work on the same area/topic. How do they compare with the results/conclusions of students from last year?

Evaluation is not a list of excuses. Naïve and simplistic statements regarding lack of time, bad weather and lack of familiarity with equipment do not form the basis of a mature evaluation. As a rough guide one side of A4 word-processed text is a probable optimum length for evaluation.

The Report

It is now expected that students make use of IT and finish reports to a professional standard. It was encouraging to see so many centres making appropriate use of IT this year and just a few hand-written reports were submitted this year.

As a rough guide, the optimum length for each report should be between 1250 and 1750 words. This excludes maps, diagrams, photographs, graphic logs and statistics. Quality rather than quantity is to be encouraged. The reports should be concise, relevant and clearly focused.
Please dissuade students from including large amounts of photocopied material from secondary sources.

The report should be based on the primary data collected in the lab or field and there should be some cross-referencing between the two. Safety considerations should be briefly acknowledged and students should be encouraged to be aware of the importance of the need for conservation of geological sites. The report might include the following sections, though they may be subsumed under a smaller number of headings:

Contents Page
Location Map
Introduction
Aims/Hypotheses
Safety Aspects
Methods Of Data Collection
Data Presentation
Data Analysis
Statistical Analysis
Graphs/Printouts With Annotations
Photographs With Annotations
Conclusions
Evaluation
Bibliography
Acknowledgements

Standards

The standard of coursework submitted this year represents yet another improvement on last year as many centres have again clearly acted upon the advice given on moderator feedback forms. Teacher marking is now very close to that of the principal moderator on all four components of the assessment criteria. In 2008 two centres were adjusted downwards and five were adjusted upwards.

Help and advice is available from the Principal Moderator at any time. Contact email address
iangkenyon@aol.com
Telephone (01872) 554469 (Home) or (01872) 272763 (School)
(07971) 961365 (Mobile)

Coursework for 2009 can be submitted any time after 1st April 2006. The deadline for submission is May 1st 2009.

Ian G. Kenyon, Principal Moderator, June 2008.

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