

Victorian Certificate of Education
2022

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER

Letter

ENVIRONMENTAL SCIENCE

Written examination

Thursday 10 November 2022

Reading time: 3.00 pm to 3.15 pm (15 minutes)

Writing time: 3.15 pm to 5.15 pm (2 hours)

QUESTION AND ANSWER BOOK

Structure of book

Section	Number of questions	Number of questions to be answered	Number of marks
A	30	30	30
B	8	8	90
			Total 120

- 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 correction fluid/tape.

Materials supplied

- Question and answer book of 29 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.
- Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.
- 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 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.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Use the following information to answer Questions 1–3.

The Okavango Delta in Botswana is one of the largest wetland systems in the world. It has been listed by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as a World Heritage site. The wetland systems are home to over 700 species of animals and are a source of livelihood for the local people.

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Source: © FRANS LANTING; Julian Smith, 'African oasis: The Okavango Delta',
The Nature Conservancy, 27 February 2021 (spring 2021)

Question 1

The local people consume fish species that spend part or all of their life cycle within the wetland habitat.

What is the ecological service provided by the Okavango Delta's wetland systems?

- A. cultural
- B. regulating
- C. supporting
- D. provisioning

Question 2

The Okavango Delta is home to many kinds of animals.

This is an example of which type of biodiversity?

- A. species
- B. genetic
- C. habitat
- D. ecosystem

Question 3

What evidence could be used to classify the Okavango Delta wetland systems as a 'biodiversity hotspot'?

- A. The climate in the area is humid with high temperatures.
- B. The area is under threat and there are many endemic species present.
- C. Rapid evolution is underway, resulting in the formation of new species.
- D. There is seasonal variation in the rainfall, with large falls occurring at certain times of the year.

Question 4

During a mass extinction event, there is

- A. an immediate loss of a large proportion of one type of species.
- B. a volcanic eruption that causes the extinction of plant species nearby.
- C. a loss of a large proportion of species during a specific period of time.
- D. a medium-term loss of animals that results in a variety of fossil evidence.

Question 5

Which one of the following is a consequence of low genetic diversity in a population?

- A. inbreeding resulting in genetic disease
- B. genetic swamping caused by inbreeding
- C. interbreeding causing death of offspring
- D. resistance to new diseases after interbreeding

Question 6

An Indigenous Protected Area (IPA) is an area of land or sea managed by Indigenous groups. An IPA is the result of an agreement between Indigenous groups and the Australian Government, which aims to promote biodiversity and cultural resource conservation in such areas.

This agreement will result in

- A. reduced cultural services in the area.
- B. the application of the user pays principle.
- C. the implementation of an international treaty.
- D. the participation of stakeholders who have specific knowledge systems.

Use the following information to answer Questions 7 and 8.

VCE Environmental Science students carried out a study to determine the impact of humans on a lake environment. They calculated the species richness in two areas of an urban lake. One half of the lake area is protected from human impact and the other half is used for recreation.

Question 7

What is the dependent variable in this study?

- A. the level of human impact
- B. the number of different species
- C. the protected area versus the unprotected area of the lake
- D. baseline data showing the overall number of organisms in the entire lake area

Question 8

Which one of the following would not be a controlled variable in this study?

- A. the sampling method used
- B. the size of the sample area
- C. the time of day that sampling takes place
- D. the number of people spending time in the unprotected area of the lake

Question 9

What are the three value systems that influence a decision-making process?

- A. economic, social, ecological
- B. recyclable, re-usable, sustainable
- C. biocentrism, ecocentrism, anthropocentrism
- D. generational, intergenerational, intragenerational

Question 10

The principle of 'intragenerational equity' refers to

- A. the sustainable generation of resources.
- B. meeting the needs of both present and future generations.
- C. the provision of resources to only those who need them.
- D. the equitable distribution of sustainable resources among the present generation.

Use the following information to answer Questions 11–13.

Students investigated the population numbers of a small marsupial, *Antechinus brownii*, which inhabits a state forest on the Mornington Peninsula. During the spring–summer period, the students used motion-activated, remote-controlled cameras to capture images of the animals in the forest. The cameras were connected to the internet and could be accessed from the school’s laboratory.

The students worked out a method of identifying marsupials by the shape and size of their ears.

The cameras were scattered in a systematic grid across the forest and operated remotely for six months.

Question 11

Which one of the following types of population data was collected by the students?

- A. anecdotal
- B. qualitative
- C. quantitative
- D. extrapolative

Question 12

The students decided that the motion-activated and remote-controlled cameras were a suitable monitoring method because there was no handling of the small marsupials, which placed less stress on the animals and allowed natural behaviours to be recorded.

Which value or guideline does this research method demonstrate?

- A. health
- B. safety
- C. ethical
- D. technical

Question 13

Before going out and setting up the motion-activated, remote-controlled cameras in the field, the students considered factors such as the fire rating for the day, having sufficient water and food supplies, types of footwear and the accuracy of their map.

This is an example of

- A. data collection.
- B. a management plan.
- C. an occupational health and safety assessment.
- D. identifying limitations of selected models and theories.

Question 14

Sea surface temperature (SST) can be recorded to monitor long-term temperature changes, forecast the weather and assist with climate modelling.

Which one of the following would be the best method to generate SST data?

- A. Use submarines to collect ocean temperature data at different depths globally.
- B. Investigate changes in tide levels at different coastal locations.
- C. Analyse ice core samples in both Antarctica and the Arctic.
- D. Use temperature sensors on ships and buoys.

Question 15

Female green sea turtles lay their eggs in beach sand at night. The eggs take around 50 days to hatch. The sex of a baby green sea turtle is determined by the temperature of the sand incubating the egg. Warmer sand temperatures of 29.1 °C and above produce females and cooler sand temperatures produce males. It has been estimated that a 2 °C increase in sand temperature will lead to a 99.86% female hatching rate.

Which one of the following is likely to be an impact of climate change on green sea turtle populations?

- A. More females in the population will mean more eggs will be laid as global warming increases.
- B. There will be little impact on the population numbers as male sea turtles will be able to find large numbers of mating partners.
- C. Overall, fewer turtles will be born because they will not survive the warmer temperatures of the sand during the day when incubating.
- D. More females will be born, disturbing the natural gender ratio (the number of males compared to the number of females) and leading to a decline in population numbers.

Question 16

Snow has a high albedo.

This means that it will

- A. store a high percentage of carbon.
- B. release a high percentage of methane.
- C. reflect a high percentage of incoming solar energy.
- D. absorb a high percentage of incoming infrared radiation.

Question 17

Agricultural production and building developments have resulted in significant land clearing across the globe.

How has land clearing changed the cycling of atmospheric greenhouse gases?

- A. by removing native fauna
- B. by creating long-term carbon storage
- C. by allowing the soil to sequester more carbon
- D. by removing trees that absorb and store carbon

Question 18

Volcanic eruptions release emissions that contribute to the composition of the atmosphere.

Which one of the following is a major gas emitted from volcanic eruptions?

- A. methane
- B. nitrous oxide
- C. carbon dioxide
- D. chlorofluorocarbons (CFCs)

Question 19

Carbon capture and storage is a method of carbon sequestration that involves

- A. removing carbon from the oceans and storing it in rock.
- B. using old growth forests to absorb high levels of carbon dioxide.
- C. filtering carbon dioxide from the atmosphere and storing it in the oceans.
- D. capturing greenhouse gas emissions from fossil fuel power stations and injecting the emissions deep into the ground.

Question 20

Which one of the following is not a method of collecting scientific evidence of past atmospheric conditions?

- A. palaeobotany
- B. ice core sampling
- C. climate modelling
- D. temperature monitoring

Question 21

As part of the natural greenhouse effect, visible light is

- A. trapped by greenhouse gases.
- B. absorbed by Earth and re-emitted as infrared radiation.
- C. converted into ultraviolet radiation in the thermosphere.
- D. reflected by Earth as infrared radiation and then absorbed by greenhouse gases.

Use the following information to answer Questions 22 and 23.

A home owner has been planning to upgrade the lighting in her house from fluorescent light globes to light-emitting diode (LED) lights. This improvement will use around one-fifth of the amount of electricity of fluorescent light globes and the new lights will last three times longer.

Question 22

Which one of the following is an environmentally sustainable reason for installing LEDs?

- A. The power will be sourced from renewables.
- B. Changing light globes less often reduces costs.
- C. LEDs consume fewer resources over the long term.
- D. Fluorescent light globes produce more heat, contributing to local warming.

Question 23

In what way is the change to LEDs by the home owner an example of environmentally responsible decision-making?

- A. It allows the home owner to make significant personal cost savings.
- B. It is a way of contributing to a reduction in personal energy consumption.
- C. It is a response to regulatory frameworks imposed on home owners by government organisations.
- D. It is of little benefit to the environment because the electricity is still mainly sourced from coal-fired power stations.

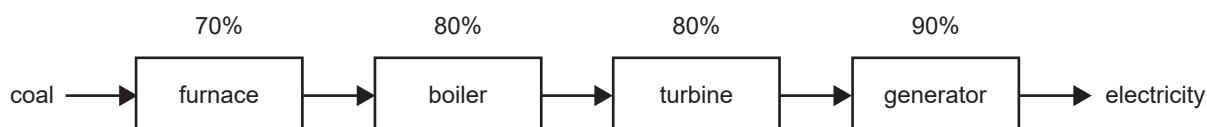
Question 24

Why is nuclear energy, which is sourced from uranium, classified as a non-renewable energy source?

- A. Uranium is a fossil fuel energy source like coal, oil and natural gas.
- B. Uranium needs to be mined, refined and processed before it can be used in a reactor to produce electrical energy.
- C. Uranium is a resource that cannot be readily replaced by natural means at a pace fast enough to keep up with consumption.
- D. The process of sourcing nuclear energy from uranium creates large amounts of dangerous radioactive waste that needs to be stored safely and securely.

Use the following information to answer Questions 25 and 26.

Within a coal-fired power station, energy is converted from coal into electricity. The coal is burnt in a furnace to heat a boiler that turns a turbine and then a generator. The percentage efficiency of each step in the conversion is shown in the diagram below.

**Question 25**

Which one of the following lists the energy form conversions in the correct order, from the coal in the power station to electricity in the grid?

- A. potential → thermal → kinetic → thermal → kinetic → electrical
- B. chemical → kinetic → kinetic → mechanical → thermal → electrical
- C. potential → potential → thermal → potential → mechanical → electrical
- D. chemical → thermal → thermal → mechanical → mechanical → electrical

Question 26

What is the approximate overall energy efficiency of this coal-fired power station?

- A. 20%
- B. 32%
- C. 40%
- D. 80%

Use the following information to answer Questions 27–30.

Fully electric vehicles currently convert between 75% and 80% of the electrical energy from the grid to power at the wheels through a battery or motor system located in the vehicle. Conventional vehicles with an internal combustion engine convert between 15% and 30% of the energy from fossil fuel (petrol or diesel) to power at the wheels.

Question 27

Where do fully electric vehicles originally source their energy from?

- A. the electric motor
- B. the battery system in the vehicle
- C. the internal combustion engine
- D. an energy source such as wind or coal

Question 28

Vehicles powered by petrol and diesel engines are very inefficient at converting the fossil fuel in their tanks into motion of the wheels, with over 60% of the energy lost as heat.

This inefficiency is explained by

- A. the first law of thermodynamics.
- B. the second law of thermodynamics.
- C. the level of emissions due to the combustion of fuel.
- D. heavy traffic in many cities and constant speeding and braking by many motorists.

Question 29

There are a variety of challenges involved in building a sustainable energy future, including moving away from conventional vehicles towards electric vehicles.

Considering environmental, sociocultural and economic concerns, a sustainable energy future for vehicles requires

- A. reducing the current high costs involved in buying an electric vehicle and improving the availability of recharging stations.
- B. maintaining the economic value of vehicles powered by internal combustion engines compared to vehicles with electric motors.
- C. considering the passion people have for vehicles powered by internal combustion engines, such as V8 and fuel-injected turbocharged motors.
- D. developing a method of significantly decreasing the level of carbon dioxide emissions from vehicles powered by petrol-fuelled internal combustion engines.

Question 30

Included in the focus on electric vehicles is a move towards circular economy thinking.

Circular economy thinking involves

- A. planning for the reduction of waste and pollutants.
- B. making sure electric vehicles are cheap to purchase.
- C. considering the economic bottom line and profits for car makers.
- D. ensuring less recycling of the rubber, metal and battery components of electric vehicles.

**END OF SECTION A
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SECTION B

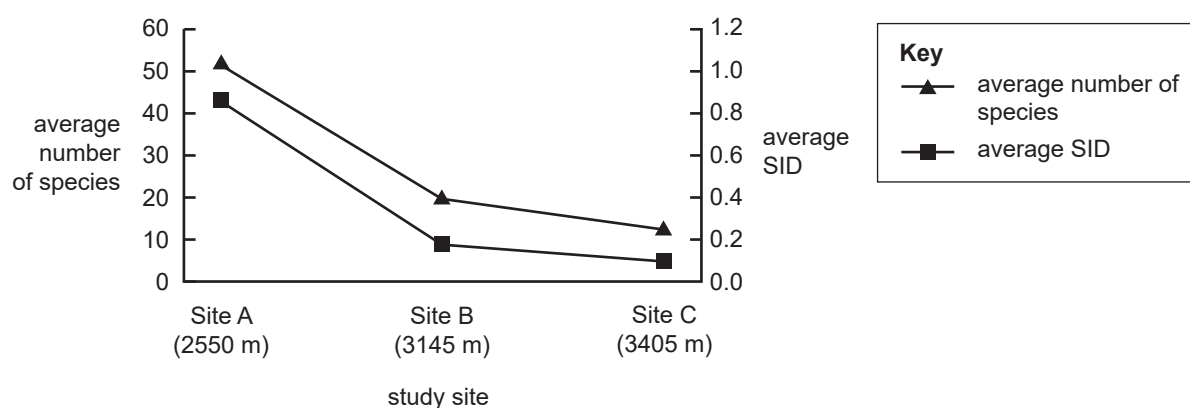
Instructions for Section B

Answer **all** questions in the spaces provided.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1 (11 marks)

A sampling study was undertaken with the aim of determining the effect of elevation on species diversity in an alpine area in Taiwan. The results of this fieldwork study are shown in the graph below, which indicates the average number of species (species richness) and average Simpson's Index of Diversity (SID) at sites of increasing elevation.



Source: adapted from Tsurng-Juhn Huang, Chin-Hui Chen et al., 'Diversity of the alpine vegetation in central Taiwan is affected by climate change based on a century of floristic inventories', *Botanical Studies*, vol. 52, October 2011, p. 510

- a. State the trend in the species richness data.

2 marks

- b. Explain why the SID and species richness data follow a similar trend, in terms of the calculation of SID.

3 marks

- c. Identify a suitable sampling method for this fieldwork study. Briefly outline this sampling method.

2 marks

The alpine area is home to an endemic species of alpine hedge sparrow. The birds breed in mountain ranges, from alpine meadows above the treeline, up to the snowline in the higher elevations. In winter, they may be found at lower elevations in rocky and scrubby habitats. Their diet consists mainly of insects, some spiders, earthworms and other invertebrates and, especially in autumn and winter, various plant seeds. They usually feed on the ground, among rocks, grasses, moss and lichens.



Source: Taiwan Encyclopedia of Life (TaiEOL),
<<https://taieol.tw/pages/75180>>;
image by Zhang Junde; licensed CC-BY-NC-SA,
<https://creativecommons.org/licenses/by-nc-sa/4.0/deed.zh_TW>

- d. The alpine hedge sparrow is endemic to the alpine region in Taiwan.

Explain what this means in terms of the range of the bird.

1 mark

- e. The alpine hedge sparrow was one of the species included in the sampling study.

Suggest how the range of the bird could have an impact on the results of the study. Refer to the term 'validity' in your response.

3 marks

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SECTION B – continued
TURN OVER

Question 2 (12 marks)

The Graveside Gorge wattle (*Acacia equisetifolia*) is a critically endangered acacia plant that is endemic to a remote region of the Northern Territory. It is pollinated by and provides food for a variety of different insect species in Kakadu National Park. It is thought that its seeds are dispersed by ants and that these seeds germinate after fires. The main threat to the Graveside Gorge wattle is fires that are too frequent or too intense.

Graveside Gorge wattle

Source: Australian Native Plants Society (Australia) Inc.,
Acacia Study Group Newsletter, no. 125, June 2014, p. 7

As a safeguard against extinction, Parks Australia has collected seed from the Graveside Gorge wattle, which is now stored in the National Seed Bank at the Australian National Botanic Gardens in Canberra. Other efforts to protect and restore the habitat of the wattle are underway, including the rehabilitation of certain areas to create wildlife corridors.

- a.** Outline how climate change contributes to an increase in the intensity and frequency of fires. 2 marks

- b.** Suggest **two** ways in which more frequent and intense fires might be a threat to the Graveside Gorge wattle. 3 marks

- c. The Graveside Gorge wattle is protected under the *Environment Protection and Biodiversity Conservation Act 1999*.

Explain **one** way in which the Act protects the Graveside Gorge wattle.

2 marks

- d. The National Seed Bank is being used to conserve the Graveside Gorge wattle.

Outline how this seed resource could be used to support future populations of the Graveside Gorge wattle.

2 marks

- e. Explain how a wildlife corridor may also be a suitable strategy for increasing the population of the Graveside Gorge wattle.

2 marks

- f. In the short term, if management strategies are successful and the population of the Graveside Gorge wattle grows, state the possible new conservation category of the wattle.

1 mark

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Question 3 (11 marks)

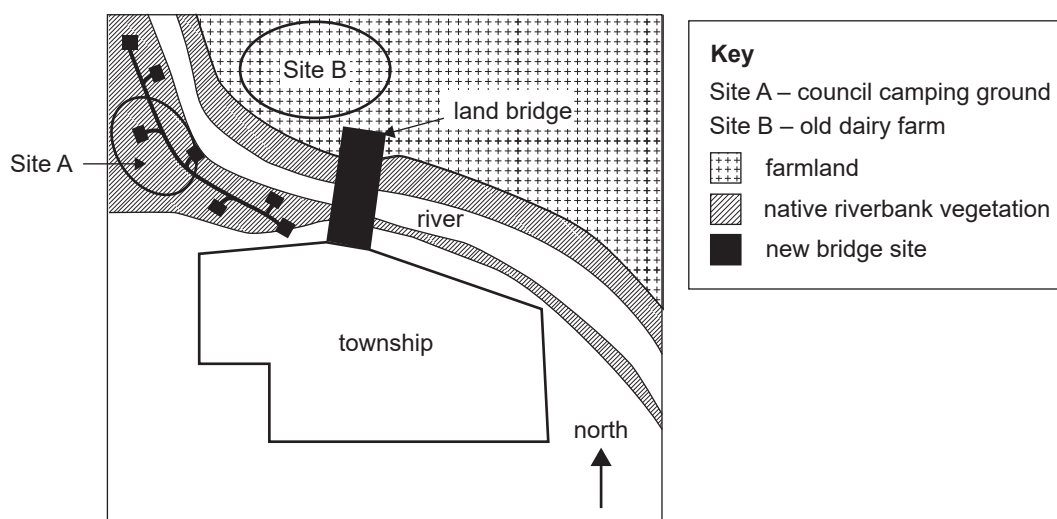
The council of a small country town, located adjacent to a healthy river, has proposed building a water park to attract tourism and improve local amenities. The council has suggested that it can source the required water and develop the site carefully so as not to disrupt the ecology of the area or the natural flow rates of the river. Water can be sourced from the river during peak flows and from stormwater. The water can be stored in tanks, treated with ozone and salt, and recycled where possible. Any excess or overflow can be directed back to the river.

Along both sides of the riverbank is native vegetation. The southern side of the river has a camping ground on it. On the northern side of the river is an abandoned dairy farm.

The council is considering two options:

- Site A – Located among native vegetation, the council-owned camping ground would be closed down and parts of the infrastructure would be used for the new water park.
- Site B – The council would purchase the abandoned dairy farm on the northern side of the river. An existing single-lane wooden bridge would need to be upgraded to cater for greater car use and foot access to the water park. To build the bridge and purchase the land, the council would have to find additional funding.

Possible locations for council water park



- a. With reference to the user pays principle, explain why the council would choose Site A rather than Site B, making clear the meaning of this term in your response.

3 marks

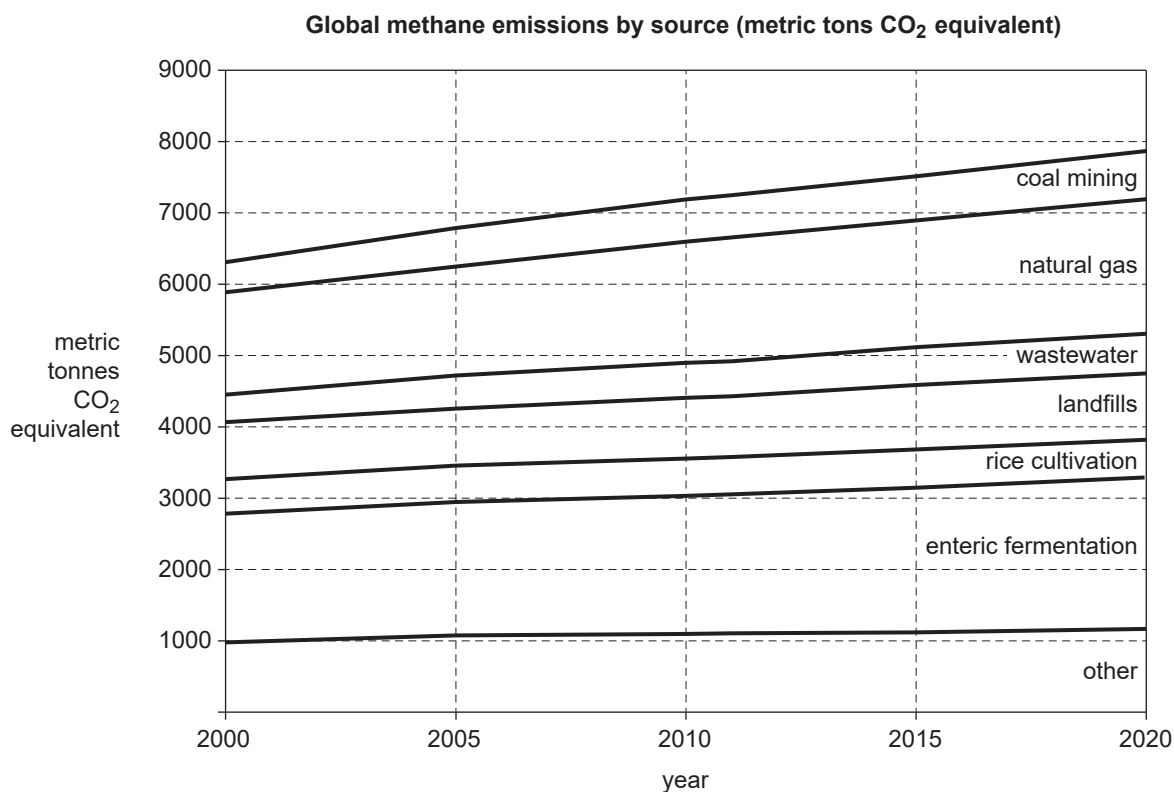
b. The council has considered feedback from stakeholders, particularly users of the camping ground. These stakeholders prefer Site B (the water park would be across the river from the township); however, the council prefers Site A (the water park would be on the same side of the river as the township).

2 marks

6 marks

Question 4 (10 marks)

The graph below shows historic trends for methane emissions from a variety of sources. The methane levels for each source have been converted to metric tons of carbon dioxide (CO₂).



Source: adapted from National Aeronautics and Space Administration (NASA), Earth Observatory, 'Methane matters', <<https://earthobservatory.nasa.gov/features/MethaneMatters>>

- a. Calculate the percentage increase in methane emissions produced by natural gas sources from 2005 to 2020. Show your working. 2 marks

- b. Outline **one** reason why methane emissions from natural gas sources are increasing globally. 2 marks

- c. Describe the role of methane in the natural greenhouse effect.

2 marks

- d. Methane does not last in the atmosphere for as long as carbon dioxide, yet it has a higher warming potential.

Explain this relationship.

2 marks

- e. Outline **two** ways in which methane emissions from landfills could be reduced.

2 marks

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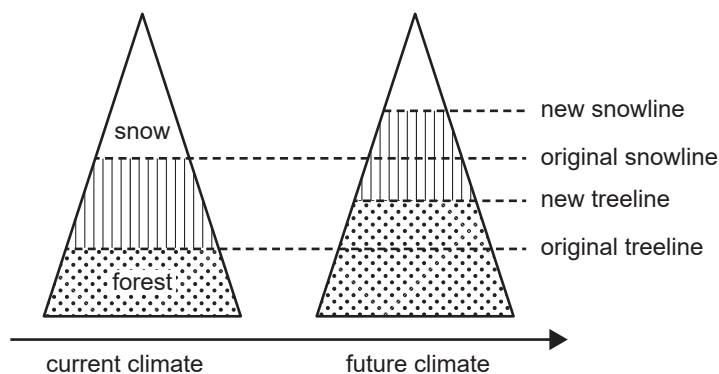
SECTION B – continued
TURN OVER

Question 5 (11 marks)

The Victorian Alps have historically had reliable snow cover, which is vital for the survival of a range of species endemic to the region. The snow also provides a water source for both commercial and domestic use. Climate modelling in this region predicts the following:

- a reduction in snow cover and depth
- higher snowlines
- less rainfall
- higher temperatures

Predicted impact of climate change in the Victorian Alps



Source: adapted from SFJ De Wekker, M Kossmann, JC Kniewel et al., 'Meteorological applications benefiting from an improved understanding of atmospheric exchange processes over mountains', *Atmosphere*, 2018, 9(10), <<https://doi.org/10.3390/atmos9100371>>; © 2018 by the authors; licensee MDPI, Basel, Switzerland; article licensed CC-BY 4.0, <<https://creativecommons.org/licenses/by/4.0>>

- a. Based on these predictions, state **two** risks to the alpine ecological system resulting from climate change.

2 marks

- b. To slow the rate of climate change, a local shire provides incentives for residents to purchase electric cars rather than petrol-fuelled cars.

Explain why this would be an effective mitigation strategy.

2 marks

- c. Name a stakeholder in the Victorian Alps who was not mentioned in **part b.** and provide a climate change mitigation strategy that this stakeholder could use.

2 marks

- d. Finley, a local resident, explains that the mitigation strategies in **part b.** and **part c.** will contribute to reducing climate change in the local area. Finley's friend Kai disagrees, arguing that these strategies will contribute to reducing climate change globally.

Which viewpoint is scientifically correct? Explain your response.

2 marks

- e. On many mountains, artificial snow-making technologies are used to increase snow cover for recreational skiers and to support the survival of snow-dependent species. However, snow-making uses large amounts of water.

Suggest a method for sourcing water sustainably so that snow-making can continue without contributing to further water scarcity. Justify your response.

3 marks

Question 6 (10 marks)

A regional area of Australia has begun extracting coal seam gas for use in gas-fired turbines to generate electricity. A neighbouring region has decided to construct a large-scale wind farm to generate electricity, rather than using the coal seam gas resources available in its area.

- a.** Describe the consequence of the combustion of coal seam gas on the carbon cycle. 2 marks

- b.** In some areas, the extraction of coal seam gas requires the use of a method called hydraulic fracturing (or fracking). The extraction of coal seam gas and the fracking method have implications related to the sustainability principle ‘intergenerational equity’.

Explain what fracking is and how it could potentially have an impact on intergenerational equity, making clear the meaning of the term ‘fracking’ and how it applies to this example.

3 marks

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- c. In terms of base and peak load power, which of the two energy sources – coal seam gas or wind – would best be able to provide these energy load requirements for the population of a region? Justify your response.

3 marks

- d. Describe the key environmental reason why a region would opt to use wind energy rather than a coal seam gas resource.

2 marks

Question 7 (11 marks)

Pumped hydro energy storage (PHES) uses water reservoirs as a way of storing energy. Excess energy can be used during periods of low demand to pump water from a lower dam to a higher one, essentially converting the upper reservoir into a giant battery. This stored energy can then be released by returning the water via a hydro-electric turbine into the lower reservoir.

Another option for energy storage is large-scale battery systems. Batteries can store excess electrical energy in chemical form by using lithium ion or zinc hybrid technology. Large-scale batteries can make stored energy available for immediate use when demand for electricity exceeds generation.

- a. What are the environmental concerns regarding the use of a large-scale battery system from a resource extraction viewpoint?

3 marks

- b. Why is it important to locate the storage system (either the large-scale battery system or the PHES) close to the community using the electricity?

2 marks

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- c. Explain why collecting data on the biodiversity and ecology of a region would be necessary when developing a management plan for a PHES system and its ongoing assessment.

4 marks

- d. In terms of accessibility, why might a region choose to use a large-scale battery storage system rather than a PHES system?

2 marks

SECTION B – continued
TURN OVER

Question 8 (14 marks)

A group of VCE Environmental Science students used a fieldwork methodology to investigate the relationship between canopy height and soil moisture content at a selected study site. The students used a line transect method to generate data. Both digital and manual methods were used at the site.

Fieldwork

1. Measuring canopy height

Digital method

- A drone that has digital sensors was used to automatically record canopy height data along the transect.

Manual method

- An inclinometer was used at a measured distance from the base of each tree to record the angle to the top of each tree along the transect.

2. Measuring soil moisture

Digital method

- A digital sensor was used to measure soil moisture along the transect.

Manual method

- Soil samples were collected along the transect for further analysis in the school laboratory.

School laboratory

1. Canopy height calculations

- Tree height was calculated from the distance and angle measurements taken with the inclinometer.

2. Soil moisture calculations

- Soil samples were weighed, dried and reweighed. The difference in mass was then used to calculate the percentage of water in the soil sample.

All data was entered into the students' logbooks, as shown in the tables on page 27.

The students then prepared their field data for evaluation and analysed the soil moisture content. They have yet to complete their graph of soil moisture data.

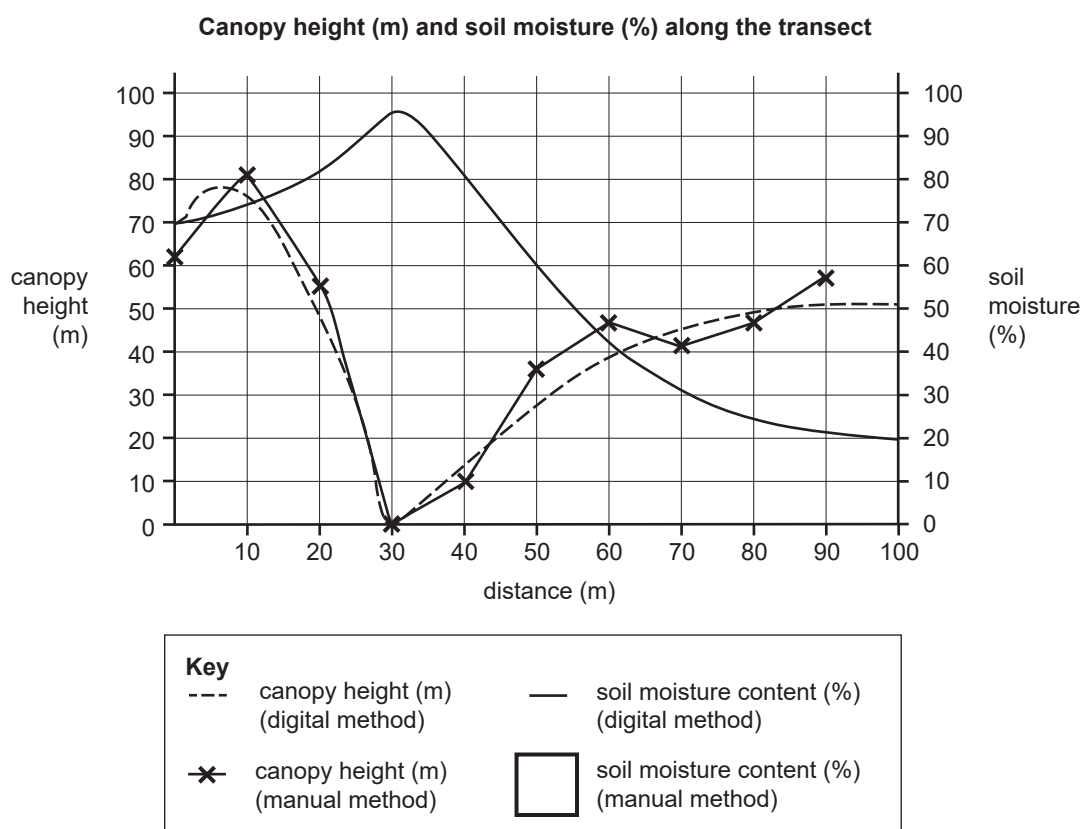
Canopy height

Transect distance (m)	Digital method (m)	Manual method (m)
0	71	62
10	76	81
20	48	56
30	0	0
40	14	10
50	28	36
60	39	47
70	45	41
80	49	47
90	51	58
100	51	186

Soil moisture content

Transect distance (m)	Digital method (%)	Manual method (%)
0	70	62
10	74	68
20	81	72
30	96	81
40	82	77
50	60	35
60	42	23
70	31	18
80	25	16
90	21	16
100	20	15

- a. Use the soil moisture content (%) data (manual method) to plot the points and draw a line of best fit on the graph below. Add this line to the box provided in the key. 3 marks



- b. Based on the data on page 27, identify where on the transect line the students have crossed a creek. Describe **two** pieces of evidence that support your response.

3 marks

- c. Describe the correlation between soil moisture and canopy height suggested by the data on page 27.

1 mark

Further analysis of the data by the students highlighted differences in soil moisture content when measurements from the digital sensor were compared to measurements from the laboratory.

- d. Suggest **two** reasons for the difference in results between the soil moisture content data collected using the digital method and the data calculated manually in the school laboratory.

2 marks

- e. At 100 m on the transect, the height calculated for the canopy was 186 m. This was either an incorrect measurement or a calculation error, and it was therefore not included on the graph.

Within this data set, what would this data point be called?

1 mark

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- f. One of the students suggests that the drone should have been used to remeasure tree height at the site multiple times per day. The student argues that this would help with data precision but not necessarily with accuracy.

Is the student's argument correct? Explain the difference between 'precision' and 'accuracy' in your response.

4 marks
