2006 Assessment Report

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2006 Environmental Science GA 1: Written examination 1

GENERAL COMMENTS

Teachers are again to be commended for their obviously skilled teaching of the Environmental Science course. It is clear that the course is in most cases being taught in accordance with the spirit of the Study Design; that is, through extensive use of appropriate case studies, which very often have an obvious local relevance.

The length of the 2006 examination seemed appropriate, and there were relatively few instances of students being unable to complete the paper.

SPECIFIC INFORMATION

Section A – Multiple-choice questions

Question	% A	% B	% C	% D	Comments
1	5	8	5	81	
2	11	78	3	8	
3	18	32	1	49	The most common incorrect response was alternative B, 'Biomass produces no greenhouse gases when burned'. Methane (and other inflammable gases) is produced by the breakdown of biomass. These gases are burned, which produces carbon dioxide – a greenhouse gas. One common misunderstanding seems to be that methane is the residual product (that is, emission) from biomass energy sources.
4	10	6	82	2	
5	3	58	6	33	Students who selected option D incorrectly ordered the percentage increase from biggest to smallest rather than smallest to biggest as asked in the question.
6	94	2	2	2	
7	15	12	71	2	
8	22	60	10	7	$0.25 \times 0.85 \times 0.60 \times 0.40 = 0.051$ = approx 5 %, alternative B.
9	6	35	47	10	In 2003 and 2004, the amount of plant matter was decreasing compared to previous years. Instead of growing and absorbing carbon dioxide, plant material was dying, putting carbon into the environment (changing from an overall carbon sink to a carbon source), alternative B. The most common response was C; however, this could not be deduced from the data.
10	28	8	62	2	
11	70	3	15	12	
12	2	83	2	13	
13	89	3	3	5	
14	8	2	86	4	
15	1	94	4	0	
16	95	2	0	3	
17	0	8	89	2	
18	4	8	86	1	
19	3	13	8	75	
20	54	5	37	4	

Section B – Short-answer questions

Question 1

Question 1a.

Marks	0	1	2	3	4	5	6	Average
%	2	1	2	9	26	41	18	**4.5**

ai.

- wind drives a propeller (or turbine), which drives an electric generator
- renewable

aii.

- water from a height flows fast (creating kinetic energy) and drives a turbine, which drives a generator
- renewable

aiii.

- brown coal is burned in a boiler to produce steam, which drives a turbine in an electric generator
- non-renewable

Almost all students were able to identify whether methods were renewable or non-renewable, but the descriptions of the processes varied considerably. The most common error was not mentioning a generator at all – to get the full six marks, some mention of the need for a generator was required. Full marks were not given for statements such as 'a turbine produces electricity' or 'coal is burned to produce electricity'. For part ii., height or gravitational potential energy needed to be mentioned.

Question 1b.

Marks	0	1	2	3	4	Average
%	2	1	3	30	65	**3.6**

Students needed to correctly name one fossil and one non-fossil energy source. For full marks, they needed to provide at least one relevant advantage and one relevant disadvantage of each energy source.

Question 1c.

Marks	0	1	2	3	4	5	Average
%	6	2	14	33	34	11	**3.2**

In order to receive full marks for Question 1c., students were required to: make a recommendation on an appropriate balance of energy sources; refer to the information provided relating to Victoria's energy needs, including reference to the suitability of sources for base and peak loads; and refer to economics, availability, and environmental issues.

Question 2
Question 2a.

Marks	0	1	2	3	4	5	6	Average
%	10	14	20	16	15	14	11	**3.0**

A good answer to this question required the following information:

- what radiations reach the atmosphere from the sun
- reference to the absorption of each radiation
- the re-radiation of infrared from the earth's surface
- absorption of radiation by greenhouse gases and consequent heating of the earth's atmosphere.

Most students included a diagram, although it was possible to get full marks without a diagram. Similarly, clear information on the diagram, for example showing infrared re-emission absorption from the earth's surface, without any mention in text was also accepted as meeting requirements.

The mechanism of the greenhouse effect is central to this part of the course, and teachers should ensure that students are aware of the basic facts, especially the role of the different types of radiation and the differential absorption of these.

Question 2b.

Marks	0	1	2	3	4	Average
%	5	7	26	35	27	**2.7**

The natural greenhouse effect (which is largely caused by naturally occurring CO_2 and water vapour) maintains the temperature on Earth so that life, including human life, can exist. The enhanced greenhouse effect is the increased global warming caused by human intervention; that is, by greenhouse gases produced by human activity. Responses also needed to include implications for human life; for example: rising sea levels; changes in rainfall/precipitation; increased frequency of extreme weather events; change in agricultural yields; disease; etc.

The most common reason for not scoring full marks was describing the difference between the two effects but making no reference to implications for human life.

Question 2c.

Marks	0	1	2	Average
%	3	30	68	**1.7**

Students needed to describe one specific strategy and refer to the enhanced greenhouse effect. A wide variety of strategies were accepted, including the Kyoto protocol.

Question 2d.

Marks	0	1	2	3	4	Average
%	5	4	14	29	48	**3.1**

Students needed to correctly list a fossil and a non-fossil energy source and describe their impact on global warming. Some reference to the greenhouse effect was expected.

Students generally answered this question well.

Question 3

This question tested students' knowledge and understanding of the endangered species they had studied in depth as part of Unit 3. Students were expected to provide considerable depth in their responses to this series of questions.

Question 3a.

Marks	0	1	2	3	Average
%	1	10	49	39	**2.3**

Students were required to name an endangered species and explain why it is considered threatened. Almost all students chose a threatened Australian species in Victoria, such as Leadbeater's possum.

Most students scored well on this question. The most common error was not including the degree of threat; some relative degree of threat should have been mentioned. The most obvious way was to mention one of the categories – vulnerable, endangered or critical – although this was not specifically required.

The choice of species can affect the ease with which the student is able to answer this question; therefore, choosing a species with a specific local population which has clear threats and specific management strategies will facilitate good marks. Most choices were appropriate.

Question 3b.

Marks	0	1	2	3	4	Average
%	4	3	13	39	41	**3.1**

Students needed to:

- state a specific population of the threatened species
- provide a reasonable description of it (numbers, etc)
- describe a specific geographic location, with at least a brief description of the nature of the habitat
- refer to the probable survivability of the population.

The vast majority of students scored three or four marks on this question. The most common reason for a loss of marks was not commenting on the long term survivability of the population.

Question 3c.

Marks	0	1	2	Average
%	17	23	60	**1.5**

Students were asked to comment on the impact of the loss of this particular population on the survival of the species as a whole. Many students scored full marks.

Question 3d.

Marks	0	1	2	3	4	5	Average
%	6	6	17	27	32	12	**3.1**

Students were asked to describe a management strategy that is being used, or could be used, to protect this population. Assessors looked for an overall coherent analysis of a management strategy and its monitoring and a method of evaluating its success.

The most common errors were not discussing monitoring and not commenting on a method of evaluating the strategy's effectiveness. For full marks, some quantitative reference was sought.

Question 4
This question described a scenario, giving all the required data. Students were not expected to know about the New Holland mouse in advance.

Question 4a.

Marks	0	1	2	Average
%	18	31	51	**1.4**

The scientist may be justified in his concern about the New Holland mouse because of:

- the very small population size
- the fact that it only existed at one location in the heathland, hence the danger of inbreeding or a lack of genetic diversity.

The stem did not say, as some students assumed, that this was the only population in existence – only that it was the only population in the area studied. While this was not specifically penalised, if the students misunderstood the question, a correct response was more difficult to achieve.

Question 4b.

Marks	0	1	2	3	Average
%	8	37	50	5	**1.5**

The *Flora and Fauna Guarantee Act 1988* gives specific legal protection to the threatened species. Once an animal is designated as threatened under the Act, an action statement is mandatory. Once an action statement is developed, the law requires its implementation and penalties are imposed for non-observance. Some reference to this legal requirement was required for full marks.

Question 4c.

Marks	0	1	2	3	4	Average
%	17	15	25	33	11	**2.1**

Individuals selected for reintroduction would be from different captive breeding programs, both different from the existing population and from a diversity of programs if possible, to ensure genetic diversity and avoid genetic swamping.

Some students answered this in a very general way by giving strategies for protecting the population, without referring to enhancing genetic diversity. Such responses did not receive full marks.

Question 5
This question tested students' ability to handle data and draw conclusions from it.

Question 5a.

Marks	0	1	2	3	4	Average
%	9	5	16	45	25	**2.7**

Species	1990	2000
Red-capped Robin	25 + 15 + 20 = 60 60 / 3 remnants = 20 20 / 10 ha = 2 individuals per hectare	26 + 8 + 20 = 54 54 / 3 remnants = 18 18 / 10 ha = 1.8 individuals per hectare
Hooded Robin	10 + 8 + 6 = 24 24 / 3 remnants = 8 8 / 10 ha = 0.8 individuals per hectare	5 + 1 + 3 = 9 9 / 3 remnants = 3 3 / 10 ha = 0.3 individuals per hectare

Partial marks were given if correct working was shown but an arithmetical error was made.

Question 5b.

Marks	0	1	2	3	4	Average
%	12	14	23	28	23	**2.4**

Red-capped Robin

- insufficient evidence to reliably conclude decline – only 10 per cent change
- numbers have gone up in one location, steady in second, down in only one

Hooded Robin

- sufficient evidence to reliably conclude decline – reduced by factor of more than 2
- reduced in each location

The key point sought was that the Hooded Robin had reduced in each location, but the Red-capped Robin in only one.

Question 5c.

Marks	0	1	2	Average
%	28	3	69	**1.4**

2000: 7
2002: 13

This was a simple calculation, which was completed correctly by almost all students who attempted it.

Question 5d.

Marks	0	1	2	3	4	5	6	Average
%	16	10	18	20	20	14	2	**2.7**

di.

The validity of the conclusion might be limited because:

- factors other than the noisy miner could have been involved
- there were relatively low numbers in the data overall.

dii.

Students were asked to outline a study that would provide a stronger test of the hypothesis. They needed to provide:

- a clear description of a study
- reasons why it would be better
- reference to numbers, significance and what would constitute satisfactory data from which a conclusion could be drawn.

Some students gave very good answers; many outlined a more controlled experiment, isolating the variables that were mixed in the original observations.