STUDENT NAME:	

Victorian Certificate of Education
2011

ENVIRONMENTAL SCIENCE

Trial Written Examination 1
May 2011

QUESTION AND ANSWER BOOK

Structure of book

Section	Number of questions	Number of questions to be answered	Number of marks
A	20	20	20
B	5	5	70
			Total: 90

Materials
- Question and answer book of 20 pages.
- Answer sheet for multiple choice questions.
- At least one pencil and eraser.
- One scientific calculator.
- A Graphics Calculator is not allowed

Instructions
- Write your **student name** and **class** in the space provided on this book
- Write your student name and class in the space provided on your answer sheet for multiple-choice.
- All written responses must be in English.
- Time allowed: 15 minutes reading time, 90 minutes writing time

At the end of the examination
- Place the answer sheet for multiple choice questions inside the front cover of this question and answer book.

Please note this is a practice exam only and its degree of hardship and content is different to the end of Unit 3 exam. VAEE takes no responsibility for your success in completing the actual VCE Environmental Science Unit 3 exam.

SECTION A—Multiple-choice questions

Specific instructions for Section A

Instructions for Section A

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.
Choose the response that is **correct** or that **best answers** the question.
A correct answer scores 1, an incorrect answer scores 0.
Marks will **not** be deducted for incorrect answers.
No marks will be given if more than one answer is completed for any question.

Question 1

Which of the following energy sources is renewable and **does** generate greenhouse gas emissions when converting it into a useful form?

a) Solar
b) Geothermal
c) Uranium
d) Biomass

Question 2

Which of the following energy sources emits the lowest concentration of carbon dioxide per unit of energy released?

a) Coal
b) Natural Gas
c) Biomass
d) Nuclear

Question 3

The natural greenhouse effect is caused mainly by the:

a) increase in the greenhouse gases due to human activity
b) trapping by the atmosphere of radiation re-emitted by the earth's surface
c) direct trapping of visible light and ultra-violet radiation by the ozone later
d) trapping by the atmosphere of infra-red radiation re-emitted by the earths surface

Question 4

Which of the following greenhouse gases has the greatest capacity to absorb infra-red radiation in the atmosphere?

a) Carbon dioxide
b) Methane
c) Water vapour
d) Ozone

The following information relates to questions 5-8

1 tonne = 1000 kg
kilo (k) = 10_3
mega (M) = 10_6

The East-West Treatment Plant harnesses methane produced from the breakdown of waste during the treatment of sewerage and uses it as an electrical power source. It uses highly efficient electrical generators that can run on the methane gas produced during sewage.

Each kilogram of methane produces 50MJ of energy.

Question 5
The combustion of methane is an important step in the production of electricity. This process is best described as:
a) An exothermic reaction
b) An endothermic reaction
c) Conversion of potential energy to chemical energy
d) Conversion of chemical energy to potential energy

Question 6
The plant burns approximately 15 tonnes of methane per hour.
Which of the following is the best estimate of the methane energy used per hour?
a) 7.5×10^5MJ

b) 3.2×10^8MJ

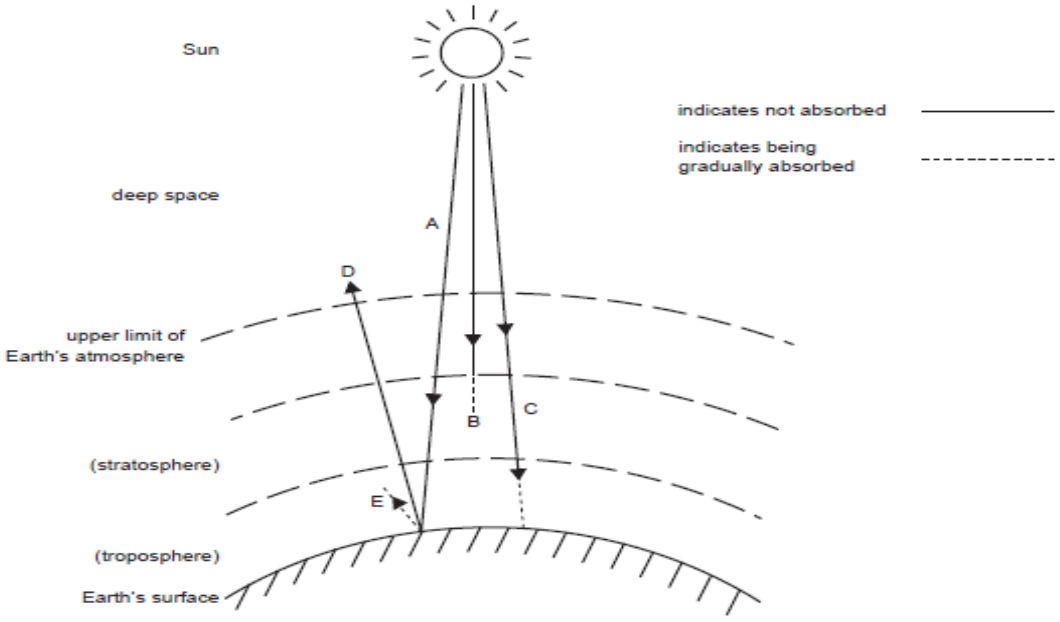
c) 7.5×10^3MJ

d) 3.2×10^6MJ

Question 7
When burning 15 tonnes of methane per hour, the output of the electricity generator is 4800MJ per minute. The percentage efficiency of the entire operation is closest to:
a) 3.8%
b) 10%
c) 38%
d) 0.38%

The following information relates to questions 8-11

The diagram below (**not to scale**) shows the Sun, Earth and parts of the Earth's atmosphere. The lines/arrows A–E can indicate ultraviolet (UV), visible or infrared radiation (IR).



Source: VCAA 2009 Unit 3 Exam

Question 8
Which of the following options best identifies ultra-violet radiation being absorbed in the atmosphere?
a) A
b) B
c) C
d) E

Question 9
The option indicated by E is associated with which type of incoming/outgoing solar radiation:
a) IR
b) Visible Light
c) UV
d) None of the above

Question 10
Which of the following man made greenhouse gases only occurs in the enhanced greenhouse effect?
a) Water vapour
b) Nitrous Oxide
c) Chlorofluorocarbons
d) Methane

Question 11
Under the Kyoto Protocol, it is proposed that countries are allowed to take into account the removal of carbon dioxide from the atmosphere by sinks.
Which of the following **does not** represent a carbon sink?
a) Woody biomass
b) Geosequestration
c) Newly cleared land for agriculture
d) Oceans

The following information relates to Questions 12-18

A study was completed by a group of scientists researching the impact of logging on the biodiversity in a region in East Gippsland. Scientists recorded their data before and after logging had occurred. They examined the impact on 5 different species in a range of locations in the region, these locations were all linked by vegetation prior to logging however, became fragmented after logging. These results are represented in the tables below.

Table 1: Represents the number of individuals found <u>prior</u> to logging

	Species 1	Species 2	Species 3	Species 4	Species 5	Total No. of Individuals
Location 1	25	14	8	21	23	91
Location 2	21	12	10	24	18	85
Location 3	24	14	9	25	20	92
Location 4	22	17	6	22	16	83

Table 2: Represents the number of individuals found <u>after</u> logging

	Species 1	Species 2	Species 3	Species 4	Species 5	Total No. of Individuals
Location 1	14	9	0	9	8	40
Location 2	15	5	4	12	6	41
Location 3	11	9	5	11	4	40
Location 4	13	10	2	9	3	37

Question 12
The **species richness** of the region **prior** to logging would be best represented as:
a) 5
b) 351
c) 10
d) 160

Question 13
The **species abundance** of the region **prior** to logging would be best represented as:
a) 5
b) 351
c) 10
d) 160

Question 14
In which **locations** has a **decrease** in species richness occurred after logging?
a) Location 1 & 3
b) Location 2 & 4
c) Location 1
d) All locations

Question 15
Scientists calculate the probability of extinction for **species 5** over the next 2 years. They estimate the probability for the population found in **Location 1** to be 0.8 while the probability for the population found in **Location 4** to be 0.9.
Which of the following best gives the combined probability of extinction for populations at locations 1 and 4 in the next 2 years?
a) 0.72
b) 1.7
c) 0.1
d) 0.54

Question 16
Based on these findings scientists suggest **Species 5** should have its threatened status upgraded from ***Vulnerable*** to ***Critically Endangered*** under the *Victorian Flora and Fauna Guarantee Act 1998***.**
This means Scientists believe **species 5** are:
a) Facing no risk of extinction in the wild
b) Facing **extremely** high risk of extinction in the wild in the **immediate** future
c) Facing **very** high risk of extinction in the wild in the **near** future
d) Facing **very** high risk of extinction in the wild in the **medium-term** future

Question 17
Scientists now propose that these locations which have become fragmented by logging need to be connected by vegetation. Connecting these remnant patches with wildlife corridors will:
a) reduce the risk of extinction for all species
b) increase the genetic diversity of all species
c) reduce the risk of predation to species
d) All of the above

Question 18
Scientists fear that without action the genetic diversity within these species will decrease over time as they are small in numbers and isolated from other populations. As a consequence, scientists fear these populations could be at risk of:
a) Genetic drift
b) Inbreeding
c) Demographic variation
d) All of the above

Question 19
Which of the following is **not** considered an ecosystem service?
a) the culling of endemic species
b) the pollination of crops
c) the formation of soil
d) the nitrogen cycle

Question 20
The agreement that aims to halt the illegal trading, poaching and smuggling of endangered animals is known as:
a) Ramsar
b) JAMBA
c) CITES
d) IUCN

SECTION B—Short-answer questions

Specific instructions for Section B
Answer all questions in the spaces provided.

Name a **fossil** fuel energy source that you have studied this semester _____

Name a **non-fossil** fuel energy source that you have studied this semester _____

You should use these fuels for question 1a-d.

Question 1

a.) Identify and discuss whether your nominated **fossil** fuel is considered renewable or non-renewable by using the steps required to extract and use this fuel as an energy source in homes. In your response, illustrate at least two energy conversions.

_____
_____
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(4marks)

b.) Identify and discuss whether your nominated **non-fossil** fuel is considered renewable or non-renewable by using the steps required to extract and use this fuel as an energy source in homes. In your response, illustrate at least two energy conversions.

_____
_____
_____
_____
_____
_____
_____
_____

(4marks)

c.) For each of your chosen energy sources state and explain two advantages and two disadvantages in their use.

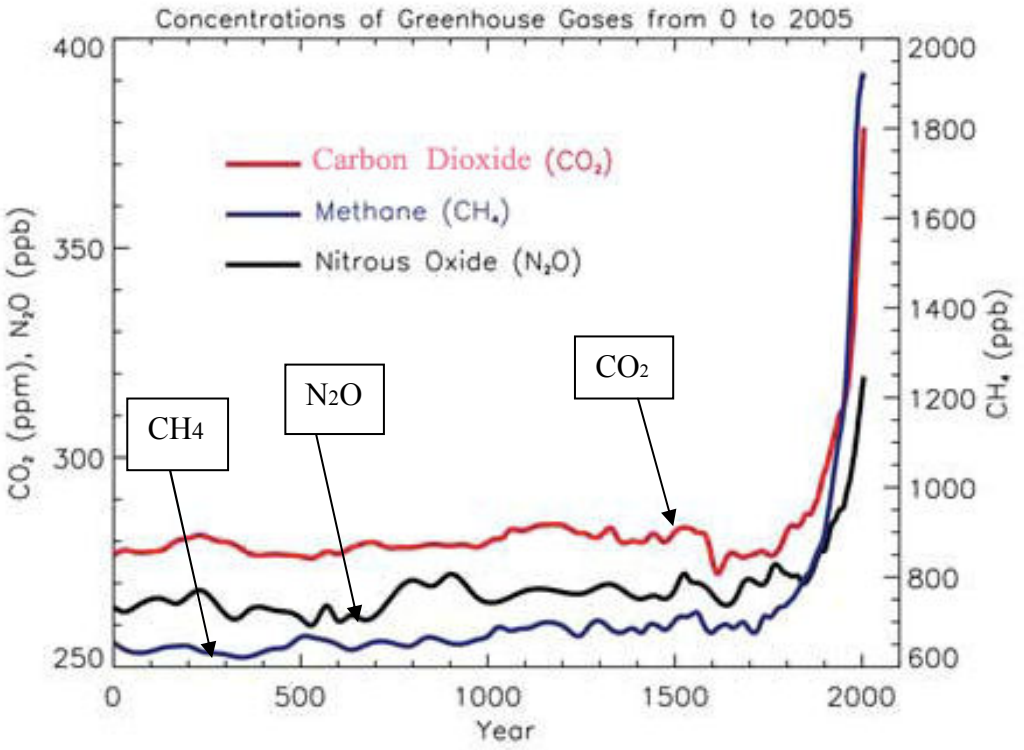
(4marks)

d.) You are working for a major energy provider in Victoria. The company is required to increase its "Green Energy" significantly or completely for residents of Melbourne by constructing a new electrical energy plant. You have been asked to recommend an implementation strategy for the company using your selected non-fossil fuel.
Justify your strategy by considering patterns of electrical demand in Melbourne, the best location of the power plant, and viability of your selected strategy in meeting all of the electrical power needs of Melbourne.

(5marks)

Use the graph below to answer questions 2a- e

ppb – parts per billion
ppm – parts per million



(New Zealand National Institute of Water and Atmospheric Research. 2010)

Question 2

a.) In which century did greenhouse gases begin to increase significantly?

_____

(1mark)

b.) What human –induced event(s) can be attributed to causing the dramatic increase in the production of methane and/or carbon dioxide?

_____

(1mark)

c.) Identify which of these gases has had the most significant increase. Using information from the graph justify your reasoning.

_____
_____
_____
_____

(2marks)

d.) Discuss the role these gases play in the (natural) greenhouse effect by describing the characteristics that enable them to be named greenhouse gases.

_____
_____
_____
_____

(2marks)

e.) Using your understanding of both the natural and enhanced greenhouse effect, explain how your selected fossil fuel energy source from Question1, has contributed to this phenomenon. In your response, discuss the main features that distinguish the natural and enhanced greenhouse effect.

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(5marks)

Question 3

Name one endangered species you have studied this year. _____

a.) State the conservation category for this species and give a definition of this classification.

_____

_____

_____

_____

(2marks)

b.) For your selected species chose one specific population and describe its geographic location, range and size. Comment on how important this population is for the survival of the species as a whole.

_____

_____

_____

_____

_____

_____

_____

_____

(4marks)

c.) Outline two main threats affecting the survival of this population.

_____

_____

_____

_____

(2marks)

d.) Describe two management strategies that have been suggested and/or implemented to reduce the threats facing your population. In your response, quote any scientific data that was used to develop these strategies and the important role scientific evidence has played in evaluating the effectiveness of your chosen strategies.

(5marks)

e.) Using the information from question **3d** predict the survival probability in the future for this particular population. Justify your prediction by referring to evidence of threats and quoting scientific data.

(3marks)

Use the following information to answer questions 4a-e

The Kangaroo Island Dunnart is a small marsupial that is on the IUCN's critically endangered list.

Kangaroo Island Dunnarts prefer to eat insects including spiders, ants, beetles, and scorpions. Males and females appear to eat the same foods. Most of the information on the feeding habits of the Kangaroo Island Dunnart have been observed through careful analysis of scats and from captured specimens. It competes for the same resources with other animals such as birds, small reptiles and other marsupials and faces predation from feral cats and dogs.

The home range of movement of the species is poorly known. Radio tracking of a few individuals has indicated that range lengths are in the order of 200-300 m. The dispersal patterns of juveniles from their natural range are also not known. The capture (and release) of Dunnarts over a period of 11 years at one site suggests that some areas provide core habitat, and Dunnarts continually occupy such areas for relatively long periods of time.

Figure 1 below provides locations of previous documented sightings and a historical reference back to 1974. The red "boxed" area is the most recent sites of collected data. Note the shaded areas along the south and east coasts of the island represent National or State Parks, under strict governmental regulation. Other land use is primary agricultural grazing with areas set aside for eco-tourism. There is no bridge to the South Australian mainland.

Management practices for this Dunnart have been in place since 1971, but population data has not been reliable since 2008. (Refer to the table below)

Figure 1: Historical data for sightings of the Kangaroo Island Dunnart

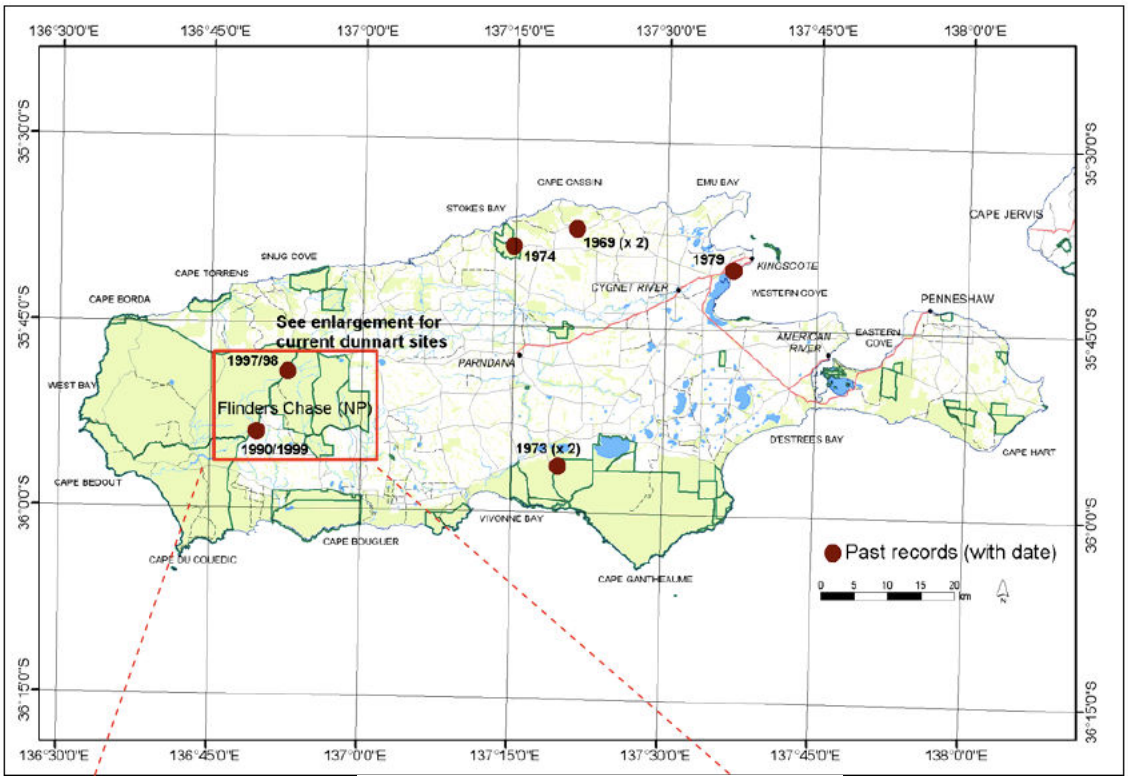

Figure 2: Location of Kangaroo Island, South Australia

Table 1: Population statistics of the Kangaroo Island Dunnart

Drop Pit Capture-Release Program (11,600 traps set for the years 2008-11)

Year	2008	2009	2010	2011
Number of individuals	29	32	35	34

Question 4

a.) From the information given, what do you think the long-term prospect for the survival of the Kangaroo Island Dunnart? Explain you reasoning.

_____

_____

_____

_____

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_____

(3marks)

b.) Describe TWO major threatening processes that have led to a reduction in population for the Kangaroo Island Dunnart. Explain the impact that these threats will have on the population inferred from the data above.

_____

_____

_____

_____

_____

_____

_____

(3marks)

c.) Outline TWO possible management strategies that are different from those you addressed in question **3d** that could support the survival of this Dunnart population.

_____

_____

_____

_____

(2marks)

d.) Compare the degree of threat and management issues of Kangaroo Island Dunnart with your chosen threatened species used in Question 3.

_____

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_____

_____

(4marks)

e.) From the data, evaluate the effectiveness of present management practices. In your response, discuss the reliability of the data provided.

_____

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_____

_____

(3 marks)

Use the following information to answer question 5a-e

Wilson Diversity Index is one of many tools that can be used to indicate the relative quality of ecosystems. The following calculation can be used to determine Wilsons Index:

$$\text{Wilsons Diversity Index} = \frac{\text{number of individual species}}{\text{total number of individuals}}$$

Students have been studying a particular part of a local creek. Site 1 is a location at point in a small wooded catchment prior to the creek passing through the township. Site 2 is at a location after the creek has passed through the township.

Species	Site 1	Site 2
Mayfly	6	0
Caddis fly	11	0
Freshwater snail	9	2
Water boatman	54	32
Mosquito fish	21	41
Gudgeon fish	15	2
Fresh water mussel	12	0
Blood worm	3	186
Freshwater shrimp	28	27
Daphnia	51	0
TOTAL		

Question 5

a.) Calculate the total **species abundance** found at each site and write the total in the table.

(1marks)

b.) Using the formula given above calculate **Wilson's Diversity Index** for each site. Show all calculations.

_____

_____

_____

_____

_____

(2marks)

c.) Identify which site has the greatest species diversity as indicated by Wilson's index. Justify your selection.

_____
_____
_____
_____
_____
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_____

(3marks)

d.) Some scientists argue that Wilson's Diversity index is not an accurate measure of species diversity. Outline two limitations of Wilson's index of species diversity.

_____
_____
_____
_____
_____

(2marks)

e.) Discuss what may be a contributing factor/s between the two sites that has brought about this change. Use the data to justify you answer.

_____
_____
_____
_____
_____
_____
_____

(3marks)

END OF EXAMINATION PAPER

ENVIRONMENTAL SCIENCE
Trial Written Examination June 2011
Section A answer sheet

Student:	Teacher:

Specific instructions for Section A

Instructions for Section A

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.
Choose the response that is **correct** or that **best answers** the question.
A correct answer scores 1, an incorrect answer scores 0.
Marks will **not** be deducted for incorrect answers.
No marks will be given if more than one answer is completed for any question.

	A	B	C	D
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