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ENVIRONMENT EDUCATION VICTORIA

Victorian Certificate of Education

2019

ENVIRONMENTAL SCIENCE

Trial Written Examination

August 2019

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Section	Number of questions	Number of questions to be answered	Number of marks
A	30	30	30
B	9	9	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

- Question and answer book of 25 pages
- Answer sheet for multiple choice questions

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
- 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 question and answer book

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

SECTION A

Question 1

A species is an organism that is considered to:

A. Look alike and live in the same habitat

B. Interbreed and produce fertile offspring

C. Interbreed and produce viable offspring

D. Look alike but live in different habitats.

Question 2

Name the phenomena that is responsible for Australia's unpredictable rainfall patterns:

A. La Niña – Southern Oscillation

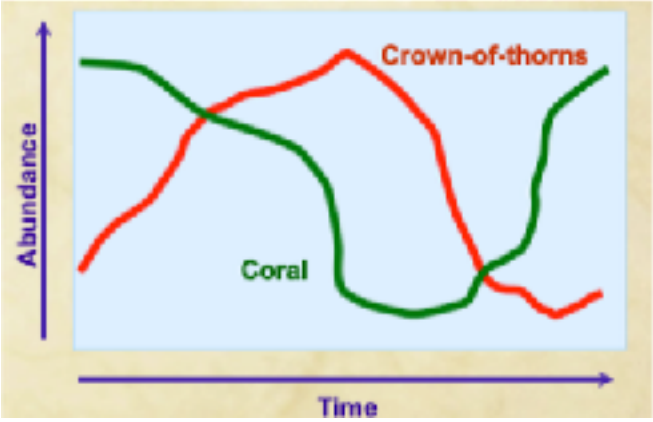
B. El Niño – Southern Oscillation

C. El Niño – Southern Orientation

D. El Niña – Southern Organisation.

Question3

Look at the following graph. It shows the crown-of-thorns starfish *Acanthaster planci*, which eats coral and causes the coral to die. Make an assumption regarding the interaction of crown-of-thorns starfish and coral.



A. The coral shows increased growth over time

B. When the coral abundance declines so does the crown-of-thorns starfish as the coral is the main food source for the crown-of-thorns starfish

C. As the crown-of-thorns starfish abundance peaks the coral abundance reaches its lowest point.

D. Crown-of-thorns starfish do not like coral.

Question 4

There have been five mass extinction events in Earth's history and some people believe the Earth is headed for a sixth mass extinction. If this were to occur it would be an example of :

A. Individual species inability to diversify

B. Natures way of diversifying remaining species

C. Human impacts on multiple Earth systems over a short timescale

D. Inability of species to adapt to Climate Change.

Question 5

The eastern barred bandicoot *Perameles gunnii* is a critically endangered species that has recently been released into its former range. The captive breeding program has seen individuals released as a test site in Victoria. To establish the success of the test site the Bandicoots must be monitored with consideration of bioethical guidelines. A bioethical guideline that should be followed at the release site would be:

A. Minimize contact with the animals during breeding season

B. Keep the site a Top Secret location

C. Maximize the amount of government funding for the continuation of the program.

D. Ensure everyone who enters the range washes their hands and boots.

Question 6

The eastern barred bandicoot is *Critically Endangered* in Victoria, *Extinct* in South Australia but still quite common in Tasmania. DNA testing of the larger Tasmanian population has proven that they more genetically similar than the very small Victorian population. What implication does this have on captive breeding programs?

A. The Tasmanian populations should be breed with the Victorian population to increase their genetic variability

B. Any captive breeding program should be designed to maintain the genetic diversity of the Victorian population

C. Captive breeding should not include the Tasmanian population as this would cause mutations

D. Only animals with the status *Critically Endangered* should be bred in captivity.

Question 7

Studies of Cheetahs in Africa have shown they have very little genetic diversity. This may lead to:

A. A variety of mutations in offspring

B. A decrease in the population

C. A higher survival rate

D. A limited ability for the species to survive rapid environmental conditions.

Question 8

According to the Department of Environment and Energy, one of the most important benefits that wetlands provide is their capacity to maintain and improve water quality. This highlights the importance of a wetland ecosystem providing a:

A. Provisional service

B. Regulating service

C. Supporting service

D. Beneficial service.

Question 9

Wetlands also play an important role in regulating exchanges of greenhouse gases to and from the atmosphere, including water vapour, carbon dioxide, methane and nitrous oxide. This is is known as:

A. Biosequestration

B. Sequestration

C. Geoengineering

D. Geological sequestration.

Question 10

CITES is the international agreement between governments that aims to ensure that the international trade in wildlife does not threaten wild populations of plants and animals. Australia has multiple domestic policies that include tighter measures than those required by CITES. One of those measures is the refusal to issue permits for new hunting trophies of the Southern White Rhinoceros. This is an example of:

A. Intergenerational equity

B. Intragenerational equity

C. User-pays principle

D. Precautionary principle.

Question 11

A major new road will be constructed in a major city. Part of that road will consist of an underground tunnel. The tunnel is most likely to impact the:

A. Hydrosphere

B. Lithosphere

C. Atmosphere

D. Biosphere.

Question 12

In order to complete the road an environmental risk management plan must be completed and made available to the general public. The purpose of the plan is to:

A. Inform the local residents about how they will be effected during construction

B. To identify all species of plants and animals so they can be relocated during construction

C. To fulfil government requirements

D. To identify and evaluate the environmental risks so they can be managed during construction.

Question 13

The theory that describes a point in time when oil production reaches its maximum and then will begin to decline is known as:

A. Maximum oil

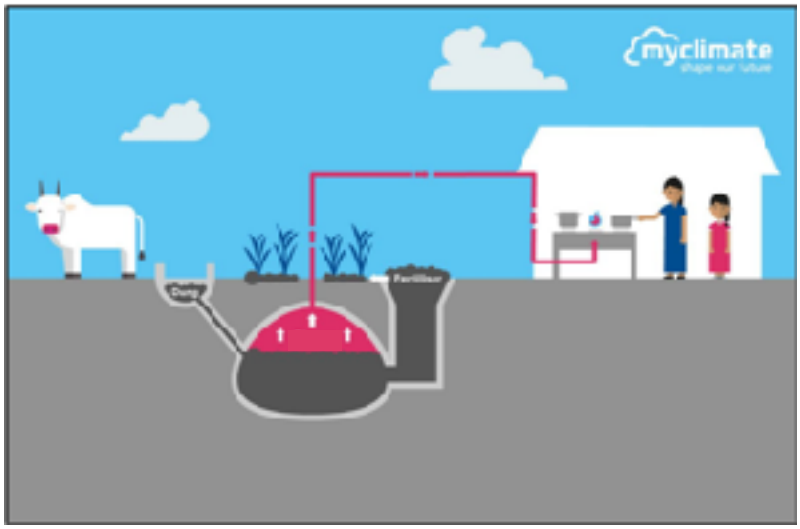
B. Peak oil

C. Declining oil

D. Holding oil.

Question 14

The picture below is an example of which type of fuel:



A. Biomass

B. Biogas

C. Methane

D. Carbon Dioxide.

Question 15

Anaerobic respiration produces which greenhouse gas?

A. Nitrogen

B. Methane

C. Carbon Dioxide

D. Water Vapour.

Question 16

Which of the following lists are examples of renewable energy?

A. Solar, Hydro, Wind and Thermal

B. Solar, Hydro, Wind and Nuclear

C. Solar, Hydro, Wind and Petroleum

D. All of the above.

Question 17

Biofuels such as ethanol are rapidly becoming a useful alternative to petroleum oil. However, at this stage they are unlikely to meet the global demand for petrol because:

A. They are not suitable for diesel engines

B. They have very low yield per hectare

C. Using these oils in engines would make them difficult for households to source

D. Ethanol is highly explosive.

Question 18

Human and non-human threats to biodiversity include genetic swamping. Genetic swamping is where:

A. Animals are forced to live in small breeding populations

B. Invasive species hybridise with native species

C. Environmental poisons cause bioaccumulation in the environment

D. Scientists add genetic code to an organism.

Question 19

Which has the highest global warming potential?

A. CO_2

B. Water Vapour

C. Methane

D. N_2O.

Question 20

A scientist is hoping to understand an observed behaviour in a colony of ants. What would be the most appropriate technique to sample this large group of organisms?

A. Mark and recapture

B. Quadrat sampling

C. Observations over time

D. Trapping.

Question 21

If a climatologist wanted to study atmospheric conditions over a period of 400,000 - 800,000 years they would look at samples from:

A. Fossil records

B. Tree rings

C. ENSO cycles

D. Ice cores.

Question 22

Natural climate variability is evidenced by many different sources. One of those sources is the Milankovitch Cycle. This cycle is focused on:

A. Ocean-atmosphere oscillation

B. Earths elliptical orbit stretching and shortening over a decade cycle

C. Earths elliptical orbit stretching and shortening over a millennium cycle

D. Solar flares disturbing the earth orbiting cycle.

Question 23

The first law of thermodynamics states:

A. Energy cannot be created or destroyed

B. All energy equals the same joules

C. Solar energy is more powerful than nuclear energy

D. Petroleum is the first source of energy.

Question 24

The phrase "meeting the needs of the present without compromising the ability of future generations to meet their own needs" can be used as a definition of:

A. Sustainability

B. Sustainable Development

C. Development for Sustainability

D. Global Environmentalism.

Question 25

When assessing if a proposed development will affect an ecosystem, a biophysical assessment needs to take place. This is to establish the size of the ecosystem, vegetation assemblage, soil composition, as well as hydrology. This assessment is known as an:

A. Ecological niche assessment

B. Biosphere composition assessment

C. Ecological principles assessment

D. Ecological integrity assessment.

Question 26

Which of the following is likely to increase the rate of climate change?

A. An increase in ice sheet cover

B. Continuing consumption of fossil fuels by countries

C. A continuing loss of plant and animal species

D. Continuing inaction by international government leaders.

Question 27

In Victoria, the body that regulates the environment and is an authority on the things that impact our environment is called the:

A. Environment Protection Authority

B. Environmental Protection Assessment

C. Environmental Protection Agency

D. Environmental Protection Alliance.

Question 28

On a global scale, plant and animal communities with the same structure are called:

A. Biospheres

B. Biohabitats

C. Biomes

D. Biomass.

Question 29

On temperate Australian rocky shores, patches of algae form when:

A. A space being cleared allows their spores to establish and escape predators until they are large

B. Predators of barnacles keep some areas of rocks clear

C. Only a few areas of the rocks are suitable habitats

D. Fishing pressures reduce the number of their predators.

Question 30

Disturbances can promote diversity when they:

A. Remove weedy species from a community

B. Occur at intermediate frequencies

C. Disrupt the predator-prey cycles

D. Enhance dispersal of organisms between patches of habitat.

END OF SECTION A

SECTION B

Instructions for Section B

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

Question 1 18 marks

a)

i. Name a **fossil fuel** you have studied this year.

Example: coal, natural gas or oil

ii. Name a **non-fossil fuel** you have studied this year 1 mark

Example: wind

Use the fuels named above to answer Questions 1b - 1e

b) Identify and discuss whether your nominated **fossil fuel** is considered renewable or non renewable by using the steps required to extract and use this fuel as an energy source in homes.
In your response, illustrate at least two energy conversions. 4 marks

1 mark – Correctly identifying fuel as non-renewable.
1 mark – Linking response to method of extraction and/or use to non-renewable.
1 mark – Correctly illustrating two energy conversions.
1 mark – Correctly applying the fuel source to an energy form used in the home .

Possible response: Coal
Coal is a fossil fuel that is non-renewable. (1m)

Coal is extracted from the earth at a rate quicker than it can be replenished by natural processes. (1m)

To use: extraction of coal (chemical energy) !Steam (kinetic energy) !Movement of turbine (mechanical energy). (1m)

Turbine connected to electrical generator and electricity transmitted to homes to power electrical appliances. (1m)

c) Identify and discuss whether your nominated **non-fossil fuel** is considered renewable or non-renewable by using the steps required to extract and use this fuel as an energy source in homes.
In your response, illustrate at least two energy conversions. 4 marks

1 mark – Correctly identifying fuel as renewable or non-renewable.
1 mark – Linking response to method of extraction.
1 mark – Correctly illustrating two energy conversions.
1 mark – Correctly applying the fuel source to an energy form used in the home.

Possible response: Wind
Wind is considered a renewable resource. (1m)

Wind is considered renewable as at a large scale it can be replenished by natural processes at a faster rate than it is harvested. (1m)

To use: harness wind (kinetic energy)!Movement of turbine (mechanical kinetic energy)! Generation of electricity (electrical energy). (1m)

Electricity transmitted to homes to power electrical appliances. (1m)

d) For each of your chosen energy sources state and explain two advantages and two disadvantages of their use. 4 marks

2 marks – Advantages.
2 marks – Disadvantages.

Possible response: Coal
Advantage: Can be used to run electrical power stations at any time 24/7. (1m)
Disadvantage: Creates large amounts of GHGs when combusted. (1m)

Possible response: Wind
Advantage: Produces no GHGs when converted into a useful form. (1m)
Disadvantage: Relies on the availability/constant wind. (1m)

e) You are working for a major energy provider in Victoria. The company is required to increase its "Green Energy" significantly or completely for residents of Melbourne by constructing a new electrical plant. You have been asked to recommend an implementation strategy for the company using your selected non-fossil fuel. Justify your strategy by considering patterns of electrical demand in Melbourne, the best location of the power plant, and viability of your selected strategy in meeting all of the electrical power needs of Melbourne. 5 marks

1 mark – Description of implementation strategy including location.
2 marks – Justification for suggested implantation strategy and location for power plant using valid figures (available energy; efficiency of conversions and likely electrical output) and terms associated with non-fossil fuel.
2 marks – Viability of strategy to meet patterns of electrical energy demands of Melbourne significantly or completely (clear stance needed for full marks).

Possible response:
Melbourne is a large city with demanding peak and base energy loads that must cater for both industrial and residential clients. **OR** Melbourne is a large city that must be able to support a high demand for energy use (such as heating, lighting, industry and transport needs). (1m)

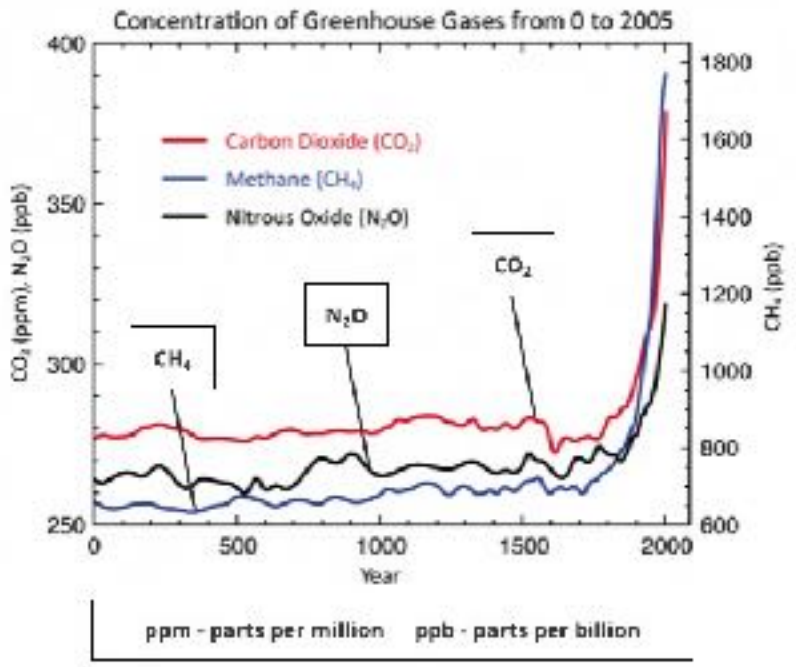
It is not viable to be completely reliant on wind energy as it depends on a constant supply of wind. (1m)

Therefore it is possible for the company to increase its green power significantly but not completely. (1m)

The best location for the new plant would be along the coast where wind is more constant (1m) as close to Melbourne as possible to reduce energy lost during transport along power lines. (1m)

Question 2 18 marks

Use the following graph to answer Questions 2a - 2g



a) In which century did greenhouse gases begin to increase significantly? 1 mark

1 mark – 18th Century.

b) What human induced event(s) can be attributed to causing the dramatic increase in the production of methane and/or carbon dioxide? 1 mark

1 mark for any of the following
The industrial revolution, using fossil fuel combustion as an energy source .
Age of steam using fossil fuel combustion as an energy source .
Rapid development of agriculture – flood irrigation and increased stock numbers, to supply food to rapidly growing human population.
Deforestation.

c) Using the graph, justify your reasoning for which gas has the most significant increase. 2 marks

1 mark – Carbon Dioxide.

Because this unit of measurement is represented in parts per million whilst the other two gases are represented in parts per billion. (1m)

d) Discuss the role these gases play in the (natural) greenhouse effect by describing the characteristics that enable them to be named greenhouse gases. 2 marks

1 mark – GHGs have the ability to absorb and retain heat (or infrared radiation) in the atmosphere.

1 mark – GHGs are important factors in the greenhouse effect as they ensure the earth's temperature remains at about 15 degrees C (30 degrees warmer than without them).

e) Using your understanding of both the natural and enhanced greenhouse effect, explain how your selected fossil fuel energy source from **Question 1** has contributed to this phenomenon.
In your response, discuss the main features that distinguish the natural and enhanced greenhouse effect.

5 marks

Possible response:

The natural greenhouse effect is integral in maintaining a relatively constant temperature, to support all life on Earth /Or Without the natural greenhouse effect the Earth's temperature would be too cold to support life on Earth as we know it, approximately -15C). (1m)

Since the industrial revolution the burning of fossil fuels such as Coal has increased significantly/Or due to human activity the burning of fossil fuels such as coal has increased significantly. (1m)

The generation of electricity through the use of coal produce large amounts of GHG emissions. (1m)

Increased GHGs in the atmosphere has increased the amount of heat (infrared radiation) being absorbed and retained in the atmosphere. (1m)

The enhanced greenhouse effect has led to significant increases in the Earth's temperature. (1m)

f) Draw an annotated diagram to explain the natural greenhouse effect. In your diagram you should include the types of solar radiation and how these forms of radiation impact the temperature on Earth. 4 marks

Drawing/annotations should include:

Sun emits visible light , UV and Infrared wavelength.s (1m)

Visible light is absorbed by Earth and re-emitted as infrared radiation. (1m)

This Infrared radiation is absorbed by greenhouse gases which heats the greenhouse gases. (1m)

This will leads to heating the atmosphere. (1m)

Note: students must write **'absorbed' not 'trapped'**.

g) Identify a fossil fuel and describe one strategy that can be taken to reduce the impact of the enhanced. greenhouse effect. 3 marks

1 mark – Correctly identify a fossil fuel.

1 mark – Name of a strategy relevant to nominated fossil fuel (eg. Alternative fuel, scrubber etc).

1 mark –Brief explanation of how the strategy works.

Question 3 16 marks

An ecologist measured the number of individuals of four tree species in two forest stands. They then calculated a number of diversity measurements and summarised their findings in the following table.

	Number of trees	
Tree Species	**Stand A**	**Stand B**
1	43	62
2	32	13
3	25	13
4		12
Diversity measure		
Species richness	3	4
Simpson's Index	0.65	0.57

Simpson's Index - 0 represents no diversity; 1 represents greatest diversity.

a) Discuss the difference between species richness and species diversity . 2 marks

1 mark – Species richness and species diversity both take into account the number of different species present in an area.

1 mark – Species diversity also takes into account the abundance of individuals within each species.

b) Identify which strand has the highest species diversity and discuss any limitations in using Simpson's Index. 3 marks

1 mark – Identifying correct stand (e.g. Stand B has a lower species diversity than Stand A).

1 mark – Using data to support answer (e.g. Stand B 0.52 compared to 0.65 at Stand A).

1 mark – limitation of using SI index (e.g. Simpon's index although a measure of species diversity gives relatively little weight to rare species and more weight to common species) .

c) Trust for Nature is a non-government conservation organization that purchases land to protect biodiversity. They are interested in purchasing the forest stand with the greatest biodiversity value. Based on the information collected, which forest stand would you recommend they purchase. Outline an argument defending your choice and justify using relevant data. 4 marks

Stand A or B could be selected as long as students justify their choice through use of the data available (eg although stand A has a higher species diversity it could be argued that B has greater species richness and it would benefit more greatly from conservation etc).

1 mark – Recommendation for either stand A or B.

2 marks – Argument as to why this choice was made.

1 mark – Data supporting recommendation.

d) A developer plans to purchase forest **Stand B**, planning to clear all or part of the land for housing. Environmental scientists are concerned that habitat fragmentation from this development will have a negative impact on the number of vulnerable animal species located in the forest stands. Outline three possible effects this development could have on populations found within the forest stand. 3 marks

Any 3 explained plausible effects such as reduction in population numbers due to isolations leading to loss of genetic diversity through inbreeding, loss of gene flow also resulting in a loss of genetic diversity.

e) Outline two possible strategies that could potentially conserve small populations if this development was to occur. Be sure to discuss both the potential benefits and drawbacks of each strategy. 4 marks

1 mark – For each appropriate strategy nominated (maximum of 2marks).
2 marks – For each evaluation of a strategy, must include at least one positive and one negative.

Possible response:

The use of habitat corridors to link isolated populations. (1m)

Advantages include increased gene flow and increased habitat area. Disadvantages include increased risk of disease spread, increased predation rates along the corridor. (1m)

Captive breeding and reintroduction of vulnerable species. (1m)

Advantages ensure survival of species for the longer term however, can reduce genetic diversity if population too small. (1m)

Question 4 (19 marks)

Each year in Australia, approximately 30 million kilograms of kangaroo meat is sold for human consumption. The meat is either sold in Australia or exported to over 55 countries around the world. The kangaroo industry is worth AUD270 million per year and directly employs 4000 people. Many of these jobs are in remote areas with few other employment opportunities. There are no kangaroo farms; all kangaroo meat is harvested from wild animals.

The species currently harvested for commercial export include:

- Red kangaroo (Macropus rufus) in areas of Queensland, New South Wales, South Australia, and Western Australia
- Eastern grey kangaroo (M. giganteus) in areas of Queensland and New South Wales
- Western grey kangaroo (M. fuliginosus) in areas of New South Wales, South Australia, and Western Australia
- Common wallaroo or euro (M. robustus) in areas of Queensland, New South Wales and Victoria.

Red, eastern grey and western grey kangaroos are the most abundant species and make up about 90 per cent of the commercial harvest. All four species subject to commercial harvesting are common and none are listed as endangered species, Kangaroos have been harvested for 25 years. Quotas are set each year, based on population surveys conducted by the state wildlife agencies and the market demand for the meat products. Environmental conditions, such as drought, are not considered. Usually, annual harvest levels are in the order of 15 per cent of the populations for grey kangaroos and wallaroos, and 20 per cent for red kangaroos. Additional special quotas, used to harvest above the set quota, can be issued in New South Wales and South Australia when continued damage by kangaroos to agricultural productivity can be proven.

a) Describe an appropriate sampling method that can be used to collect kangaroo numbers. 3 marks

1 mark – For correctly identifying appropriate sampling method.
1 mark – For description of this sampling method.
1 mark – For linking why it is an appropriate method to use.

Possible response:

Spotlighting for kangaroos is a possible sampling method for approximating the relative abundance of the population in question. (1m)

This method involves quietly working along tracks at night and listening for tell-tale rustlings of kangaroos in their environment. The animals are then viewed with a hand-held powerful torch or spotlight and counted. (1m)

This is an effective way of gaining relative numbers as it can provide an approximate average of kangaroo numbers for the wider region under investigation. (1m)

b)

i. Name a convention that protects against the trading of endangered species. 1 mark

1 mark – For correctly naming Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

ii. Briefly explain why kangaroo meat can be exported and is not affected by this convention. 2 marks

2 marks – For effectively explaining kangaroos are not protected by this convention as they are not endangered.

Possible response:

Kangaroos are not protected under CITES as they are not listed as an endangered species. (1m)

CITES only covers animals listed as endangered thus; kangaroos are not included in the convention. (1m)

c) With reference to the key principles of ecological sustainable development, explain why kangaroo harvesting may be considered a sustainable practice? 3 marks

1 mark – For referring to principles of ESD.
2 marks – For explaining why kangaroo harvesting may be considered a sustainable practice.
2 marks– For level of detail.

Possible response:

ESD refers to the process of conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained and the quality of life for both present and future generations is also maintained. (2m)

Kangaroos if in too high a population numbers could have detrimental effects on both agricultural production and/or their own habitat interfering with key ecological processes. (1m)

The Victorian Government is proposing to also harvest kangaroos for meat products and intends to complete an Environmental Impact Assessment. The Government has unveiled plans for a two-year trial, which will see culled kangaroos harvested for domestic pet food in parts of north east and western Victoria. This follows years of lobbying from farmers and industry who claimed not allowing the 30,000 - 70,000 kangaroos killed under permit in Victoria each year to be processed commercially led to a "wasted meat supply".

Farmers claim kangaroos detrimentally affect their agricultural productivity which results in lost income. Those opposing the culling of kangaroos argue that kangaroos should be allowed to graze in their natural habitat as they are not having a detrimental effect on the natural environment. Despite this, little scientific research has been conducted to determine if kangaroos are not having any detrimental effects on the environment.

d) Outline and discuss the purpose of preparing an Environmental Impact Assessment for the culling and meat production of kangaroos in Victoria. 4 marks

1 mark – For outlining purpose of EIA.
1 mark – For linking purpose of EIA to kangaroo culling and meat production.
2 marks – For discussion of why EIA is important to this process.

Possible response:

An EIA is undertaken in compliance with environmental legislation to determine the environmental effects of a proposed action prior to its implementation. (1m)

Completing an EIA is an essential step in understanding the relative environmental impacts and effects of kangaroo culling and meat production to the environment where this project is set to take place. (1m)

An EIA will help decision makers in:

- Understanding the proposed action and alternatives

- Predicting the nature and magnitude of likely environmental damage.

- Identifying the relevant human concerns and social impacts

- Defining criteria to be used in measuring the significance of environmental changes, including relative weightings given to different changes

- Estimating the significance of predicted environmental changes.

- Describing mitigation measures to be adopted and recommend monitoring procedures to be followed after the action is completed. (2m)

e) Identify two stakeholders that should be consulted in regards to this proposal. 2 marks

2 marks – 1 mark for each correctly identified relevant stakeholder eg. farmer, local community members, local government, Parks staff, DELWP staff etc.

f) Describe how you would evaluate whether the proposal to harvest kangaroos in Victoria should proceed or not. Justify your response. 4 marks

1 mark – For description of how evaluation could be made.
1 mark – For linking to principles of ESD.
1 mark – For linking to EIA.
1 mark – For level of detail.

Possible response:

To evaluate whether or not this proposal should or shouldn't go ahead, a number of factors need to be considered as to whether the economic and social benefits of the project outweigh any potential environmental impacts. (2m)

To make this decision a comprehensive EIA will guide decision makers in understanding all of the factors that need to be considered as to whether or not this proposal is viable and of benefit to the community without significantly affecting the environment. (1m)

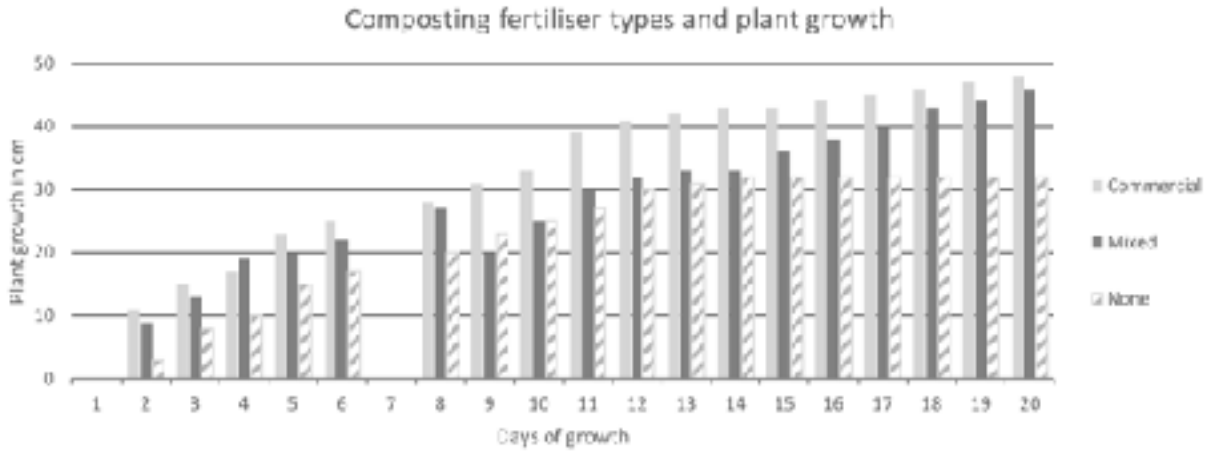
This will have to align to the principles of ESD to ensure this project not only meets the currents needs of society but doesn't affect future generations either. (1m)

Question 5 (19 marks)

Amy's Environmental Science class were studying various ways to recycle materials, including in compost, that could then be used as fertilizer. Members of the class investigated the effectiveness of various recycled materials in compost to promote plant growth.

Amy and three members of her class decided to compare the effect of paper mixed with compost and commercial fertilizer on plant growth. Three trays of bean plants (25 plants per tray) were grown for five days. The plants were then fertilized as follows:

Tray A received 10 grams of commercial fertilizer; Tray B received 10 grams of mixed compost fertiliser; and Tray C received no fertilizer. The plants received the same amount of sunlight and water each day. The students recorded the height of the plants in centimetres.



a) State the independent variable and dependent variable. 2 marks

1 mark – For stating the dependent variable as days of growth.
1 mark – For stating the independent variable as fertiliser mixture.

b)

i. Accuracy is one essential aspect required to ensure scientific investigation results are comprised. Define the term accuracy. 1 mark

1 mark – For identifying that accuracy refers to the exactness of a measurement.

ii. Is the data from this experiment accurate? Justify your response. 2 marks

1 mark – For identifying that day 1 and/or day 7 data is missing.
1 mark – For identifying that the rest of the data is accurate.

c) Explain the importance of repeating experiments. Include how you think repeating the test would help the results. 4 marks

1 mark – For identifying repetition would increase the reliability of the experiment .
1 mark – For identifying that repeating an experiment can confirm a result more consistently.
1 mark – For identifying that repeated experiments can complete the data for day 1 and/or 7.
1 mark – For the use of a formula to calculate an average growth increase and eliminate outliers.

d)

i. Identify the limitations of the experiment. 2 marks

2 marks – For identifying that it is unlikely to be determined whether the paper mixture is any better as it is unknown what ingredients are held with the compost the paper is mixed with.

ii. Redesign the experiment so that the limitations you have identified are overcome. 4 marks

Teacher to determine in respect to response given in d) i. However, the answer must include the need to identify the active ingredients within the compost to determine which factors led to increased plant growth.

e) Name four ways the data from this experiment could assist in dealing with waste in Victoria. 4 marks

Teacher to determine the validity of responses. Creativity should be rewarded.

END OF SECTION B

END OF EXAM