Geology

2011 Assessment Report

Government of South Australia

SACE Board of SA

GEOLOGY

2011 ASSESSMENT REPORT

OVERVIEW

Assessment 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

The two school-assessed components were centrally moderated by a panel of experienced teachers who carefully viewed the samples of student work submitted. This process is required to ensure that school grades are awarded fairly and consistently across the schools

Teachers are reminded to refer to the Sciences Learning Area Manual for information about the selection and labelling of work sent in for moderation.

Assessment Type 1: Investigations Folio

The most helpful teachers had attached copies of the performance standards to each task sheet they handed out to their students. On this document, the specific features relevant to that particular task were shown in bold with the level achieved by the student highlighted. Another useful way of indicating to students the nature of the evidence expected in a task is to name the assessment criteria that are relevant to each of the task requirements.

It is important that teachers carefully read the assessment design criteria and task requirements described in the subject outline and design their tasks for the year so that their students can provide evidence against all the assessment design criteria within the set of tasks. Teachers need to ensure that, in the collection of tasks set, students have the opportunity to demonstrate their understanding in all of the specific features, including design of geological investigations (numbered I1 in the subject outline).

Tasks covered a wide range of topics and provided students with the opportunity to communicate their knowledge and understanding of Geology in a range of different formats.

Assessment Type 2: Skills and Applications Tasks

As was the case with the investigations folio, helpful teachers had indicated which of the specific features were relevant to each task, as well as each student's level of achievement in that standard.

In this assessment type, students need to be given the opportunity to demonstrate their learning in all assessment design criteria. It should be noted that it is very difficult to meet these criteria using only multiple-choice or short-answer questions from past examination papers. This comment applies particularly in giving students the opportunity to demonstrate a level of achievement in such specific features as AE1 (Analysis of connections between data, concepts, observations, and issues in geology), A1 (Application of geological concepts and evidence from investigations to solve problems in new and familiar contexts) and KU2 (Use of knowledge of geology to understand and explain social, economic, or environmental issues).

Teachers are encouraged to provide information regarding the conditions of assessment on the task sheet to inform students and moderators with details about how the task is to be completed.

EXTERNAL ASSESSMENT

Assessment Type 3: Examination

Only 31 students sat for the examination, a reduction of 73% relative to 2010. This was particularly disappointing in view of the steady increase in numbers that occurred over the preceding five years.

The mean examination mark was also very disappointing, being only 50/120 or 42%, which was significantly lower than previous years.

Section A: Multiple-choice Questions (mean 67%)

This section was done much better than the other two sections of the examination. A majority of students were able to demonstrate an understanding of the broad range of topics covered.

Question	Answered correctly %
1	68
2	45
3	77
4	84
5	58
6	71
7	81
8	74
9	65
10	68
11	97
12	97
13	52
14	48
15	26

Section B: Short-answer Questions

Question 16 (mean 34%)

(a) Most students were able to correctly indicate the oldest rock layer on photograph A and name the geological principle as superposition.

(b) Some students misunderstood the question and discussed metamorphism as the cause for the outcrop forming, but the question asked about the *layers*. Students were expected to discuss sedimentary bedding and how it can be formed.

(c) Some students discussed how the amount of weathering was higher in photograph B compared to A, but many incorrectly discussed 'exposure' as a cause, which would not have been likely as the sites are only 100 metres apart, as stated in the opening sentence. Students needed to explain the level of consolidation in the layers, which affected the amount of weathering and erosion.

Students who mentioned vegetation were given some credit, as this can stabilise an area, but can also accelerate weathering. Another acceptable answer was the direction of bedding, as in photograph B the layers appear to be dipping towards the road, while in photograph A they could be dipping away from the road.

(d) Students seemed to be aware of how to correlate rock strata from different areas, such as by identifying marker beds or comparing fossil assemblages, but they needed to make sure that they fully explained their answer.

Question 17 (mean 36%)

(a) and (b) Many students easily recognised that the organism was an ammonite and identified that it lived in a marine environment.

Many students had trouble identifying the important structure of ammonites as being the internal gas chambers that could be emptied and refilled in order to control buoyancy.

(c) Students who could recall general information about ammonites were also able to correctly state that their distribution was worldwide.

(d) Both the Mesozoic Era and 250–65 Ma were accepted for this question, but students need to remember to add units, such as 'Ma' or 'millions of years ago'.

Question 18 (mean 38%)

(a) Students easily described two environmental impacts of a large petroleum spill.

(b) Many students struggled to draw two geological structures that could trap petroleum. Many drew an anticline as one of their traps, but they needed to annotate the detail and add a scale.

Question 19 (mean 47%)

(a) Many students correctly labelled the P and S waves; however, those who marked the arrivals occurring at the peaks of the seismic wave rather than the beginning were not awarded marks.

Most students correctly determined the difference between the arrival times of the P and S waves as approximately 10 minutes.

(b) A majority of students correctly stated that the closest recording station to the earthquake was Adelaide because that was the station to first receive the seismic waves. Some students seemed to be distracted by the reference to Hamley Bridge in part (c) and suggested that station as the closest because the seismic waves were the greatest there.

(c) Students needed to describe the cause of the greater intensity and longer duration of waves as being possible unconsolidated sediments that would magnify the intensity of the waves.

(d) This was generally answered well by indicating that very little damage, if any, would have been expected.

(e) Students needed to link the information at the beginning of the question with the scales and the appropriate symbols to correctly label the diagram. Some students oppositely labelled the focus and epicentre, and some did not use the scale to position the symbols.

(f) Students could have interpreted the information at the beginning of the question to state that the Richter scale was a measure of magnitude and that the Mercalli scale measured intensity. Many students used ‘amount of damage’ for both the answers under the Mercalli scale, so students were only given one mark.

Question 20 (mean 54%)

(a) Some students correctly read the article and identified that diprotodons were from around 4.8 million years ago to 40 000 years ago. Just stating the ‘Neogene Period’ was not a detailed enough answer. Another common answer included writing ‘from the Pliocene to Holocene’. This was not accepted as the Holocene began 10 000 years ago, well after Aborigines arrived in Australia.

Many students correctly stated that dinosaurs were around for a much longer time range (approximately 185 million years) compared to diprotodons. Some students incorrectly read the question and wrote that dinosaurs are much older than diprotodons, but this does not ‘compare the time range’ as asked in the question.

(b) This was well answered, with many students identifying a contributing factor as being either hunting by humans, the climate drying out, or burning off by humans that changed vegetation patterns.

Many students also recognised that because there were no humans during the time range of the dinosaurs, hunting could not have contributed to dinosaur extinction.

Question 21 (mean 66%)

(a) This was the best-done question in the paper. Students easily listed two reasons why the world might give up coal-fired power generation.

(b) Although many students recognised that ‘mineable grade’ referred to the ore being able to be mined for a profit, there were two marks allocated to this question, so students also needed to describe factors affecting mineable grade, such as a sufficient amount available, or in a high concentration.

(c) Again, students stated these reasons easily.

Question 22 (mean 61%)

(a) Only a few students correctly stated the term for the visible cracks as joints. For part (ii), many students described the form of physical weathering, such as tree roots, frost-wedging, or vibrations from road traffic.

(b) Students easily recognised the hazard as rocks potentially falling onto the road and described a preventive measure, such as bolting the rocks together, removing the hazard, or building a retaining wall.

Question 23 (mean 58%)

(a) Most students correctly named the two minerals in part (i) as olivine and calcium-rich plagioclase. Some students, however, just wrote 'plagioclase' and this was not accepted.

For part (ii), students needed to remember that andestite is an intermediate rock. If they did, they easily identified augite, hornblende, biotite, or plagioclase.

(b) A common mistake in answers to this question was students writing that chromite crystallised at a *lower* temperature than the other minerals, rather than a *higher* temperature.

For the reasons why a layer of chromite has formed, students were expected to refer to it being the first to crystallise and settle out, and that it is denser than the other minerals (in the magma) when it crystallises.

For part (iii), Students needed to say that due to the layer forming, it could become an 'ore-body' from which chromite could be mined at a profit, but many did not make this link.

Section C: Extended-response Question

Question 24 (mean 29%)

Answers to this question were particularly disappointing. Only 25% of students were able to write a satisfactory response.

One common oversight was the requirement to discuss the importance of water as a sustainable resource.

Some sections were completed well, but students struggled to clearly explain themselves in the depth required. Although diagrams could have been used in most sections, many students forgot to add a scale.

First dot point (20% of students passed this section)

Students were expected to list the methods of transportation in a river and describe each of them. Although most students recognised this, they were unable to give the detail required. It was pleasing that some drew a diagram to support their answers.

Second dot point (38% of students passed this section)

This part of the question required a diagram and many students attempted to draw one but were unable to completely annotate it with an aquifer, aquiclude, recharge area, and scale. It was also expected that students would describe the importance of porosity and permeability. Those who did not address all of these points did not meet the requirements of this section.

Third dot point (20% of students passed this section)

Students struggled to explain all of the process involved in using aquifers to conserve stormwater in metropolitan areas. It was expected that students would discuss how stormwater is cleaned in wetlands through reed beds, pumped into and stored in an aquifer during the winter, and then pumped out during summer for watering and other uses. Students could also have used a diagram to support their answers in this section.

Fourth dot point (45% of students passed this section)

Students were able to recognise that the dam was large and therefore could hold a considerable amount of water. The spillway was also a feature that students identified as important. Some students also discussed the strength of the dam and its heavy, earth-filled design that reduces the possible impact of stresses caused by sudden changes in water level.

GENERAL COMMENTS

Teachers seemed to be confused about which tasks belonged in the investigations folio and which were skills and applications tasks. Similar tasks from different schools were classified differently for the two assessment types.

Field investigations and practical investigations were all included in the investigations folios, but some research or investigation tasks were in skills and applications folders. Different teachers classified mineral and rock identification tests differently.

When designing their assessment programs for the year, teachers should ensure that:

- the specific features of the assessment design criteria for the task are indicated to the students
- the requirements of the task enable all the indicated specific features of the assessment design criteria to be fulfilled
- tasks set for the year enable students to provide evidence against all the assessment design criteria indicated in the subject outline — about three or four specific features for each task will enable this requirement to be met.

Chief Assessor
Geology