GENERAL CERTIFICATE OF EDUCATION
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EXAMINERS' REPORTS

GEOLOGY (NEW)
AS/Advanced

JANUARY 2009

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 (NEW SPECIFICATION)

General Certificate of Education

January 2009

Advanced Subsidiary/Advanced

Principal Examiner: David Evans
King George V College, Southport

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	146	60	26.9

Grade Ranges

A	41
B	36
C	31
D	27
E	23

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

GL1

The GL1 Examination was designed to test a wide range of skills including the interpretation of diagrams, graphs and geological cross-sections. 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) Many students correctly identified both body parts, although teeth were more commonly misidentified as the thecae on the graptolite or the crenulations on the margin of the bivalve.

(b) The sedimentary structure was identified as ripples by the majority of students and the symmetrical nature of the ripples was the key to gaining full marks in part (ii) where the description of the two-way movement of water was essential to gain full marks. In section (iii) credit was given to most candidates who noted the importance of hard parts in the bivalve and the implications for preservation.

(c) This question received a wide range of quality of responses with the best candidates gaining 4 or 5 of the marks for simply noting and explaining the presence of the desiccation features and the footprints, indication a shallow water/land based origin for the sedimentary rocks. Best candidates also suggested that the presence of bivalves indicated a water based environment, without necessarily being a deep water environment. This mudstone was also noted as being a low-energy deposit which may occur in deep water but which also occurs in shallow water conditions too.

Q.2 Whilst it is recognised that it is preferable to have questions and diagrams on the same pages, the marks for this question were high and suggest that candidates were not disadvantaged by the layout of the question. In addition there were very few candidates who failed to complete the paper, suggesting that the layout of question 2 did not significantly slow candidates down.

(a) In this section, students were led through the stages of the calculation and consequently it was completed accurately by the majority. However there were a surprising minority who did not know how to calculate velocity. In part (ii) many students noted the deeper path taken by S-waves arriving at station B and consequently their path through more rigid material.

(b) Most candidates successfully read off the S-wave travel time on Figure 2c and used the graph to determine the distance. A few candidates incorrectly chose to use the arrival time of the surface wave. In part (ii) students should have used the calculated distance for seismic recorder C and the arrival time for the P-wave in Figure 2c to plot a point on Figure 2a. The best students then drew a curving P wave line through this point on Figure 2a. The line was well drawn by most candidates.

(c) The majority of candidates noted the absence of S-waves on Figure 2d, together with the longer arrival time of P and surface waves and the lower amplitude of the waves on seismogram D. In part (ii) these differences were explained well by most in terms of the liquid nature of the outer core, and the greater distance of seismogram D from the epicentre. A few candidates both described and explained in c(i), and did not repeat their explanations in c(ii). Consequently no credit could be given for explanations in c(i) despite the fact that students knew the answers. Care should be taken to answer the question set in each section.

Q.3 (a) Surprisingly only about one quarter of the candidates correctly identified the fault as a reverse fault and many failed to use the included fragment information to note the conglomerate as the youngest rock.

(b) The description of the rounded pillow shape was well documented, but fewer candidates commented on the tapering "tops" to them. The majority of candidates correctly named basalt in section (ii) and noted the rapid cooling on contact with water as the origin of the fine grained rim in part (iii).

(c) It was hoped in part (i) that candidates would note the fact that the direction of dip of the fault in the model, Figure 3c, was inconsistent with the fact that it "dips steeply to the north-west" in Figure 3a. The most common error was to comment on the dip direction of the beds. It was also hoped that students would recognise that the down throw direction marked on Figure 3c was consistent with that shown in Figure 3a. Many candidates wrote nothing in this section. In section (ii) students should have used the included fragment information to ascertain that the sandstone is younger than the igneous rock and therefore the sequence is inverted. This was also indicated by the orientation of the pillow structures which were shown with rounded "bases" and pointed "tops", a fact noticed by very few. Consequently students should have suggested that the shale is therefore the oldest and not the youngest rock. This section too generated few correct responses.

Q.4 (a) Many candidates used igneous terminology incorrectly in a metamorphic rock. Some candidates stated the size of the block of rock in Figure 4 for which no marks were generated. The best answers quoted the size of the chiastolite crystals, noted their random orientation and observed that the rock is actually fine-grained.

(b) Candidates were expected to simply note that this was formed by contact metamorphism of a fine grained sedimentary rock by heat from an igneous intrusion. Few students gained full marks, with a significant number commenting incorrectly on the effects of heat and pressure.

(c) Most students correctly named a mineral in schist and noted the foliation/schistocity in schist. Fewer candidates recalled that a schist is coarser than rock P. In part (iii) it was pleasing to see that candidates recognised the role of regional metamorphism in the formation of schist rather than the contact metamorphism forming rock P.

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Principal Examiner:

Unit Statistics

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Unit	**Entry**	**Max Mark**	**Mean Mark**
GL3	231	50	32.4

Grade Ranges

A	37
B	32
C	27
D	23
E	19

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

GL3

Section A

General
Section A proved to be equally accessible to most candidates taking either the new specification or old (legacy) papers. Both papers shared data questions 1 and 2 because of the similarity in assessment objectives.

Q.1 This question was very accessible and generally well done.

(a) Well answered. The most popular correct responses were lahars and flooding though other valid alternatives were credited.

(b) (i) Most candidates gave an acceptable answer with only a small minority ignoring the instruction "above its background level."

(ii) The vast majority answered this correctly.

(c) This caused few problems, although a few gave an acceptable source (magma or gas) but could not elaborate. There were many references to "**lava** (moving) underground (here and in e).

(d) Most scored at least one mark but some found it difficult to explain. Vague examples such as *the temperature changes are not reliable* gained little credit. The candidates who obtained the marks most readily were those who quoted data from the figures. A suitable example being *although there was a rise of 12^oC for the 1965 eruption it was only 6^oC in 1966 and 4^oC in 1967. Also there is data missing in 1965 and 1966 so we cannot see the full pattern*.

(e) Overall this was well done but many, having given a correct method, failed to adequately explain their answers. Candidates should be wary of making statements that are open to interpretation. For example, *there is an increase in the frequency of earthquakes just before an eruption*.

Q.2 An accessible question with part (c) causing the most problems**.**

(a) This was well done though even more able candidates estimates were sometimes out of tolerance.

(b) Generally well done. The most common correct response was *voids (spaces) are left behind and the weight of the rock above causes collapse*. However, many just gave vague reference to just one factor - such as *empty space is left when the seams are removed* or *the weight of the rock on top is too much*.

(c) This question discriminated well. The question clearly asked candidates to "assess" the effects of three factors that might account for the difference in subsidence of the two mines. Despite the data provided, a number considered the depth of the **shallowest** seam. Those that considered the effect of the superficial deposits, water table, or depth to the deepest worked seam were unlikely to gain credit in their explanation. Weaker candidates even assessed 'total surface subsidence' to be a factor!

(d) Acid mine drainage was very popular and there were some excellent descriptions. This is obviously very well understood by the majority of candidates. Responses that cited subsidence gained no credit.

Section B:

General
Candidates consistently exhibit a reluctance to use labelled diagrams. Some candidates produced very interesting discussions which, unfortunately, did not adequately address the question set and were unable to gain much credit.

Q.3 Not a popular choice.

(a) This was generally well answered with most describing and clearly distinguishing between the Richter and Mercalli Scales. Almost all stated that the Mercalli Scale is a twelve point scale defined in roman numerals (I - XII). However, a significant number thought that the Richter Scale was a ten point scale. An interesting common omission was any reference to isoseismal lines.

(b) This was not so well done. There were very few convincing discussions, even allowing for breadth versus depth. Most candidates gave generalised descriptions of named events but often with very little reference to the factors listed.

Q.4 By far the most popular choice and generally well answered. Though candidates referred to case studies, a number were not detailed or did not relate to real situations. For example, lavas are often quoted as having been a major problem at Mt St Helens and the use of water pumps, artificial channels, explosives, bombing, concrete barriers etc. often inaccurately related to a whole range of volcanoes.

(a) Generally produced a good response but, even some high scoring candidates, wasted far too much time and effort describing the nature and behaviour of the hazard, e.g. lava flows, instead of concentrating on how they might be managed and controlled. A significant number of candidates chose to relate all they knew about the destructive effects of volcanoes.

(b) Though some excellent responses were credited, many vague answers were seen. A significant number chose (in spite of the wording of the question) to concentrate exclusively on non-geological considerations such as building regulations; infrastructure; support services; communications etc. Credit for these answers was limited.

Q.5. Not a popular choice and responses were generally disappointing.

(a) Few candidates produced convincing diagrams and often these were poorly labelled. The best came from those who reproduced diagrams from past papers. Cones of exhaustion were often missing or poorly described as were the relationship of the saline interface with freshwater. Few candidates considered the pollution from potential pollutants in the aquifer.

(b) Too often candidate responses lacked detail of “properties of the rock” as stated in the question. Often more effort was devoted to as discussion on the structure and problems associated with a landfill site, the nature of the waste, wildlife and the proximity of buildings. Few adequately discussed permeability and porosity with any conviction or were able to relate this to rock type.

Even for those who scored above average marks, it is interesting that it is a commonly held belief that granites (and all crystalline rocks) are impermeable. It is very rare for a candidate to state that although granite is an impermeable rock type, it is usually highly jointed such that the rock unit is usually very permeable. This is surprising as it leads into an interesting argument which has the potential to obtain the candidate high marks.

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