

**2006 HSC Notes from
the Marking Centre
Earth and Environmental Science**

© 2007 Copyright Board of Studies NSW for and on behalf of the Crown in right of the State of New South Wales.

This document contains Material prepared by the Board of Studies NSW for and on behalf of the State of New South Wales. The Material is protected by Crown copyright.

All rights reserved. No part of the Material may be reproduced in Australia or in any other country by any process, electronic or otherwise, in any material form or transmitted to any other person or stored electronically in any form without the prior written permission of the Board of Studies NSW, except as permitted by the *Copyright Act 1968*. School candidates in NSW and teachers in schools in NSW may copy reasonable portions of the Material for the purposes of bona fide research or study.

When you access the Material you agree:

- to use the Material for information purposes only
- to reproduce a single copy for personal bona fide study use only and not to reproduce any major extract or the entire Material without the prior permission of the Board of Studies NSW
- to acknowledge that the Material is provided by the Board of Studies NSW
- not to make any charge for providing the Material or any part of the Material to another person or in any way make commercial use of the Material without the prior written consent of the Board of Studies NSW and payment of the appropriate copyright fee
- to include this copyright notice in any copy made
- not to modify the Material or any part of the Material without the express prior written permission of the Board of Studies NSW.

The Material may contain third party copyright materials such as photos, diagrams, quotations, cartoons and artworks. These materials are protected by Australian and international copyright laws and may not be reproduced or transmitted in any format without the copyright owner's specific permission. Unauthorised reproduction, transmission or commercial use of such copyright materials may result in prosecution.

The Board of Studies has made all reasonable attempts to locate owners of third party copyright material and invites anyone from whom permission has not been sought to contact the Copyright Officer, ph (02) 9367 8289, fax (02) 9279 1482.

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

Tel: (02) 9367 8111

Fax: (02) 9367 8484

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

ISBN 978 174147 6019

2007084

Contents

Section I – Core.....	5
Section II – Options	7

2006 HSC NOTES FROM THE MARKING CENTRE

EARTH AND ENVIRONMENTAL SCIENCE

Introduction

This document has been produced for the teachers and candidates of the Stage 6 course in Earth and Environmental Science. It provides comments with regard to the responses to some questions in the 2006 Higher School Certificate examination, indicating the quality of candidate responses and highlighting the relative strengths and weaknesses of the candidature in each section.

This document should be read along with the relevant syllabus, the 2006 Higher School Certificate examination, the marking guidelines and other support documents which have been developed by the Board of Studies to assist in the teaching and learning of Earth and Environmental Science.

General Comments

In 2006, 1138 candidates attempted the Earth and Environmental Science examination. The most popular option was Introduced Species and the Australian Environment (78%) with approximately 7% attempting each of the other options.

Teachers and candidates should be aware that examiners may write questions that address the syllabus outcomes in a manner that requires candidates to respond by integrating their knowledge, understanding and skills developed through studying the course, including the Prescribed Focus Areas. This reflects the fact that the knowledge, understanding and skills developed through the study of discrete sections should accumulate to a more comprehensive understanding than may be described in each section separately. It is important to understand that the Preliminary HSC course is assumed knowledge for the HSC course.

Teachers and candidates should also be aware that questions may be asked that focus on the mandatory skills content in Module 9.1.

Overall, the level of understanding of Earth and Environmental Science concepts indicated by the responses was appropriate for most HSC candidates. Candidates need to be reminded that the answer space provided and the marks allocated are guides to the maximum length of response required. Similarly, the key word used in the question gives an indication of the depth of the required response. Candidates should use examination time to analyse the question and plan responses carefully, working within that framework to produce clear and concise responses. This may include the use of dot points, diagrams and/or tables, and avoids internal contradictions. This is particularly so in holistic questions which need to be logical and well structured. There was evidence that some candidates had a very poor knowledge of basic definitions specific to terminology associated with the course. Of particular concern in 2006 was that many candidates confused the terms and concepts of global warming and ozone depletion.

Better responses indicate that candidates are following the instructions provided on the examination paper. In these responses, candidates:

- show all working where required by the question
- do not repeat the question as part of the response

- look at the structure of the whole question and note that in some questions the parts follow from each other, ie responses in part (a) lead to the required response in part (b) etc
- use appropriate equipment, for example, pencils and a ruler to draw diagrams and graphs. (A clear plastic ruler would aid candidates to plot points that are further from the axes and rule straight lines of best fit.)

In Section II, the option question is divided into a number of parts. Candidates should clearly label each part of the question when writing in their answer booklets. In part (c) of the 2006 option questions, the best responses presented ideas coherently and included the correct use of scientific principals and ideas. Many candidates wrote a lot of information that was not relevant to the question. Some responses showed evidence of rote learning an anticipated answer based on a single source. These responses did not address the syllabus content and/or outcomes being assessed and hence did not score full marks. Candidates are required to attempt one question only in Section II, but some candidates responded to more than one option question. Candidates are strongly advised to answer the option they have studied in class.

Section I – Core

Part A – Multiple choice

Question	Correct Response
1	B
2	C
3	D
4	B
5	A
6	C
7	D
8	B

Question	Correct Response
9	A
10	A
11	D
12	D
13	B
14	A
15	C

Part B

Question 16

In the best responses, candidates related the sea level changes to the thermal effects of expansion and contraction of the ocean resulting from a change in atmospheric temperature. These responses explained the trend in the graph immediately after each major volcanic eruption.

Question 18

- Better responses referred to the specific processes of divergence and convergence and related these processes to the continents in the diagram.
- In some of the best responses, justification for the movement of the continents was supported by diagrams.

Question 19

In analysing the case study of a natural disaster, better responses made the connections between the tectonic event, the tectonic plates involved and the impacts on the environment.

Question 20

- (a) The evidence provided in the best responses included that the abundance of stromatolites in ancient times could be related to a lack of predation.
- (b) The best responses noted that modern stromatolites only occupy harsh, shallow, low energy, aquatic environments such as saline lagoons where there is a lack of predators of the algae.

Question 22

- (a) Better responses gave a clear description of the diversity and abundance of fossils from the chosen locality. Fossil localities chosen included Riversleigh, the Burgess Shale, the Canowindra Fish beds and Ediacara.

Question 23

The best responses provided points for and against an alternative management practice to the use of pesticides. For example, biological control in which biomagnification does not occur, but it is important that the introduced predator does not become a problem in itself, such as the cane toad.

Question 24

An example of a good response was one that focused on stormwater treatment by using artificial wetlands as a means of reducing sedimentation and algal blooms in natural waterways. The description included the channeling of stormwater into man-made lakes which contain a variety of aquatic plants leading to a drop in water velocity and a settling of sediment. Such responses made a judgement that the method was effective as the plants take up the nutrients and therefore the water that leaves the lake is lower in sediment and nutrients.

Question 25

The best responses in this cross-modular question clearly related the changes in the diversity of life, providing specific examples of atmospheric change in the past. In some of the weaker responses, there was considerable evidence of confusion between the concepts of global warming and ozone depletion.

Question 26

In the best responses, candidates identified components and the relationship between them in well-structured answers.

Section II – Options

General Comments

In part (a)(ii) of each of the option questions, candidates were asked to describe how they assessed the reliability of information provided by secondary sources on a particular content area or topic from the option. It was important that candidates related the reliability of information provided by secondary sources to the topic indicated in the stem of the question.

In part (c) of each question, the best responses demonstrated coherence and logical progression and included the correct use of scientific principles and ideas.

Question 27

- (b) (i) The best responses clearly stated what was meant by good areas and bad areas in terms such as weed infested areas and least weed affected areas. Candidates should note that the Bradley Method of bush regeneration does not include the use of pesticides.
- (c) The best responses showed evidence of careful planning, identified the introduced animal species and clearly indicated its impact on the environment. This question addressed a number of outcomes from the syllabus and required the careful synthesis of knowledge and understanding. In making a justification, it was important to provide supporting evidence.

Question 28

- (c) The best responses described and gave details of the use of fossil fuels in Australia. They discussed both positive and negative issues relating to this use. In making a judgement, they included a comparison with potential fuel alternatives.

Question 29

- (c) The best responses compared economic and environmental costs with the benefits of mining and made a clear supported argument for and against the continuation of mining of ore deposits.

Question 30

- (c) The best responses were well structured, establishing firstly the unique physical and chemical processes of hydrothermal vents and making clear the relationship of these to the unique biotic communities.

Earth and Environmental Science

2006 HSC Examination Mapping Grid

Question	Marks	Content	Syllabus outcomes
Section I Part A			
1	1	9.2.4.2.5	H7
2	1	9.2.4.2.5, 9.2.5.2.1	H7
3	1	9.2.1.3.1	H7, H8
4	1	9.2.1.2.3, 9.2.2.2	H7, H8
5	1	9.2.1.2.2 14.1 (f)	H7, H8, H14
6	1	9.3.4.2.1	H7
7	1	9.3.1.3.1, 12.3 (c), 14.1 (a)	H12, H14
8	1	9.3.3.2.2	H7
9	1	9.3.1.2.5	H7
10	1	9.3.5.2.1	H7, H8
11	1	9.4.4.2.1	H10
12	1	9.4.6.2.1, 9.4.6.2.2	H7, H8
13	1	9.4.6.3.1, 9.4.6.3.3, 14.1 (a)	H10, H14
14	1	9.4.5.2.1	H10
15	1	9.4.3.3.1, 12.3 (c), 14.1 (a)	H10, H12, H14
Section I Part B			
16(a)	1	9.2.5.3.1, 14.1 (a)	H14
16(b)	3	9.2.5.3.1, 9.2.5.2.2, 12.3 (c)	H7, H12
17(a)	3	9.2.2.3.1, 13.1 (d), (e)	H7, H13
17(b)	2	9.2.1.2.22, 9.2.2.2.1, 13.1 (e)	H7, H13
18(a)	4	9.2.3.2.2, 14.1 (a)	H7, H14
18(b)	3	9.2.3.3.2, 14.1 (d), (g)	H7, H14
19	6	9.2.4.3.3, 9.2.4.3.1, 9.2.4.2.7	H4, H7

Question	Marks	Content	Syllabus outcomes
20 (a)	3	9.3.4.2.3	H7
20 (b) (i)	1	9.3.1.2.2, 9.3.1.3.3	H8
20 (b) (ii)	3	9.3.1.2.2, 9.3.1.3.3	H8
21(a)	2	9.3.5.3.3	H2, H8
21(b)	3	9.3.5.2.5	H2, H8
22 (a)	3	9.3.4.3.3	H12, H13
22 (b)	3	9.3.4.3.1, 13.1 (e)	H7, H13
23	3	9.4.4.2.2	H7, H10
24	4	9.4.5.2.1	H6, H9, H10
25	7	9.3.2.2.3, 9.3.1, 9.3.2, 9.4.6	H2, H4, H7
26	6	9.4.3.2.2, 14 (c), (g)	H7, H9, H14
Section II			
27 (a) (i)	2	9.5.6.3.1, 12.3 (a) (d)	H12
27 (a) (ii)	3	9.5.6.3.1, 12.4 (e)	H12
27 (b) (i)	3	9.5.5.3.2, 13.1 (c)	H13
27(b) (ii) (1)	1	9.5.1.3.1, 13.1 (e)	H6, H13
27(b) (ii) (2)	2	9.5.2.3.1, 14.1 (a), (g)	H13, H14
27 (c)	7	9.5.5, 14.3 (b)	H4, H6, H9, H10, H14
27 (d) (i)	1	9.5.6.2.1	H1
27 (d) (ii)	2	9.5.6.3.1	H1
27 (d) (iii)	4	9.5.6.2.3, 14.1 (b), 14.2, 14.3	H10, H13, H14
28 (a) (i)	2	9.6.3.3.1, 12.3 (a), (d)	H12
28 (a) (ii)	3	9.6.3.3.1, 12.4 (e)	H12
28 (b) (i)	3	9.6.4.3.1, 13.1 (e)	H13
28 (b) (ii) (1)	1	9.6.1.2.3	H6
28 (b) (ii) (2)	2	9.6.4.2.3, 14.1 (a)	H14

Question	Marks	Content	Syllabus outcomes
28 (c)	7	9.6.3, 9.6.5, 14.3 (b)	H4, H6, H9, H10, H14
28 (d) (i)	1	9.6.2.2.4	H6
28 (d) (ii)	2	9.6.2.2	H6
28 (d) (iii)	4	9.6.6.2.2, 14.1 (b)	H6, H13, H14
29 (a) (i)	2	9.7.1.3.1, 12.3 (a), (d)	H6, H12
29 (a) (ii)	3	9.7.1.3.1, 12.4 (e)	H12
29 (b) (i)	3	9.7.4.2.6, 13.1 (e)	H13
29 (b) (ii) (1)	1	9.7.3.2.6	H6
29 (b) (ii) (2)	2	9.7.3.3.2, 14.1 (a), (g)	H14
29 (c)	7	9.7.5, 9.7.3 14.3 (b)	H4, H6, H9, H10, H14
29 (d) (i)	1	9.7.3.2.4	H7
29 (d) (ii)	2	9.7.3.2.6, 9.7.3.3.2	H5, H9
29 (d) (iii)	4	9.7.4.2.5, 9.7.4.3.3, 14.1 (b)	H6, H9, H14
30 (a) (i)	2	9.8.3.3.2, 12.3 (a), (d)	H7, H12
30 (a) (ii)	3	9.8.1.2.1, 12.4 (e)	H12
30(b) (i)	3	9.8.1.2.4, 13.1 (e)	H13
30 (b) (ii) (1)	1	9.8.3.3.4	H6
30 (b) (ii) (2)	2	9.8.3.2.4, 9.8.5.2.2, 14.1 (a), (g)	H14
30 (c)	7	9.8.6, 14.3 (b)	H4, H6, H9, H10, H14
30 (d) (i)	1	9.8.7.2.1	H7
30 (d) (ii)	2	9.8.4.2.3	H6
30 (d) (iii)	4	9.8.4.3.2, 14.1 (b)	H4, H6, H10, H13, H14

2006 HSC Earth and Environmental Science Marking Guidelines

Section I, Part B

Question 16 (a)

Outcomes assessed: H14

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> States increasing trend 	1

Question 16 (b)

Outcomes assessed: H7, H12

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Identifies link between eruption and drop in sea level. Links cause of sea level drop to global cooling Links cooling of ocean to general cooling of climate 	3
TWO of the following: <ul style="list-style-type: none"> Identifies link between eruption and sea level drop Identifies link between eruption and cooling of climate Makes a link between sea level drop and cooling of climate 	2
ONE of the following: <ul style="list-style-type: none"> Identifies link between eruptions and sea level drop Identifies link between eruption and cooling of climate 	1

Question 17 (a)*Outcomes assessed: H7, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Arrow on plate A pointing between north-northeast• X on or close to the M.O.R• ▲ within mountain range or on island	3
<ul style="list-style-type: none">• TWO of above correct	2
<ul style="list-style-type: none">• ONE of above correct	1

Question 17 (b)*Outcomes assessed: H7, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Diagram of a reverse fault or syncline or anticline• Correctly labelled diagram	2
<ul style="list-style-type: none">• Diagram of a correct structure, not labelled, or incorrectly labelled	1

Question 18 (a)*Outcomes assessed: H7, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Identifies and describes TWO tectonic processes, referring to the continents on the diagram	4
<ul style="list-style-type: none">• Describes TWO correct tectonic processes OR	2–3
<ul style="list-style-type: none">• Identifies and describes ONE tectonic process	
<ul style="list-style-type: none">• Identifies ONE tectonic process	1

Question 18 (b)*Outcomes assessed: H7, H14***MARKING GUIDELINES**

Criteria	Marks
• Makes a prediction of future positions of continents, with a justification, including a reference to time	3
• Makes prediction of future position of continents with reference to time, but no justification	2
• Makes a prediction	1

Question 19*Outcomes assessed: H4, H7***MARKING GUIDELINES**

Criteria	Marks
• Identifies a tectonic event that has caused a disaster • Describe causes of the event • Describes extent of damage to the environment • Makes connection between the damage and causes of the disaster itself	5–6
• As above, but makes a weak link between damage and causes	3-4
• Identifies a tectonic event and a cause or impact	1–2

Question 20 (a)*Outcomes assessed: H7***MARKING GUIDELINES**

Criteria	Marks
• Sketches in general terms THREE evolutionary changes required for life in terrestrial environment	3
• Sketches in general terms TWO evolutionary changes required for life in a terrestrial environment	2
• Sketches in general terms ONE evolutionary change required for life in a terrestrial environment OR • Identifies TWO or more changes required for life in a terrestrial environment	1

Question 20 (b) (i)*Outcomes assessed: H8***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">States one piece of evidence	1

Question 20 (b) (ii)*Outcomes assessed: H8***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Describes distribution and abundance of modern and ancient stromatolitesMakes clear the relationship between the environment and abundance	3
<ul style="list-style-type: none">Describes distribution and abundance of modern and ancient stromatolites OR <ul style="list-style-type: none">Makes clear ONE relationship between the environment and abundance	2
<ul style="list-style-type: none">Identifies ONE factor that effects abundance OR <ul style="list-style-type: none">Identifies the environment conditions	1

Question 21 (a)*Outcomes assessed: H2, H8***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Sketches in general terms TWO hypotheses to explain the extinction of Australian megafauna	2
<ul style="list-style-type: none">Sketches in general terms ONE hypothesis to explain the extinction of Australian megafauna	1

Question 21 (b)*Outcomes assessed: H2, H8***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Outlines ONE hypothesis to account for the mass extinction and briefly describes its impact• Makes a judgement about its explanation to account for the extinction	3
<ul style="list-style-type: none">• Outlines ONE hypothesis to account for the mass extinction and briefly describes its impact	2
<ul style="list-style-type: none">• Outlines ONE hypothesis to account for the mass extinction	1

Question 22 (a)*Outcomes assessed: H12, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Provides features of the diversity and number of fossils found at a named fossil locality	3
<ul style="list-style-type: none">• Provides features of the diversity OR number of fossils found at a named fossil locality	2
<ul style="list-style-type: none">• Names a fossil locality and ONE type of fossil found there OR <ul style="list-style-type: none">• Provides features of diversity OR <ul style="list-style-type: none">• Provides features of abundance	1

Question 22 (b)*Outcomes assessed: H7, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• ALL columns correct	3
<ul style="list-style-type: none">• FOUR columns correct	2
<ul style="list-style-type: none">• TWO columns correct	1

Question 23*Outcomes assessed: H7, H10***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Describes an alternate practice and identifies issues and points for and/or against this named strategy	3
<ul style="list-style-type: none">Names and describes an alternate management strategy	2
<ul style="list-style-type: none">Names a possible alternate management strategy	1

Question 24*Outcomes assessed: H6, H9, H10***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies some natural processes in surface waterDescribes a storm water treatment methodMakes a supported judgement about the results of identified treatment method on identified natural process	4
<ul style="list-style-type: none">Identifies some natural processes in surface waterDescribes a stormwater treatment method <p>OR</p> <ul style="list-style-type: none">Relates some aspect of treatment to a natural process, without a supported judgement	2–3
<ul style="list-style-type: none">Identify a stormwater treatment method	1

Question 25*Outcomes assessed: H2, H4, H7***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Describes a past impact of atmosphere change on the diversity of life and makes TWO plausible predictions about the consequences of a correctly identified recent, human induced atmospheric change	7
<ul style="list-style-type: none">• Identifies a recent atmospheric change and describes plausible consequences for diversity of life• Identifies a past impact of atmospheric changes on diversity of life	5–6
<ul style="list-style-type: none">• Describes a recent atmospheric change with TWO plausible effects on the future diversity of life OR <ul style="list-style-type: none">• Identified past relationship between atmospheric change and diversity of life and identified recent human induced change and predicts an effect	3–4
<ul style="list-style-type: none">• Identifies a recent atmospheric change caused by humans OR <ul style="list-style-type: none">• Makes TWO predictions but does not relate these to atmospheric change OR <ul style="list-style-type: none">• Identifies a recent change with a plausible effect on the future diversity of life	1–2

Question 26*Outcomes assessed: H7, H9, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies the THREE parameters that changeDescribes why they changeRelates the implication of the changes	5–6
<ul style="list-style-type: none">Identifies TWO parameters that changeDescribes what the change is and describes the implication of the change OR <ul style="list-style-type: none">Describes how THREE parameters change	3–4
<ul style="list-style-type: none">Correctly identifies TWO parameters which change OR <ul style="list-style-type: none">Correctly identifies ONE parameter which changes and describes the implication of the change	1–2

Question 27 (a) (i)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies TWO sources of information and gives some description of the process of information gathering	2
<ul style="list-style-type: none">Identifies TWO correct sources of information	1

Question 27 (a) (ii)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Provide features of TWO criteria that allow them to make a judgement of reliability	3
<ul style="list-style-type: none">Provide features of ONE criteria OR <ul style="list-style-type: none">Identify TWO criteria used to assess reliability	2
<ul style="list-style-type: none">Identify ONE criteria used to assess reliability	1

Question 27 (b) (i)*Outcomes assessed: H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Draws a flow diagram that indicates all the major steps of the Bradley method and all the processes used	3
<ul style="list-style-type: none">• Gives an incomplete flow diagram of the Bradley method• OR• Describes the Bradley method in detail	2
<ul style="list-style-type: none">• Gives a brief description of the Bradley method	1

Question 27 (b) (ii) 1*Outcomes assessed: H6, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• States all FOUR abiotic factors	1

Question 27 (b) (ii) 2*Outcomes assessed: H13, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Explains the distribution of TWO introduced species with respect to TWO abiotic factors	2
<ul style="list-style-type: none">• Explains the distribution of TWO introduced species with respect to ONE abiotic factor	1

Question 27 (c)*Outcomes assessed: H4, H6, H9, H10, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Describes in detail TWO control methods• Names introduced animals and their environmental impact• Supports the argument of the use of this method for that species• Provides a response that demonstrates cohesive and logical progression and includes correct use of scientific principles and ideas	6–7
<ul style="list-style-type: none">• Describes TWO control methods for named introduced animals and their impact• Attempts to justify the control method	4–5
<ul style="list-style-type: none">• Describes in general a control method for a named introduced animal AND/OR <ul style="list-style-type: none">• Mentions the environmental impact of the animal OR <ul style="list-style-type: none">• Describes TWO control methods	2–3
<ul style="list-style-type: none">• Describes simply a control method OR <ul style="list-style-type: none">• Describes generally the environmental impact of introduced animal	1

Question 27 (d) (i)*Outcomes assessed: H1***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• States TWO quarantine methods	1

Question 27 (d) (ii)*Outcomes assessed: H1***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Describes in detail ONE correct quarantine method• Links the method to how it controls the introduction of a named species	2
<ul style="list-style-type: none">• Briefly outlines a quarantine method	1

Question 27 (d) (iii)*Outcomes assessed: H10, H13, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Makes a clear judgement about the effectiveness of TWO quarantine methods• Identifies a potential exotic introduced species for each method• Presents evidence to support judgement on each method	4
<ul style="list-style-type: none">• Makes a judgement about the effectiveness of TWO quarantine methods AND/OR <ul style="list-style-type: none">• Gives ONE reason to support each judgement	2–3
<ul style="list-style-type: none">• Makes a judgement about ONE quarantine method	1

Question 28 (a) (i)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Identifies TWO sources of information and give a description on the process of information gathering given	2
<ul style="list-style-type: none">• Identifies TWO correct sources of information	1

Question 28 (a) (ii)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Provide features of TWO criteria that allow them to make a judgement of reliability	3
<ul style="list-style-type: none">• Provide features of ONE criteria OR <ul style="list-style-type: none">• Identify TWO criteria used to assess reliability	2
<ul style="list-style-type: none">• Identify ONE criteria used to assess reliability	1

Question 28 (b) (i)*Outcomes assessed: H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Draws a flow diagram that shows all steps required to convert petroleum (a mixture of compounds) into individual products and indicates the processes used in each step	3
<ul style="list-style-type: none">• Gives an incomplete flow diagram OR <ul style="list-style-type: none">• Describes the process in detail	2
<ul style="list-style-type: none">• Brief description of either distillation or catalytic cracking	1

Question 28 (b) (ii) 1*Outcomes assessed: H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Defines fossil fuel	1

Question 28 (b) (ii) 2*Outcomes assessed: H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Identifies and quantifies the difference in the trends in oil versus coal in electricity generation and produces reasons for the difference	2
<ul style="list-style-type: none">• Describes the trends	1

Question 28 (c)*Outcomes assessed: H4, H6, H9, H10, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Describes in detail the use of fossil fuels in Australia• Justifies the uses or non-uses of fossil fuels in Australia• Makes a judgement about the use• Supports judgement with arguments• Provides a response that demonstrates coherence and logical progression and includes correct use of scientific principles and ideas	6–7
<ul style="list-style-type: none">• Describes at least TWO uses of fossil fuels in Australia• Outlines the positive or negative impacts of fossil fuel use, but does not make a judgement	4–5
<ul style="list-style-type: none">• Outlines ONE use of fossil fuels AND/OR <ul style="list-style-type: none">• Outlines the positive/negative impact of fossil fuels	2–3
<ul style="list-style-type: none">• Identifies ONE use of fossil fuels	1

Question 28 (d) (i)*Outcomes assessed: H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• States the difference in organic matter	1

Question 28 (d) (ii)*Outcomes assessed: H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Relates the stages in petroleum accumulation to the rocks that constitute traps	2
<ul style="list-style-type: none">• Describes ONE a type of trap	1

Question 28 (d) (iii)*Outcomes assessed: H6, H13, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Makes a clear judgement about the effectiveness of methods for conserving energies• Presents evidence to support judgement	4
<ul style="list-style-type: none">• Makes a judgement about the effectiveness of a method for conserving energy AND/OR	2–3
<ul style="list-style-type: none">• Gives ONE reason to support judgement• Briefly describes a method for conserving energy	1

Question 29 (a) (i)*Outcomes assessed: H6, H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Identifies TWO sources of information and gives some description of the process of information gathering	2
<ul style="list-style-type: none">• Identifies TWO correct sources of information	1

Question 29 (a) (ii)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Provide features of TWO criteria that allow them to make a judgement of reliability	3
<ul style="list-style-type: none">• Provide features of ONE criteria OR	2
<ul style="list-style-type: none">• Identify TWO criteria used to assess reliability• Identify ONE criteria used to assess reliability	1

Question 29 (b) (i)*Outcomes assessed: H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Draws a flow diagram<ul style="list-style-type: none">– Names deposit– Shows separation of ore from waste rock– Shows separation of concentrate and ore mineral concentrate from tailing	3
<ul style="list-style-type: none">• Gives an incomplete diagram OR <ul style="list-style-type: none">• Describes the process in detail	2
<ul style="list-style-type: none">• Names deposit OR <ul style="list-style-type: none">• Brief description of the process	1

Question 29 (b) (ii) (1)*Outcomes assessed: H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Define grade	1

Question 29 (b) (ii) (2)*Outcomes assessed: H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Relates variation in gold production to at least TWO of ore mined, average grade and gold recovery	2
<ul style="list-style-type: none">• Relates variation in gold production to ONE of ore mined, average grade and gold recovery	1

Question 29 (c)

Outcomes assessed: H4, H6, H9, H10, H14

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Provides a response that demonstrates coherence and logical progression and includes correct use of scientific principles and ideas AND • Describes a range of benefits or costs of mining ore and makes a justification of the continuation or discontinuation of mining ore • OR • Compares benefits with environmental and economic ‘cost’ of mining ore and makes a judgement on the continuation or discontinuation of mining ore 	6–7
<ul style="list-style-type: none"> • Describes benefits OR compares benefits with environmental and economic ‘costs’ of mining ore but does not provide adequate justification of continuation or discontinuation 	4–5
<ul style="list-style-type: none"> • Lists some benefits of mining ore AND/OR issues related to economic/environmental impact 	2–3
<ul style="list-style-type: none"> • Identifies ONE benefit or cost associated with mining ore 	1

Question 29 (d) (i)

Outcomes assessed: H7

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Distinguishes between ore and gangue minerals 	1

Question 29 (d) (ii)

Outcomes assessed: H5, H9

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Describes how change in technology can affect value of a deposit giving reason for increase in value 	2
<ul style="list-style-type: none"> • Describes how technology affects value of a deposit 	1

Question 29 (d) (iii)*Outcomes assessed: H6, H9, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Makes a clear judgement of the availability of infrastructure on feasibility of mining a named ore deposit• Presents evidence to support judgement	4
<ul style="list-style-type: none">• Makes judgement of infrastructure availability on determining feasibility of mining for a named ore deposit AND/OR <ul style="list-style-type: none">• Given ONE reason to support judgement	2–3
<ul style="list-style-type: none">• Related infrastructure to mining	1

Question 30 (a) (i)*Outcomes assessed: H7, H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Identifies TWO sources of information and gives some description of the process of information gathering	2
<ul style="list-style-type: none">• Identifies TWO correct sources of information	1

Question: 30 (a) (ii)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Provide features of TWO criteria that allow them to make a judgement of reliability	3
<ul style="list-style-type: none">• Identify TWO criteria used to assess reliability	2
<ul style="list-style-type: none">• Provide features of one criteria OR <ul style="list-style-type: none">• Identify ONE criteria used to assess reliability	1

Question 30 (b) (i)
Outcomes assessed: H13
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Draws a flow diagram that <ul style="list-style-type: none"> – identifies that water carbon (as CO₂) and oxygen move into ocean from the atmosphere and vice versa. – includes at least TWO processes that show how carbon and oxygen are used in the ocean 	3
<ul style="list-style-type: none"> • Gives an incomplete flow diagram OR <ul style="list-style-type: none"> • Describes the process in detail 	2
<ul style="list-style-type: none"> • Identifies a process involving carbon (as CO₂) and oxygen moving into and out of the ocean • OR • Outlines the movement of water, carbon (as CO₂) and oxygen moving into and out of the ocean 	1

Question 30 (b) (ii) (1)
Outcomes assessed: H6
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • States the meaning of attenuation of light 	1

Question 30 (b) (ii) (2)
Outcomes assessed: H14
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Identifies that certain organisms live in the surface water and at depth and relates this to TWO types of data in the table such as high O₂, high temperature and wave lengths of light 	2
<ul style="list-style-type: none"> • Identifies that different organisms live in the surface waters and at depth and relates this to only ONE type of data in the table 	1

Question 30 (c)

Outcomes assessed: H4, H6, H9, H10, H14

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none">• Describes the physical, chemical and biological processes around hydrothermal vents• Relates abiotic characteristics to the existence of unique species• Provides a response that demonstrates coherence and logical progression and includes correct use of scientific principles and ideas	6-7
<ul style="list-style-type: none">• Describes the physical, chemical and biological characteristics of hydrothermal vents	4-5
<ul style="list-style-type: none">• Describe ONE abiotic characteristic of vents AND/OR	2-3
<ul style="list-style-type: none">• Describes biotic characteristics of hydrothermal vents	
<ul style="list-style-type: none">• Identifies a characteristic at hydrothermal vents	1

Question 30 (d) (i)

Outcomes assessed: H7

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none">• States TWO types of sediment found in deep sea environments far from continental margins	1

Question 30 (d) (ii)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none">• Relates the solubility of chemicals to their ease of transportation how long lived synthetic chemicals can be transported in the sea	2
<ul style="list-style-type: none">• Describes how long lived synthetic chemicals can be transported in the sea	1

Question 30 (d) (iii)*Outcomes assessed: H4, H6, H10, H13, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Makes a clear judgement of why laws about ocean are necessary or unnecessary to world society• Presents evidence to support judgement	4
<ul style="list-style-type: none">• Makes a judgement about why laws are necessary or unnecessary AND/OR <ul style="list-style-type: none">• Gives ONE reason to support such laws	2–3
<ul style="list-style-type: none">• Briefly describes of pollution/ resources in oceans OR <ul style="list-style-type: none">• States a law relating to ocean protection from pollution/resources depletion	1