WJEC
CBAC

GCE EXAMINERS' REPORTS

GEOLOGY
AS/Advanced

JANUARY 2011

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

January 2011

Advanced Subsidiary/Advanced

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 award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this unit 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	367	60	33.4

Grade Ranges

A	43
B	38
C	33
D	29
E	25

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

General Comments

The GL1 examination was designed to test a wide range of skills including the interpretation of diagrams, graphs, a thin-section, a geological map and cross-sections. As usual the paper covered a broad selection of the specification content and included both straightforward and more complex ideas, making it appropriate for a wide ability range.

Q.1 (a) Most candidates recognised that upper high weathering rate zone represented the most rapid chemical weathering. The text of the question for section (a)(i) provided the background for this. Most candidates recognised the role of physical weathering at point Y on the graph and correctly noted the sun or "external" as the energy source for weathering.

(b) The definition of erosion was not often precisely answered but credit was given for candidates who recognised elements of the "wearing down of the land surface". Some answers reflected weathering rather than erosion and could not be credited. Most candidates correctly identified the lower most arrow in Figure 1b as weathering and erosion.

(c) The best candidates noted the crystalline nature of the rock and quoted crystal sizes using the scale provided. Credit was also given for commenting on the foliation within the rock and the term porphyroblast although full marks could be achieved without using this term. A few candidates incorrectly used the igneous term "phenocryst". The majority of candidates correctly understood the rock to be metamorphic and sited the crystalline and foliated nature of the rock together with the presence of the metamorphic mineral garnet as evidence.

(d) This section was the most testing of question 1 and many candidates, but by no means all, recognised that igneous rocks generally form at the highest temperature, and that contact metamorphic rocks generally form at lower temperatures since the heat for their formation is derived from igneous rocks. Most candidates correctly noted that sedimentary rocks derive from sediments accumulating on the relatively cool surface of the Earth and hence form at the lowest temperatures.

Q.2 (a) The detailed description in Figure 2a of rock E provided ample evidence for this being a shale. However a few candidates identified this incorrectly as coal, basalt or even metamorphic rocks such as slate and schist. The key factors in interpreting the environment of deposition were the presence of intact graptolites suggesting low energy marine conditions. This low energy environment was also indicated by the fine grain size. A few candidates even noted the anoxic conditions associated with the black colour of the shale.

(b) Most candidates correctly drew a pendant graptolite as described.

(c) The key to this question, recognised by relatively few candidates, is that the beds dip towards the younger bed. Consequently knowledge of graptolite evolution indicates that bed Q is younger than P and hence the beds dip southward. Many candidates gave partially correct answers.

(d) The best candidates noted the sinuous nature of the fault which must therefore not be vertical in cross-section. In addition the downthrow side of the fault on the map towards J means that model 2 is correct. A number of candidates noted only one of the two "clues" needed to answer it correctly. A few candidates answered model "J" or "K" suggesting a lack of understanding and reading of the question.

(e) The most simplistic answer recognised that shale (rock E) does give rise to slate after regional metamorphism. However only the better candidates recognised that the slate predated this graptolite-containing shale and therefore the slate could not have been derived from it.

Q.3 (a) Most candidates drew a line bisecting the fold in cross section in response to question (a)(i). The fold was described as an anticline by most candidates but few gained a second mark by referring to the fact that the axial plane dips southwards, or that the fold shows overturning. Credit was also given to the recognition that it is an antiform and shows isoclinal folding. Full marks could however have been gained by the more simple terms covered at AS level. In part (iii) many candidates unhelpfully linked the term "tectonic stresses" to plate tectonics whereas all that was required was recognition of compression from North-South. Very few candidates noted these two points.

(b) Most candidates correctly measured the displacement in part (i). In part (ii) candidates needed to recognise that the fault shows normal movement and hence could not be formed by the compression which formed the fold.

(c) The most common answers related to graded bedding or desiccation cracks, the formation of which were often well described. In section (iii) most candidates gained two marks by drawing the structures accurately and in correct orientation to the bedding planes. The key which eluded some for the third mark was to draw the structure inverted since this limb of the fold is overturned.

Q.4 (a) Most candidates correctly identified the rock as basalt, mineral Y as plagioclase feldspar and most commonly stated olivine or augite as another possible mineral in the basalt.

(b) Few candidates fully noted that normal polarity relates to the alignment of the magnetic components of the rock with the present-day magnetic field of the Earth.

(c) The best answers recorded that lava flow D would have the highest proportion of daughter isotope because being the oldest more time had elapsed in which parent could break down to daughter isotope. A number of candidates showed limited understanding by irrelevantly writing about the polarity of lavas.

(d) Surprisingly few candidates could transfer the information in the cross-section Figure 4a concerning the timing of reversals to the ocean floor surface Figure 4b. Consequently few answers gained both marks.

(e) The answer to this question was poorly undertaken with many candidates focussing on the processes by which rocks retain magnetic polarity. The question was more concerned with explaining why the pattern is almost symmetrical about the oceanic spreading centre. The weakest answers simply described the pattern rather than explain it.

GEOLOGY

General Certificate of Education

January 2011

Advanced Subsidiary/Advanced

Chief Examiner: Mr. Peter Loader

Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
GL3	417	50	29.8

Grade Ranges

A	35
B	31
C	27
D	23
E	19

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

SECTION A

General Comments

Both questions in Section A proved to be equally accessible to all candidates.

Q.1 This question was generally done well though it discriminated between the range of candidates.

(a) Only one answer was required which then had to be explained. The best answers concentrated on the width of the valley at this point and the need for a smaller dam or the strength of limestone for the foundations. Weaker answers suggested that the faults did not cut through the dam itself whilst a number misread the question and answered in relation to the reservoir rather than the dam site. There were a significant number who suggested that the limestone was suitable as it was impermeable, only to contradict this idea in the next question.

(b) (i) The majority suggested that the fault zone or the limestone joints made the dam site permeable and full marks were given to those who mentioned both. The term *porosity* was also used inappropriately by some. Credit was also given to the few who stated that the beds dip downstream under the dam.

(ii) Few, even the more able candidates, suggested erosion would undermine the dam. Vague statements about saturation and collapse were common, though credit was given where candidates referred to changes in pore water pressure.

(c) This was generally answered correctly though accuracy (within the range of 9-11 for both) was required to gain full marks.

(d) B was the most popular suggestion which was given full credit if candidates made reference to data in Figure 1b. Few suggested that at this location shale would be dipping towards the reservoir and thus unsupported. A was also suggested as the most likely to slip as it has the greater dip and some credit was given where reference was made to Figure 1b. The graph shows that the shale at this location marginally has a greater strength than B and the map shows it was unlikely to slip as it dips away from the reservoir.

Q.2 This question also discriminated well. Though generally accessible to most, parts (a) and (d) caused candidates the most problems.

(a) (i) The answers to this question were often disappointing. A significant number were clearly confused as to the difference between the focus and epicentre of an earthquake. Even some of the more able candidates scored zero marks on this question.

(ii) Again, this was disappointing as there was also a clear link here with knowledge from GL1. Few gained full marks with many vague answers given often referring to earthquakes at the trench. Some quoted the evidence as being the word of the scientists as outlined in Table 2b. Better answers made reference to the convergent nature of the plate boundary and described the subduction process in terms of the production of earthquakes at depth.

(b) (i) This was well answered with most opting for the linear distribution, in a short time range and noting the similarities in depth or magnitude.

(ii) This was less well answered with many simply restating the question without explaining a mechanism. More able candidates suggested that distressing one area of the fault may de-stable the stress regime in the next "locked" area along.

(c) This was generally well attempted with most candidates referring to either the lower magnitude or the depth with an explanation that related to lower intensity. Candidates who suggested the area was uninhabited or that the built environment was earthquake-proof could get little credit as the question states clearly that answers should be made "*with reference to Table 2a*".

(d) This was moderately well answered. Most good examples suggested that volcanic earthquakes were more numerous and smaller in magnitude with weaker answers stating the complete opposite. A significant number also misread the question and described the origin of volcanic earthquakes in terms of rising magma.

SECTION B

General Comments

Candidates responses to this section were generally favourable. Question 3 was generally the most popular choice though a number of candidates within each centre also opted for Questions 4 and 5. Following years of improvement there seems to have been deterioration in spelling in this exam session. By far the most commonly mis-spelt words were liquefaction, porous and meter (metre). It was also disappointing to see that candidates did not make as much use of annotated diagrams as they might.

Q.3 (a) Examiners interpreted *ground properties* in its wider sense which, though precluding animal behaviour, allowed students to choose a wide range of predictive methods. However, a number of candidates did not confine their answers to just two, as stated in the question, but gave superficial answers for a range of techniques without detail or development thereby reducing their chance of good marks. Radon gas, groundwater, tilting and resistivity were most popular. For the few who chose radon and mentioned its origin most claimed it was due to the "decay of granite" with no reference to uranium. Mention of the use of satellites was usually superficial and changes in resistivity was often considered to reflect the speed at which electricity passes through the ground.

(b) Explanations on hazard reduction were often good, particularly when case studies were used to illustrate the script and some candidates scored full marks on this section. A range of management and control methods were seen including the engineering of buildings and construction design, hazard planning and evacuation methods. However, there was often an overconcentration on evacuation procedures and aid at the expense of the geological and engineering considerations. A number made reference to the difference between areas at different levels of economic development and to the management and control of earthquake generated tsunamis. Credit was given equally to those who either gave a wide range of methods or those who chose to give more in depth explanations of fewer techniques.

Q.4 (a) Many candidates who opted for this question had little real idea about how slopes might effectively be monitored and the responses were generally poor with only a few achieving more than half marks. They had clearly decided that they were better able to answer part (b). At best, answers suggested measuring angles of slope, water or rock type whilst it is clear that, though many students consider that satellites and GPS might usefully be involved in slope monitoring, few understand how. This is clearly an area for further development in teaching this course and reference should be made to the suggested range of techniques in the published mark scheme for this paper.

(b) This section was generally answered better with candidates feeling more comfortable with the topic. However, there was again a reluctance of candidates to answer on the "effectiveness" of the engineering solutions as required in the question. The few candidates that did answer the question directly invariably scored very highly.

Q.5 (a) Most candidates that attempted this question referred to factors such as porosity, permeability, though these were not always understood. Some good responses were seen which were appropriately illustrated. Where candidates had considered factors such as grain-size, shape, sorting, packing and the degree of cementation they inevitably gained full marks. Many answers were very general, however, and lacked suitable detail.

(b) Candidates who attempted this question almost all mentioned cones of depression, saltwater incursion (though not other pollutants) and the effect of subsidence. Few gave actual examples but those that did were given further credit. The problems faced by London, which has experienced falling water tables in the past contrasting with a rising water table today, was considered to be an excellent example.

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