**Victorian Certificate of Education
2003**

STUDENT NUMBER

Letter

Figures

Words

ENVIRONMENTAL SCIENCE
Written examination 2

Friday 21 November 2003

Reading time: 2.00 pm to 2.15 pm (15 minutes)
Writing time: 2.15 pm to 3.45 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, an approved graphics calculator (memory cleared) and/or 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 16 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 electronic communication 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

High concentrations of ozone in the air can damage the leaves of plants.

This occurs because of excessive

A.   sinks.

B.   allergies.

C.   exposure.

D.   mobility.

Use the following information to answer Questions 2–4.

EPA scientists established sites at varying distances from a freeway to measure the concentrations of airborne particles released by motor vehicles travelling along the freeway. The scientists found that, as the distance of the measuring site from the freeway **increased**, the particle concentration in the air **decreased**.

Question 2

The transport mechanism for the particles is

A.   the motor vehicles.

B.   people's lungs.

C.   the freeway.

D.   the air.

Question 3

What type of pollution source does the freeway represent?

A.   point source

B.   diffuse source

C.   chronic source

D.   stationary source

Question 4

Which of the following represents a likely sink for the airborne particles?

A.   the freeway

B.   trees and soil

C.   vehicle fuel tanks

D.   the scientists' monitoring equipment

Use the following information to answer Questions 5–7.

Ozone is a gas that is one of the main components of photochemical smog. It is harmful to people because it attacks the tissue of the throat and lungs. Scientists believe that long-term exposure to ozone concentrations of more than 0.05 parts per million in air should be avoided.

Question 5

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

A. absorbed per unit of body weight.
B. taken in through the mouth.
C. present in the environment.
D. that will cause harm.

Question 6

The harm caused to people's health by prolonged exposure to high concentrations of ozone in the air is known as

A. mobility.
B. mortality.
C. persistence.
D. chronic toxicity.

Question 7

Ozone pollution can cause synergistic action, especially for people suffering from asthma.

An example of a synergistic action involving ozone is

A. an allergic reaction to ozone pollution.
B. asthma sufferers also getting sore throats.
C. a greater number of people getting hay fever.
D. asthma attacks becoming worse as a result of other air pollutants in combination with ozone.

Question 8

Environmental Risk Assessments are designed to

A. determine the least expensive way to protect the environment.
B. eliminate the risk of pollution affecting people and the environment.
C. minimise the number of people who are concerned about an issue.
D. provide decision-makers with information about the impacts of their decisions.

Use the following information to answer Questions 9–11.

Dryland salinity is a major environmental problem in parts of Australia, and is mainly caused by the clearing of trees. Removal of the trees and planting of annual grasses have decreased the amount of water removed from the soil by transpiration (the loss of water from the leaves of plants after it has been absorbed by its roots). As a result, the subsurface water rises, bringing salt nearer to the surface. Few grass species can survive in soil with high salt concentration.

The depth to the subsurface water is the distance from the earth's surface to the top surface of water.
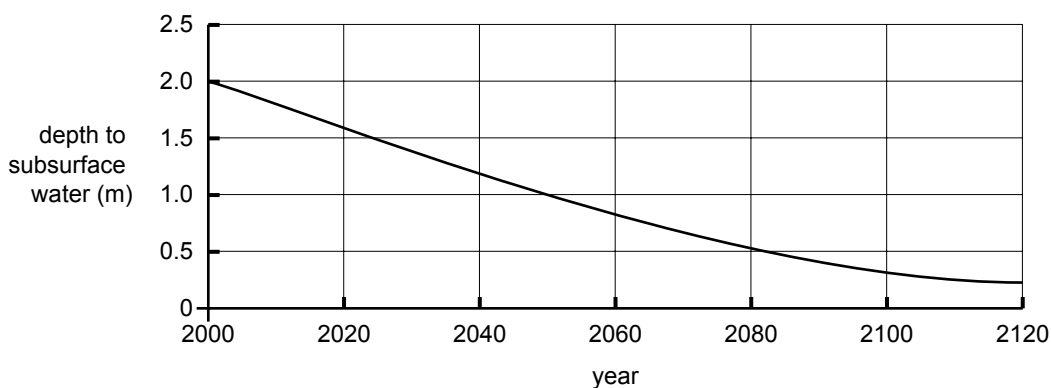
Question 9

One suggested strategy for reducing the risk of salinity is to plant more trees.

Tree planting will help reduce salinity by

A. providing a life cycle analysis.

B. reducing bioaccumulation of salt.

C. increasing the depth to the subsurface water level.

D. acting as a diffuse source of pollution in the soil.

The graph below shows the predicted depth to the subsurface water for a particular location in Victoria.

Question 10

From the graph, at what approximate rate (metres per year) is the depth to the subsurface water predicted to decrease during the next 50 years?

A. 0.02

B. 0.2

C. 0.5

D. 1.0

Question 11

The risk of salinisation is high when the depth to the subsurface water level is less than 0.5 m.

Using the above graph, in which of the following years is a high risk of salinisation most likely to begin to occur?

A. 2030

B. 2060

C. 2090

D. 2120

Question 12

A developer applies to the government for a permit to build a housing complex on salt-affected land.

Which of the following steps would **not** be part of an Environment Impact Assessment for the development?

A.   community consultation

B.   requirements for monitoring soil salinity levels after development

C.   an assessment of the developer's likely costs to build the housing complex

D.   predicting likely environmental changes to the land surrounding the development

Question 13

Large metal frames are used to collect floating rubbish in the Yarra River in Melbourne.

This improves the quality of the water by removing

A.   items from pollution sinks.

B.   acute toxicity due to oil pollution.

C.   items from diffuse pollution sources.

D.   heavy metals from industrial sources.

Question 14

After prolonged exposure to bites from a particular insect, David has become more sensitive to the bites.

The next time he is bitten, he is more likely than previously to

A.   be unaffected.

B.   have an allergic reaction.

C.   experience chronic toxicity.

D.   receive a lower dosage of any toxin.

Question 15

The amount of dioxin required to kill an animal depends on its body weight.

If 50% of dogs die when they consume a dose of 1.5 mg/kg, what dose would be expected to kill 50% of dogs that weigh 15 kg?

A.   0.1 mg

B.   1.5 mg

C.   7.5 mg

D.   22.5 mg

Question 16

A factory uses recycled paper to produce pulp that is then used to make paper.

If 75% of the recycled paper is converted into pulp, how much recycled paper is required to produce 1 tonne of pulp?

A.   0.25 tonnes

B.   0.75 tonnes

C.   0.95 tonnes

D.   1.33 tonnes

Question 17

An organism consumes 1 g of lead each year from the environment and expels 20% of this from its body.
This process is an example of

A.   acute toxicity.

B.   bioaccumulation.

C.   life cycle analysis.

D.   waste minimisation.

Question 18

A common agricultural chemical is known to cause genetic damage to frogs. A scientist investigates how the probability of damage is influenced by the concentration of this chemical in water.
This information would be most important for which of the following management tools?

A.   synergistic action

B.   waste minimisation

C.   mobility of pollutants

D.   Environmental Risk Assessment

Use the following information to answer Questions 19–20.

The water in car batteries contains sulfuric acid and dissolved lead (in solution). The batteries must be carefully handled and stored, so that contents are not spilled. A factory must have a discharge licence from the regulatory authority to discharge any material into the environment. The acidity of a liquid is measured by the pH scale. The scale extends from 0–14, with lower numbers indicating high acidity, higher numbers low acidity (alkali), 7 indicates neutral. The presence of sulfuric acid in waste water would make it more acidic. The discharge licence for a particular car battery factory for industrial waste water requires the pH to be in the range of 5.0–6.0 and the lead content of the waste water to be less than 10 milligrams per litre. The waterborne emission is monitored daily by measuring the pH and the lead content in a one litre sample of the water in the drainage outfall from the factory.

The following data was recorded over a one-week period.

day	1	2	3	4	5	6	7	average
pH	5.8	5.7	5.6	5.2	4.6	4.4	4.2	5.1
lead*	6.9	7.0	7.0	6.9	7.1	6.9	7.1	7.0

* measured in milligrams per litre

Question 19

Which of the following would be the most likely cause of the variation in pH measurement throughout the week?

A.   very heavy rainfall midweek

B.   seepage from an acid storage tank

C.   random error in measuring or reporting the pH values

D.   spillage from completed batteries awaiting dispatch from the factory to shops

Question 20

The variation between the daily lead readings is most likely due to

A.   daily fluctuations in the background level of lead in the ground.

B.   random variations in the measured lead concentrations.

C.   steadily rising lead concentrations in the discharge.

D.   the factory floor being washed every second day.

SECTION B – Short-answer questions

┌───┐
│   **Instructions for Section B**   │
│   Answer **all** questions in the spaces provided.   │
└───┘

Question 1

In answering this question (a.–g.), use **one** pollutant that you have studied during the year.

a.   Name the pollutant and describe two characteristics or properties of the pollutant which affect its impact on the environment or its behaviour within the environment.

_____

_____

_____

_____

_____

3 marks

b.   **i.**   Describe the source of the pollutant and its method of introduction into the environment.

_____

_____

_____

ii.   Is the source a point or diffuse source? Give a reason for your answer.

_____

_____

2 + 1 = 3 marks

c.   Describe the transport mechanism of the pollutant; that is, how it moves through the environment.

_____

_____

_____

_____

2 marks

d. Describe the impact of the pollutant; either on human health **or** the health of the environment.

_____

_____

_____

_____

2 marks

e. Describe how the pollutant is removed or is dissipated from the environment, other than by human action.

_____

_____

_____

_____

2 marks

f. Outline **two** management strategies that have been taken, or could be taken, to reduce the environmental impact of the pollutant.

_____

_____

_____

_____

2 marks

g. Evaluate the effectiveness of one of these actual or proposed management strategies. Use evidence to support your answer.

_____

_____

_____

_____

_____

_____

3 marks

Question 2

A ship carrying a container full of car batteries capsizes in deep water close to the coast. The ship breaks apart and the container is washed overboard and sinks to the ocean floor. Oil from the ship's fuel tanks leaks into the sea.

Following the accident, scientists monitor oil washed ashore at each of the locations A, B, C and D. The results are presented in the table below.
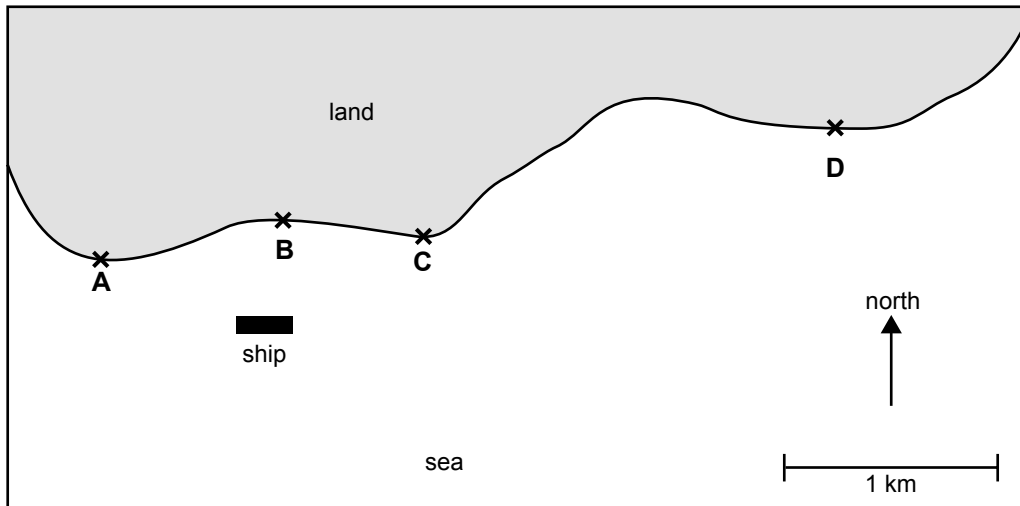
Time after the accident (days)	Oil concentration (parts per million)			
	site A	site B	site C	site D
0	0	0	0	0
1	0	2	1	0
2	2	3	8	3
3	1	3	9	4
4	0	3	7	5
5	2	2	4	3
6	2	2	3	3
7	2	2	4	3

a. Using terms such as 'pollutant sources' and 'transport mechanisms', account for the different measurements of oil concentrations at sites A, B, C and D.

_____

_____

_____

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_____

_____

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_____

4 marks

b. One approach to reduce the oil would be to set it alight. Name two environmental **disadvantages** of this strategy.

   i. _____

_____

   ii. _____

_____

4 marks

c. Describe two other steps that could be taken to minimise the environmental damage caused by the oil spill.

   i. _____

_____

   ii. _____

_____

4 marks

d. The batteries on the sea floor release lead into the marine environment. Three years after the accident, although there is almost no trace of oil, scientists detect high lead levels in tissues of fish caught at site B. However, lead levels in marine plants and in the small marine animals that the fish in the area feed on are quite low. Explain this data.

_____

_____

_____

_____

3 marks

SECTION B – continued
TURN OVER

Question 3

The diagram shows a river in a rural location.

The river flows generally from north to south, passing locations A, B and C in order. An environmental scientist takes three water samples at each location A, B and C. She then analyses each sample to find concentrations of the following pollutants: nitrates, copper and hydrocarbons.
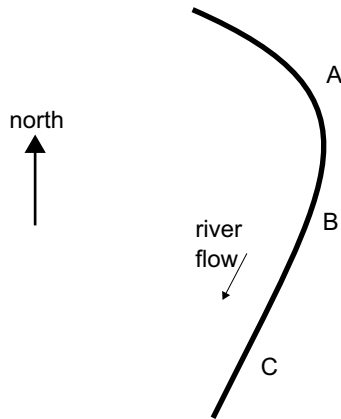
There are 1000 milligrams (mg) in a gram.

Sample	Nitrates (mg per litre)			Copper (mg per litre)			Hydrocarbons (mg per litre)		
	1	2	3	1	2	3	1	2	3
Location A	0.32	0.29	0.32	0.004	0.004	0.005	30	40	35
Location B	1.86	1.73	1.72	0.010	0.009	0.010	3200	3300	3200
Location C	1.95	1.75	1.86	0.011	0.010	0.009	2600	2400	2400

a. Why do the three samples taken at the same location often differ in measured concentrations of pollutants?

_____

_____

_____

_____

2 marks

b. The river flows past location C at a rate of 5000 litres per minute. Find the mass of copper passing C each day. Show working.

_____

_____

_____

_____

3 marks

c.   An industrial plant was once present in the region shown on the map. It was positioned on land near the river.

Using the measurements in the table, suggest the position of the plant relative to locations A, B and C. Explain your answer.

_____

_____

_____

_____

                                                                                                                    2 marks

d.   Give a possible explanation for the drop in concentrations of hydrocarbons between locations B and C.

_____

_____

_____

_____

                                                                                                                    2 marks

e.   A survey found that three species of fish live in the river near location C. This leads a local person to say that there is no pollution problem in the river as fish live there. Comment on this statement.

_____

_____

_____

_____

                                                                                                                    2 marks

f.   Local health standards specify the maximum allowable quantities of these pollutants in drinking water are to be

nitrates   –   50 mg/L
copper   –   2 mg/L
hydrocarbons –   50 mg/L

Is the river water at each of the sampling locations suitable for drinking? Give reasons for your answers.

_____

_____

_____

_____

                                                                                                                    3 marks

Question 4

In answering this question (a.–h.), use one environmental project that you have studied during the year.

a. Name the project and briefly describe it.

_____

_____

_____

2 marks

b. Define the term 'ecologically sustainable'.

_____

_____

2 marks

c. Would you describe this project as ecologically sustainable? Give a reason for your answer.

_____

_____

_____

2 marks

d. Describe two environmental impacts of the project (either positive or negative).

1. _____

_____

_____

2. _____

_____

_____

2 marks

e. Describe an Environmental Management Plan **or** consultation involved in the planning of the project, **or** a desirable form of plan if none was attempted.

_____

_____

_____

_____

2 marks

f. Describe the influences or consequences of any regulatory frameworks that affect the project.

_____

_____

_____

2 marks

g. Describe the monitoring process (or possible monitoring plan) that was used to evaluate either the adverse environmental impacts or the environmental success of the project.

_____

_____

_____

2 marks

h. How was the data gathered by the monitoring process used (or could have been used)?

_____

_____

_____

2 marks

2 marks

CONTINUED OVER PAGE

Question 5

There is a plan to improve a river system by removing weeds and rubbish, planting native vegetation and reducing inputs of pollution from stormwater and industry.

a.   An Environmental Management Plan (EMP) is to be developed for the project. Name a government agency or regulatory agency that should be involved in the development and monitoring of the EMP. Describe its role.

_____

_____

_____

_____

_____

_____

2 marks

b.   Give one specific example of how community groups could contribute to the rehabilitation of the river. In your answer, explain why this contribution would be important.

_____

_____

_____

_____

2 marks

c.   Give two specific examples of how the government (local, state or federal) could contribute to the improvement of the river. In your answer, explain why each of these contributions would be important.

example 1 _____

_____

_____

_____

example 2 _____

_____

_____

_____

4 marks

END OF QUESTION AND ANSWER BOOK

Victoria
The Place To Be