Geology

2013 Chief Assessor's Report

Government of South Australia

SACE Board of SA

GEOLOGY

2013 CHIEF ASSESSOR'S REPORT

OVERVIEW

Chief Assessors' reports give an overview of how students performed in their school and external assessments in relation to the learning requirements, assessment design criteria, and performance standards set out in the relevant subject outline. They provide information and advice regarding the assessment types, the application of the performance standards in school and external assessments, the quality of student performance, and any relevant statistical information.

SCHOOL ASSESSMENT

Assessment Type 1: Investigations Folio

It was pleasing to see some new and innovative ways of presenting reports of field investigations, including animated video and PowerPoint presentations submitted on DVD. Some schools included two field reports in their assessment plans, which had been based on several full-day field trips. The increased time spent on fieldwork, and the presentation of two reports, provided more opportunities for assessment of the italicised items in the content section of the subject outline in the field rather than in the classroom or laboratory. This emphasis aptly reflects the nature of the subject.

In some cases there seemed to be a misunderstanding about the nature of a 'field investigation'. Some students presented reports that were almost entirely based on internet research or on other sources such as interpretive signs or published field brochures. Reports should be largely based on students' own direct observations. Reports should primarily focus on demonstrating learning of the italicised sections of the curriculum statement, through annotated sketches, photographs, or video. These should be associated with descriptions and explanations of geological features seen in the field, written in students' own words, and include reference to evidence (including sketches and other data) recorded in a field notebook. Fieldwork should also ideally provide students with an opportunity to investigate, interpret, and explain features in simple and familiar contexts, as well as in more complex and new situations (A1).

The best folios provided a broad range of student activities that gave students an opportunity to demonstrate specific features at the highest levels of the performance standards, without any unnecessary duplication across multiple tasks. One of the requirements in Assessment Type 1 is that students have an opportunity to design a method for an investigation, but some students were not provided with this opportunity. Tasks such as a field investigation or a rock/mineral identification practical are suitable for the assessment of the I1 specific feature.

It is important that teachers ensure that all of the italicised sections of the subject outline are included in either the fieldwork or the practical work provided for students throughout the course. It is suggested that teachers use a checklist when designing their teaching programs, to ensure that the full extent of this work is included. While not every italicised item will be assessed within the folio presented for moderation, there should be evidence that students have had an opportunity, for example, to

recognise some common deformation features and rock types as part of their fieldwork and to test and identify the prescribed minerals in the laboratory.

Assessment Type 2: Skills and Applications Tasks

Tasks should provide opportunities for students to demonstrate high levels of achievement in all specific features. It was often noted that this was not the case for the features that relate to analysis, problem solving, and explanation of issues. When selecting questions, teachers should be mindful that these features are adequately covered. Teachers are encouraged to provide information about the conditions of assessment on each task sheet, to inform both students and moderators. Teacher marks and highlighted performance standards, or other indicators of grades for specific features in tasks, were also very useful for moderating Skills and Applications Tasks (SATs).

Tasks in both assessment types must enable students to provide evidence against all four assessment design criteria. Three or four specific features per task are often sufficient to cover this requirement.

EXTERNAL ASSESSMENT

Assessment Type 3: Examination

This year 55 students sat for the examination, representing a significant increase from the 42 who sat last year. However, 11 others were registered but did not attend the examination. There was no significant change in the overall quality of answers from this year's cohort compared with those from last year's cohort.

Section A: Multiple-choice Questions

This section was not as well done as it has been in recent years. A relatively small number of students were able to demonstrate knowledge and understanding across the wide range of topics covered.

Section B: Short-answer Questions

Question 16

(a) (i) Many students were unable to correctly identify the rock that was <u>less</u> resistant to erosion despite the fact that rock B was clearly undercutting rock A.

(ii) Most students found it difficult to state a feature about rock layer B that might explain why it was less resistant to erosion.

(b) (i) (ii) This was very poorly answered, with many students interpreting the rock at the bottom of the photograph as representing the stream bed and then the subsequent erosion of layer B being caused by flowing water. Only a few students made reference to the large rounded/sub-rounded clasts and poor sorting of the sediments in layer A. Several students mentioned what appeared to be ripple marks /scour features at the boundary between the two layers.

(c) (i) (ii) Poor interpretation of the photograph (as above), and a failure by most students to read that it was the 'boundary' between the rock layers A and B that may have been the stream bed, resulted in most students choosing regions 3 or 4 as the locations where gold might be deposited. Consequently most students were unable to explain why gold would most likely be found at location 2. Very few students made reference to the density of gold as a factor.

Question 17

(a) (b) (i) (ii) Most students were able to correctly identify two similarities and two differences between the internal structure of the moon compared with that of the Earth. Common responses for similarities referred to general structure (crust, mantle, inner and outer cores) and specific features such as 'liquid outer core' and 'solid inner core'. Differences mainly related to the presence of a 'moonquake zone' and lack of tectonic plates.

(c) (i) (ii) Most responses alluded to the moon's lack of tectonic plates and subsequent lack of orogenic processes, and the moon's lack of atmosphere and resultant minimal weathering and erosion on its surface.

Question 18

(a) This question was generally well done by most students.

(b) (i) (ii) Most students answered this question correctly. Errors occurred when students gave a single time rather than a range.

(c) This part was generally well answered, with most students explaining that several fossil types will reduce the possible age range and subsequently give a more precise age.

(d) (i) (ii) Students who were able to correctly interpret the chart had no problems naming the Belemnites as the cephalopod group of most interest due to their existence over a relatively narrow time span that included the Cretaceous.

Question 19

(a) Marks were allocated for labelling of axes (including the naming of appropriate units), plotting of points, and accurate construction of lines connecting plotted points. Students commonly lost marks by failing to appropriately label both the x and the y axes. Although best-fit line graphs were accepted they made answering part (b) more difficult.

(b) A common incorrect answer suggested that the periodic short-term fluctuations were due to volcanic activity, as opposed to seasonal variations.

(c) (i) (ii) Most students recognised that the temperature was increasing (warming). There were a number of accepted descriptions of human activity that might be linked to the trend in CO_2 levels increasing, including the burning of fossil fuels and the effects of deforestation.

(iii) Students who correctly answered the previous questions were able to explain that the average temperature of the Earth's atmosphere has gradually increased over the past 200 years and that this has most likely been the

result of the rising levels of CO_2, which acts as a greenhouse gas.

(d) (i) Most students answered this correctly, describing the influence of being sited near large urban environments where higher CO_2 levels may 'contaminate' collected air samples.

(ii) Most students correctly named ice cores as another source of data that documents both atmospheric and climatic changes over geological time.

Question 20

(a) (i) (ii) The range of responses indicated that many students did not understand that if minerals have been extracted from a 'prosperous' mine, then the deposit is consequently classified as an 'ore body'.

(b) Few students were able to correctly name and spell two copper minerals that could have been mined at the Moonta site.

(c) (i) Many students correctly stated that the Moonta copper mines were a heritage site but could not make the connection that further mining might destroy historical aspects of the site and therefore possibly affect tourism.

(ii) The most common response was the economic benefit to the local economy, although many students chose to use a similar argument for both parts of the question rather than describing two different arguments. Arguments based on the company ensuring that dust/noise and other forms of pollution would be minimised, and that heritage aspects of the mine site would be preserved, were largely overlooked.

Question 21

(a) This question was correctly answered by most students.

(b) A significant number of students simply stated the background value of methane and its value within the Tara Gas field. Marks were allocated for *calculating* that the *relative* concentration of methane inside the gas field was more than three times that of the average background level.

(c) Most students made the connection between methane and its role as a significant and very potent greenhouse gas.

(d) 'Cows and other livestock' was the most common correct response.

(e) (i) (ii) There was a range of correct responses of which 'cleaner burning' (less polluting) figured prominently. Other suggested reasons included 'a smaller environmental footprint' (for coal seam gas), and some students suggested that delivery of fuel by pipelines as opposed to by road or rail is a more cost-effective solution.

Question 22

(a) (b) This question was poorly done. To obtain full marks students had to show the shape of the syncline, corresponding sequence of strata, and the cross-cutting dolerite dyke. Many students drew the bedding planes either vertically or horizontally and subsequently were not able to indicate the fold axis.

(c) Most students marked the unconformity with an arrow rather than with the conventional wavy line to indicate the break in geological time.

(d) Interestingly, most students correctly identified the structural feature as a syncline. This answer was apparently based on the dip and strike symbols, even though they had not sketched a syncline in the block diagram.

(e) (f) (g) These were generally well answered, with the majority of students recognising that the bottommost sandstone layer was the oldest and that the shale was youngest.

Question 23

(a) (b) This question was not well done. Students were required to describe two features that would make a high-rise building more resistant to damage during an earthquake. Many students reasoned that inserting deep pillars into the ground would make the building resistant to damage, rather than suggesting the use of flexible footings or base isolating systems that allow for ground movement. Cross-bracing and steel frames around the building's core were also acceptable answers. Many made reference to the nature of the underlying substrate as being part of the design, but these were not awarded a mark. Sketches often had no labels explaining the features that students had drawn.

Section C: Extended-response Question

Question 24

Answers to this question were particularly disappointing. Some sections were satisfactorily completed but students struggled to clearly explain themselves to the required depth.

A number of students misinterpreted the first dot-point and described the effect of surface processes breaking down rocks. A small number of students identified the impact of temperature, time, pressure, and the presence of fluids on the ability of rocks to bend or conversely break.

Many students who connected deformation to petroleum traps used anticlinal traps and structural traps formed by faulting. Although diagrams could have been used in most parts, these were not well done, with many students forgetting to add labels and a suitable scale. Occasionally, diagrams of petroleum traps were inaccurate in terms of permeable and impermeable layers and the spatial relationship of liquid petroleum to water and gas.

Diagrams displaying convergent plate boundaries were often too simplistic, lacking details of processes that were occurring at these boundaries. The focus of this question should have been the process of orogenesis, with fold belts displaying synclines and anticlines parallel to plate boundaries and associated normal and reverse faulting. Few students addressed these concepts, with most describing the different types of convergent boundaries.

Most students made the connection between deformation features (such as faulting) and earthquakes and tsunamis. Some students mentioned that fold structures

produce steep mountains with the potential for landslides (and avalanches), and that deformation along subduction zones results in generation of magma and associated volcanic activity. Unfortunately only a few students explained how these deformation structures actually cause the hazards.

OPERATIONAL ADVICE

Task sheets that indicate the specific features related to particular task requirements can be helpful for students and also for moderators.

Clearly labelled tasks, identified as either SATs or Investigations Folio tasks, help facilitate the moderation process. A cover sheet that summarises the tasks in each assessment type is also helpful.

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