VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2011 Environmental Science GA 1: Written examination 1

GENERAL COMMENTS

Similar to previous years, the 2011 Environmental Science examination 1 paper contained 20 multiple-choice questions and five short answer questions. The intent of the study is that it will be taught through the in-depth treatment of case studies, ideally based on a local issue. Students needed to answer at least two of the short answer questions in terms of the in-depth study they had undertaken. Other questions may also have been required to be answered in terms of these case studies, such as Question 2c. on this paper.

Because students should have explored their case studies in some detail, it was expected that they would have used quite specific knowledge. In evaluation questions, for example, some numerical data to support the judgment was expected.

Attention should be drawn to the use of the key term 'evaluate'. When students are asked to evaluate a situation or an argument a judgment is required, and if there is no specific judgment full marks cannot be awarded.

SPECIFIC INFORMATION

Section A – Multiple-choice questions

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

Question	% A	% B	% C	% D	% No Answer	Comments
1	4	94	1	1	0	
2	9	3	7	82	0	This question was quite well done. However, some students thought that trapped carbon dioxide would lower the temperature. It should be noted that the equilibrium temperature in Earth's biosphere is a balance between incoming and outgoing energy.
3	0	88	8	3	0	
4	5	1	1	93	0	
5	89	2	6	3	0	
6	54	13	29	4	1	The most common incorrect response was option C (2600 kW), which was the energy transmitted rather than lost.
7	2	6	81	11	0	
8	15	0	8	77	0	
9	14	14	42	29	1	Received energy = light per square metre x area = 980 x 3.0 = 2940 W Efficiency = 530 x 100/2940 = 18%
10	5	7	12	77	0	
11	5	83	5	8	0	
12	10	81	5	4	0	
13	12	70	11	7	0	
14	6	6	65	22	0	Students who selected option D (ensure that both trees and shrubs are planted when revegetating along the stream) may have ignored the remnant vegetation mentioned in the stem of the question.
15	9	14	5	73	0	
16	3	7	3	87	0	

Question	% A	% B	% C	% D	% No Answer	Comments
17	76	14	3	8	0	Some students did not differentiate carefully enough between 'within a species' (genetic diversity) and 'between species' (species diversity).
18	3	3	14	79	0	
19	7	17	6	70	1	
20	7	11	74	7	1	

Section B

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 marks.

Question 1

This question required students to answer in terms of one fossil and one non-fossil fuel energy source they had studied in depth as a case study. Therefore, students were expected to display considerable depth of knowledge about it. Students missed out on one mark if they did not name suitable fossil and non-fossil fuel energy sources.

The common error in Question 1 was students not relating their knowledge of their energy sources to the scenario described. Many gave very general, prepared answers.

1a.

Marks	0	1	2	3	Average
%	1	12	42	44	**2.3**

A suitable answer would have been: The required power could be provided by coal as this would enable the supply to be maintained for the full 24 hours, with the power station at the port and transmission lines to the plant.

Students were required to make reference to relevant characteristics of one or both of their sources and to relate these to the specific requirements of the scenario; for example, to operate for 24 hours. They were also required to refer to the situation; for example, geographic location of source and transmission/transport.

1b.

Marks	0	1	2	3	Average
%	5	10	39	46	**2.3**

A suitable answer would have been: A coal-fired power station with boilers, turbines and generators could be constructed at the port where there is supply of coal and high-voltage transmission lines to the plant.

Students needed to describe the infrastructure, including any transport needed. A common error made by students was to suggest a renewable energy source such as wind or solar, ignoring the requirement of the scenario for a 24-hour operation. Some good answers suggested a wind farm near the factory, with a type of backup; for example, a natural gas plant.

1c.

Marks	0	1	2	3	4	Average
%	1	2	9	42	46	**3.3**

Many students gave very generic advantages and disadvantages and did not refer to the scenario's requirements; for example, distance from the port, requirement for 24-hour 7-day-a-week operation, transport or transmission issues, and so on.

1d.

Marks	0	1	2	Average
%	3	23	74	**1.7**

Students were asked to outline the advantages and disadvantages of the non-fossil fuel energy source if it was to be used to provide the power for the plant. Each of the advantages and the disadvantages should have related specifically to the needs of the town. Students' responses should also have referred to the properties of their nominated source.

Question 2

2a.

Marks	0	1	2	3	4	Average
%	3	10	19	40	27	**2.8**

This question required students to draw arrows on the diagram in the question indicating:

- incoming ultraviolet light (UV), showing absorption somewhere in atmosphere
- incoming infrared radiation (IR), showing absorption somewhere in atmosphere
- incoming visible radiation, reaching the surface
- outgoing infrared radiation, absorbed in the lower atmosphere.

2b.

Marks	0	1	2	3	4	Average
%	20	32	23	11	14	**1.7**

The following points were required for full marks:

- incoming visible radiation (and infrared radiation; however, this was not essential) from the sun reaching Earth's surface
- absorbed by Earth's surface
- reradiated as IR
- absorbed by greenhouses gases, heating these gases and hence the atmosphere.

The underlined words were required for full marks.

This question was not completed successfully by many students. The mechanism of the greenhouse effect, although central to the study, seems poorly understood by students. A common error was to give irrelevant material, such as the sources of greenhouse gases, the increase in greenhouse gases and the consequences of global warming.

2c.

Marks	0	1	2	Average
%	7	30	63	**1.6**

The following points were required for full marks:

- reference to the nominated energy source
- mention of an emitted greenhouse gas its contribution to the greenhouse effect.

A possible answer could have been: When coal is burned in a boiler it produces carbon dioxide, which is a greenhouse gas. This contributes to the greenhouse effect by absorbing outgoing infrared radiation.

Question 3

3a.

Marks	0	1	2	3	4	Average
%	0	2	4	20	74	**3.7**

Students were required to nominate a suitable threatened animal species. Common responses were Leadbeater's possum, the Eastern Barred Bandicoot (especially the population at Mount Rothwell) and the Yellow-bellied Parrot.

The selected population of a species should have had clear threats, a clear management plan, and sufficient data to form a conclusion about the success of intervention. Current data should have been used. For example, with the population of Eastern Barred Bandicoots at Mount Rothwell, there were many instances of students quoting outdated data, which is very different to the current data. Students are reminded that current data is readily available on the Internet.

For full marks students needed to:

- identify specific populations
- give the explicit geographical location
- state the size (explicit numbers) of the population
- give a description of the habitat; for example, heavily wooded.

Most students achieved full marks for this question. A common error made by students was to describe a whole species rather than a specific population. The question asked students to respond by providing a specific population in a specific geographic area.

It was expected that students would know the explicit (or at least approximate) numbers in a population. If this information was not available, this probably indicated a poor choice of threatened animal species studied. Data should have been reasonably current. Some quoted data was out of date. Students are reminded that current data is readily available on the Internet.

3b.

Marks	0	1	2	Average
%	10	44	46	**1.4**

This question required students to relate the numbers and trends of their population to the numbers of the species as a whole as well as draw a conclusion about the importance of the population. To obtain full marks students needed to give numbers or ratios.

3c.

Marks	0	1	2	3	Average
%	4	6	32	58	**2.5**

This question required students to state:

- a relevant treaty or piece of legislation
- the conservation category of species; for example, vulnerable, endangered, critical, or one specific to the piece of legislation or treaty
- at least one criterion that was not too general.

This question was generally well answered. A common error was not stating a piece of legislation or simply providing a very general comment such as ‘government’.

3d.

Marks	0	1	2	Average
%	11	39	50	**1.4**

A wide variety of responses was given to this question. The most common error was not quoting any numerical data, despite this being a specific requirement of the question. A stated numerical risk (for example, 50 per cent risk of extinction in the next 5 years) or data relating to the decline of the species (for example, it has declined from 5000 to 500 in 10 years) was acceptable.

3e.

Marks	0	1	2	Average
%	12	28	60	**1.5**

Students gave a wide variety of responses to this question. Some described the management plan/strategy that had been put in place to protect the threatened population, whereas others quoted its effect on other species. Some stated that there would be no impact on other species. This response was accepted, provided students justified their response; for example, a species that effectively is extinct in the wild and only exists in captivity is unlikely to have any ecosystem function.

3f.

Marks	0	1	2	3	Average
%	2	9	37	52	**2.4**

Students were required to describe a management plan that had been put in place and that addressed a specific threat. A common error in students' responses was omitting reference to a threat.

The following is an example of a good response.

> *A major threat to the Eastern Barred Bandicoot is predation by introduced species such as foxes and cats. To guard the Mt Rothwell population against this threat, and fox and cat proof electrified fence was erected when the population was introduced in 2005.*

3g.

Marks	0	1	2	3	4	Average
%	9	8	18	31	35	**2.8**

This question required students to make a judgment about the effectiveness of the management plan or strategy in reducing the risk of extinction of the population. The response needed to relate to the specific threat or management plan described in Question 3f. and be supported by numerical evidence.

Many students did not provide any numerical data.

The following is an example of a good response.

> *This fence has been very effective, as the numbers of EBBs in the enclosure has increased from 40 to 300 in 6 years, and no foxes or cats have been observed inside the enclosure, and there have been no EBBs obviously attacked by predators as shown by constant daily monitoring.*

Question 4

4a.

Marks	0	1	Average
%	58	42	**0.4**

The response needed was overfishing or overexploitation (or similar).

4b.

Marks	0	1	2	Average
%	18	5	78	**1.6**

This question required students to show an understanding of the term 'endemic'. Most students succeeded in stating that the tuna is also found outside Australian waters, in the South Pacific or off Indonesia.

4c.

Marks	0	1	2	Average
%	15	13	72	**1.6**

The tuna needs to be protected in the waters south of Indonesia because this is where the spawning grounds are located.

The term 'breeding' or other similar terms were accepted.

Most students were able to achieve full marks for this question.

4d.

Marks	0	1	2	Average
%	20	10	70	**1.5**

4015 x 1000/20 = 200 750

One mark was awarded for an answer that showed the student's understanding but included an incorrect calculation. Some students did not attempt this question.

4e.

Marks	0	1	2	3	Average
%	35	34	15	16	**1.2**

Guidelines that relate to other species are being developed to avoid incidental deaths of other species while fishing for tuna.

There was a wide variety of other answers, some of which indicated that students did not read the question carefully. Partial marks were awarded for plausible comments on how the fishing of tuna affected other species (for example, the effect on predator species' food supply) or other relevant comments

4f.

Marks	0	1	2	3	4	Average
%	5	9	30	34	21	**2.6**

This question asked students for one possible advantage and one possible disadvantage that commercial Bluefin tuna farms provide for the conservation of tuna. Some students provided a long list of advantages and disadvantages. Students are reminded that if one point is required, then only one can be rewarded. While it is sometimes possible to interpret a number of comments as one advantage, students often provided a long, unrelated list.

A possible answer would have been: An advantage of commercial fish farms is that it will provide fish for the market demand without catching fish from the wild, and consequently prevent extinction of the wild fish population. A disadvantage of commercial fish farms is that in a captive population, genetic diversity can decrease, with consequent effects on the characteristics of the fish.

Question 5

Students were not expected to have knowledge of any particular index; all the information for the calculation and interpretation of the index was given in the question. However, teachers and students are encouraged to use a variety of indices in their own investigations to prepare for this type of question.

A common error (for example, in Question 5b.) was that students did not use the index in answering the questions.

5a.

Marks	0	1	2	3	4	Average
%	19	21	7	3	49	**2.4**

Unknown and shallow = 5/8 = 0.625
Unknown and deep = 4/9 = 0.44

Partial marks were awarded for an answer that showed the student's understanding of the topic but where an incorrect calculation was given. Many students did not attempt this question.

5b.

Marks	0	1	2	Average
%	27	22	51	**1.3**

Shallow wetlands/unknown wetlands have a higher value of index (0.625) than deeper/unknown wetlands (0.44). There is a higher similarity between the unknown wetland than between the unknown and deep wetlands. Since a higher value indicates greater similarity, the unknown data was likely to be from a shallow wetland.

Where a student wrote an incorrect response to part a., but correctly applied these to b., full marks were awarded for part b.

Many students did not refer to the index and instead relied on other criteria. Few students thought that the index referred to each wetland rather than the relationship between two wetlands.

5c.

Marks	0	1	2	3	Average
%	15	29	35	21	**1.7**

Items that should be included in an Action Statement under the *Flora and Fauna Guarantee Act 1988* are:

- size/description of current status of species
- threats to the species
- management strategy.

5d.

Marks	0	1	2	3	Average
%	17	40	30	14	**1.4**

The key elements needed to make the investigation meaningful. These included:

- a control group
- an adequate timeline
- a method of counting/recording.

Students achieved a wide variety of marks for this question, depending on how the account met the above elements.

Common issues overlooked in responses included:

- the need for a control site or sites at the same time as the fox control was implemented at test sites
- simply taking into consideration what happens now and what happens later when the fox control is implemented did not adequately control other variables (for example, weather)
- an adequate timeline. Breeding patterns should have been considered. To count eggs/chicks now, and then again in three months' time, would give much information; at least two breeding cycles were necessary.

The following is an example of a good response.

Eight similar sites would be selected. In four of these, fences would be erected to exclude foxes from them, and four left unchanged. Then the number of eggs and chicks would be counted over at least two breeding seasons.

5e.

Marks	0	1	2	Average
%	18	57	26	**1.1**

Responses to this question needed to relate to the plan described in 5d., to describe what sort of evidence, ideally of a numerical type, would indicate it was successful.

The following is an example of a good response.

The number of eggs and chicks should be counted at similar times over at least two breeding seasons. The differences between the control sites and test sites should be compared and checked for a statistically significant difference. If there is such a difference, the control has been effective.