

STUDENT NAME:



**Victorian Certificate of Education
2012**

ENVIRONMENTAL SCIENCE

**Trial Written Examination 1
May 2012**

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	6	6	70
			Total: 90

Materials

- Question and answer book of 14 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.

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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 non-renewable and a non-fossil fuel

- A. coal
- B. natural gas
- C. uranium**
- D. wind

Question 2

The enhanced greenhouse effect is caused mainly by

- A. trapping by the atmosphere of ultra-violet radiation re-emitted by the earth's surface
- B. direct trapping of visible light and ultra-violet radiation by the ozone layer
- C. increase in greenhouse gases due to human activity**
- D. trapping by the atmosphere of infra-red radiation re-emitted by the earth's surface

Question 3

Hydroelectric power generation is an example of

- A. an exothermic reaction
- B. gravitational potential energy being converted to kinetic energy being converted to electrical energy**
- C. kinetic energy being converted to potential energy being converted to electrical energy
- D. an endothermic reaction

Question 4

The best example of a carbon sink is

- A. the atmosphere which stores large amounts of Carbon dioxide
- B. the ocean which converts large amounts of Carbon dioxide into carbonic acid
- C. the ozone layer which traps Carbon dioxide beneath it
- D. a newly planted forest**

Question 5

Biodiversity can best be explained as

- A. the diversity of life at all levels of organization including genes, species, and ecosystems**
- B. the variety of plants and animals of the world
- C. the entire earth including the oceans and the surrounding atmosphere
- D. all the species of the world both known and unknown

The following information relates to Question 6

Chart I shows the major gases contributing to the greenhouse effect. Chart II shows the major sources of methane entering the atmosphere.

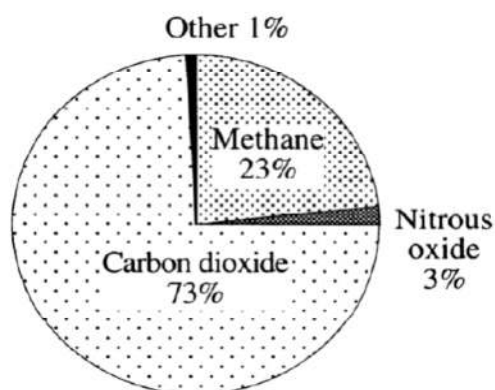


CHART I— MAJOR GREENHOUSE GASES IN ATMOSPHERE

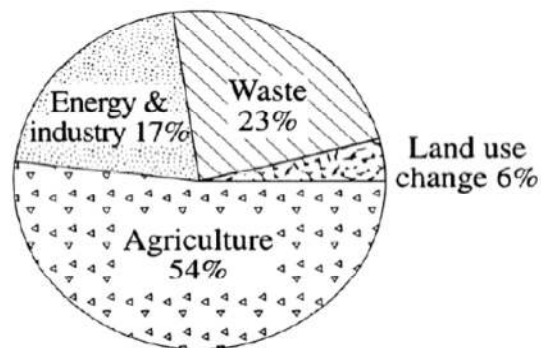


CHART II— SOURCES OF METHANE

Question 6

Based on the information above it would be reasonable to conclude:

- A. agriculture contributes more to the Enhanced Greenhouse Effect than energy and industry
- B. methane is the fastest growing area of greenhouse gas production
- C. that most methane is produced from agriculture
- D. that Energy and Industry is not a producer of methane gases

The following information relates to Question 7

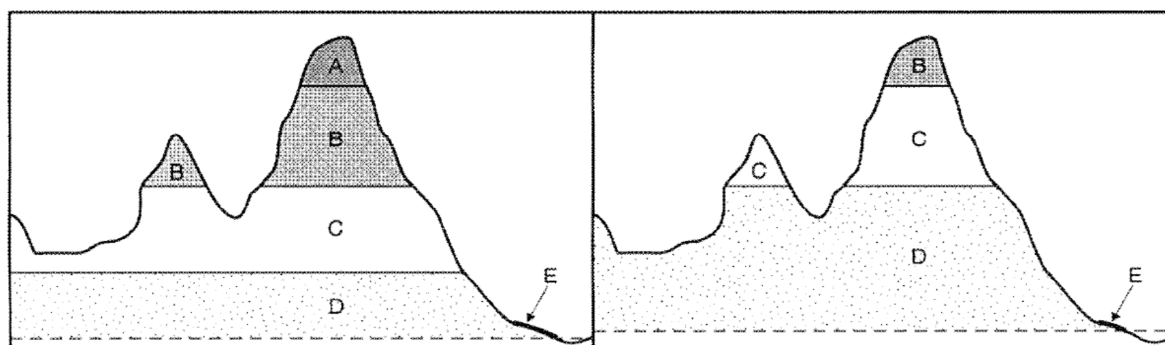


Figure 1 Present climate

Figure 2 3°C temperature rise, 1 m rise in sea level

Figure 1 and 2 demonstrate the profile of a coastal land mass. The dashed line at the bottom of each figure represents sea level at low tide. The areas labelled A, B, C, D and E represent the presence of different but typical organisms and their habitats. Figure 1 shows the current situation. Figure 2 shows what is expected to happen if the mean global temperature rises by 3°C and causes a 1 metre rise in sea level.

Question 7

What is most likely to happen to the species in area A if the temperature rises by 3°C?

- A. they will adapt to the new conditions and allow species of Area B to move up
- B. most will fail to adapt to the changing conditions and become locally extinct**
- C. they will find a new mountain with similar conditions to live on
- D. the warming temperatures will allow them to move down the mountain and disperse into new areas

The following information relates to Questions 8 & 9

A marine biologist assessed the impact of a sewerage outfall by monitoring a shellfish population that inhabits the nearby shore. She sampled five areas, each of one square metre, before and after the outfall was in use. Her data is shown in the table below.

Site	number of shellfish per m ² before the outfall was in use	number of shellfish per m ² after the outfall was in use
A	12	5
B	18	10
C	2	15
D	8	3
E	10	8

Question 8

The mean number of shellfish (per m²) found in this area before and after the outfall was in use:

- A. before: 50 & after: 31
- B. before: 10 & after: 8.2**
- C. before: 5.67 & after: 8.45
- D. before: 5 & after: 5

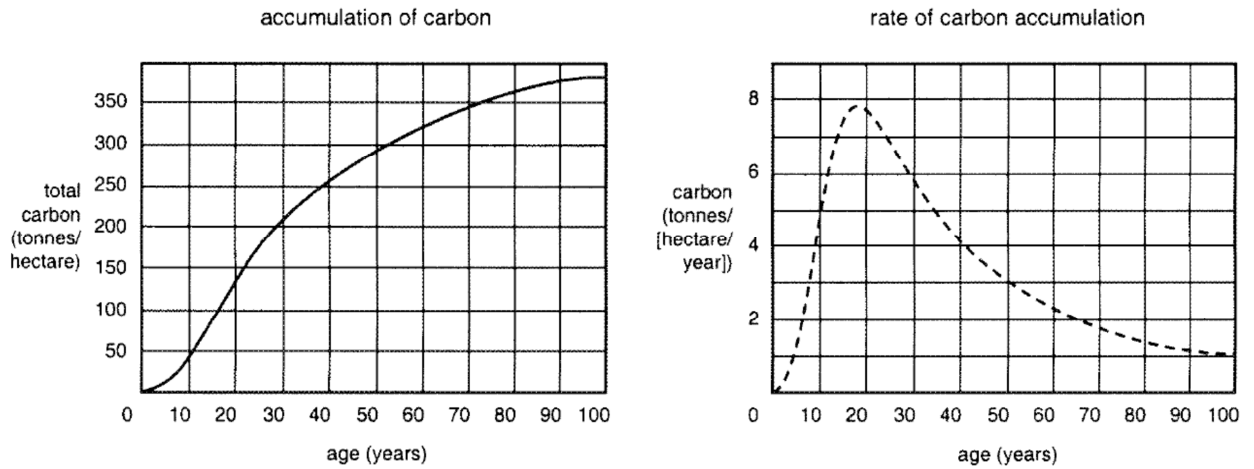
Question 9

The biologist concluded that the outfall had a significant impact on the shellfish population.

- A. this is reasonable because overall numbers have gone down
- B. this is reasonable because the average before and after has decreased
- C. this is not reasonable as one site has increased and sampling was only conducted once**
- D. this is not reasonable as shellfish are difficult to collect

The following information relates to Questions 10 & 11

The graphs below illustrate the variation in carbon storage by a plantation over a period of 100 years.



Question 10

The period of most rapid accumulation of Carbon into the trees occurs at the age of

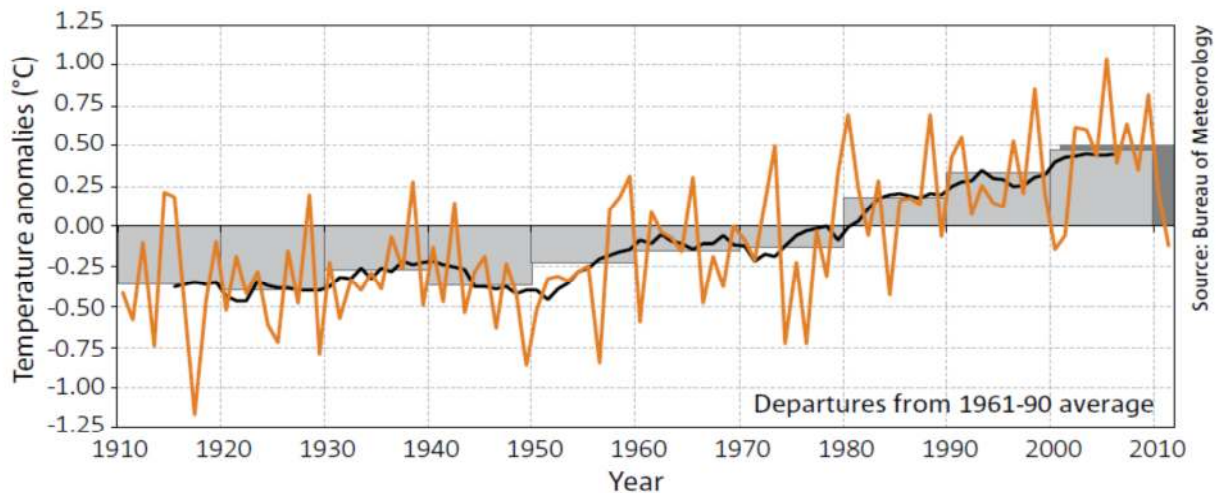
- A. 90 -100 years
- B. 0 - 10 years**
- C. 15 – 25 years
- D. 55 – 65 years

Question 11

The percentage increase of carbon deposited into the plantation between 30 and 70 years of age is:

- A. approximately 75%
- B. approximately 13.75%
- C. approximately 43%**
- D. approximately 5%

The following information relates to Question 12



Source: Bureau of Meteorology

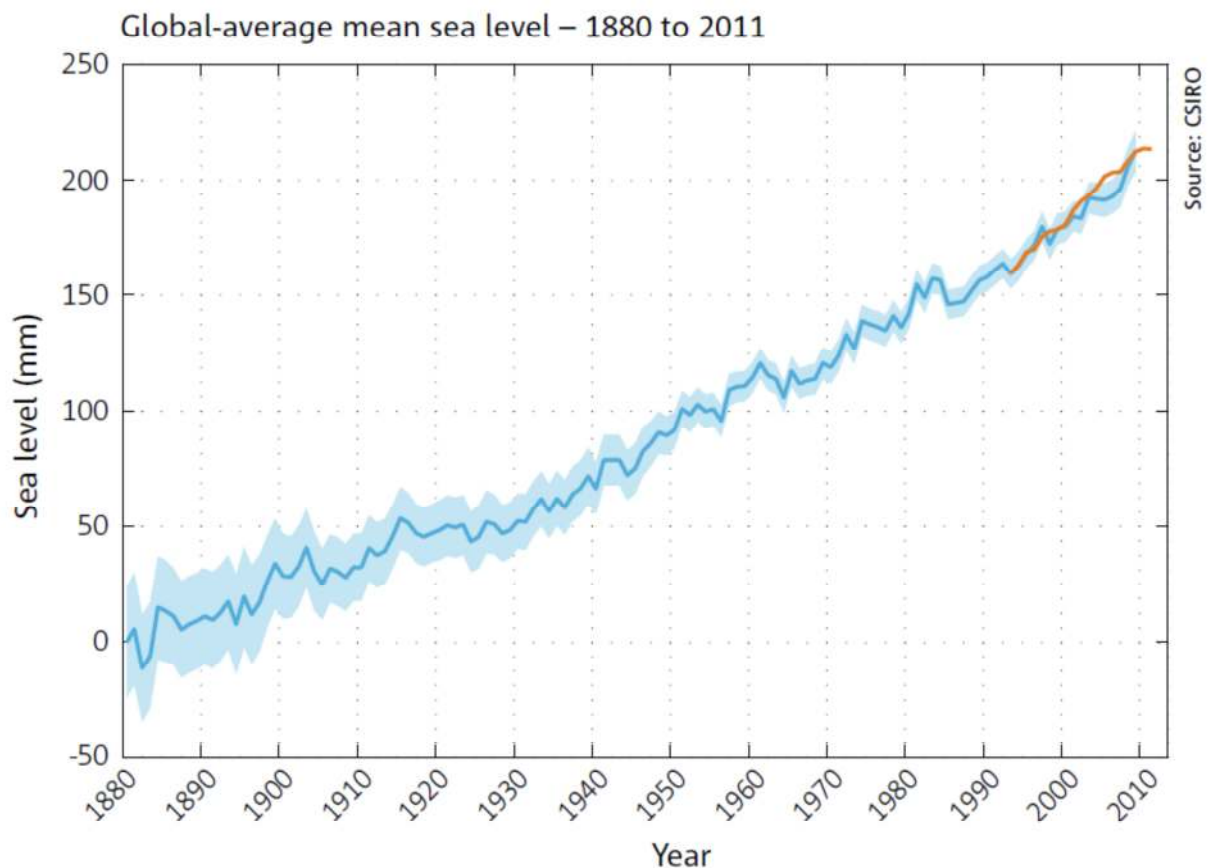
Figure 1 represents changes in average temperature for Australia for each year (orange line) and each decade (grey boxes), and average trend (black line – an 11-year period is the standard used by the Intergovernmental Panel on Climate Change). The average value for the most recent 10-year period (2002–2011) is shown in darker grey.

Question 12

The most likely reason for the change in Australia’s average temperature over the last 100 years is:

- A. increases in greenhouse gas concentrations in the lower atmosphere
- B. increase in UV radiation reaching the Earth’s surface due to a thinning of the Ozone layer
- C. increase in small particles in the upper atmosphere blocking visible light from reaching the Earth’s surface
- D. variations caused by El Nino and La Nina events

The following information relates to Question 13



High-quality global sea-level measurements have been available from satellite altimetry since the start of 1993 (red line), in addition to the longer-term records from tide gauges (blue line, with shading providing an indication of the accuracy of the estimate). Sea level rose at a global-averaged rate of about 3 mm per year between 1993 and 2011, and 1.7 mm per year during the 20th century as a whole.

Question 13

The effect demonstrated in the graph is most likely due to:

- A. melting of sea ice
- B. melting of land ice
- C. underwater volcanic activity
- D. thermal expansion of water**

Question 14

Which of the following is an example of a non-natural greenhouse gas

- A. Methane (CH₄)
- B. Carbon Dioxide (CO₂)
- C. Chlorofluorocarbons (CFC's)**
- D. Nitrogen (N₂)

Question 15

Zeegowhats are often caught as by-catch in the fishing industry. Population studies have shown no observable effect on the population size due to by-catch however the fishing industry undertook an extensive education program to help prevent Zeegowhat by-catch. This is an example of:

- A. improving sustainability of the species
- B. managing the genetic diversity of the species
- C. applying the precautionary principle**
- D. an environmental impact assessment

Question 16

Genetic drift is most likely to occur in:

- A. small isolated populations**
- B. small populations with gene flow
- C. large isolated populations
- D. populations on tropical islands

Question 17

Inbreeding

- A. can decrease genetic diversity in a population**
- B. is always harmful to individuals in a population
- C. is necessary for natural selection
- D. can increase genetic diversity in a population

Question 18

Species richness is a measure of:

- A. the complexity of ecosystems in an area
- B. the variation in genetic, species and ecosystem diversity
- C. the number of different species in an area**
- D. the number of different species and their relative abundance

The following information relates to Questions 19 & 20

The Baw Baw Frog, *Philoria frosti*, has its entire distribution restricted to the Mount Baw Baw Plateau located approximately 120km east of Melbourne. In 1995 estimated adult male populations on the mountain were in excess of 10,000 plus. Since then a massive decline in population has occurred so that less than 1% of the original population remains. The species is now listed as critically endangered.

Question 19

The Baw Baw Frog has its entire distribution restricted to the Mount Baw Baw Plateau and hence it is best described as:

- A.** *frog species which is endemic to the Baw Baw plateau*
- B.** frog species found on the Baw Baw plateau
- C.** native Australian species of frog found on Mt Baw Baw
- D.** a frog species adapted to alpine environments

Question 20

Which best describes the risk of the Baw Baw Frog becoming extinct:

- A.** high risk of extinction in the near future
- B.** high risk of extinction in the medium term future
- C.** *high risk of extinction in the immediate future*
- D.** high risk of extinction in the long term

END OF MULTIPLE CHOICE SECTION A

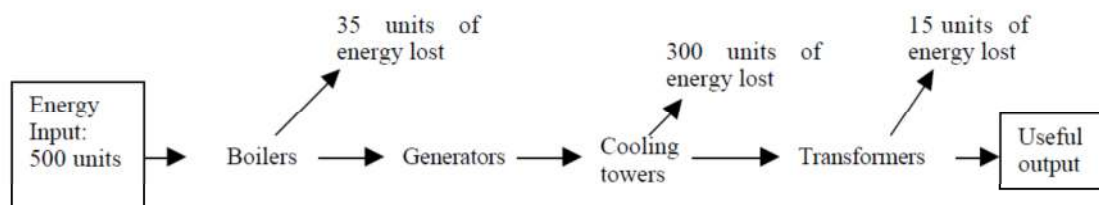
SECTION B – Short-answer questions

Specific instructions for Section B

Answer all questions in the spaces provided.

Question 1

This diagram shows the efficiency in electrical production at a coal-fired generation plant.



- a) In what form is most of the energy in these transformations?

Thermal energy/ heat energy

(1mark)

- b) If all the energy lost during transformations was collected along with the useful output, how much energy would be collected?

500 units

(1mark)

- c) What is the overall energy efficiency of this process?

Original energy 500 units useful/total x100 = %EE

Energy lost 350 units 150/500 x100 = 30% EE

500-350 = 150 useful energy

The overall energy efficiency of this process was 30%.

(2marks)

- d) None of these processes are 100% efficient in terms of the energy conversion involved. Using the laws of energy, explain why this is to be expected.

Law of conservation of energy states that energy is not lost or gained during transformations however the 2nd law of thermodynamics also states that when transforming energy from one form to another some of the energy will be degraded into a less useful form – in this case heat energy. (1mark)

So while all the energy entering this system can be accounted for at the end of the process, it is not all in a form that can be used. In fact 70% of the incoming energy is lost as degraded heat energy. (1mark)

(2marks)

Total: 6marks

Question 2

Nominate a fossil fuel energy source and a non-fossil fuel energy source you have studied this year:

• Nominated fossil fuel energy source is: _____

• Nominated **non-fossil** fuel energy source is: _____

You should use your nominated energy sources for questions 2a-c.

- a) For each of these energy sources identify a specific geographic location where you would find this energy source and briefly discuss the ability for this energy source to meet the energy needs of the community.

i. selected fossil fuel energy source

1 mark for identifying location

1 mark for identifying energy source ability to meet the energy needs of town

1 mark discussing why it can/not meet the needs of the town

Eg Coal can largely be found in the La Trobe Valley located approximately 1.5 hours South East of Melbourne in Gippsland, Victoria (1 mark). Coal can meet both the base and peak loads energy needs of the community (1 mark) as it is readily available and can be used at all times (1 mark).

(3marks)

i. selected non-fossil fuel energy source

1 mark for identifying location

1 mark for identifying energy source ability to meet the energy needs of town

1 mark discussing why it can/not meet the needs of the town

(3marks)

- a) Given the problems of using fossil fuels such as issues of greenhouse gas production and sustainability, explain why the selected fossil fuel is still used? (hint: include two examples/evidence to support your response)

1 mark for each plausible reason to a maximum for 2 marks.

1 mark for the use of data/justification within the answer

(3marks)

Total: 9marks

Question 3

- a) Describe the key difference between the natural and the enhanced greenhouse effect.

1 mark for the natural GHE acknowledged being non-anthropogenic and good for life on the planet

1 mark for the enhanced GHE being due to anthropogenic causes and deleterious for life on the planet

(2marks)

- b) Name one greenhouse gas associated with the natural greenhouse effect.

1 mark for any of the following: carbon dioxide, methane, nitrous oxide, ozone, water vapour

(1mark)

- c) Name one greenhouse gas associated with the enhanced greenhouse effect.

1 mark for any of the following: CFC, perfluorocarbons

(1mark)

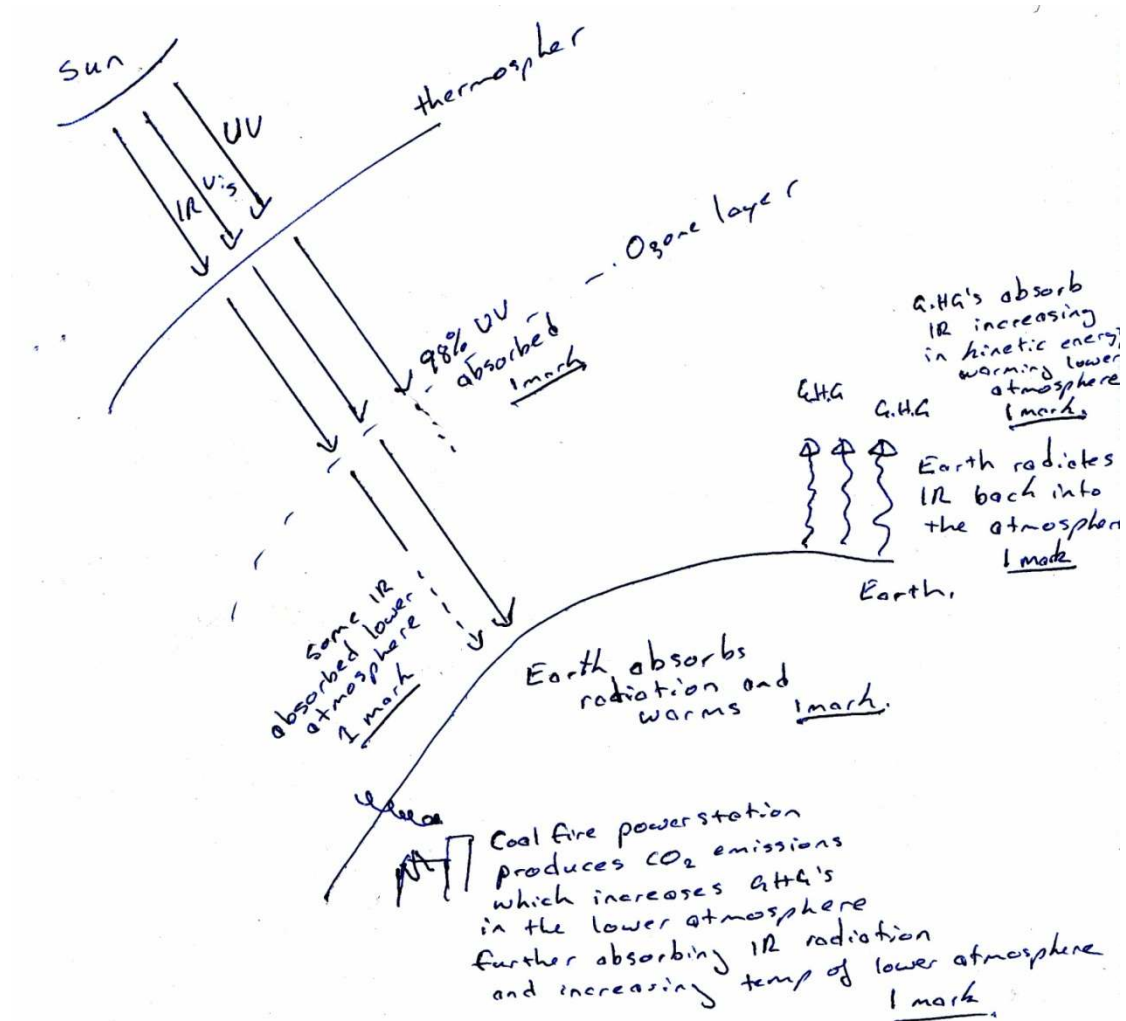
- d) Use the following table to describe an advantage and a disadvantage of a fossil fuel energy source and a non-fossil fuel energy source **(as used in question 2)**, if applicable, as it relates to the **Enhanced Greenhouse Effect**.

Fossil Name:	Non-fossil Name:
Advantage of the use of this energy source	Advantage of the use of this energy source
Disadvantage of the use of this energy source	Disadvantage of the use of this energy source

4 marks

e) Illustrate, using a labelled diagram, the mechanism of the natural greenhouse effect **and** how one of your energy sources contributes to the enhanced greenhouse effect. Your diagram should include:

- the types of incoming solar radiation UV, Visible and IR
- the types of radiation re-emitted from the surface of the earth
- radiation absorbed in the atmosphere
- the specific area (in your diagram) and mechanism of enhancement of your energy source



6 Marks

Total: 14 marks

Question 4

Name one endangered (threatened) animal species you have studied this year.

- a) Describe the ecological niche of the species including its habitat and the location and size of a known population of the species.

1 mark for specific location of a population

1 mark for an approximate size of a population

1 mark for some description of the niche (only award this mark if the student provides specific detail in the answer – avoid rewarding answers that refer to general references such as forest dwelling.)

(3marks)

- b) Scientists often assess the degree of threat to a species in terms of conservation categories. In what threat conservation category is your nominated species and which agency or act of law has placed it in this category? Explain the meaning of this category, and why/ why not, you would place the species there.

1 mark for nominating a conservation category (NB threatened is not a conservation category)

1 mark for nominating an appropriate agency (NB The Fauna and Flora Guarantee Act does not include conservation categories. Appropriate answers might include:

Advisory list of threatened vertebrates – Victorian Government

EPBC ACT – Federal Government

Red List – IUCN

1 mark for correctly providing details on the category

1 mark for any logical justification provided

(4marks)

- c) Outline two main threats to this species.

1 mark for each threat identified (eg introduced predators, habitat loss etc)

(2marks)

- d) Outline the conservation management strategy that have been used to help ensure the survival of the population nominated in question 4a) and evaluate the effectiveness of these measures.

1 mark for the use of data within the answer

Max 3 marks for the detailed explanation of conservation measures undertaken (must be specifically for this population)

1 mark for an explicit evaluation

1 mark for some elaboration on this evaluation that provides evidence to support opinion

(6marks)

Total: 15 marks

Question 5

An ecologist measured the number of individuals of 4 tree species in two forest stands. He then calculated a number of diversity measurements and summarized his findings in the following table. (**Note:** species evenness is a measure of the relative abundance of each species present, and is a component of both the Simpson's and Shannon-Weiner Diversity indices).

Simpson's Index - 0 represents no diversity and 1, greatest diversity

Tree species	Numbers of trees	
	Stand A	Stand B
1	43	62
2	32	13
3	25	13
4		12
Diversity Measures		
Species richness	3	4
Species evenness	0.977	0.781
Simpson's Index	0.65	0.567

- a) Discuss the difference between species richness and species diversity

Species Richness and Species diversity both take into account the number of different species present in an area – 1 mark.

Species diversity also takes into account the abundance of individuals within each species – 1 mark

(2marks)

- b) Explain what a diversity index measures and compare the interpretation of values given for Simpson's Index and the Shannon-Weiner index for stands A & B. (You do not need to write the formulas of the indices).

2marks – A diversity index is a mathematical method for determining the diversity of a given area based on an assessment of both species richness and the abundance of individuals within a species

1mark – SI indicates that Stand B has a lower biological diversity than Stand A

(3marks)

- c) Trust for Nature is a non-government conservation organization that purchases land to protect biodiversity. They are interested in purchasing the forest stand with the greatest biodiversity value. Based on the information collected, which forest stand would you recommend they purchase? Outline an argument defending your choice and critically evaluate the data that you are using to make your decision.

Stand A or B could be selected as long as students justify their choice through use of the data available (eg although stand A has a higher species diversity it could be argued that B has greater species richness and it would benefit more greatly from conservation etc).

1mark Recommendation for either stand A or B

2mark argument as to why this choice was made

1mark Data supporting recommendation

1 mark evaluation as to why this choice would be most beneficial for conservation of biodiversity

(5marks)

- d)** A developer plans to purchase the second forest stand, planning to clear the all or part of the land for housing. Environmental Scientists are concerned that habitat fragmentation from this development will have negative consequences on a number of vulnerable animal species located in these forest stands. Outline three possible effects this development could have on population found within the forest strands.

Any 3 explained plausible effects such as reduction in population numbers due to isolations leading to loss of genetic diversity through inbreeding, loss of gene flow also resulting in a loss of genetic diversity.

(3marks)

- e)** Outline and evaluate two possible strategies to help conserve small populations if this development was to occur. Be sure to discuss both the potential benefits and drawbacks of each strategy.

1 mark for each appropriate strategy nominated

2 marks for each evaluation of a strategy – must include at least one positive and one negative

For example the use of habitat corridors to link isolated populations 1 mark

Advantages include increased gene flow and increased habitat area 1 mark

Disadvantages include increased risk of disease spread, increased predation rates along the corridor 1 mark

(6marks)

Total: 18marks

Question 6

Use the following figure below to answer questions 5a-5b.

This figure represents a hypothetical landscape with 9 habitat patches. Each box represents a distinct patch. Boxes with **F** are forest habitats, **G** are grassland habitats, **W** are wetland habitats, **U** are urban habitats. The ● represents the known location of population of an endangered plant species. Numbers in **bold** at the bottom right corner of each box is the number of species located in that patch. The number in the top left of each box is an identification number for the patch (box).

1 F 120	2 G 70	3 F 95
4 W 20	5 F 100	6 W 30
7 U 10	8 U 12	9 ● G 65

- a) You are on a team of conservation planners. Your organization only has enough money to conserve three of the 9 patches. There are two proposals under consideration. Proposal 1 is to protect patches **1, 3 and 5**. Proposal 2 is to protect patches **3, 6 and 9**.

Identify which proposal you would recommend and evaluate the strengths and weaknesses of each of the proposals. In your answer be sure to discuss species richness, ecosystem diversity, genetic diversity and specific biodiversity management strategies.

There are a variety of possible answers: Eg I would favour proposal 2 (1mark) as it provides the least edge to area ratio of protected land, while also including the endangered species within its protected area (1mark). It contains a representation of all three habitat types and hence should also have the greater ecosystem diversity (1mark). The other advantage is that it is a large un-fragmented protected area enabling better gene flow hence preserving genetic diversity of species within its boundaries (1mark). The downside of this proposal is that it fails to represent the 2 areas of the greatest species richness which may in fact push development into area 5 resulting in a potentially greater loss of species richness in the region (1mark).

(5 Marks)

- a) Within Patch 9 an isolated population of an endangered species of bird can be found. State and discuss one possible management option you could recommend to help protect this population and explain your reasoning for choosing this option.

1mark Stating plausible management option (eg reintroduction, translocation, habitat corridors, breeding programs etc)

1mark Explanation of the management option

1mark reasoning for the choice of this option (how will it help to protect the population)

(3marks)

Total: 8marks

Total for Section B: 70marks

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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