



Victorian Certificate of Education 2011

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STUDENT NUMBER

Letter

Figures

Words

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ENVIRONMENTAL SCIENCE

Written examination 2

Friday 11 November 2011

Reading time: 11.45 am to 12.00 noon (15 minutes)

Writing time: 12.00 noon to 1.30 pm (1 hour 30 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

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers and one scientific calculator.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.

Materials supplied

- Question and answer book of 23 pages.
- Answer sheet for multiple-choice questions.

Instructions

- Write your **student number** in the space provided above on this page.
- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- All written responses must be in English.

At the end of the examination

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

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

SECTION A – Multiple-choice questions**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

Methyl mercury can be absorbed over a long period of time if a person experiences

- A. acute toxicity.
- B. its direct effects.
- C. acute absorption.
- D. chronic exposure.

Question 2

Mercury particles are emitted from a smokestack at an industrial plant.

The smokestack is an example of a

- A. point source.
- B. diffuse source.
- C. fugitive source.
- D. transport mechanism.

Question 3

Bioaccumulation is best described as

- A. the toxicity of a substance in fatty tissue.
- B. the increasing toxicity of a substance over time.
- C. increasing the exposure of a body to a toxic substance over time.
- D. the increasing concentration of a toxic substance in a biological system.

Question 4

Elemental mercury can vaporise at room temperature.

This increases the likelihood of

- A. bioremediation by plant roots.
- B. exposure of humans to elemental mercury.
- C. waterborne transport of elemental mercury.
- D. high persistence of elemental mercury at a particular site.

Question 5

The dosage of a pollutant that a person receives is the amount of pollutant

- A. that will cause harm.
- B. absorbed per unit of body weight.
- C. occurring naturally in the environment.
- D. to which they are exposed over a period of time.

Question 6

Low levels of the insecticide DDT may be detected in vegetables grown in fields in which DDT was used years earlier.

This is a demonstration of DDT's

- A. acute toxicity.
- B. diffuse source.
- C. high persistence.
- D. effectiveness as an insecticide.

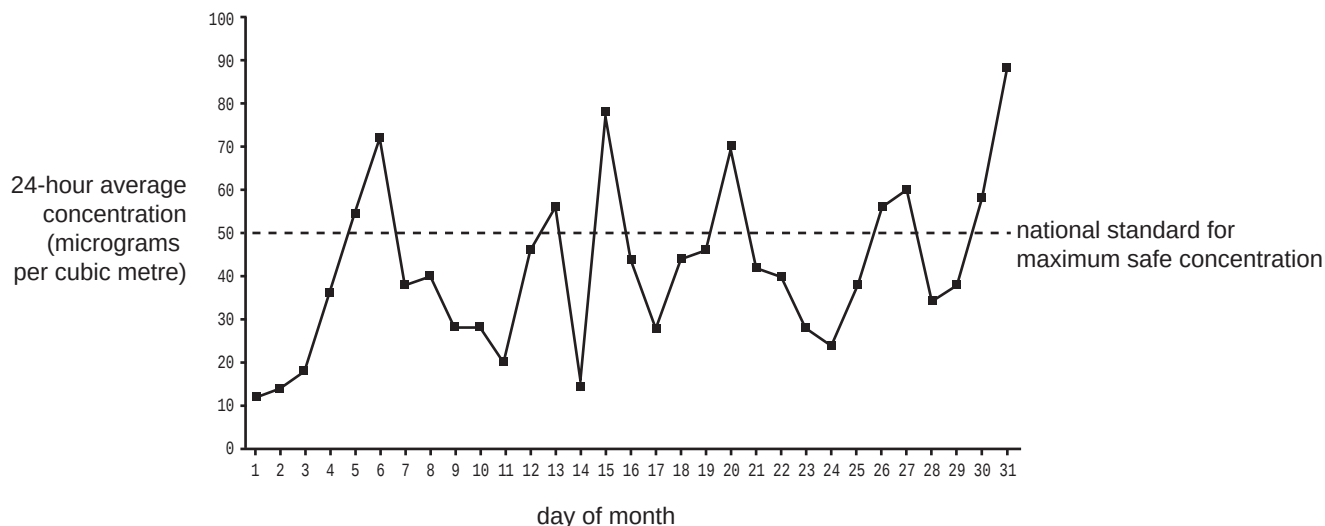
Use the following information to answer Questions 7 and 8.

The Environment Protection Authority measured the concentration of atmospheric particles in a town.

The graph below shows the daily average concentrations of atmospheric particles of 10 micrometres or less in diameter recorded during January 2011.

The dashed horizontal line indicates the national standard for these particles, which is 50 micrograms per cubic metre.

Graph of daily particle concentration for January 2011



Question 7

For what percentage of time in January 2011 was air quality at, or below, the national standard for the particles measured?

- A. 9%
- B. 29%
- C. 71%
- D. 91%

Question 8

A town resident claims that the January 2011 graph shows that there is a long-term upward trend in levels of the particles.

Which of the following statements is most correct?

- A. The resident is right, as particle levels are greater towards the end of the month.
- B. The resident is right, as particle levels on some days exceed the national standard.
- C. The resident is wrong, as the time period is too short to determine an air quality trend.
- D. The resident is wrong, as particle levels on many days are below the national standard.

Use the following information to answer Questions 9–11.

In an investigation of the impacts on human health of atmospheric particles and nitrogen dioxide in the air, researchers tracked hospital admissions over six days.

The following table presents their results.

Date February	24-hour average particle concentration (parts per million)	24-hour average nitrogen dioxide concentration (parts per million)	Daily hospital admissions (related to atmospheric conditions)
1	32	0.044	50
2	80	0.026	44
3	76	0.048	215
4	72	0.052	220
5	30	0.068	60
6	90	0.022	53

Question 9

The average nitrogen dioxide concentration (in parts per million) over these six days is

- A. 0.034
- B. 0.043
- C. 0.26
- D. 6.33

Question 10

The ratio of particle concentration to nitrogen dioxide concentration on 1 February was

- A. 0.14
- B. 140
- C. 324
- D. 727

Question 11

Which of the following best explains the high number of hospital admissions on some days?

- A. persistence
- B. synergistic action
- C. high particle concentrations
- D. high nitrogen dioxide concentrations

Question 12

A scientist takes multiple measurements over several days with a nitrogen dioxide monitor to assess air quality inside a road tunnel.

The scientist takes more than one measurement over several days with the monitor in order to

- A. establish a control reading.
- B. assess the impact of the pollutant.
- C. eliminate any abnormally high or low pollution readings.
- D. ensure that the monitor is accurately measuring nitrogen dioxide concentrations.

Question 13

A manufacturing company conducts an investigation into a new product it is considering making. This investigation identifies problems with large energy demands during production and waste disposal problems when there is no further use for the product.

This investigation could best be described as

- A. a Life Cycle Analysis.
- B. a regulatory framework.
- C. a waste minimisation scheme.
- D. an Environmental Management System.

Question 14

A new chemical is to be released for use as an agricultural pesticide. Before the chemical can be used, an Environmental Risk Assessment is conducted.

This assessment would focus on

- A. identifying the key environmental benefits of using the chemical.
- B. assessing how effectively the pesticide works when used in agriculture.
- C. establishing the main components of the relevant regulatory framework.
- D. providing detailed information on the potential health impacts of using the pesticide.

Question 15

As part of the decision-making process regarding the introduction of an environmental project, a number of key stakeholders may be consulted by regulators.

Consultation should involve input from

- A. the organisation proposing the project (that is, the project's proponent).
- B. government environmental monitoring agencies.
- C. community environmental groups.
- D. all of the above.

Question 16

Waste minimisation is an environmental management strategy which has a major focus on

- A. reducing the amount of waste production and discharge.
- B. minimising the impact of waste on human health.
- C. finding suitable sites to dispose of waste.
- D. decreasing production costs.

Use the following information to answer Questions 17–20.

Basslink consists of a power line and associated systems that connect the Tasmanian and Victorian electricity grids. Basslink has a high-voltage DC undersea and overland power line, as well as the necessary equipment at each end. The aim of the system is to allow electricity generated by hydroelectric power stations in Tasmania to be used as a peak power source to supplement brown-coal-burning power stations in Victoria at times of high demand. Before Basslink, natural gas-powered generators in Victoria were used during peak times. If necessary, power can also be transmitted the other way (Victoria to Tasmania).

Those in favour of Basslink point out that this will mean that more electricity for Victoria can be generated from hydroelectricity, which causes less carbon dioxide emissions. People who live along the route of the land section of the power line want it placed underground. The electricity company points out that this will be approximately three times the cost of overhead lines, and that this cost will have to be passed on to consumers.

Question 17

The governments require an environmental impact assessment for the project.

The main purpose of this assessment is to

- A. ensure that the project is completed at minimum cost.
- B. ensure that there are no environmental risks associated with the project.
- C. balance the risks involved in the project against the community benefits.
- D. ensure that the environmental consequences impact on as few people as possible.

Question 18

For an Environmental Risk Assessment for the project, which is the most important group to consult?

- A. the electricity generation company
- B. those taking financial risk in the project
- C. local communities along the proposed route
- D. the consumers who are the end users of the electricity

Question 19

Which issue should be considered most strongly in an environmental impact assessment?

- A. the decreased carbon dioxide emissions from using hydroelectricity from Tasmania
- B. the visual impact of overhead lines compared to underground transmission lines
- C. the financial benefit to Tasmania of selling power to Victoria
- D. the cost of electricity to the consumer

Question 20

The electricity company argues that using hydroelectricity is more ecologically sustainable than using brown coal for electricity generation.

This is a valid argument because ecological sustainability involves

- A. doing no damage to the environment.
- B. providing the power for this generation as cheaply as possible.
- C. putting the needs of future generations ahead of our current needs.
- D. using renewable rather than non-renewable resources where possible.

**END OF SECTION A
TURN OVER**

SECTION B**Instructions for Section B**

Answer **all** questions in the spaces provided. Write using black or blue pen.

Question 1

Name one pollutant, other than sulfur dioxide or mercury, that you have studied this year. Use this pollutant when answering **parts a.–g.**

- a.** Describe a precise geographic location where you would find this pollutant.

2 marks

- b.** Explain how the concentration of this pollutant is measured. In your answer include the equipment used to measure it, and the units in which the measurements are typically expressed.

2 marks

- c.** Consider the life cycle of this pollutant.

- i.** Describe a major source of this pollutant.

- ii. Would the source you have described be considered a point or a diffuse source?

Justify your answer.

- iii. Describe the **major** transport mechanism for this pollutant. Include an estimate of how far it will be observed from the source you have described in **part c. i.**

2 + 2 + 3 = 7 marks

- d. Describe a **major** natural sink for this pollutant.

2 marks

- e. i. Identify a specific population of human beings or animals affected by this pollutant. In your answer describe the method of exposure.

- ii. State the dosage of pollutant required to cause significant harm to an individual of the population. In your answer include a numerical value, including units.

2 + 2 = 4 marks

- f. Describe a strategy that has been used to reduce **either** the exposure to the pollutant **or** the impact on human or animal health.

2 marks

NO WRITING ALLOWED IN THIS AREA

- g.** Evaluate the effectiveness of the strategy you discussed in **part f.** Include some evidence.

3 marks

SECTION B – continued
TURN OVER

NO WRITING ALLOWED IN THIS AREA

Question 2

A power station fuelled by coal can produce sulfur dioxide, leading to the formation of acid rain.

- a.** Describe why a coal-fired power station can generate sulfur dioxide.

2 marks

- b.** List **four** characteristics of sulfur dioxide.

2 marks

NO WRITING ALLOWED IN THIS AREA

- c. Describe the effect on human health of exposure to high concentrations of sulfur dioxide.

2 marks

- d. Describe the processes involved in the formation of acid rain due to emissions of sulfur dioxide from the chimney of a power station, including the likely transport mechanisms.

2 marks

- e. Describe **two** methods by which the power station owners could reduce the sulfur dioxide produced by their station.

2 marks

SECTION B – continued
TURN OVER

NO WRITING ALLOWED IN THIS AREA

Question 3

Name an environmental project which you have studied this year. Use this project when answering **parts a.–f.**

- a.** Describe the key aspects of this project, including the general goals and major outcome.

3 marks

- b.** Name a process that was used to identify any potential impacts on the environment of this project **before** the project was actually approved. Describe how this process was carried out.

3 marks

NO WRITING ALLOWED IN THIS AREA

- c. Identify two of the major environmental aims or objectives which were established before the project commenced.

1. _____

2. _____

2 marks

- d. Explain what specific actions were taken to achieve **each** of these two environmental aims or objectives during the life of the project.

3 marks

- e. Name a specific organisation that was responsible for monitoring the environmental impacts during the life of the project. Explain the regulatory guidelines this organisation used in monitoring and evaluating the project.

3 marks

- f. Evaluate how effective the project was in meeting **each** of the two environmental aims or objectives you have stated. You should include evidence to support your evaluation.

3 marks

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SECTION B – continued
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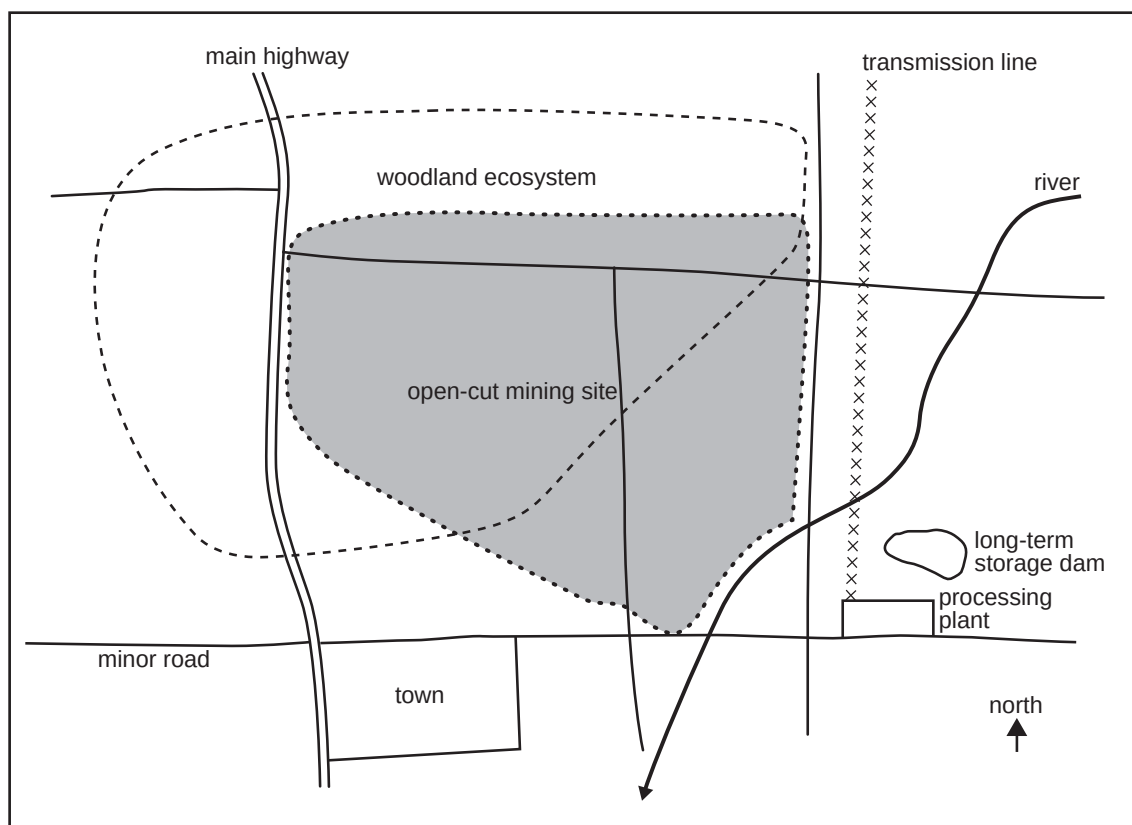
Question 4

A mining company has put forward a proposal to develop an open-cut mine in a farming region. This mine will be composed of 13 separate pits, each approximately 4 metres deep and 10–12 hectares in size. Each pit will take between two and three years to mine. To process the ore it must be crushed, washed and treated with various chemicals. Large amounts of water will be taken from the local river to use in the mining and dust management processes. Waste water will need to be treated and stored in a long-term storage dam. Production is planned at 4 million tonnes per year. Each tonne of metal is currently valued at \$2500. A large amount of electricity is required as part of the process to produce the final metal. Electricity supply will need to be transported through a high-voltage transmission line to the processing plant. The government will also need to investigate upgrading the regional power stations to cope with demand. The company plans to generate 300–400 local jobs in the mine, transport industry and processing plant.

There are concerns in the local community regarding health issues from the dust released during the mining and crushing of the ore, as well as the damage to road surfaces from the large trucks transporting the material to the processing plant. Some locals are unhappy with the visual impact of the transmission-line towers. Twelve farms will be lost if the mine is developed. The local environmental group is worried about the loss of water from the river, and the possibility of contaminated water from the long-term storage dam ending up in the river in the event of major floods.

The region to be mined also includes part of a woodland ecosystem, with over 90 species of indigenous flora and fauna, including five that are locally threatened. The mining company plans to stockpile the topsoil and spread it back over the mined area when each pit expires. They plan to create a seed bank and use this to progressively revegetate the mine site. The local environmental group is concerned that the woodland community will never fully recover from the impact of the open-cut mining.

Location of open-cut mine proposal



- a. Using the following table, construct a summary of the major arguments for and against the proposal, identifying key social, economic and environmental factors.

	For	Against
Social factors		
Economic factors		
Environmental factors		

4 marks

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NO WRITING ALLOWED IN THIS AREA

- c. Explain whether the proposal should be regarded as an ecologically sustainable development. In your answer include the key principles of ecologically sustainable development.

3 marks

SECTION B – continued
TURN OVER

NO WRITING ALLOWED IN THIS AREA

Question 5

Greentree Eco Lodges is an ecotourism resort where visitors experience interpretive trails, guided walks, a resource library and an entertainment/lecture amphitheatre. Many flora and fauna species found at Greentree are unique to the area. Fifty-seven native orchid species, many of which are rare and endangered, have been recorded on the property. Over 200 recorded bird species attract tourists who enjoy bird-watching activities. Kangaroos, wallabies, emus, shingle back and blue tongue lizards, and echidnas are all found at Greentree, attracting both local and international visitors. Greentree collects all its own water, generates power and processes its waste on site. Greentree Eco Lodges employs the latest technologies available to construct sustainable buildings, including the use of rainwater tanks, solar power and self-composting waste treatment.

- a. Describe another example of an ecotourism activity or business. Do not use Greentree Eco Lodges.

2 marks

- b. Describe **two** environmental impacts of the ecotourism activity or business you have described in **part a**.

3 marks

- c. Compare Greentree Eco Lodges with the ecotourism activity or business you described in **part a.** with respect to their abilities to meet two criteria that characterise an activity as ecotourism.

Criterion 1 _____

Criterion 2 _____

4 marks