



BOARD OF STUDIES
NEW SOUTH WALES

1999 HSC
Geology
Notes from the Examination Centre

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Published by
Board of Studies NSW
GPO Box 5300
Sydney NSW 2001
Australia

Tel: (02) 9367 8111

Fax: (02) 9262 6270

Internet: <http://www.boardofstudies.nsw.edu.au>

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ISBN 0 7313 4528 2

200071

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1999 HIGHER SCHOOL CERTIFICATE GEOLOGY NOTES FROM THE EXAMINATION CENTRE

Introduction

275 candidates presented for the 1999 Higher School Certificate Examination which continued the small increase shown the previous year.

The examination covered a wide range of the course content and skills, offering candidates the opportunity to demonstrate communicative, interpretive and analytical skills as well as geological knowledge. As in previous years, the quality of the responses varied considerably. The majority of candidates demonstrated achievement in all of the outcomes addressed, with the most able candidates demonstrating an excellent level of attainment in all these outcomes. The weaker candidates generally showed a knowledge of the course content but experienced difficulty in applying the skills of interpretation, analysis and communication.

Section I – Core

PART A – Multiple Choice (15 marks)

Question	Correct Answer	% of Candidature
1	A	91.64
2	A	44.36
3	B	74.55
4	C	61.82
5	D	73.45
6	D	71.27
7	C	69.09
8	D	57.82
9	B	72.73
10	C	56.00
11	A	69.82
12	A	64.00
13	B	48.73
14	C	74.91
15	A	10.55

PART B – 3 mark questions (30 marks)

Question 16

This question was well answered by the majority of candidates. A few candidates chose features which were only small in scale, such as dykes, and some candidates had difficulty in clearly expressing the role of plate tectonics in the formation of the features.

Question 17

- (a) This question was well answered although a few candidates confused east and west.
- (b) Most candidates answered this question correctly.
- (c) The standard and variety of correct responses to this question was most encouraging.

Question 18

- (a) This question was well answered although some candidates forgot to use the term ‘similar’ or ‘matching’ to link the evidence. Also, candidates who mentioned lithological evidence often left out reference to ‘of similar age’.
- (b) This question was well answered. However some candidates who chose fossil evidence did not indicate that the fossils needed to be terrestrial.
- (c) (i) Candidates were confused by this question. Some of the better answers considered it would not contribute unless there was additional information on the sandstone and/or a shorter age range.
(ii) This was well answered, but some candidates stated age which was given in the question.

Question 19

- (a) Candidates had difficulty expressing their understanding of isostasy in words.
- (b) Many candidates only referred to block 5 in completing their diagrams. A significant number of candidates omitted to *explain your answer*.

Question 20

Responses to this question were good.

- (a) Some candidates did not give examples from the graph.
- (b) A great variety of correct answers were given.
- (c) This part was well answered.

Question 21

- (a) Candidates showed a good knowledge of the properties of reservoir rocks.
- (b) This question was well answered although some candidates confused the upper and lower sandstones in part (ii).
- (c) Many candidates showed a poor understanding of the origin of oil and the chemical changes that take place during oil formation.

Question 22

- (a) Nearly all candidates correctly identified the boundary as convergent.
- (b) Fewer candidates realised that the convergent boundary was specifically a continental collision zone and consequently answered this question incorrectly by assuming it was an island arc type boundary. However, the majority of candidates correctly described processes of folding, thrust faulting, crustal shortening and regional metamorphism.

Question 23

Candidates performed well in all aspects of this question.

Question 24

- (a) Candidates demonstrated a good knowledge of the different volcano types.
- (b) Most candidates had a good knowledge of the rock types associated with volcanoes but some responses incorrectly included plutonic rocks.
- (c) This part was poorly answered with many candidates describing the shape or simply restating information given in the question.

Question 25

- (a) This question was well answered.
- (b) Many candidates indicated that unconsolidated sand is unstable but did not relate this to resort construction.
- (c) This question was poorly answered as few candidates provided specific details relating to geological problems.

PART C – 5 mark questions (30 marks)

Question 26

This question was poorly answered. In particular, candidates did not demonstrate a knowledge and understanding of the preliminary course work which is needed to consider this type of engineering situation. In parts (b) and (c) candidates often stated a problem but did not expand on this to *describe* the problem.

- (a) Few candidates could describe the weathering of the minerals found in their chosen rock type. Many incorrectly used the terms weathering and erosion as interchangeable synonyms. Only a few candidates used the stimulus material provided on climate to assist them to answer this question.
- (b) A significant number of candidates did not recognise the difference in symbols for schist and alluvium. As a result they provided incorrect answers related to faulting of the alluvium.
- (c) Many candidates incorrectly interpreted the angle of dip as an angle of topographic slope and presented answers based on incorrect assumptions.

Question 27

This question was well answered overall.

- (a) Most candidates correctly positioned the trench off the southern coast of Alaska. However some candidates had difficulty plotting an accurate position using information from all three cross-sections. Of those candidates who did link the information from the three cross-sections, many often depicted the trench as a thin line, ignoring the width information provided.
- (b) Candidates demonstrated a good knowledge of plate structure and features. The quality of the diagrams was good and about half the candidates provided some indication of vertical scale. Nearly all candidates identified a subduction zone, lithosphere and aesthenosphere, and the direction of relative plate movement.

Question 28

- (a) Most candidates demonstrated a knowledge of remnant magnetism but many incorrectly believe that crystals align with the earth's magnetic field whilst still in a melt.
- (b) This question was poorly answered with many candidates simply restating the question.
- (c) This question was well answered.

Question 29

- (a) Many candidates had difficulty recognising the feature shown in the photograph, with a significant number naming an igneous intrusion.
- (b) This question was well answered.
- (c) Most candidates identified and drew *another structure found in this type of mountain range* but a significant number of the diagrams were not *fully labelled*.

Question 30

- (a) This part was well answered by most candidates but some candidates gave mineral names instead of rock names.
- (b) Most candidates correctly identified the ridge system which was clearly shown on the cross-section. Candidates had difficulty naming the features at C and H which had to be interpreted from the map.
- (c) Although most candidates gave a correct age for the volcanic rock at E, few were able to justify their answer.

Question 31

This question was well answered particularly with respect to placer deposits.

- (a) Some candidates had difficulty explaining the formation of platinum in a layered mafic intrusion and appeared confused by the presence of platinum in the placer deposits.
- (b) This was well answered although a significant number of candidates omitted the question. As many of these candidates had excellent answers to the remainder of the question it is possible they included their answer on their question book rather than the answer booklet.
- (c) This question was very well answered.
- (d) This question was well answered.

Section II – Electives (25 marks)

General Comments

As in previous years, the electives on Igneous Rocks and Economic Geology were the most popular, and very few candidates chose Regional Geology or Palaeontology. The table below shows the approximate percentage of the candidature choosing each elective.

Question 32 – Contemporary Sedimentary Processes	18%
Question 33 – Igneous Rocks	40%
Question 34 – Economic Geology	25%
Question 35 – Regional Geology	8.5%
Question 36 – Palaeontology	8.5%

In general, the responses in the electives did not indicate the depth of study expected. This was particularly significant in igneous rocks where candidates' answers often did not demonstrate knowledge beyond the Core. This may in part have been due to the fact that some candidates selected this elective instead of the one they had studied.

Question 32 – Contemporary Sedimentary Processes

All candidates presenting this elective had studied appropriate sedimentary environments and the responses to the questions showed evidence of effective fieldwork activity. In many cases, answers to questions requiring descriptions and/or explanations tended to be too brief.

- (a)(i) and (ii) The quality and accuracy of the maps varied greatly amongst the candidates with a significant proportion of small cluttered maps. Most candidates adequately included geographic features, watercourses and sample sites but many omitted reference to townships (or suburbs). Few candidates provided a regional perspective for their map. Most candidates represented direction using a north point but many did not provide an adequate key or sufficiently accurate labels. Where scales were used they were often inaccurate even for a sketch map.
- (b) (i) Most candidates named a relevant sedimentary structure.
- (ii) The quality of the diagrams varied considerably with a significant number of candidates drawing a plan view rather than a *cross-section*. Few candidates provided an appropriate scale or relevant labelling.
- (iii) Many candidates had difficulty describing the environment in which the structure formed.
- (iv) This question was poorly answered. Many candidates named the transporting medium involved but most failed to *explain the role that the energy of the transporting medium had in the formation of this structure*.
- (c)(i) This part was well answered by most candidates.
- (ii) Most candidates were able to describe the methods used in their investigations but often neglected to relate the methods to variations in the property chosen.
- (iii) Many candidates were unable to relate the property of the sediment to the environment.
- (iv) Few candidates were able to answer this question.
- (d)(i) Most candidates chose a relevant sedimentary structure although a few chose landform or structural features such as headlands or faults. As in (b) (ii), the standard of diagrams varied considerably and candidates often chose an inappropriate type of diagram, for example a plan view for ripple marks.

- (ii) Most candidates were able to describe two pieces of information but few could describe three.
- (iii) This question was poorly answered with most candidates failing to both *compare and contrast the properties* of the two structures.
- (e)(i) Both parts to this question were well answered.
- (ii) A significant proportion of candidates was unable to accurately read the graph and a number who could did not include the units in their answer.
- (iii) This question was well answered.
- (iv) This question was not interpreted well by candidates and the majority did not answer the question asked. Most candidates tried to compare data from different parts of the stimulus material.

Question 33 – Igneous Rocks

As this elective is closely linked to several areas of the preliminary and HSC core, there is a tendency for candidates to choose this elective without having studied it. The responses of these candidates and of a number from centres who have studied the elective, lack the depth of knowledge and understanding expected at the elective level.

- (a)(i) This question was very well done.
- (ii) Most candidates mentioned silica, but many omitted reference to the amount of silica typical for a mafic rock. Many recognised that mafic rocks were high in total iron, magnesium or calcium but others discussed minor oxides that are not diagnostic of a mafic rock.
- (iii) Most candidates described the formation of magma correctly but did not include enough information on the source of the magma.
- (iv) This part was very well answered.
- (v) This part was very well answered.
- (vi) Most candidates correctly named one mineral but many had difficulty naming a second.
- (b) (i) Most candidates correctly identified quartz but many were unable to identify a second mineral.
- (ii) The majority of candidates only stated textural terms without describing them. Very few identified flow banding although it is a very common texture in rhyolite.
- (iii) Many candidates indicated that the ore deposit would be associated with a convergent zone but a significant number of candidates then made the mistake of relating the deposit to a continental arc.
- (iv) Most candidates identified hydrothermal solutions as having played a role in the formation of the deposit but were unable to adequately explain why the massive ore was deposited in this situation or what part the fluids may have played in the chloritic alteration.
- (v) Most candidates were unable to correctly identify three metals deposited in association with hydrothermal deposits. A significant proportion of candidates assumed the deposit was a layered intrusion.
- (c)(i) The quality of the andesite diagrams varied greatly. Too many were haphazardly drawn and failed to show a scale or label the diagnostic features and texture. Most candidates represented the characteristic shapes of plagioclase and hornblende. For the second diagnostic feature, candidates generally illustrated multiple twinning in plagioclase and 2 cleavages at 60° or 120° in hornblende.

- (ii) Most candidates demonstrated knowledge of the structure of andesitic volcanoes but only a few answers included sufficient detail to achieve full marks. Most candidates recognised that andesitic volcanoes are internally stratified with layers of ash and lava. Many candidates failed to provide either an adequate horizontal or vertical scale and most candidates drew volcanoes with highly exaggerated slopes.
- (d)(i) Both parts of this question were well answered.
- (ii) Many candidates were unable to explain why these curves were a similar shape.
- (iii) A majority of candidates misinterpreted this question and attempted to explain the graph when they were only required to describe the shape.
- (iv) Many candidates correctly described the texture but few were able to describe the mode of formation.
- (v) This question was well answered.

Question 34 – Economic Geology

Candidates had difficulty determining the depth of answer required in many parts of this question. The majority of answers were long despite the frequent use of the term *briefly* in the question. Whilst this resulted in some excellent answers candidates were likely to have been disadvantaged in other parts of the paper as a result of lack of time. Candidates need to learn to extract the framework of major concepts or ideas so they can present concise answers when required.

An alarming number of candidates (over 20%) did not attempt question (d) which was worth 5 marks. There was no indication that the candidates had run out of time and it appears possible that they did not check to see they had completed all parts of the question, despite the note on page 39 that Question 34 continues on page 40. Similar problems have been encountered in this elective in previous years and candidates should be reminded that they should check very carefully that they have completed the entire question. They cannot assume that the elective is complete because they have answered questions on both case studies and one general question.

- (a)(i) and (ii) Nearly all candidates were able to correctly identify a metal or material from the deposit chosen.
- (iii) A number of candidates had difficulty describing the geological processes responsible for concentrating the metal or material.
- (iv)
 1. This question was well answered.
 2. Many candidates were unsure of the properties of the metal or material they were considering.
- (v) This question was poorly answered as few candidates could adequately describe how the geology of the deposit influenced *the grade of the ore or the quality of the material*.
- (b)(ii) This question was well answered with most candidates providing four different examples of the impact of the development of the project.
- (iii) The quality of the answers to this question varied considerably. Some candidates described the local geography instead of the local *geology*.
- (iv) This question was not answered well as many candidates found it difficult to link local geology to development or construction.
- (v)
 - 1 This question was well answered.
 - 2 Many candidates found it difficult to identify the type of data they were considering. Some candidates wrote about samples and others considered results.

- 3 As in question 2, candidates were unsure what was required. Some wrote about compiling data, whilst others wrote about analysing data.
- (c)(i) Most candidates answered this question correctly.
- (ii) This question was not well answered. Many candidates chose geophysical techniques instead of detailed drilling.
- (iii) This question was well answered.
- (iv) This question was well answered, with most candidates describing a specific environmental problem and linking its cause(s) to its effect(s).
- (d)(i), (ii), (iii) These questions were well answered.
- (iv) Most candidates were unable to explain the link between world copper prices and the mineable grade of ore.

Question 35 – Regional Geology

All candidates presenting this elective had studied the Sydney Basin. Many candidates attempted to present answers on the geological history of the area instead of responding to the questions asked.

- (a) The quality of the maps produced varied considerably. There were some excellent maps that demonstrated good mapping skills as well as spatial and geological knowledge of the region. Nearly all candidates demonstrated a good knowledge of the shape of the region, its boundaries and an adjoining region. However, most candidates did not include a scale and many had difficulty geographically locating items (i) to (iv).
- (b) This question was poorly answered. Very few candidates used diagrams which would have assisted them in their answers.
- (c) Most candidates indicated why the material was exploited but the majority did not adequately indicate its importance *to the local or regional community*.
- (d) This question was poorly answered. Candidates often had difficulty describing its appearance unless they drew a diagram. Few candidates described the geology of the feature or described why it was special, important or interesting.
- (e) Most candidates correctly named a rock but failed to describe its texture and composition. Candidates had difficulty describing and illustrating *how the igneous rock body formed*.
- (f) Most candidates indicated some knowledge about the relationship of their region and the adjoining area but few considered all three of the major aspects of structure, lithology and age.
- (g)(i)
- 1 This question was quite well answered with most candidates choosing an unconformity and fault as two possible boundary types.
 - 2 This question was poorly answered. Most candidates did not understand or were unable to communicate how fieldwork, samples or experimental data can be used to determine boundary types.
- (ii)
- 1 Most candidates realised that fossils would be used but gave no other information on the method involved. Several candidates incorrectly suggested radiometric methods such as Uranium-Lead.
 - 2 Most candidates used the term radiometric dating but again provided no development of the method.

Question 36 –Palaeontology

The standard of answers in this elective was poor. Candidates appeared to have difficulty interpreting what was required in some questions and often provided information which was not relevant.

- (a)(i) Most candidates correctly ordered the trilobites according to the information given.
- (ii) Most candidates provided a very weak link between a morphological change and survival but few provided sufficient information.
- (iii) Candidates who selected the morphological changes in the eyes of trilobites answered the question well but most other responses were inadequate and used vague generalisations such as ‘furrows changed’. A few candidates merely repeated the information given in the stem of the question.
- (b) Most candidates interpreted this question in terms of reasons for gaps in the fossil record. The majority of answers were poor with generalised comments such as ‘fossils are damaged or lost’ and no indication of the cause. In general, the answers lacked the depth required for elective study.
- (c)(i) Most candidates recognised the importance of studying the morphology of fossils but few provided any other information.
- (ii) Most answers to this question were too general to score any marks.
- (d)(i) Most candidates recognised that ammonites decreased in number but use of supporting information indicated candidates did not understand the graph.
- (ii) Again, answers were too general, for example, ‘environment changed’.
- (iii) About half the candidates were able to draw the shape of an ammonite but labels were often incorrect and few candidates indicated the relationship between morphology and adjusting buoyancy.
- (e) (i) Nearly all candidates suggested that graptolites were marine but only a few provided any additional information about the environment. Candidates rarely provided any relevant evidence to support their suggestion.
- (ii) Most candidates recognised the trends shown in the diagram and about half of the candidates could adequately describe these trends.
- (iii) Candidates appeared to have difficulty understanding what was required in this question.
- (f) (i)
 - 1 Of the few candidates attempting this question about half correctly named the group of organisms whilst most of the others called them ammonites.
 - 2 This question was not well answered with most candidates only stating one or two characteristics without any description.
 - 3 A few candidates tenuously related these microorganisms to oil sources but none were able to describe how they were used in oil exploration.
- (ii)
 - 1 Most candidates provided only one problem and in many cases it was stated, not *described*.
 - 2 Few candidates mentioned more than one line of evidence and again, in most cases, it was stated, not described.
 - 3 Candidates all recognised that the Principle of Uniformitarianism was involved but their answers did not address the question.

- (iii)
- 1 Most candidates generally listed one or two characteristics but the nature of their answers suggested they knew little about the fossil history of humans. As a result they found it difficult to communicate their answers.
 - 2 Answers again were very basic and described patterns observed in very simple terms. The descriptions were often insufficient to delineate a specific characteristic.
 - 3 Candidates appeared to have little understanding of palaeontological principles. Very few candidates made any reference to evolutionary change, correlation, morphology or stratigraphy in relation to stone tools, cave art or burial sites.