STUDENT NAME	

Victorian Certificate of Education 2009

ENVIRONMENTAL SCIENCE

Trial Written Examination 1
June 2009
Time allowed 1.5 hours [90 minutes]

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 18 pages.
- Answer sheet for multiple-choice questions.
- Writing materials.
- One approved scientific calculator

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 difficulty and content is different to the VCAA Unit 3 Examination. 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

Answer all questions.
All questions should be answered on the answer sheet for multiple-choice questions, in pencil. Choose the response that is **correct** or **best answers** the question, and shade the square on the multiple-choice answer sheet according to the instructions given on that sheet. A correct answer is worth 1 mark; an incorrect answer is worth no marks. No marks will be given if more than one answer is shown for any question. Marks will not be deducted for incorrect answers.

Question 1

The two primary contributors to the natural greenhouse effect are:

- **A.** water vapour and nitrous oxide
- **B.** water vapour and carbon dioxide
- **C.** carbon dioxide and methane
- **D.** chlorofluorocarbons and methane

Question 2

The energy efficiency of a photovoltaic cell is 7.5%. After 10 seconds, the amount of energy transferred into electrical energy was 20kJ. How much energy input was needed to achieve the 20kJ?

- **A.** 1.5 kJ
- **B.** 26.7kJ
- **C.** 266.67 kJ
- **D.** 15kJ

Question 3

Melbourne's electricity supply is mainly generated from:

- **A.** hydroelectricity
- **B.** renewables such as solar and biomass
- **C.** uranium
- **D.** coal

Question 4

The Australian Government's proposed national greenhouse gas emissions trading scheme:

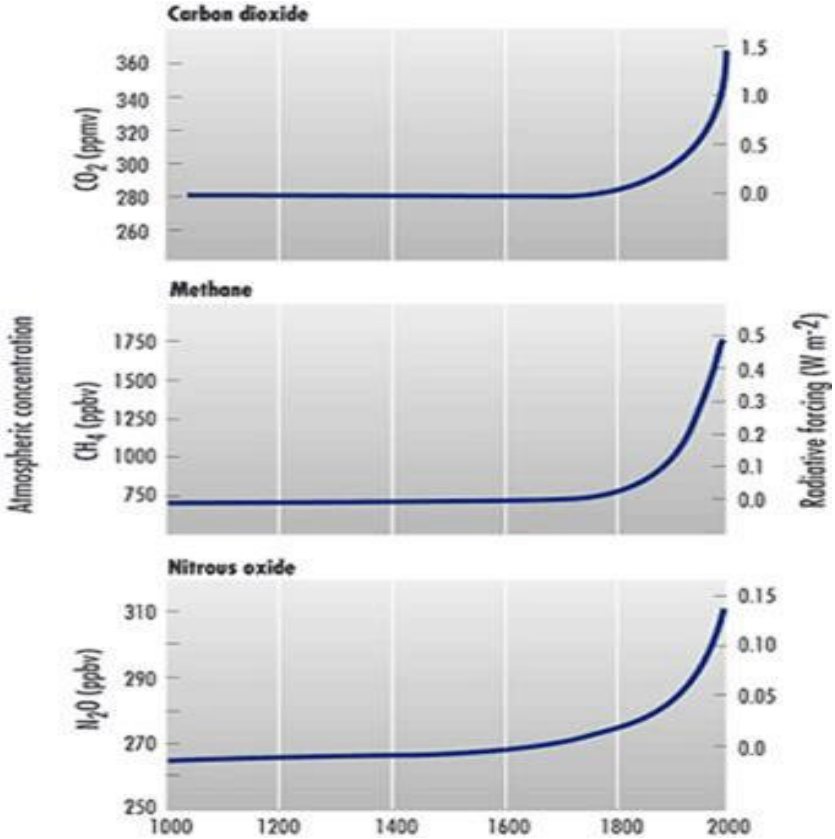
- **A.** involves companies buying and selling greenhouse gases
- **B.** was put in place in 2008 and aims to allow larger companies to sell carbon credits to smaller companies
- **C.** aims to place economic value on reducing greenhouse gases in order to reach emissions targets
- **D.** will allow Australia to export greenhouse gases to poorer countries

Question 5

Wind, hydroelectric and coal can all be used to generate electricity. The type of energy each utilizes to produce electricity is, respectively:

- **A.** kinetic, gravitational potential, chemical
- **B.** heat, chemical, chemical
- **C.** kinetic, kinetic, heat
- **D.** gravitational potential, kinetic, heat

The following information relates to Questions 6 to 8



Question 6

A typical sample of atmospheric gases is analysed. The component with the lowest concentration would be:

A. N_2O
B. N_2
C. CH_4
D. CO_2

Question 7

Carbon dioxide is the primary contributor to the enhanced greenhouse effect because:

A. each carbon dioxide molecule has a higher potency than any other greenhouse gas molecule
B. the abundance of carbon dioxide is lower than methane
C. the atmospheric concentration of carbon dioxide is higher and is increasing at a greater rate than other greenhouse gases
D. agricultural processes mainly emit carbon dioxide

Question 8

The average yearly rate of increase in atmospheric concentration of methane between 1800 and 2000 is:

A. 200 ppbv per year
B. 5 ppbv per year
C. 1000 ppbv
D. 200,000 ppbv per year

Question 9

The earth's outgoing infra-red radiation undergoes:

- **A.** dissipation from the thermosphere
- **B.** absorption by nitrogen gas in the troposphere
- **C.** re-radiation from oxygen molecules in the stratosphere
- **D.** radiation from the earth's surface

Use the following information to answer questions 10 to 12:
Biopetrol contains 5% ethanol (a combustible alcohol derived from sugarcane). The Federal Government subsidises the sale of biopetrol allowing it to cost less per litre than conventional unleaded petrol.

Question 10

The most likely reason that biopetrol is subsidised by the Government is because:

- **A.** biopetrol does not emit greenhouse gases when combusted
- **B.** biopetrol has non-fossil ingredients, whereas conventional petrol does not
- **C.** biopetrol represents a sustainable fuel source
- **D.** biopetrol emits less nitrous oxide when combusted

Question 11

A small car has a 50L fuel tank, what volume of ethanol would be present in a full tank of biopetrol?

- **A.** 8.33L
- **B.** 833.33L
- **C.** 300L
- **D.** 3L

Question 12

The release of energy from biopetrol:

- **A.** is an endothermic reaction
- **B.** involves the conversion of heat energy to chemical potential energy
- **C.** can be made more energy efficient if more energy conversions are used
- **D.** is an exothermic reaction

Question 13

In the Great Barrier Reef, sea anemones provide clownfish with protection from predators (which cannot tolerate the stings of the anemone's tentacles) and the clownfish defend the anemones against butterflyfish which eat anemones.

If sea anemones were to suffer a decrease in population numbers, the number of clownfish would:

- **A.** increase, because the species are competitors
- **B.** decrease, because the species are displaying mutualism
- **C.** remain steady, because commensalism is occurring
- **D.** increase, because symbiosis is occurring

Question 14

When two populations interbreed they:

- **A.** have a high risk of genetic disease
- **B.** may experience genetic swamping
- **C.** mate with individuals of a different species
- **D.** always experience increased genetic diversity

Question 15

The main purpose of the Vic. Flora and Fauna Guarantee Act 1988 is to:

- **A.** develop an action plan and legislation for the management of listed wetland birds
- **B.** provide an ecosystem service by protecting imported species from genetic drift
- **C.** develop an action plan and legislation for the management of listed Victorian plants and animals
- **D.** prosecute individuals who hunt in protected (national park) habitats

Question 16

A small population of Tasmanian Devils is most likely to:

- **A.** suffer inbreeding depression, which involves increased risk of genetic disease
- **B.** be affected by inbreeding depression, which causes mutations and therefore increased genetic variation in a population
- **C.** experience resistance to adverse changes such as disease
- **D.** experience genetic drift, which results in increased genetic variation in the population.

Question 17

A species management strategy that will most likely result in increased genetic diversity is:

- **A.** taking individuals from a population to start a captive breeding program
- **B.** overexploitation of prey species
- **C.** introduction of an exotic competitor
- **D.** connecting remnant habitat to allow individuals to move into different areas to reproduce

Question 18

An advantage of using *relative abundance* or *species eveness* to quantify species diversity is:

- **A.** it takes into account species composition
- **B.** it gives higher value to communities with relatively high numbers of each species present
- **C.** it takes into account species density
- **D.** it allows a measure of both species and genetic diversity for flora and fauna present

Use the following information to answer questions 19 and 20
The Ramsar convention protects wetland habitats and therefore protects all species that rely on these habitats whether they are listed as threatened or as data deficient. Such species include birds that migrate to other countries seasonally. At present, the convention has around 150 signatories, and hopes to attract more.

Question 19

An advantage of the Ramsar convention at present is that:

- **A.** it makes use of the precautionary principle
- **B.** it protects many different types of ecosystems
- **C.** it protects every species on the IUCN red list
- **D.** it protects exotic species

Question 20

A disadvantage of the Ramsar convention at present is that:

- **A.** it makes use of the precautionary principle
- **B.** because it only protects one type of habitat it does not contribute to maintaining ecosystem diversity
- **C.** it does not protect all wetland migratory species throughout the year
- **D.** it allows culling of exotic species

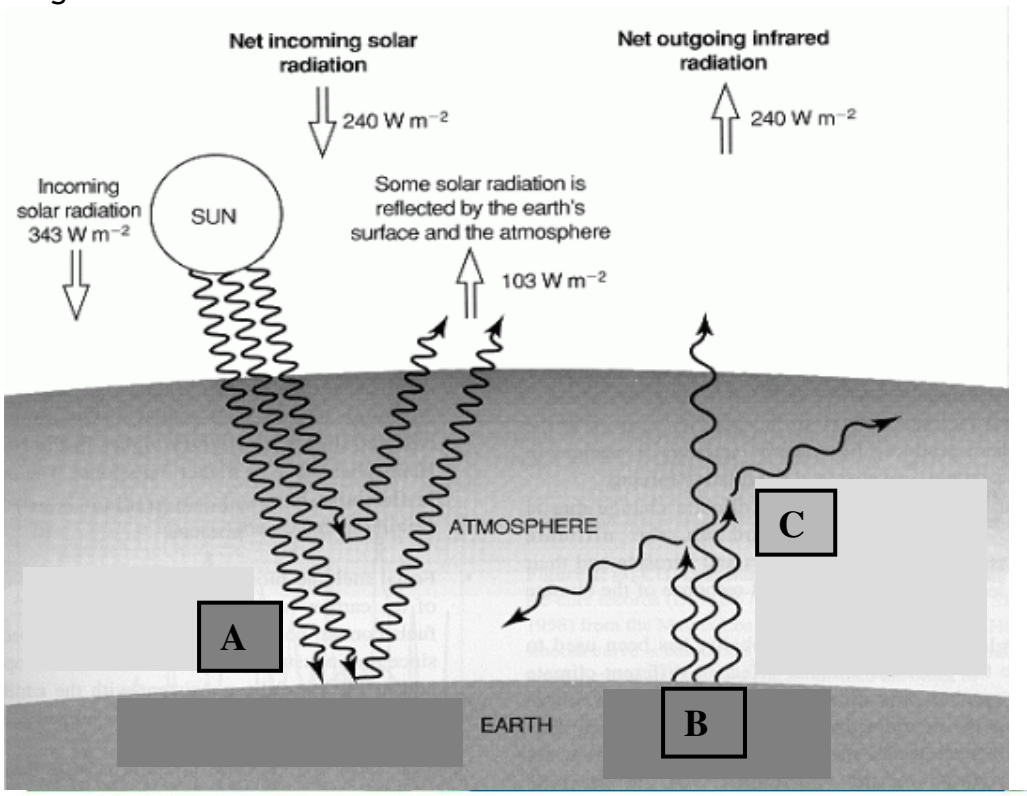
SECTION B – Short answer questions

Specific instructions for Section B

Answer all questions in the spaces provided.

Question 1

Diagram 1:



Sources: Okanagan university college in Canada, Department of geography, University of Oxford, school of geography; United States Environmental Protection Agency (EPA), Washington; Climate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge university press, 1996.

a. Name the overall process represented in diagram 1.

_____

1 mark

b. A probe detects 700 W of incoming solar radiation reaching the earth's atmosphere over a certain area. What amount of this radiation would be directly reflected by the earth's surface and atmosphere? Show your working.

2 marks

c. Outline the processes occurring at “A” and “B”.

3 marks

d. Name and describe the contribution of two substances to the process shown at “C”.

2 marks

e. Describe one negative **consequence** for humans if an increase in the process occurring at “C” was to occur:

2 marks

Total 10 marks

Question 2

An island off the coast of Victoria has recently been chosen as the base location for a large group of scientists who are studying the behavior of marine animals. The scientists and their families will move from Melbourne and will spend the next 4 years on the island.
A mainland town with an electric power supply provided by a nearby coal burning power station is around thirty kilometers from the island. During weekdays, half of the community will travel to this town via a small ferry in order to attend school and work. On its return trip in the afternoon this ferry will bring food supplies to the general store on the island but has capacity for other necessities as well.
In terms of climate, the island is exposed to strong ocean wind currents that blow most of the time. The terrain is very flat and dry. During summer the island experiences hot cloudless days and in winter the weather is mostly overcast.
Organisers are adamant that the marine behavior project reach completion and that data and observations are gathered daily. As such it is important that this small community is able to maintain a similar lifestyle to that which they enjoyed in Melbourne.

Name a fossil fuel source that you have studied this year _____

Name a non-fossil fuel source that you have studied this year _____

a. Explain whether the nominated **non-fossil** fuel source is renewable.

_____

_____

_____

2 marks

b. Describe two disadvantages of the nominated **non-fossil** fuel source for use in Melbourne.

_____

_____

_____

2 marks

c. Outline how the nominated **fossil** energy source generates electricity.

_____

_____

_____

2 marks

d. Outline how the nominated **non-fossil** energy source generates electricity.

2 marks

e. Give your recommendation to the research organisers as to how to provide sufficient energy to the island community. Your answer should refer to at least one of the nominated energy sources and should include economic considerations, environmental impacts and should address the particular needs of the community.

5 marks
Total 13 marks

Question 3
Name one local threatened animal species you have studied.

a. Briefly describe the habitat of this species.

2 marks

b. Define the term 'endemic' and comment on whether this term applies to the nominated species.

2 marks

State the IUCN conservation category assigned to this species.

c. Justify this conservation category with reference to population numbers and main threats to the species.

3 marks

d. Describe 2 realistic recommendations for the management of this species. Explain how each strategy combats the main threats outlined in c. above.

1.

2.

4 marks

e. Explain how one of the above management options could be monitored and evaluated.

3 marks

Total 14 marks

Question 4

The Siberian tiger is a threatened species that once ranged throughout Eastern Russia. Today, after many localised extinctions, it is endemic to far Eastern Siberia, where it is now protected. The International Union for the Conservation of Nature has determined the Siberian tiger to be at high risk of extinction in the near future.

Siberian Tigers (*Panthera tigris altaica*) in Amersfoort Zoo (Netherlands); picture taken by Wilma Verburg 10/9/2005
The mother, 3-year old Kira, and one of her children, born June 27, 2005

The wild population in the Far East is mostly confined to low mountains, having been displaced by humans from lower areas. Its most common habitats are mountain river valleys and pads overgrown with pine and oak, as well as among mountains with deciduous shrubs or in oak or nut-tree groves. Within its present range, the diet of the tiger consists of wild game such as deer and boar. In similar habitat where it has suffered localised extinction, the tiger would often feed on livestock and domestic animals.

Genetic studies have revealed low variability in the wild Far Eastern population. On the other hand, captive cats appear to show higher genetic diversity. This may suggest that the wild population has experienced a very recent loss of population numbers caused by human pressure, with the founders of the captive population being captured when genetic variability was higher in the wild.

a. Use the information above to determine the IUCN conservation category allocated to the Siberian tiger.

1 mark

b. Explain, using examples from the stem, how all three levels of biodiversity are important for the survival of the Siberian tiger.

1.

2.

3.

6 marks

c. State two likely threats to the survival of the tiger that result from ‘human pressures’.

2 marks

d. Suggest **one** advantage and **one** disadvantage of each of the following management strategies for the tiger.

i. Captive breeding in a zoo or sanctuary

2 marks

ii. Captive breeding and Reintroduction into the wild

2 marks

iii. Translocation

2 marks

e. Outline two important functions of CITES in the protection of the Siberian tiger. I think that the stem information of this question should state that the Siberian tiger has been listed with CITES. And then ask for the expansion of the abbreviation 'CITES'. The second part of the question (2nd mark) could ask for a suggestion as to why the Siberian Tiger might need protection under this international convention?

2 marks

Table 1 below gives an estimation of the number of Siberian tigers in captivity since the worldwide program began in 1982:

Year	1982	1989	1994	1999	2004	2009
No. animals in captivity	83	92	116	131	146	160

f. Evaluate the success of the international captive breeding program by stating its primary aim and determining the percentage change represented in table 1.

3 marks

Total 20 marks

Question 5

Shane is an ecologist studying the Great Barrier Reef in Northern Queensland. He wishes to determine whether coral bleaching has reduced species diversity in a 1000m^2 site within the reef between 1995, 2000 and 2005.

He identifies a random sample of ten species from the area, two of which are the large green sea turtle and the leatherback turtle which are both indentified as endangered by the IUCN.

In order to compare the species diversity over the years, he wishes to design a simple index that incorporates both relative abundance and species richness.

Shane's index is defined as: S = (1- highest value of p) x species richness

Where p = No. individuals in species / Total number individuals

a. Calculate Shane's index for the site in 2000 and 2005 (1995 has been calculated for you):

	1995		**2000**		**2005**	
SPECIES	**Abundance**	**P = no/total**	**Abundance**	**p = no/total**	**Abundance**	**p = no/total**
Dugong	1	0.0031	0		1	
Yellow-faced angle fish	5	0.0153	4		1	
Trevally	20	0.0612	42		28	
Large Green Sea Turtle	1	0.0031	1		2	
Goby	230	0.7033	215		273	
Humpback Whale	1	0.0031	0		1	
Sea urchin	41	0.1254	20		0	
Leatherback Turtle	3	0.0092	2		3	
Manta Ray	24	0.0734	16		14	
Tiger shark	1	0.0031	0		0	
	TOTAL = 327	HIGHEST P = 0.7033	TOTAL =	HIGHEST P =	TOTAL =	HIGHEST P =
	RICHNESS = 10	S=(1-0.7033) x 10 = 2.966	RICHNESS =	S =	RICHNESS =	S =

4 marks

b. Explain whether a high or low value of S indicates greater species diversity:

2 marks

c. Explain why both relative abundance and species richness are important in determining the species diversity of a habitat. Refer to the data in table 2 in your answer.

3 marks

d. Evaluate whether the Barrier Reef area has declined in biodiversity quality between 1995 and 2005. Your answer should refer to relative abundance, species richness and endangered status.

4 marks

Total 13 marks

- **END OF EXAM –**

ENVIRONMENTAL SCIENCE
Trial Written Examination June 2009
Section A answer sheet

Student:	Teacher:

Specific instructions for Section A

- Answer all questions
- All questions should be answered on the answer sheet for multiple-choice questions, in Pencil.
- Choose the response that is **correct** or **best answers** the question, and shade the square on the multiple choice answer sheet below.
- A correct answer is worth 1 mark, an incorrect answer is worth no marks.
- No marks will be given if more than one answer is shown for any question.
- Marks will not be deducted for incorrect answers

1	**A**	**B**	**C**	**D**
2	**A**	**B**	**C**	**D**
3	**A**	**B**	**C**	**D**
4	**A**	**B**	**C**	**D**
5	**A**	**B**	**C**	**D**
6	**A**	**B**	**C**	**D**
7	**A**	**B**	**C**	**D**
8	**A**	**B**	**C**	**D**
9	**A**	**B**	**C**	**D**
10	**A**	**B**	**C**	**D**

11	**A**	**B**	**C**	**D**
12	**A**	**B**	**C**	**D**
13	**A**	**B**	**C**	**D**
14	**A**	**B**	**C**	**D**
15	**A**	**B**	**C**	**D**
16	**A**	**B**	**C**	**D**
17	**A**	**B**	**C**	**D**
18	**A**	**B**	**C**	**D**
19	**A**	**B**	**C**	**D**
20	**A**	**B**	**C**	**D**