2012 Assessment Report

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2012 Environmental Science GA 1: Written Examination 1

GENERAL COMMENTS

This examination was the final Unit 3 June examination for the *VCE Environmental Science Study Design*. From 2013, a single examination covering both Units 3 and 4 will be held in November.

It was pleasing to see that students had undertaken in-depth case studies of local issues, as is required by the *VCE Environmental Science Study Design*. The questions (Questions 1 and 3) that related to a specific case study were generally well done. In particular, the wide range of threatened species studied reflects an endeavour to apply scientific concepts and principles in local environments and/or contexts.

Teachers and students are reminded that, from 2013, specific details relating to the study of a selected threatened animal will be assessed through school-assessed coursework only, and not in the end-of-year examination. However, the underlying principles related to threatening processes on biodiversity will be assessed through both school-assessed coursework and the examination. Therefore, from 2013, all information about the threatened species in the examination will be provided on the paper – as is clear in the cassowary question on the sample paper. Specific details related to the study of one fossil fuel and one non-fossil fuel energy source will continue to be assessed in both school-assessed coursework and in the end-of-year examination.

Students are reminded to pay careful attention to the command terms in questions, particularly in Section B. For example, when students are asked to 'evaluate' a situation or argument, a judgment is required. This often involves making an assessment of two possible approaches or two lines of argument. For example, Section B, Question 3f. on this examination asked students to evaluate the success of the management plan they had described. Full marks were not awarded unless there was a clear judgment expressed.

Students also need to be aware that when a specific number of examples or reasons are asked for, only the number asked for will be assessed, in the order they are presented. If more examples or reasons are given, they will not be assessed. For example, if three examples are requested and five are given, only the first three will be assessed.

SPECIFIC INFORMATION

The table below indicates the percentage of students who chose each option. The correct answer is indicated by shading.

Section A – Multiple-choice questions

Question	% A	% B	% C	% D	% No Answer	Comments
1	1	1	8	89	1	
2	2	10	24	64	0	Exothermic and endothermic reactions are specifically mentioned in the study design.
3	3	71	4	22	0	Some students may have thought the question related to the whole power station rather than the generator and, therefore, chose option D.
4	73	16	5	6	0	
5	3	5	90	2	0	
6	0	82	11	7	0	
7	1	80	16	3	0	
8	6	7	22	65	0	Students who chose option C may believe that there is a connection between the ozone layer and global warming.
9	8	68	12	11	1	
10	2	0	96	2	0	
11	1	5	6	88	0	
12	94	2	2	2	0	
13	10	18	3	68	1	Area A had an area of 10 km^2. The sample area was 1 km^2, in which 62 Common Brushtail Possums were found, hence there would have been 62 × 10 = 620 in the whole area (option D).

Question	% A	% B	% C	% D	% No Answer	Comments
14	75	16	4	5	0	Since species richness is the total number of species present, Area A (which had only four species, compared with seven in each of the other areas) had the least species richness.
15	10	61	20	9	0	Species richness was stronger in Locations B and C than in Location A. Location B had a much more even distribution than either Location A or Location C, so the answer was Location B. Students may be understanding species diversity too much in terms of an index, without having a conceptual understanding of what it actually means.
16	4	2	60	34	0	
17	8	7	69	16	0	The relatively small number of these possums in area A makes inbreeding possible, hence introducing some from a different area would reduce this. The common incorrect response was option D, which showed a lack of understanding of the term 'species richness'.
18	8	16	68	8	0	Genetic swamping occurs when a larger population overtakes a smaller one.
19	26	6	4	64	0	Combined probability = product of two individual probabilities: 0.4 × 0.3 = 0.12 (option D). A common incorrect response was achieved by adding the two: 0.3 + 0.4 = 0.7 (option A).
20	11	7	1	81	0	

Section B – Short-answer questions

For each question, an outline answer (or answers) is provided. In some cases the answer given is not the only answer that could have been awarded full marks.

Question 1

This question required students to answer in terms of a fossil fuel and a non-fossil fuel energy source that they had studied in depth as case studies, hence there was an expectation of considerable depth of knowledge about both of these.

Question 1a.

Marks	0	1	2	3	Average
%	4	16	38	42	2.2

Students were required to provide a very specific geographic location, not simply a general description (such as an open-cut mine). Responses had to refer to accessibility or availability; for example, how easy it is to extract an energy source from the ground. Also needed was some quantitative estimate of the length of time this source will remain useful.

Overall, this question was well done. Weaker responses did not include reference to accessibility or availability or not giving a quantitative reference (for example, just stating 'a long time').

Question 1b.

Marks	0	1	2	3	4	Average
%	4	5	15	33	43	3.1

This question was quite well done. Some students neglected to refer to the method of distribution, which was explicitly asked for. 'High-voltage transmission lines' is one example of an acceptable way of answering this question.

Question 1c.

Marks	0	1	2	3	Average
%	2	6	27	65	2.6

Most students scored highly on this question, which required them to refer to impacts of the extraction/production/ distribution, not the end use. Some students incorrectly referred to end use.

Question 1d.

Marks	0	1	2	3	4	Average
%	2	2	9	33	54	3.3

This question was well done, with most students scoring highly. Most responses referred to carbon dioxide emissions.

Some students overlooked the instruction to give advantages and **unrelated** disadvantages and, therefore, were unable to score full marks.

Question 1e.

Marks	0	1	2	3	4	5	Average
%	5	6	15	30	31	13	3.2

This question required:

- a specific geographic location; for example, Melbourne
- a description of energy needs; for example, domestic, transport (trams, trains), industrial
- a description of how the needs could be met; that is, infrastructure – coal-powered power stations in the Latrobe Valley and transmission lines. Students should have indicated that this would need to be supplemented in peak periods by, for example, hydro-electric power stations
- some reference to sustainability.

Students should have studied some examples of how their selected energy sources met the needs of a particular location.

Question 2

This question related to the greenhouse effect.

Question 2a.

Marks	0	1	2	3	Average
%	4	18	41	37	2.1

This question was well done. Students needed to explain that the natural greenhouse effect is caused by natural causes while the enhanced greenhouse effect is caused by human activity adding to greenhouse gases.

The major gas contributing to the natural greenhouse effect is water vapour and the major gas contributing to the enhanced greenhouse effect is carbon dioxide. These had to be included for full marks.

Question 2b.

Marks	0	1	2	3	Average
%	4	16	44	36	2.1

Three points that needed to be mentioned were:

- a fossil source
- the way this fossil source emits greenhouse gases
- that this gas absorbs outgoing infrared radiation.

Question 2c.

Marks	0	1	2	3	Average
%	4	24	45	27	2

This question required:

- mention of a strategy taken to reduce the enhanced greenhouse effect
- **how** this strategy reduced the **enhanced** greenhouse effect; for example, by reducing the emission of some (explicit) greenhouse gas and the effect of this on infrared absorption.

Simple mention of a treaty or similar (for example, the Kyoto Protocol, energy trading scheme or carbon tax) could not achieve full marks. Responses required an explanation of how this treaty would reduce the greenhouse effect for full marks to be awarded.

Question 2d.

Marks	0	1	2	3	Average
%	20	12	25	43	**1.9**

This question required mention of a land use change and an explanation of how it can either increase or reduce the greenhouse effect. The most common answers were related to either land clearing or planting trees and referred to carbon sinks for full marks.

Some students mentioned the use of land for some other purpose; for example, building wind farms. Although this scored some marks, it is not really what was meant by land use change in terms of increasing or reducing the enhanced greenhouse effect.

Question 3

Question 3 related to a threatened animal species that students had studied throughout the year.

Question 3a.

Marks	0	1	2	3	4	Average
%	0	1	4	16	79	**3.7**

This question was very well done, with over three-quarters of students achieving full marks. As in previous years, the only real errors were being too general or referring to the species as a whole rather than selecting a specific population.

Question 3b.

Marks	0	1	2	3	Average
%	9	11	33	47	**2.2**

This question required students to refer to overall numbers of the species (ideally a numerical response was given, but this was not essential), to give some indication of what fraction the nominated population is of the whole species, and then judge the importance of this population to the survival and wellbeing of the whole species.

Below is a very good answer relating to the population of Eastern Barred Bandicoots at Mt Rothwell.

> *The population of Mt Rothwell is approximately 300, which is over three quarters of the total population of EBBs – the only other populations being at Warnambool and a very small captive breeding group at Melbourne Zoo. Hence the Mt Rothwell population is essential to the survival of the species as a whole.*

Question 3c.

Marks	0	1	2	Average
%	4	20	76	**1.7**

The study design uses three conservation categories: 'vulnerable', 'endangered' and 'critical'. It was expected that students would respond in terms of these. 'Critically endangered' was acceptable for the third category. A small number of other categories used by specific treaties or protocols were accepted, provided the treaty was explicitly mentioned. A reason for the category was also required.

The following is an example of a good response.

> *Critical, since the population has declined from 2000 to 300 in 20 years and continues to decline.*

Question 3d.

Marks	0	1	2	3	Average
%	1	10	60	29	**2.2**

Most students could name an appropriate threat; however, some students did not mention specific numbers related to the threat and missed out on some marks.

Question 3e.

Marks	0	1	2	3	Average
%	3	7	35	55	**2.4**

Most students outlined an appropriate management strategy; for example, fox-proof/feral cat-proof fences at Mt Rothwell, a captive breeding program, etc.

Question 3f.

Marks	0	1	2	3	Average
%	8	8	29	55	**2.3**

This question asked students to provide an evaluation – that is, a judgement about the strategy's success or otherwise – together with some supporting evidence (including numerical data) to back up the judgement.

Many students scored well on this question. The most common error was not providing any numerical supporting evidence.

The following is an example of a good response.

> *The management plan at Mt Rothwell for the Eastern Barred Bandicoot has been very successful as the numbers have risen from 50 in 2007 to almost 300 now. Almost no foxes or feral cats have been discovered inside the enclosure.*

Question 3g.

Marks	0	1	2	Average
%	14	50	36	**1.2**

This question proved to be a little more challenging. Common improvement plans included setting up alternative populations some distance away to avoid catastrophic loss (as occurred for the Leadbeaters Possum in the bushfires), captive breeding programs, etc.

Full marks were not given for a mere extension of the management plan provided in part e. (for example, a higher fence).

Question 4
Question 4a.

Marks	0	1	Average
%	26	74	**0.8**

CITES

Question 4b.

Marks	0	1	2	Average
%	11	30	59	**1.5**

Either of:

- there is a danger of both males being killed/poached/removed
- lack of genetic diversity/inbreeding.

Merely stating that the lower number of males would cause less breeding was not enough to achieve full marks.

Question 4c.

Marks	0	1	2	3	Average
%	4	17	49	30	**2.1**

A number of suggestions were acceptable, including to:

- avoiding the consequences of a loss of males in Population 2
- increasing genetic diversity
- increasing the available habitat
- making it easier to oppose poachers.

Just 'increasing the numbers' did not get full marks as joining the populations will not increase the total number.

Question 4d.

Marks	0	1	Average
%	30	70	**0.7**

Population 1: 10 ÷ 36 = 0.28
Population 2: 2 ÷ 50 = 0.04
So Population 1 was the correct answer.

A wide variety of ways of expressing 'ratio' was accepted.

Question 5
Question 5a.

Marks	0	1	2	3	Average
%	7	15	16	62	**2.3**

	Site C
Total number of individuals	100
Mean	10
Sum of differences	70 (1 mark)
Index D = 1 – (sum of differences ÷ total number)	0.3

Index D_C for site C = 0. 3

Partial marks were given for responses that showed some correct working but gave the wrong answer. Full marks were given for a correct answer, irrespective of the working.

Question 5b.

Marks	0	1	2	3	Average
%	15	10	24	51	**2.1**

Site B, since it has a higher index. A high value means greater species diversity.

Only partial marks were given if Site B was mentioned but there was no reference to index.

Question 5c.

Marks	0	1	2	3	4	Average
%	17	14	26	28	15	**2.1**

Pat is correct. While the same total number of individuals and species is correct (same species richness), species diversity also involves the relative abundance. Site B has a much more even distribution of numbers in species, whereas Site A and Site C are dominated by a small number of species.

For full marks, students needed to provide some discussion of numbers or data.

The following is an example of a good answer.

> *Pat is correct. While each site has the same number of individuals (100) and same number of species (8), the distribution (relative abundance) at B is much more even than at other two locations. Species diversity involves both species richness (which is the same) and relative abundance (which is stronger at B). This is shown by the index (0.6 at B, compared to 0.3 and 0.5).*

Question 5d.

Marks	0	1	2	Average
%	36	31	33	**1**

Students were expected to realise that Site C has the only population of the obviously endangered Leaf Green Tree Frog. Some other explanations received partial marks.