

STUDENT NAME	
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Victorian Certificate of Education 2010

ENVIRONMENTAL SCIENCE

Trial Written Examination 2

October 2010

Time allowed 1.5 hours [90 minutes]

SUGGESTED SOLUTIONS

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.
- 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

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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.

ENVIRONMENTAL SCIENCE
Trial Written Examination October 2010
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

SECTION B - Short answer questions

Specific instructions for Section B

Answer all questions in the spaces provided.

Question 1 (20 marks)

Name a substance, other than sulfur dioxide and mercury, you have studied this year.

a. State the following properties of the pollutant:

- i. State at room temperature: **solid, liquid or gas**¹
- ii. Density in comparison to atmospheric gases: **eg. if solid or liquid, more dense**¹
- iii. Solubility: **soluble or insoluble**¹
- iv. Transportation mechanism: **eg. waterborne (soluble), airborne (gas)**¹
- v. LD50: **must be value in mass/kg**¹

6 marks

b. Describe the chemical or physical properties of the pollutant that contribute to its

- i. natural sink
correct chemical/physical property¹
linked to correct sink¹
- ii. toxicity
correct chemical/physical property¹
linked to toxicity¹

4 marks

c. State a location in which the pollutant is found and fully describe two factors that contribute to its definition as a pollutant.

Specific location¹
Source, point or diffuse¹, **why human emitted**¹
Harm to enviro or humans¹, **explanation**¹

5 marks

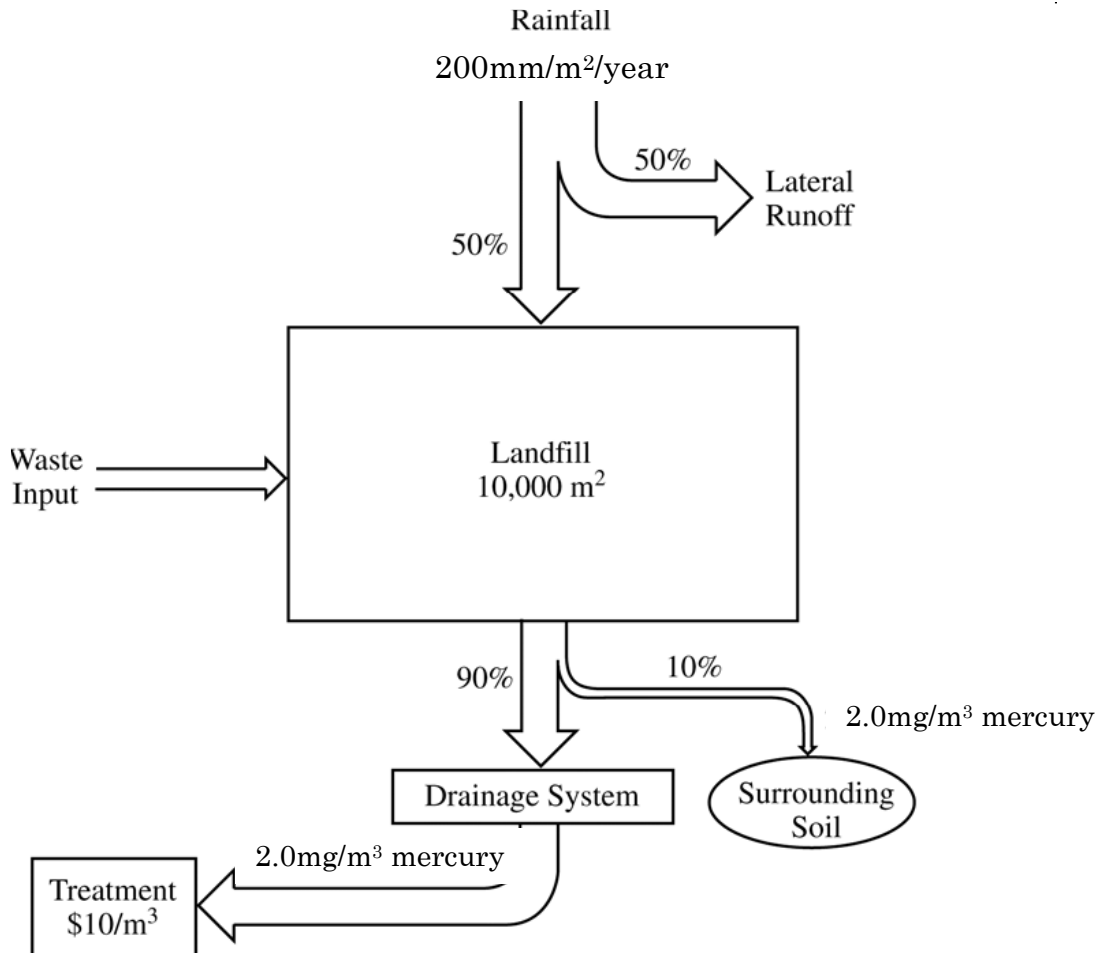
d. Describe and evaluate a strategy that has been introduced to minimise the impact of this pollutant, ensuring you refer to the sink of the pollutant in your answer.

Strategy described including details of harm minimisation¹ **(must relate to c. above)**¹
Linked to pollutant sink¹
Effectiveness of strategy evaluated¹
Clear judgement as to effectiveness¹

5 marks

Question 2 (Total 11 marks)

A city operates a municipal solid-waste landfill (rubbish tip). As represented in the diagram below, the annual precipitation in the city is 200 mm/year: 50 percent of this water infiltrates through the landfill cover soil into the waste, and 50 percent drains off the landfill. A drainage system withdraws 90 percent of the leachate generated within the landfill for treatment. The rest of the leachate travels through the bottom liner of the landfill into the surrounding soil. Most of the mercury disposed of in the landfill remains in the landfill; the leachate withdrawn from the landfill by the drainage system has an average mercury concentration of 2.0 mg/m³.



Source: <http://apcentral.collegeboard.com>

a. Calculate the volume, in m³, of the water infiltrated through the landfill per year.

$$\begin{aligned} 200\text{mm} &= 0.2\text{m}^1 \\ V(\text{m}^3) &= 0.2\text{m} \times 10,000\text{m}^2 \\ &= 2000\text{m}^3 \end{aligned}$$

2 marks

b. Given that the mercury concentration in the water draining from the landfill is 2.0 mg/m³, calculate the mass, in g, of mercury that is released into the surrounding soil per year.

$$\begin{aligned} \text{Mass} &= 2000 \times 2.0\text{mg}^1 \\ 4000\text{mg} &= 4\text{g} \end{aligned}$$

¹ Award consequential marks if a. incorrect.

2 marks

c. Describe one viable method for reducing the amount of mercury entering the municipal waste input.

Government ban on use of mercury in commercial products (eg. thermometers, whitegoods).¹

Government provided mercury disposal point (eg. thermometers, whitegoods).¹

1 mark

The city council is considering two options for reclaiming the soil surrounding the landfill. The first option is to excavate and remove the contaminated soil, and the second option is to decontaminate the soil on the site using vegetation.

d. Assume that the city council chooses the first option. Describe a problem that may result from removing the contaminated soil from the site. Refer to a form of mercury and its toxic mechanism in your answer.

Issue of disposal of contaminated soil after removal from the site.¹ Any site has risk of bioaccumulation and biomagnification of methyl mercury¹ in living organisms, resulting in build up of this highly toxic form (only low concentrations needed to cause harm).¹

OR any other logical answer that refers to form and toxic mechanism.

3 marks

e. Assume that the city council chooses the second option. State how vegetation could be used to decontaminate the soil. Discuss one advantage and one disadvantage of using this reclamation method.

Vegetation absorbs traces of mercury through roots.¹

Advantage: Removal from soil, soil decontaminated.¹

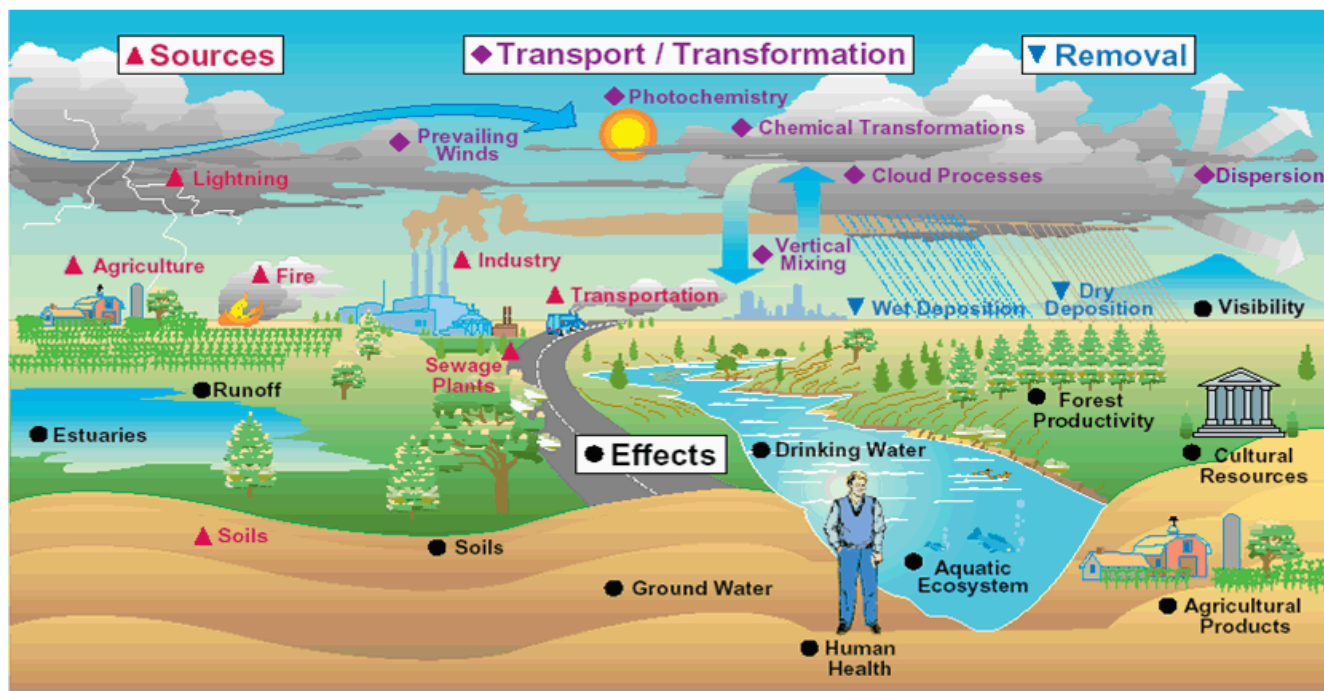
Disadvantage: Mercury present in plants, there may not be a suitable site to dispose of plant matter.¹ OR possible toxic build up in plants.¹

OR any other logical advantage or disadvantage

3 marks

Question 3 (Total 14 marks)

The diagram below shows possible pathways for many types of pollution in the Canadian Great Lakes area. Sulfur dioxide pollution has been detected in this area of the Great Lakes, moving through some of the pathways depicted below:



Source: <http://www.solcomhouse.com>. A not-for-profit environmental education website

a. Describe a source of sulfur dioxide depicted in the above diagram.

High-sulfur coal burning power station¹, point source through chimney stack¹
just "industry" 1mark only

OR another logical response including point or diffuse source and explanation

2 marks

b. Describe the "transport" and "removal" processes of sulfur dioxide represented in the above diagram, ensure you refer specifically to the chemical and physical properties of sulfur dioxide in your answer.

Transport: sulfur dioxide airborne gas¹ via prevailing winds¹

Removal: wet deposition: reacts with rain water (dissolves in)¹ to produce sulfuric acid rain that falls to earth¹ OR dry deposition: dense sulfur dioxide gas moves to ground level and is absorbed by plants or dissolves in/ reacts with water in lake/ water on ground¹

4 marks

c. State three "effects" of sulfur dioxide represented in the above diagram.

Any three below:

Low pH (acid) aquatic ecosystem/lake

Low pH (acid) drinking water

Low pH (acid) ground water

Low pH (acid) soils

Degradation of plant structure, reduced seeding, reduced forest productivity

Acid rain degradation of marble, cultural resources

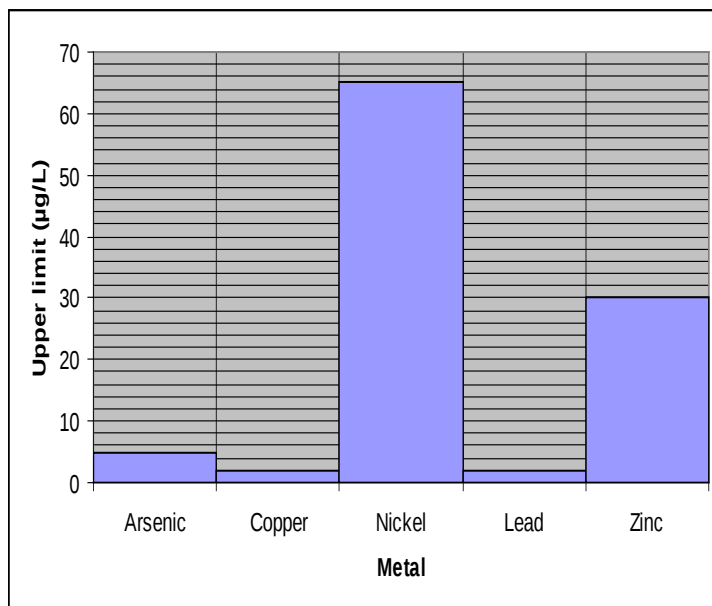
3 marks

The table below shows water quality guidelines for the Canadian Great Lakes:

Compound		Upper limit
		$\mu\text{g/L}$
Metals	Arsenic	5
	Copper	2
	Mercury	0.026
	Nickel	65
	Lead	2
	Zinc	30
Pesticides	Atrazine	1.8
	Metolachlor	7.8

Source: http://www.on.ec.gc.ca/csl/fich/fich005_002_e.html

- d. What type of measurement is $\mu\text{g/L}$? **concentration**¹ 1 mark
- e. Draw a labelled bar graph below, showing the upper limits for all metals except mercury.



2 marks

- f. Which metal, zinc or copper, is likely to have a lower LD50 for fish? Explain your choice.

Copper¹ would have a lower LD50, as the upper limit for concentration of copper in the lakes is lower, so less dosage must be required to cause harm to fish.¹

2 marks

Question 4 (Total 16 marks)

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

- a. Summarise the location, two aims and the timeline of the project.

Location and timeline¹

Aims¹

2 marks

- b. Outline the interests of two key stakeholders in the project and their role in enforcing or adhering to regulatory frameworks associated with the project.

2 x key stakeholders and interest in project²

Logical link to at least 1 regulatory framework¹

3 marks

Describe two important components of the environmental impact assessment for the project.

Must describe primary environmental risk of the project¹

Can be 2nd risk or any other logical answer¹

2 marks

- c. Explain how environmental risks were monitored in the management plan for the project.

Clear description of monitoring process²

2 marks

- d. Evaluate whether the precautionary principle was utilised in the environmental management plan for the project.

Definition: The precautionary principle is to take precautionary action to minimise environmental damage even when there is a lack of scientific certainty of harm occurring.¹

Link to action taken by management plan¹

Clear judgement as to whether principle utilised¹

3 marks

- e. Evaluate the success of the management plan in upholding the principles of sustainable development.

Definition present: maintained to meet the needs of future generations¹

At least 2 principles stated and related to project: environmental sustainability OR social sustainability OR economic sustainability²

Clear judgement as to whether principle upheld¹

4 marks

Question 5 (Total 9 marks)

The following is an excerpt taken from the website of the Lane Cove River caravan park, winner of a high commendation in the 2009 Ecotourism Australia awards:

“Just 10kms from the Sydney Harbour Bridge and Sydney Opera House, the Lane Cove River Tourist Caravan Park and Camp ground provides a peaceful experience in ecotourism. The bushland and eucalypt forests of Lane Cove River National Park abound with native birds, bandicoots, tawny frogmouths and lace monitor lizards (and now Brush Turkeys). Park visitors stay close to nature in fully serviced cabins or their own caravan, campervan, or tents on grassy camp sites.

Since 2005, the park has been auditing and monitoring its carbon footprint. In 2007, the park was able to claim carbon neutral status. It was certified in 2008/09 under the Climate Action Program through Sustainability Australia.

To gain carbon neutral status the park set out to reduce energy consumption, switch to 100% accredited Green Energy, installed solar stations to offset emissions it could not otherwise offset, and embarked on an ambitious visitor assisted tree planting program as part of its bush regeneration strategy.

Below is a photo of the park's solar panels and cabins:

Since our water plan was established in 2006, we have harvested over 138,000 litres of rainwater, and have reduced our water consumption in our shower blocks by replacing our old shower heads with water saving shower heads.

The park has a comprehensive environmental education program. We can provide everything from classroom presentations for students, through to a speaker for your next function or event. Our programs and speakers are provided to your organisation at NO COST.

When you stay with us at the Tourist Park, every dollar from your fees contributes to habitat creation, erecting interpretative signs and ecosystem maintenance. Thanks for your support."

- a. Compare the ecotourism venture you studied this year with Lane Cove River Tourist Caravan Park in terms of:

- i) Minimisation of environmental impact.

Description of environmental benefits of ecotourism venture¹

Summary of related points from stem: Carbon neutral, use of renewable energy sources, sustainable water use¹

Clear comparison¹

3 marks

- ii) Environmental education.

Description of environmental education aspect of ecotourism venture¹

Summary of related points from stem: environmental education program, classroom speakers at no cost, interpretative signs¹

Clear comparison¹

3 marks

- iii) Extent to which the venture allows tourists to come into contact the natural environment.

Description of level of contact with the natural environment in ecotourism venture¹

Summary of related points from stem: visitors stay close to natural habitats, a variety of native animals are present, activities include tree planting¹

Clear comparison¹

3 marks