STUDENT NAME	

Victorian Certificate of Education 2008

ENVIRONMENTAL SCIENCE

Trial Written Examination 2
November 2008
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 end of year Unit 4 exam. VAEE takes no responsibility for your success in completing the actual VCE Environmental Science Unit 4 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.

The following information relates to Questions 1 to 3

In February 1999, a shipment of beef to Korea was rejected because it was found to contain unacceptably high levels of endosulfan, a biomagnifying insecticide used to control a caterpillar that infests cotton. These cattle came from properties in cotton-growing regions of NSW.[1]

Question 1

The high levels of endosulfan in cattle can be attributed to the

A. wind-borne transport mechanism and fat-solubility of the toxin
B. water-borne transport mechanism and water-solubility of the toxin
C. wind-borne transport mechanism and water-solubility of the toxin
D. water-borne transport mechanism and fat-solubility of the toxin

Question 2

Originally, local farmers had tried a small portion of the endosulfan-contaminated beef and remained unharmed. They claimed it was safe for consumption. Authorities maintained that the beef was unsafe. In this scenario

A. the farmers were correct because they suffered no harm after acute exposure
B. the authorities were correct because chronic exposure to the pesticide may result in harm to consumers
C. the farmers were correct because the LD50 for endosulfan was lower than the concentration of endosulfan found in cattle tissues
D. the authorities were correct because the LD50 for endosulfan was lower than that found in the tissues of the farmers

Question 3

Compensation was paid to some cattle producers by Cotton Australia. This could have been best avoided if Cotton Australia had conducted

A. an Environmental Risk Assessment
B. a Life Cycle Analysis of the cotton product
C. an analysis of the environmental sustainability of the cattle industry
D. a Risk Assessment of the pesticide and implemented the precautionary principle

[1] Judith Kinnear & Marjory Martin *Nature of Biology Book 1,* John Wiley & Sons Aus, QLD, 1992.

The following information relates to Questions 4 to 7

The following graph shows the results from an experiment testing the effect of increasing concentration of acids on the germination rate of mustard seeds. In the experiment, 50 mustard seeds were placed on cotton wool in each petri dish in a total volume of 40mL of solution:

Dish	Sulfuric acid concentration (mg/mL)	Nitric acid concentration (mg/mL)	Number of seeds germinated
A	0	0	50
B	1	0	45
C	5	0	25
D	0	1	40
E	0	5	20
F	1	1	0
G	5	5	0

Question 4

The amount of nitric acid placed into dish G was

A. 40mg
B. 200mg
C. 5mg
D. 10mg

Question 5

The concentration that resulted in lack of germination in 50% of seeds was

A. 5 mg/mL sulfuric acid
B. 1 mg/mL nitric acid
C. 0 mg/mL both acids
D. 5mg/mL both acids

Question 6

The results for dish F demonstrate the principle of

A. dosage of the toxins
B. chronic toxicity
C. synergistic action of the toxins
D. acute toxicity

Question 7

The best way to determine the reliability of the experimental results would be to

A. use hydrochloric acid in place of nitric acid
B. change the concentrations of sulphuric acid used
C. use an identical experimental method with another type of plant
D. repeat the experiment using a larger sample size

The following information relates to Questions 8 and 9

Cadmium is a heavy metal that was found to be a by-product of the zinc refining process used in Germany in the 1800s. At the time, the zinc refining plant would pump waste into a nearby lake.

Question 8

The discharge pipe at the plant is an example of

A. a diffuse source
B. a natural sink
C. a mitigation source
D. a point source

Question 9

As a heavy metal, the most likely natural sink for cadmium is

A. biodegradation
B. prevention at the source
C. sediment at the bottom of the lake
D. evaporation

The following information relates to Questions 10 to 13

Many commercial fertilisers contain nitrate (NO_3^-) salts. Although beneficial to crops when present in soil at the intended concentrations, nitrates can contaminate underground water supply. At high concentrations they are harmful to humans.

Question 10

In this scenario, nitrates present in soil

A. are pollutants because they are released into the environment by humans
B. are not pollutants because they are not harmful to humans or the environment in this form
C. are pollutants because they exist in high concentrations in soil
D. are not pollutants because they are not manufactured by humans

Question 11

In this scenario, the source of nitrates is

A. diffuse
B. natural
C. acute
D. point

Question 12

A physical property of nitrates implied by the above information is that

A. they are soluble
B. they are reactive with oxygen
C. they are a heavy metal
D. they are gases at room temperature

Question 13

Research has found that 8.25×10^4 mg of nitrate in tissues resulted in death of 21 out of 42 cows weighing an average of 250kg. The LD50 of nitrates for cows would therefore be

A. 0.033 mg/kg
B. 50 mg/kg
C. 330 mg/kg
D. 0.003 mg/kg

The following information relates to Questions 14 and 15

Hydrogen fuel cells are often presented as an environmentally sustainable alternative to petrol-fuelled transport, because they do not produce carbon dioxide whilst running. However, researchers argue that the production of hydrogen gas for use in the cells is an energy-intensive process that may require the use of fossil fuels.

Question 14

In order for hydrogen cells to be determined environmentally sustainable they must

A. meet the energy needs of the world's population in the long term without negatively impacting future generations
B. be financially viable for the next generation
C. not emit any greenhouse gases at any stage of their production
D. contain unreactive components

Question 15

In the above example researchers are analysing the processes involved in manufacturing the hydrogen cells, their environmental impact whilst they are running, as well as at the point of disposal. In doing so, they are undertaking

A. an Environmental Management Program
B. an education program
C. ecotourism
D. a Life Cycle Analysis

The following information relates to Questions 16 to 18

Penicillium roqueforti is a species of fungi used to make stilton cheese. In the early stages of growth, the fungus is non-toxic and gives a characteristic taste and texture to the cheese. However under certain growth conditions, the fungus has been shown to produce harmful mycotoxins. Research into the level of mycotoxins in commercial cheeses has returned inconclusive findings. In its Risk Assessment, the US Environmental Protection Agency has recommended stilton cheese be exempt from regulation.[2] It continues to be sold throughout the country.

Question 16

The Risk Assessment generated by the Environmental Protection Agency would contain

A. a strategy for managing the toxin
B. waste minimisation procedures
C. quantification of exposure risks and toxicology as well as historical data
D. a 'cradle to the grave' analysis

Question 17

In its recommendation, the US Environmental Protection Agency has ignored the

A. environmental risk assessment
B. life cycle analysis
C. source of the toxin
D. precautionary principle

Question 18

There is a documented case where a worker in a blue cheese manufacturing plant experienced hypersensitivity to the fungus itself. Serum from the patient showed antibodies against *P. roqueforti*.[3] These symptoms are characteristic of

A. an allergic reaction
B. chronic toxicity
C. acute toxicity
D. toxin specificity

Question 19

The reaction between sulphur oxides and water produces

A. sulphur dioxide
B. sulphuric acid
C. sulphur trioxide
D. solid sulphur

[2] United States Environmental Protection Agency. *Penicillium roqueforti Final Risk Assessment* (1997).
[3] ibid

Question 20

Carbon monoxide is a pollutant that is harmful to organisms with a circulatory system containing haemoglobin. Plants and most insects are unaffected by carbon monoxide. This information describes the

A. dosage of carbon monoxide
B. specificity of carbon monoxide
C. source of carbon monoxide
D. toxicity of carbon monoxide

SECTION B – Short answer questions

Specific instructions for Section B

Answer all questions in the spaces provided.

Question 1 (Total 15 marks)
Name a substance, other than sulphur dioxide and mercury, you have studied this year.

a. Name and describe the source of this substance, explaining how this source allows the substance to be defined as a "pollutant".

3 marks

b. Describe a situation where this pollutant has affected or could affect human health. Refer to **exposure** and **dosage** in your answer.

3 marks

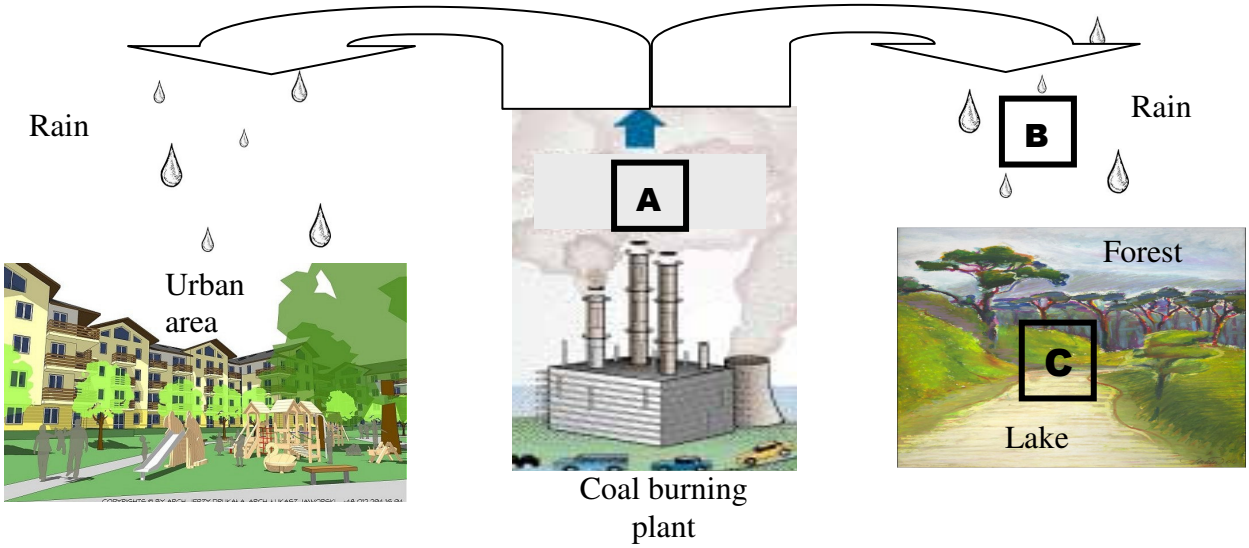
c. Outline the fate of this pollutant given no human intervention to remove it, in your answer refer to **persistence** and if relevant, the **natural sink** of the pollutant.

4 marks

d. Describe a strategy that has been or could be introduced to minimise the impact of this pollutant and, using quantitative data, either evaluate the effectiveness of this plan or describe criteria that could be used to evaluate the effectiveness of this plan.

5 marks

Question 2 (Total 12 marks)
The diagram below shows a high sulphur-content-coal burning plant near forest and urban areas:



a. Name the pollutant you have studied this year that is likely to be found at point **A**. Describe two physical properties and the transport mechanism of the pollutant in this form.

4 marks

b. Describe one property and the transport mechanism of the pollutant at point **B**.

2 marks

c. Describe two detrimental environmental effects of the pollutant at point **C**.

3 marks

d. Name a second source of this pollutant, other than a coal burning plant. Explain whether the source is a diffuse or point source.

3 marks

Question 3 (Total 13 marks)
The table below shows hypothetical results from mercury testing in Minamata Lake in Japan:

Substance/organism	Hg Concentration (ppm)
Sediment	8.5
Suspended particulate matter	2
Fish species A	5.5
Fish species B	7.8
Fish species C	2

a. Use the table above to label the food chain below with each of the fish species, A, B and C:

i) Fish species _____

ii) Fish species _____

iii) Fish species _____

1 mark

b. Name the form of mercury that was detected in the fish species

1 mark

c. Explain the results in the table. Compare and contrast the terms 'bioaccumulation' and 'biomagnification' in your answer.

3 marks

d. Outline an appropriate sampling method that could have been used for gathering the suspended matter from the lake for testing.

3 marks

e. A proposed strategy for removing mercury from the lake was to dredge the lake and remove the sediment. Use the results from the table as well as your understanding of the properties of mercury to evaluate this strategy.

5 marks

Question 4 (Total 14 marks)

Name an environmental science project that you have investigated this year.

a. Name and describe the timeline, major objectives and at least three stakeholders involved in the project.

6 marks

b. Describe 3 methods by which the project addresses the objectives described in a.

3 marks

c. Evaluate, giving evidence, the effectiveness of the project in meeting these objectives.

5 marks

Question 5 (Total 16 marks)

In 1998, the Federal Government offered to sell the Commonwealth land at Point Nepean, originally site of a quarantine station and occupied since 1951 by the Department of Defence, to the Victorian State Government. The State Government refused to buy the land, stating that it should be designated as a National Park. In October 2003 a developer was tentatively chosen by the Federal Government to lease part of the land, and was rumored to have proposed the development of new five-storey buildings on bushland, a 250-bed hotel and conference centre. This company presented an environmental impact assessment as part of their proposal.
In December 2003, after much media attention and public debate, the Federal Government declared that Point Nepean would be listed as a National Park by 2008.
Point Nepean National Park is now a popular tourist destination. Besides spectacular ocean scenery, the park is home to Fort Nepean, established in 1882, and the historic Quarantine Station first established in 1852.

• Public cars are not allowed access beyond the Point Nepean Visitors Centre and visitors can access the park via a transporter service, by walking or by bicycle.[4] Bicycles may only travel on designated roads and visitors must access interpretative trails and tracks by foot. Areas of the park are fenced off on a rotational basis for environmental regeneration.

• Visitors pay a daily fee, the proceeds of which are used for the maintenance of the park and historical sites.

• The park is home to 32 mammal species, 167 birds, 22 reptiles, 7 amphibians and 2 freshwater fish species. One section of the park, Greens Bush, supports the largest population of Eastern Grey Kangaroos on the Mornington Peninsula and contains a large viewing area.

• A number of vegetation communities present in the park, particularly coastal grassy forests, banksia woodlands and sand heathlands, have been greatly depleted since European settlement and are of particular conservation significance.

• Fires and camping are not permitted in the park and visitors are encouraged to take their rubbish out of the park.

[4] Mornington Peninsula Online Business and Tourism Directory. *http://www.mornington-peninsula.com/ptnepean.php.*

a. Discuss two risks that could have been addressed in the environmental impact assessment put forward by the hotel developer in October 2003.

Risk 1

2 marks

Risk 2

2 marks

b. List 3 key components that should be included in the environmental management plan implemented by the hotel developer if the development had gone ahead.

3 marks

c. Evaluate whether the present use of Point Nepean National Park can be classified as ecotourism.

5 marks

d. Discuss whether the recent development at Point Nepean can be classified as ecologically sustainable.

4 marks

- END OF EXAM -