GCSE EXAMINERS' REPORTS

GEOLOGY (LEGACY)

SUMMER 2018

Grade boundary information for this subject is available on the WJEC public website at:
https://www.wjecservices.co.uk/MarkToUMS/default.aspx?l=en

Online Results Analysis

WJEC provides information to examination centres via the WJEC secure website. This is restricted to centre staff only. Access is granted to centre staff by the Examinations Officer at the centre.

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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Theory paper

The on-screen examination ran very smoothly with virtually all centres being able to complete on-screen as intended. Feedback from centres suggested that the candidates enjoyed the experience, especially the quality of the diagrams and style of questioning and found the examination paper a fair but challenging test. The 2018 cohort included some exceptional candidates. The candidates coped well with some difficult questions. Candidates at the lower end of the ability range showed positive achievement also and almost all gained a reasonable number of marks on each question. It was evident that some candidates found the extended writing more challenging whereas others lost too many marks on the multiple-choice sections - either through not reading the question carefully enough or simply guessing the answer. The ability of the candidates seemed similar to that of 2017. As the majority of the paper is now machine marked it is not possible to make detailed comments about every question and this report concentrates on those questions which were marked by examiners.

Section 1
This was a question which tested the ability of candidates to interpret data on rock weathering and rock strength, interpretation of a graph of variation in CO_2 content of the atmosphere over time and knowledge of the albedo effect. Candidates had sufficient mathematical skills to calculate ratios (Q2) and use the information to relate rock strength to resistance to erosion. Not all candidates correctly used the terms scarp and vale and wrote in general about sandstone being higher topographically and shale lower (Q3). Many candidates knew about ice cores and their use in determining the CO_2 content of the atmosphere in the past (Q5). Some candidates erroneously wrote about CO_2 being contained in rock cores. Most candidates knew about the albedo effect although some incorrectly thought that melting of ice sheets generated enough CO_2 to affect climate change (Q8).

Section 2
This was a plate tectonics question which involved two types of plate margin and the characteristic seismic and volcanic activity at the San Andreas Fault. This was followed by questions on earthquake hazards, methods of prediction using radon gas and ways of alleviating the risk through building design. A number of candidates were caught out by Q4 (not recognising the San Andreas as a strike-slip fault), Q5 (a variety of answers) and, surprisingly, Q6 where VII was a common incorrect answer. A variety of solutions were proposed for Q7 although some without any detailed description. The calculation (Q8) proved challenging particularly getting the powers of 10 correct in the calculation and even reading the graph correctly.

Section 3
This question required the description of sedimentary rock textures, identification of sedimentary structures and interpretation of changes in the environment of deposition using the evidence obtained. Most candidates correctly described the textures of the rocks in Figure 10 (Q1). Most also identified the structures in Figure 12 (Q4). Many candidates incorrectly thought the large-scale cross bedding was a product of water transport (Q5)

rather than a dune environment. However there were some good answers to Q5 and candidates made good use of the evidence available in Figures 9-12.

Section 4
A wide-ranging question based on rocks and structures associated with the Caledonian orogeny. The relative dating of the granite and faulting proved to be a challenge in Q1 but the relative dating of the rock units in Q4 was correctly answered by most candidates. Whilst the pillow lavas were correctly identified by the majority (Q6), fewer candidates explained their origin sufficiently well to obtain all three marks (Q7). The causal mechanism of the pillow shape was not well explained. Most candidates could distinguish between marble and metaquartzite through appropriate tests on the minerals they contain.

Section 5
This was a fossils used in dating question. Surprisingly a large number of candidates were caught out by Q3 because the age of the Burgess shale was not known. The majority of candidates could describe changes in the suture line of ammonoids (Q4) but not all could assign a type of suture line to the correct ammonoid. Answers to Q7 were sometimes vague, mentioning warm conditions without specific reference to black smokers or hydrothermal vents.

Section 6
A number of candidates have difficulties with geological maps and cross-sections, skills which were once second nature to candidates and thoroughly understood. The interpretation of maps and cross-sections are important geological skills which need to be assessed. This question also included formation of oil traps, characteristics of oil reservoir rocks and oil exploration. Candidates did often recognise the difference in the width of outcrop of the sandstone on each side of the syncline (Q2) although often referred to thickness and left/right instead of outcrop width and providing a compass direction. However they less often went on to explain the variance in the angle of dip. Q4 produced some of the weakest answers on the paper with candidates more than likely guessing the answer with poor explanations. The information in the stem (vertical faults) was often ignored and there was rarely reference to the age of the shale and sandstone in order to determine down-throw. Seismic survey was well known as a method of hydrocarbon exploration (Q5-7). Most candidates knew something about the migration and accumulation processes involved in the formation of hydrocarbon traps (Q10). The impermeable nature of the cap rock was the best known property but the high porosity and high permeability of the reservoir rock was also well described. The unconformity trap was not always identified.

Section 7
This question involved an interpretation of data on the copper content of soils near an ore body and the cleaning up of heavy metal contamination after mining has ceased. The final question invited candidates to choose the best possible site for domestic waste disposal based on geological reasons. The calculation of ore concentration was usually correct (Q3) although some candidates tried to take one value away from the other. There were some interesting answers on the problem of soil contamination (Q4). Phytomining (correct answer). Most candidates gained some marks for describing the merits of the geological conditions of sites S or T (Q5) and there were some very good answers. Poor answers wrote about the proximity of the town, problems of smell etc.

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Controlled Internal Assessment

Thirty four centres submitted coursework for moderation which is a reduction on previous years.

Administration

The administration and moderation of the coursework samples ran smoothly once again this year. The system of task accreditation assisted centres by highlighting possible problems at an early stage. A small number of centres did not complete a Task Accreditation Form (Option 2) for 2018 and so missed out on any early advice from the Principal Moderator. A minority of centres submitted work late or without the correct paperwork. There were some samples submitted which were extremely bulky and difficult to handle and included field notebooks which were 80% blank pages. In some cases all of the elements submitted did not have the name or number of the candidate on it so that if the work became separated it was difficult to identify.

Option 1 Virtual Fieldwork

Few candidates attempted this option. Candidates attempting Option 1 had difficulty with the evaluation and planning because of their lack of field experience. Candidates who were absent from class for Option 2 correctly completed Option 1. Candidates handled the data efficiently and logically and demonstrated most of the geological skills well. The observations in the field notes were accurate in the main and clearly recorded, particularly the specimen descriptions. However, one or two centres had no distinguishable field notes or merely annotated the photographs without drawing field sketches. Marks awarded were occasionally on the generous side and it was felt that in order to justify the higher marks, candidates should have included most of the following:

Field notes

- locality 1 labelled sketch of trilobite specimen A
- locality 2 table of similarities/differences between *Calymene* and *Trinucleus.* Sketch of specimen B
- labelled field sketch of folding in photograph C, locality 3
- measured dip angles of folds in photograph C
- description of dolerite at locality 4
- description of conglomerate specimen E at locality 5
- labelled field sketch of the unconformity in photograph F at locality 6
- measured angle of dip of lower beds in the unconformity in photograph F
- description of specimen G halite at locality 7

Report

- mode of life of trilobites/environment
- annotated photographs folding and unconformity
- interpretation of the folding - trend, orogeny style etc.

- history of the unconformity
- evidence for dolerite dyke/cooling history
- origin of halite
- rose diagram of clast orientation at locality 6
- interpretation of currents from clast orientation at locality 6
- cross-section of map

- **conclusion** interpretation of changing **geological environments** from fossils/rocks/data
- sandstones and shales- trilobites marine/age
- conglomerate -shallow marine high energy
- limestone- shallow tropical
- breccia/red sandstone/halite - wadi/desert

- **geological history** table summary –
- deposition of sandstone/shale, conglomerate, fine sandstone, limestone
- folding
- dyke intrusion
- uplift and erosion forming unconformity
- deposition of breccia, red sandstone, halite
- sill intrusion
- uplift, tilting

Option 2 Actual Fieldwork

The majority of candidates attempted this option. The best investigations allowed the candidates to demonstrate essential field skills (such as rock descriptions, field sketching, fossil identification, dip and strike measurement and sedimentary logging) and perform suitable analytical techniques on the data collected. A mixture of field tasks was undertaken with a rough break down being investigations into:

- interpretation of sedimentary environments
- mapping exercises leading to geological sections and geological history
- structural analysis such as orientation of strike of folds, assessment of the degree of crustal shortening and fault/joint analysis
- fossil counts and orientation of fossils
- clast analysis of pebble beds and interpretation of environment
- origin of igneous structures

Centres are to be congratulated on the variety of opportunities given to candidates in areas of outstanding geology such as Purbeck, Lulworth, Walton on the Naze, Peak District, Wenlock Edge, Wirral, Bude, Bridgnorth, Ogmore, Crookdale Crag (A6 Shap), Broad Haven (Pembrokeshire), Clitheroe, Marloes Sands (Pembrokeshire), West Angle Bay (Pembrokeshire), Amroth, Stackpole, Colliery Bay (Northern Ireland), Banff Coast (Scotland), Forest of Dean, Isle of Portland, Swanage, Durdle Door, Dollar Cove (Cornwall), Lindisfarne, Tideswell Dale, Hastings and Port Howard (Falkland Islands).

The following criticisms are highlighted from this year’s submission;

1. Some candidates had little or no data in the field notes yet were able to produce much data in a report.
2. In a number of cases, opportunities for the collection of basic field data were missed. Observations such as rock identification, grain size, sorting, direction of cross-bedding, clast roundness/orientation, field sketches, dip and strike measurements and sedimentary logs should normally be part of every investigation (where appropriate).

3. Additional thought needed to be given as to whether the data collected was suitable for processing and analysis as histograms, cross-sections, logs, rose diagrams, maps and geological histories.
4. There was no need for candidates to repeat observations made in the field notebook within a report unless it contributed significantly to the analysis.
5. Evaluation required more attention and practice. Simplistic statements regarding lack of time and bad weather were seen too often.
6. There were examples of large amounts of photocopied material from secondary sources being included which was unnecessary.
7. When rose diagrams of 'dip' were constructed candidates did not make it clear as to whether the diagram was of dip direction or strike direction (in which case strike direction and plus 180° should be shown). Dip angle is not usefully displayed on a rose diagram.

Assessment

Assessment was generally accurate. There were two main reasons why scaling had to be applied.

- Awarding of high marks for inappropriate tasks e.g. lack of focus for the investigation or lack of opportunity for the candidates to collect suitable tabulated data.
- Reliable rank order but marks generous. The assessment criteria were interpreted too generously or there was little/no evidence for skills such as tabulation and processing of data, evaluation or forward planning.

Support

GCSE controlled internal assessment finishes with this assessment and the WJEC specification has been rewritten for awarding in 2019. Details of the specification can be downloaded from the WJEC website where the appropriate forms and guidance for teachers can also be found. For further support contact David Evans the subject officer at WJEC (david.evans@wjec.co.uk).

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