GCE EXAMINERS' REPORTS

GEOLOGY
AS/Advanced

JANUARY 2013

Statistical Information

The Examiner's Report may refer in general terms to statistical outcomes. Statistical information on candidates' performances in all examination components (whether internally or externally assessed) is provided 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.

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GEOLOGY

General Certificate of Education

January 2013

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	387	60	32.3

Grade Ranges

A	43
B	38
C	33
D	28
E	24

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

General Comments

The GL1 examination tested a wide range of skills including the interpretation of a map, diagrams, a photograph, a geological map and geological cross-sections. The paper covered many areas of the specification content and as usual included both straightforward and more complex ideas, making it accessible to a wide ability range.

Q.1 (a) The question was well answered by the majority who noted the convergent nature of the boundary and the need for partial melting of the mafic ocean lithosphere to account for the magma at the Taupo Volcanic Zone.

(b) Most candidates correctly inserted arrows showing right movement but a significant minority drew arrows implying convergent movement. The role of erosion was noted by many students to explain a lack of overall height increase. A few candidates incorrectly interpreted the cause as due to isostatic depression despite the question stating that the area showed uplift.

(c) Candidates were expected to draw foci descending to the west from the trench, to a maximum of 700km. A wide variety of incorrect answers were received including foci descending to the east, foci descending to the west but from the eastern edge of the diagram, and even horizontal lines of foci at 700km. This range of answers was unexpected. The explanation in part (ii) was usually well answered, but it was less so in part (iii) where references to the outer core were not uncommon. Section (iv) proved to be particularly demanding with only the best candidates taking note of the location of the trench to the west of the plate boundary in the south, and the consequent indication of subduction occurring in the opposite direction to that in the north.

Q.2 (a) (i) Most candidates were able to identify the fault as normal and noted the relative movements of footwall block and hanging wall block. A few correctly noted the movements but then identified the fault as reverse.

(ii) This proved to be a difficult question with very few candidates noticing the fold in the shale alongside the southern edge of the granite.

(iii) This section was well done by most candidates who recorded the cross cutting nature of the granite and the xenoliths of shale as evidence of relative age. It was also expected that candidates would refer to the folding of the shale or the fact that the sedimentary rocks have undergone heating, as further evidence.

(b) The majority of candidates recognised that the isotherms on the south of the intrusion should mirror those on the north, but a significant number of candidates did not. Part (ii) was commonly quite well undertaken, with the best candidates recognising that metaquartzite was originally sandstone and shaded the area of this rock type between the isotherm labelled 500 and the granite. Incorrect answers included shading the shale and even the granite.

(c) The texture of Rock E was poorly described with few candidates scoring 3 marks despite the wide range of possible comments to trigger the marks. Many candidates mixed igneous and sedimentary terminology in what is clearly a metamorphic rock. Few candidates gained many marks on part (ii) despite so much information being given in Figure 2a, such as its origin as shale, heating to 500-600°C and proximity to a granite intrusion.

Q.3 (a) Significantly fewer than half of the candidates opted for a direction of flow towards the east and even fewer understood that the current flowed in the same direction as the current bedding dips. Most candidates correctly recognised that the poorly sorted and sub angular grains are indicative of fluvial rather than aeolian deposition.

(b) Most candidates correctly identified mineral P as calcite and feature Y as a suture line. In addition the majority correctly identified the fossil as an ammonite and justified their choice in terms of the complex suture line.

(c) Knowledge of carbon-dating was varied with few candidates gaining high marks and even fewer expressing their ideas accurately.

(i) Few answers referred to the role of respiration in living organisms.

(ii) The best answers referred to the radioactive decay of ^{14}C and its lack of replenishment from the atmosphere. Weaker answers often assumed that ^{14}C decays to ^{12}C. One answer suggesting that "the fossil dies over time and gets sort of ill and begins to lose carbon" demonstrates that students find this topic difficult to master.

(iii) This question was very poorly answered. Most candidates could not recognise that the plant fossils had been through two half-lives, and many of those who did so failed to double the 5730 years of the half-life.

(iv) Many candidates noted the lack of fossil material in the sand and gravel and hence its unsuitability for dating by carbon methods. Fewer candidates however recognised that the Jurassic fossil is too old for use in carbon dating.

Q.4 (a) Most candidates correctly identified that the dolerite forms dykes.

(b) (i) The best candidates noted that the question asked for a relative date for the gneiss compared to the silicic pluton and responded with the term "older". The question directed candidates to the need to refer to the key, since the answer could not be determined from the map. Candidates were, therefore, expected to know that the "Precambrian is older than the Tertiary". Some candidates knew this but simply gave an actual age for the Precambrian as their answer to relative age rather than using the phrase "older" and thereby failed to gain the mark.

(ii) This question was well answered with many clear explanations of the law and good use of one of many examples on the map.

(c) The texture of rock H was poorly described with many candidates using sedimentary terminology and many referring to porphyritic texture. Few used the scale accurately and often the slightly irregularly shaped crystals were described incorrectly as euhedral. It was disappointing to see so many inaccurate responses. Most responses in part (ii) however correctly identified mineral X as plagioclase feldspar.

(d) The correct response of "mafic pluton" was not commonly noted despite the mafic nature of the augite-rich rock H and its coarse crystal size. Some credit was given to those who identified H as a mafic lava or dolerite, if they referred to the augite as indicative of a mafic rock. Similarly some credit was given to those who opted for the silicic pluton if they referred to the coarse crystal size.

GEOLOGY

General Certificate of Education

January 2013

Advanced Subsidiary/Advanced

Principal Examiner: Dr Rebecca Gould

Unit Statistics

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Unit	Entry	Max Mark	Mean Mark
GL3	408	50	28.9

Grade Ranges

A	34
B	30
C	26
D	23
E	20

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

Section A

Most of the questions were attempted by all candidates. On the whole they were generally answered well.

Q.1 (a) (i) This question was well answered by most candidates successfully linking subsidence with the collapse of tunnels.

(ii) This question was also accessed by most candidates showing a clear calculation.

(b) Most candidates provided detailed descriptions and comparisons between the two transects. The best answers involved the use of data from Figure 1a. The most popular explanation for the difference between the two transects involved the movement or influence of the fault. Very few candidates considered the depth of the coal seam to have influenced the amount of subsidence.

(c) This question was designed to test whether candidates understood that mining may cause low magnitude earthquakes. Most candidates linked the collapse of tunnels with the generation of earthquakes. Very few candidates explained why their magnitude was low. Some discussion was required to obtain the full marks.

(d) The quality of the answers for this question varied a lot. Some candidates offered vague explanations such as ‘machines’ or ‘coal’. Other students discussed air pollution caused by the mining vehicles and failed to relate it to groundwater pollution. The best candidates offered a full and detailed explanation of acid mine drainage.

Q.2 (a) (i) This question posed few problems for the candidates. Most developed the idea that the water table was a level/surface.

(ii) Most candidates answered this question successfully.

(iii) This question posed few problems for the candidates.

(iv) This question was designed to examine whether candidates could use terminology that they were unfamiliar with as well as interpret a data set. On the whole, it posed no difficulties with the majority of candidates achieving full marks.

(v) This question was answered well by the candidates. The majority discussed how increasing the water table will influence pore pressure and lubricate the slope. The stronger candidates gave full explanations as to how water can change forces within the slope.

(b) This question aimed to test whether candidates could apply their knowledge and understanding to a specific scenario. The question produced answers of varying quality. The better answers discussed the varied geology and related this to permeabilities and the forces acting in the slope.

(c) Out of the two remediation techniques drains were answered in more detail. Most candidates discussed how the reduction in the water table stopped lubrication and therefore caused changes in the forces acting in the slope. Meanwhile the concrete barrier produced some varied responses. Most candidates described how the barrier acts as retaining structure, holding back the slope. Some candidates discussed how it would act as an impermeable barrier stopping water entering further down the slope. This idea was not accepted as the barrier is likely to have some drains within it (to stop failure due to increased water pressure) as well as not being a continuous barrier therefore it would allow water through.

Section B

General Comments

Question 5 was the most popular question chosen by candidates followed by question 4 and 3 respectively. Though not always asked for in the essay question it would be helpful for candidates to use case studies to illustrate their knowledge and understanding. Candidates did not make use of annotated diagrams as much as they might which would have aided their communication.

Q.3 This was the least popular essay and the quality of the essay varied greatly. Very few candidates used diagrams, maps or even case studies to illustrate their knowledge and understanding.

(a) Only the better candidates considered the nature of the waste itself and how this would impact on the method of disposal. Radioactive waste disposal was more commonly addressed than toxic waste. Most candidates considered and discussed how the water table, permeability of the rock, location of faults as well as the recurrence of earthquakes could have an impact on waste disposal. Very few candidates and only the better ones considered the geological future and potential climate change.

(b) Most candidates identified that leachate and gases are the main problems associated with domestic waste disposal and the majority discussed site selection in relation to the leachate. Most candidates discussed the water table and permeability of the rock. Generally speaking this section would have benefitted from the use of diagrams to help to illustrate how geological structures and bedding could influence fluid pathways. Some candidates still considered the non-geological problems (noise, dust and gas emissions from vehicles) associated with domestic waste disposal even though the question specifically asked about geological site selection. They received no credit for these ideas.

Q.4 This was the second most popular essay and as with question 3 the quality of the answers varied greatly. The stronger candidates went into greater detail in their explanations as well as using diagrams and case studies.

(a) The majority of candidates provided definitions of an aquifer as well as porosity and permeability and how this influences how water is stored and moved in aquifers. The answers tended to be restricted to permeability as well as structure. Most students referred to rock types in the essay and this is applauded. Very few candidates discussed how texture can influence permeability and porosity and this was needed for the higher mark bands. The better candidates used an example of an aquifer.

(b) This section was better answered than part (a). Most candidates discussed a general fall in the water table, the development of a cone of depression, ground subsidence as well as saltwater incursion. The level of explanation varied and most candidates found it challenging to explain how a saltwater incursion develops. The more able candidates successfully used annotated diagrams to illustrate the development of a cone of depression as well as saltwater incursions. The use of case studies however was patchy and tended to be restricted to the essays from the stronger candidates.

Q.5 This was by far the most popular essay and on the whole achieved the highest marks. Most candidates used multiple case studies throughout the essay and this should be applauded. However there is the occasional case of dubious geography in relation to the case studies which can detract from the essay for example Pinatubo or Mount St Helens used for a basaltic volcano.

(a) On the whole this question was answered well and often illustrated with more than one case study. Most candidates discussed the diversion of lava flows and lahars as well as evacuation and monitoring. Occasionally some candidates did use this part of the essay as an opportunity to describe all that they know about a particular case study. To achieve the higher marks a balance between depth and breadth of knowledge and discussion of more than one technique was required.

(b) There were no preferred choices out of the three phenomena and the quality of the responses varied. The better understood explanations tended to be for ground deformation. To gain higher marks candidates had to explain how the phenomenon worked, describe what equipment is used as well as how it could be used to predict an eruption. More often than not the weaker candidates failed to mention the equipment used to monitor the volcano and the explanation as to how it was used could be quite superficial. Some candidates were also prone to repeating their argument throughout this section. Not all candidates mentioned case studies and occasionally they talked about modern monitoring techniques used during inappropriate eruptions such as the AD79 Vesuvius eruption.

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