



GCE AS EXAMINERS' REPORTS

**GEOLOGY
AS**

SUMMER 2018

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GEOLOGY

GCE AS

Summer 2018

GEOLOGICAL ENQUIRIES

Question 1

- (a) Nearly all candidates identified a piece of evidence from Map 1. A minority did not mention grain size for D and just stated that Rock D was crystalline.
- (b) The majority of candidates were able to identify cleavage but many thought that mineral J was mica/hornblende despite having the mineral data sheet.
- (c) The most common incorrect answer was granite and a number of candidates correctly named the rock as gabbro but then went on to suggest that quartz was present.

Question 2

- (a) Generally good quality diagrams were seen. However a minority of candidates drew “floating” grains not in contact with each other. A number of candidates incorrectly drew the grains as perfect circles.
- (b) Many candidates stated the evidence in just two words e.g. poorly sorted, well rounded etc. Credit could not be given as the question had asked the candidates to explain three pieces of evidence not just to state three pieces of evidence.
- (c) This question proved to be a good discriminator with the more able candidates being able to name the minerals present in Specimens D and C as opposed to weaker candidates who often just talked about colour. The majority of candidates were able to coherently discuss the cross-cutting from the map and the age relationship. A number of candidates also discussed the grain sizes of the two specimens. Weaker candidates focused on the geographical locations on the map.

Question 3

- (a) Almost all candidates scored full marks. However some candidates were unable to give the correct units.
- (b) Credit was given to a wide range of correct answers but a significant number of candidates simply talked about repeating the procedure and then calculating a mean value without recognising that this could well lead to the same error being repeated.
- (c) Some candidates simply stated the name of the test e.g. hardness, without describing the test. No credit could be awarded for this. A surprisingly high number of candidates responded that the mineral could be scratched with a steel pin but then went on to name the mineral as quartz.

Question 4

- (a) The majority of candidates who dropped marks on the question did not access the detail mark by either drawing the incorrect number of whorls and/or drawing the whorl thickness constant.
- (b) Most candidates scored full marks, although a number of candidates incorrectly identified the fossil as being either a goniatite or a ceratite.

Question 5

- (a) The majority of candidates were unable to identify the correct location, with locality 3 being the most common incorrect answer.
- (b) This appeared to be a particularly challenging question with very few candidates being able to correctly describe two pieces of field evidence. Weaker candidates simply stated that "you would have different rocks".

Question 6

- (a) This question provided a wide range in the quality of responses, with the classification of fault 1 proving particularly difficult for the candidates.
- (b) Most candidates were able to accurately measure the deviation of the dyke although some stated that this deviation was due to the dyke having been faulted.

Question 7

There was a considerable range with regards to the quality of answers produced by different centres with some centres having all their candidates achieving double figures and others having very few candidates scoring more than ten marks. The most common errors included not having the base of Rock Unit A at 300m, having fault F1 dipping towards X instead of Y and not showing any cross-cutting relationships at the base of Rock Unit G. There are a number of resources on the exam board website that centres can access for help. The candidates at a number of centres used red ink to identify fold axis, a practice that should be discouraged as it raises issues with regards to the authenticity of the candidates work.

Question 8

Surprisingly few candidates were able to correctly identify the flute casts, with the most common mistake being identifying the photograph as asymmetrical ripples or imbricate structures. Credit was given for correct descriptions and interpretations of these structures. However no credit was given to those candidates that discussed pillow lavas.

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FOUNDATION GEOLOGY

Foundation Geology - Mark range 7 to 76 out of 90. Mean mark 44.5

Question 1 Mark range 1 to 14 out of 14. Mean 9.83, Facility Factor 70.21

This was a very accessible question on graptolites where most candidates scored highly. Most identified Feature A as theca/thecae but incorrect responses included teeth, ribs and spines.

Calculating the true length of the stipe was done well but a small number of candidates multiplied their answer by 4 instead of dividing it and ended up with stipe lengths of over 50cm.

Naming the graptolite shown in Figure 1a and stating when it became extinct were answered correctly by nearly all candidates.

Many students correctly identified two differences between *Didymograptus* and *Dicellograptus*, but a significant number lost marks through poor exam technique. Stating that *Didymograptus* is pendent alone did not gain credit, since some comparison between the two graptolites was needed e.g. *Dicellograptus* has fewer and more widely spaced thecae than *Didymograptus*. A few candidates compared their appearance and extinction times which also gained credit.

It is evident that the majority of candidates understand the characteristics of a good zone fossil. Many excellent and detailed answers were provided in c (ii) which gained full credit. Incorrect responses referred to having hard parts and that they were restricted to living in certain environments.

Most candidates correctly identified the replacement mineral in Figure 1c as pyrite. Incorrect responses included calcite, chalcopryite and haematite.

Many candidates scored full marks on the final question which asked for evidence to support a death assemblage of graptolites in Figure 1c. The majority of responses referred to current alignment, broken/incomplete graptolites, some degree of sorting/similar size and that they were planktonic and had been transported after death. A few weak candidates simply stated the qualities of a good zone fossil again repeating their answers from c (ii).

Question 2 Mark range 1 to 11 out of 11. Mean 5.45, Facility Factor 49.55

This question had an easy mathematical starter that the vast majority of candidates answered correctly. A few candidates carelessly added $47 + 28 + 8.1$ and did not get 83.1 (82.1 and 84.1 being common). A small number of candidates did not understand the word abundant and added the lowest three values together ($2.6 + 2.1 + 0.8$) to get 5.5.

Matching the Goldschmidt element groups to the definitions was generally done quite well. The most common error was to confuse Siderophile with Chalcophile which resulted in 1 mark instead of 2. Only a small number of candidates scored 0 here.

Estimating the percentage of orthoclase feldspar as 40% was correctly done by the majority of candidates. Incorrect answers included 20%, 60% and 80%.

It was surprising to see so many incorrect answers here, with biotite mica, quartz and plagioclase being common answers. Under half of the responses correctly stated orthoclase feldspar. Many students were unable to give 2 reasons to support their answer. Many correctly stated that orthoclase feldspar was the largest crystal but failed to add that it was euhedral/subhedral with straight edges. A very small number of responses referred to temperature of crystallisation which also gained credit.

The rock forming Feature D was correctly identified as basalt by many but incorrect responses included dolerite, gabbro, phenocryst, xenolith, greywacke and columnar jointing.

The origin and formation of Feature D was answered well by many candidates. Xenolith or included fragment was often stated but there was a range of incorrect responses including phenocryst, andesite, granite, fossil and garnet. Explanations were often lacking enough detail to pick up the additional 2 marks with only the better candidates referring to country rock, Feature D being older than the enclosing rock or the process of stoping.

Question 3 Mark range 1 to 14 out of 14. Mean 6.75, Facility Factor 48.21

The graph construction question was accessible to all candidates with the vast majority scoring full marks. Some candidates dropped one mark by inserting a best fit line rather than joining up the individual plots. A few candidates plotted some of the points inaccurately and lost 1 mark. One or two candidates extended the graph to the present day.

Most candidates made two valid statements regarding the pattern of latitudinal change of the UK on the graph. Weaker candidates put Table 3a back into text without drawing any conclusions. A few incorrect answers stated the UK drifted at a steady or constant rate.

The calculation was found difficult by many candidates with quite ridiculous answers being given at times. A number of candidates ignored the instructions in the stem and calculated between 500 Ma and 65 Ma rather than 280 Ma and 65 Ma. Many candidates realised that the UK had drifted 50 degrees over 215 Ma but were unable to do the maths to get the correct answer.

Part (b) was answered poorly by the majority of candidates agreeing that the UK had clearly moved from East to West during this time period. Only a minority of candidates understood that palaeo-magnetic evidence only revealed N-S movements and that the magnetic inclination is the same along any line of latitude so of no use in determining E-W movement.

Responses to part (c) were rather variable with weaker candidates giving the latitude, age and rock types without linking these to the climatic belts. Better responses cited that red sandstones and breccias indicated hot desert conditions and that limestone with corals suggested equatorial conditions with tropical climates close to the equator. Many candidates did not refer to rocks from all 4 dates in the table, the majority mentioned just 2 or 3 of them. A disappointing number of candidates scored full marks here.

Question 4 Mark range 0 to 18 out of 19. Mean 7.5, Facility Factor 39.47

This question had the highest mark allocation of 19 but was generally the lowest scoring question on the paper.

A surprisingly high proportion of candidates did not recognise Figure 4a as a divergent/constructive margin even with the ocean ridge being clearly labelled. The most common incorrect response was conservative margin. A small number thought it was a convergent/destructive margin.

Stating the age of the oceanic crust at K and L was found to be problematic for many candidates. Fewer than half of the responses correctly identified K as 0.78 Ma and L as 0.90 Ma. It seems that candidates were unable to translate the ages in Figure 4b to the locations on Figure 4a.

Part a (iii) also elicited poor quality responses from many candidates. Few recognised the symmetrical pattern or that they were parallel to the ocean ridge or discontinuous due to the transform faults. Many simply listed the age of the anomalies from the ridge using Figure 4b. Credit was awarded for saying there were alternating periods of normal and reversed polarity and many candidates only picked up this mark.

Part b (i) Many candidates seemed to get confused by this question and tried to look for something far more complex than what was actually required. Looking at Figure 4b there are 7 anomalies in 2 Ma (4 normal/3 reverse) or 6 times when the polarity changed. All kinds of strange answers were given here including 1, 2, 3, 4, 5, 6, 7, 8 reversals.

Part b (ii) simply required the number given in b (i) to be divided into 2 Ma for 1 mark. Many candidates failed to pick up the 'follow through' mark here by not doing this. A significant number of candidates had huge numerical lists gleaned from working out the length of the individual reversals from Figure 4b and failed to measure/compute the data accurately. A very simple question that many candidates scored zero on.

The explanation of how the magnetic polarity was preserved in rocks was generally done quite well, but a significant number of candidates failed to mention basalt and that the mineral being aligned was magnetite. Many simply referred to 'iron particles' in the oceanic crust but still gained credit. It was pleasing to see a number of candidates referring to the Curie Point when the magnetic alignment was 'locked in'.

Part (c) was well answered by the majority with the reference to the transform fault, friction, stress build up then release. A few weak candidates suggested the earthquake was due to volcanic activity.

The extended response question produced very poor quality answers in general with only a small number of candidates scoring more than 3 out of 6 marks. A large proportion of candidates scored between 0 and 2. Candidates will need practice in answering this type of question in order to score more marks in the future. Most candidates ignored the scaffolding in the stem which gave mafic, layered structure, composition and 7 km thick. Many answers were generic cross-sections through a divergent plate margin and referred to convection currents, ridge push, slab drag and normal and reversed polarities. Very few drew a section through the oceanic crust to show pillow lavas, dolerite dykes, massive gabbro and layered peridotite. Little reference was made to decompressive melting of the mantle to produce basaltic magma. The quality of diagrams in general was very poor. The weakest candidates drew diagrams of subduction zones and collision zones and gained zero credit.

Question 5 Mark range 0 to 15 out of 15. Mean 6.05, Facility Factor 40.33

Very few candidates correctly identified and described the weathering process as insolation/exfoliation in a (i). Incorrect responses included erosion, glaciation, attrition, abrasion, acid rain, chemical weathering, freeze-thaw, hydrolysis, biological weathering, wind and rain. It seems that many students did not notice the key words 'hot desert' in the stem.

The description of the texture of the sediment in 5b was very well done in general and most candidates scored 2 or 3 marks here. Poorly sorted, angular, matrix support, clastic and appropriate grain size ranges were given by many candidates. The weakest candidates referred to igneous and metamorphic terminology instead of sedimentary. One or two candidates claimed the sediment was well sorted and quite well rounded.

Linking the sediment in Figure 5b to the landform in Figure 5a was problematic for many candidates. Alluvial fan as an answer was in the minority with dried up lake bed, dune field and scree slope being more common. It was still possible to pick up marks if the landform answer was incorrect. Some candidates correctly noted that it represented high energy as it was poorly sorted and that limited transport and erosion had occurred as the fragments were angular.

The extended response question was generally poorly answered but actually much better than the extended response in question 4. Once again candidates ignored the information in the stem which stated relative effectiveness of wind and water in sorting and rounding sedimentary grains in a hot desert environment. Many candidates ignored hot desert in Figure 5a and gave generic geographical answers about rivers, the sea and wind and referred to erosional processes and size of particles. Only a small proportion of answers addressed the question set and stated that wind was more effective as it blew most of the time and produced well rounded and well sorted deposits of sand size grains due to constant abrasion and attrition. Figure 5b should have prompted the correct response for water but candidates tended to ignore this and referred to rivers in temperate environments which were much better at rounding and sorting sediments than wind. A few candidates claimed that sediment in rivers became more angular the further it was transported.

Question 6 Mark range 0 to 17 out of 17. Mean 8.93, Facility Factor 52.53

Many candidates failed to suggest an appropriate name for rock P with incorrect answers including slate, greywacke, sandstone, marble, granite, basalt, shale and limestone.

The dip angle of the fault was correctly measured by most candidates but a few responses clearly measured the dip angle from vertical giving around 80 degrees which was not credited. The direction of dip is simply west but many candidates incorrectly stated east to west or other compass orientations.

Part b (i) was generally well done with the majority of candidates identifying rock unit T as a dyke as it was discordant, small scale, sheet-like/linear and intrusive.

The calculation of the true thickness of rock unit T in b (ii) proved problematic for a number of candidates. Mistakes were made by adding 39 and 23 rather than subtracting. Many candidates simply multiplied 16 by 60 to get 960 as the answer. Clearly a number of candidates did not know how to use the cosine function on a calculator.

Part (c) elicited good quality responses in general but many candidates ignored the guidance given in the bullet points in the stem. A significant number of candidates still do not understand the concept of fold symmetry being linked to limb length.

The final question was a very good discriminator with the more able candidates logically working their way through to the conclusion that it could only be a thrust fault. Many failed to realise that the foliated rock was metamorphic and therefore had to be older than everything underneath, so the hanging wall must have gone up. The weaker candidates just agreed with the statement or said that you couldn't tell as none of the rocks matched up across the fault.



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