Specimen Paper Answers – Paper 1

Cambridge International AS Level
Environmental Management 8291

For examination from 2022

Contents

Introduction

The main aim of this booklet is to exemplify standards for those teaching Cambridge International AS Level Environmental management 8291 for examination from 2022. In this booklet, we have provided examples of very good answers for Specimen Paper 1, Section A.

Each response is accompanied by a brief commentary on performance, explaining the strengths and weaknesses of the answers. Comments are given to indicate where and why marks were awarded, and how additional marks could be obtained. In this way, it is possible to understand what candidates have done to gain their marks and how they could improve.

The mark scheme for the Specimen Paper is available to download from the School Support Hub

2022 Specimen Paper 1

2022 Specimen Mark Scheme 1

Past exam resources and other teaching and learning resources are available on the School Support Hub

Details of assessment

The syllabus for Cambridge International AS Level Environmental Management 8291 is available at School Support Hub

Paper 1 Principles of Environmental Management

Written paper, 1 hour 45 minutes, 80 marks

Paper 1 contains two sections:

- Section A: between four and six structured questions, with a range of task types. (60 marks)
- Section B: one essay from a choice of two questions. (20 marks)

Externally assessed

50% of the AS Level

Question 1

Question 1(a)(i)

1 (a) Italy is a high-income economy country (HIC) in Europe and Bangladesh is a low-income economy country (LIC) in Asia.

Table 1.1 shows population data for Italy and Bangladesh in 1990 and 2010.

Table 1.1

country	area / km^2	population 1990	population density 1990 / people km^{-2}	population 2010	population density 2010 / people km^{-2}	percentage increase in population density
Bangladesh	147 630	105 983 136		151 616 777	1027.0	43.1
Italy	301 340	57 007 577	189.2	59 588 066	197.7	

(i) Calculate the population density of Bangladesh in 1990.

Give the answer to 1 decimal place.

Specimen answer

$$\frac{105\ 983\ 136}{147\ 630} = 717.897$$

population density 1990 ....717.897........... people km^{-2} [2]

Mark awarded = 1 out of 2

Examiner comment

The candidate has been awarded one mark for correctly selecting the appropriate data and calculating the population density. The second marking point cannot be awarded because the final answer is not given to one decimal place.

Manipulating numerical data is an AO2 skill.

Common mistakes

In calculation questions, it is important to take note of any additional instructions. In this question, the question requires candidates to express their final answer to one decimal place. It is good practice to show working in calculations as credit may be awarded for an error carried forward if examiners can clearly see how a candidate has reached their final answer even if this answer is incorrect.

Question 1(a)(ii)

(ii) Calculate the percentage increase in population density for Italy.

Give the answer to 3 significant figures.

Specimen answer

$$\frac{(197.7-189.2)}{189.2} \times 100 = 4.4926 = 4.49$$

percentage increase ....4.49..................................% [2]

Mark awarded = 2 out of 2

Examiner comment

The candidate has correctly calculated the percentage increase and rounded the final answer to three significant figures.

Common mistakes

Candidates often confuse decimal places and significant figures. It is important that the difference is understood and that final answers are expressed appropriately. If the question does not specify the required number of significant figures, the final answer should be expressed to the least number of significant figures of any data in the calculation.

Section 5 of the syllabus specifies the mathematical skills that candidates should be familiar with and should practise through their studies.

Question 1(a)(iii)

(iii) Suggest how social factors can cause the changes in population density in Bangladesh and Italy. Refer to the data in your answer.

Specimen answer

Bangladesh has a much larger increase in population density than Italy. The increase in population density for Bangladesh is almost 10 times greater than Italy. This could be due to more migration into Bangladesh or an improvement in healthcare in Bangladesh.

Mark awarded = 4 out of 4

Examiner comment

The candidate has been awarded full marks. The response gives a clear comparison of Bangladesh and Italy and includes two reasons that may explain the difference in population increase. The data quote is also awarded a mark as it manipulates the data and doesn't simply restate the data.

This question assesses both AO1 and AO2. Factors that cause population change is AO1 knowledge, whereas using the information in the question to compare the two countries is an AO2 skill.

Common mistakes

Questions that require a comparison to be made, require the response to be comparative, so terms such as 'greater than' and 'smaller than' ensure the description is comparative.

When asked to refer to data, candidates often restate the data rather than manipulating it to show a trend or justify a conclusion. Simply restating data is often insufficient unless it is clearly comparative.

Question 1(b)(i)

(b) Fig. 1.1 shows two population pyramids representing the percentage of the population in different age groups in Italy in 1950 and 2010.
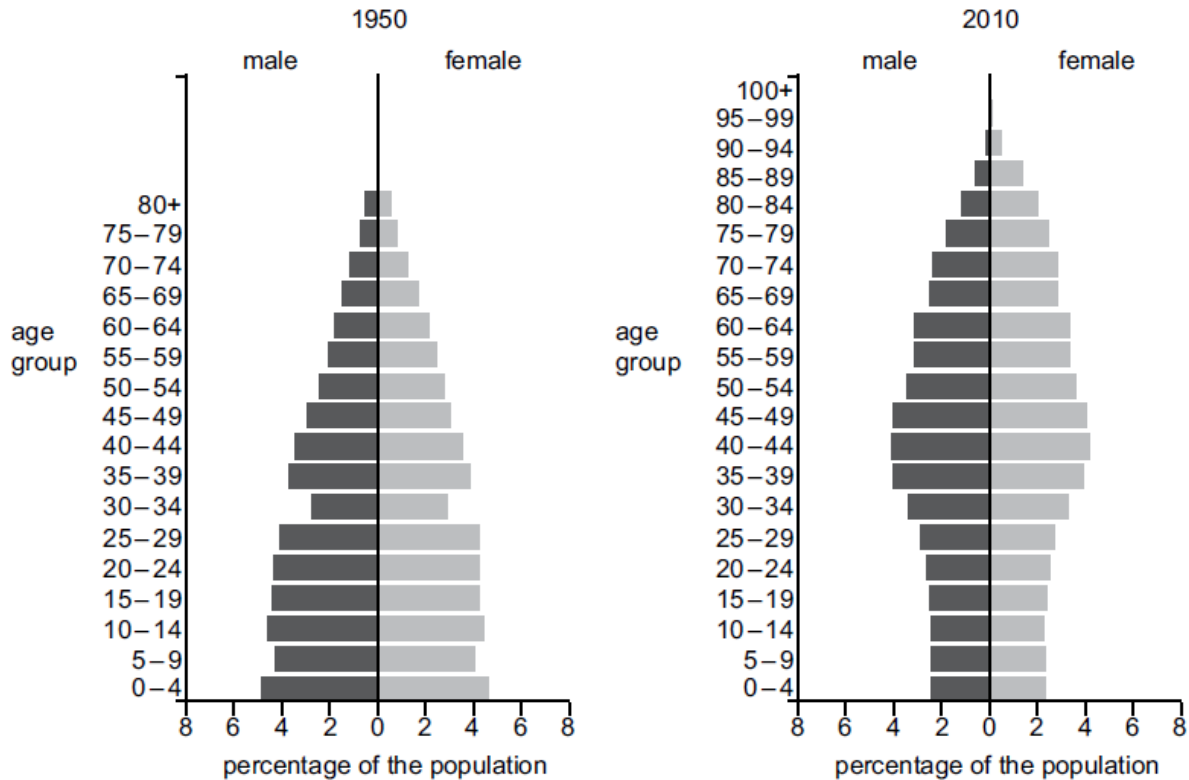

Fig. 1.1

(i) Describe the changes in population distribution using data from Fig. 1.1.

Specimen answer

In 2010, there are more people older than 80 years of age, compared to 1950. However, there are less people aged 0-29.

Mark awarded = 2 out of 2

Examiner comment

The candidate has been awarded full marks. The response clearly identifies the year and gives a comparative change in population distribution. The second statement is also correct but could be improved by again restating the years being compared. However, the mark is awarded because the first statement clearly indicates which years are being compared.

This question assesses AO2 as it requires data to be interpreted.

Common mistakes

The question asks for changes to be described. Often, candidates do not make it clear what is being described. In this question, it is important that the years are specified so it is clear which change is being described. The question is worth two marks and the candidate has used this as a guide to the number of descriptive changes to provide in their answer.

Question 1(b)(ii)

(ii) Describe the impacts that the changes in **(i)** could cause.

Specimen answer

In 2010, there were more people over 80 so they would be a burden on the government as they need more healthcare than younger people and are given pensions that require taxes.

Mark awarded = 2 out of 3

Examiner comment

The candidate has been awarded two marks for stating that people over the age of 80 years are given a pension and that they may require more healthcare than younger people. The mark scheme lists several impacts, but others would be acceptable provided they fit the data.

This question assesses both AO1 and AO2. Describing the impacts of changes in population distribution is AO1 knowledge, whereas using the information in the question is an AO2 skill.

Common mistakes

Candidates often give a good response but do not give sufficient points to be awarded full marks. If a question is worth three marks, a response must make three separate points if it is to be awarded full marks.

Total mark awarded = 11 out of 13

Question 2

Question 2(a)

2 Approximately one third of all food produced for human consumption is wasted.

In many low-income economy countries (LICs) food wastage occurs when food is stored.

Fig. 2.1 is a news report on a method for farmers to reduce food waste in Uganda, an LIC in Africa.
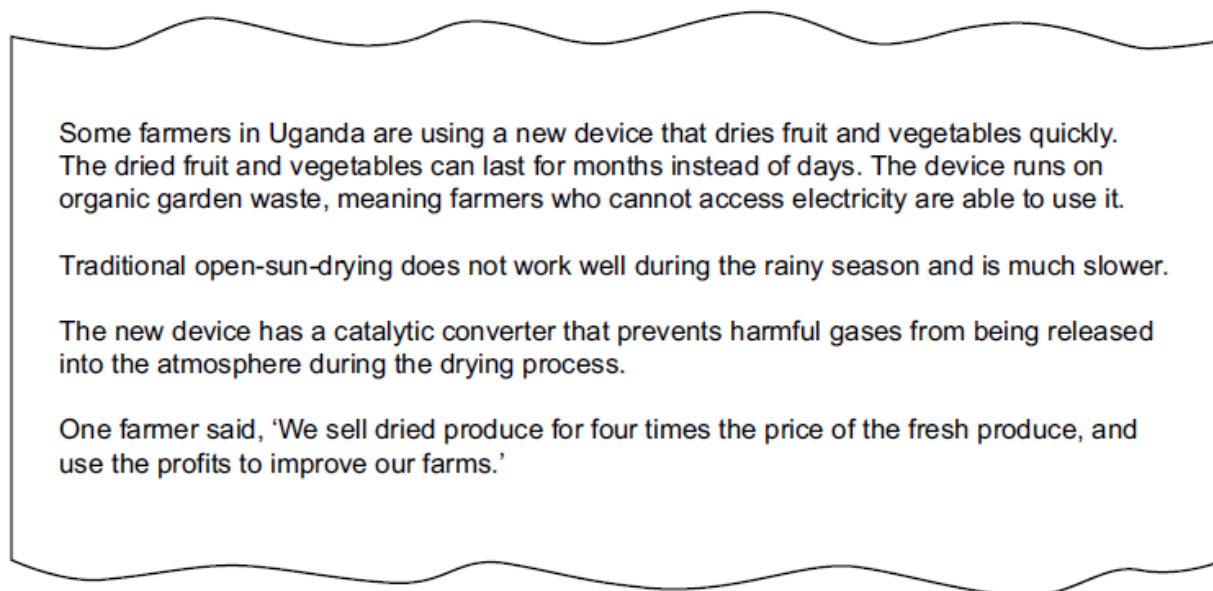
Some farmers in Uganda are using a new device that dries fruit and vegetables quickly. The dried fruit and vegetables can last for months instead of days. The device runs on organic garden waste, meaning farmers who cannot access electricity are able to use it.

Traditional open-sun-drying does not work well during the rainy season and is much slower.

The new device has a catalytic converter that prevents harmful gases from being released into the atmosphere during the drying process.

One farmer said, 'We sell dried produce for four times the price of the fresh produce, and use the profits to improve our farms.'

Fig. 2.1

(a) Explain how the device described in Fig. 2.1 provides a sustainable method of food production in Uganda.

Specimen answer

The device makes food production sustainable because:

- Less food is wasted as it lasts a lot longer.

- The device can be used all year round so the weather doesn't matter.

- The device doesn't use electricity.

- Dried food produces good revenue that can be used to improve their land.

Mark awarded = 3 out of 4

Examiner comment

The candidate has written a good response and has been awarded three marks. Bullet points 1, 2 and 4 clearly explain how the device makes this method of food production sustainable. However, bullet point 3 doesn't explain why not using electricity makes the method sustainable. Stating that not using electricity means there is less demand for fossil fuels, or that it allows the device to be used in remote areas, would have been awarded full marks.

This question assesses both AO1 and AO2. Understanding sustainability is AO1 knowledge, whereas using the information in the question is an AO2 skill.

Common mistakes

The use of bullet points is often a good way of expressing ideas and allows candidates to ensure they have made sufficient points to be awarded full marks. However, bullet points can sometimes be too brief and lack detail, particularly where an explanation is required.

Question 2(b)

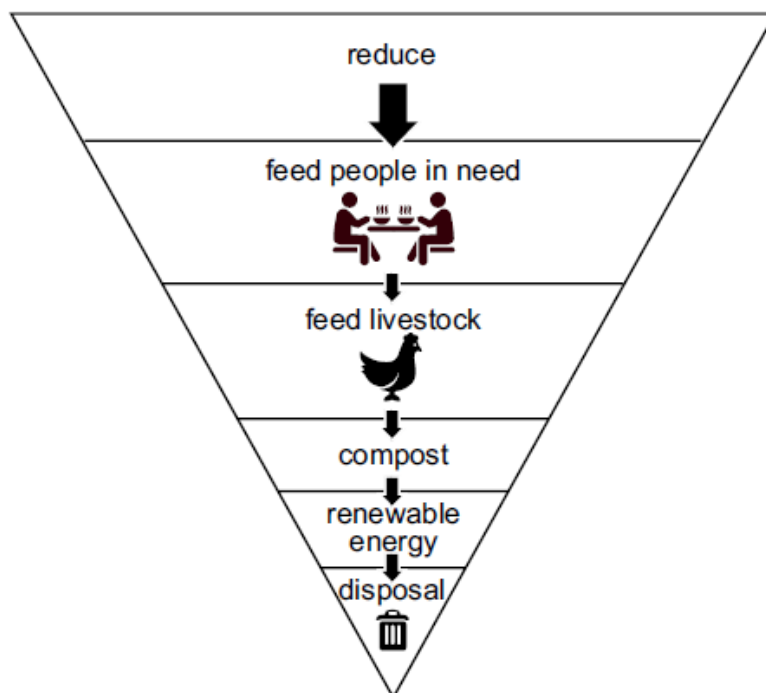**(b)** Fig. 2.2 shows how some companies in Europe plan the management of their food waste.

Fig. 2.2

One benefit of this food waste management strategy is that it provides food for people in need.

Explain **two** other benefits of this management strategy.

Specimen answer

1 Waste food can be used to feed livestock so less land has to be used to grow feed for livestock.

2 Waste food can be used to produce energy. This means that less fossil fuels need to be used.

Mark awarded = 3 out of 4

Examiner comment

The candidate has identified two strategies from the diagram but this does not directly gain credit. Marks are awarded for explaining how each strategy is a benefit. The first response identifies the strategy and gives two reasons that the strategy is a benefit. The second response identifies the strategy and gives one benefit. Producing energy cannot be credited as it is given in the question. To be awarded a mark, the response should explain that waste food can be used as a biofuel or that the strategy is carbon neutral.

This question assesses both AO1 and AO2. Understanding sustainability is AO1 knowledge, whereas using the information in the question is an AO2 skill.

Common mistakes

Candidates often identify the benefits but do not fully explain them. The question uses 'explain' as the command word which means that knowledge must be applied to the context of the question and the response must explain how the strategy is a benefit.

Question 2(c)

(c) Food wastage is one reason why there is a global shortage of food.

State **two** other reasons.

Specimen answer

1 The human population is too large.

2 Many people are too poor to buy food.

Mark awarded = 2 out of 2

Examiner comment

The candidate has clearly stated two appropriate reasons for the global shortage of food.

This question assesses AO1 knowledge.

Common mistakes

If a question requires two reasons to be given, only two reasons should be provided. Some candidates list many reasons but only the first two can be awarded marks. In addition, candidates may contradict a previously correct response by giving a list of incorrect answers.

Total mark awarded = 8 out of 10

Question 3

Question 3(a)(i)

3 (a) (i) Countries need long-term and short-term energy security.

Define:

long-term energy security ....

....

short-term energy security ....

.... [2]

Specimen answer

Long-term security – this is when the supply of energy is sufficient for economic benefits and the environmental needs.

Short-term security – this is when the supply of energy is sufficient for sudden changes in demand.

Mark awarded = 2 out of 2

Examiner comment

The candidate has used the definitions in the syllabus and is awarded both marks.

This question assesses AO1 knowledge.

Common mistakes

Candidates often use phrases from the question. In most cases, that is insufficient to gain credit. In this question, stating that long-term security means that there is sufficient energy supply in the long-term, is inadequate for a mark. If definitions are provided in the further guidance of the syllabus, candidates would benefit from using them as closely as possible.

Question 3(a)(ii)

(ii) Energy insecurity impacts low-income economy countries (LICs).

Outline **four** of these impacts.

Specimen answer

Energy insecurity means that supply of electricity could be interrupted so industries cannot produce goods continually or consistently. This means that they will produce less profit so they may need to make people unemployed.

Mark awarded = 3 out of 4

Examiner comment

The candidate has explained that supply may be disrupted and this will reduce profit as goods cannot be produced consistently. This explanation has been awarded two marks. A third mark has been awarded for realising that a loss of profit may lead to unemployment. A fourth mark would have been awarded for stating that industries may be forced to buy, or import, additional energy resources.

This question assesses AO1 knowledge.

Common mistakes

The command word 'outline' requires candidates to set out the main points. This question asks for four points so it's essential that four separate points are given.

Question 3(b)

(b) Fig. 3.1 shows the location of hydroelectric projects in country **Y** and country **Z**.

A new dam is planned in country **X** to meet the increasing energy demands of the country. Country **X** is a low-income economy country (LIC). Currently, only 22% of the population of country **X** has access to electricity.
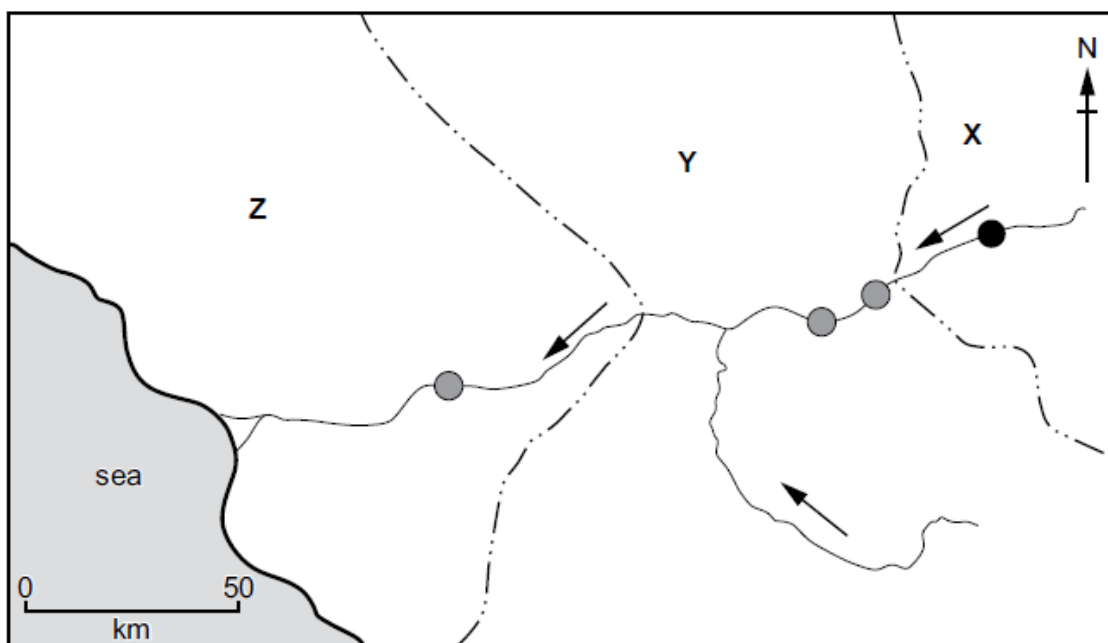
Key

- ● planned dam
- ⬤ existing dam
- ﹏ river
- ～ coast
- —..⁀ international boundary
- ⟶ flow direction of river
- **X/Y/Z** country

Fig. 3.1

Explain the impacts the new dam could have on the economies of countries **X**, **Y** and **Z**.

Include positive and negative impacts in your answer.

Specimen answer

Positive impacts:

Country X will have increased energy security so its industries can produce more goods.

Country X will be less reliant on fossil fuels, and it will not have to buy energy from country Y and country Z.

For country X there will be a more consistent supply of electricity so industry will be able to produce more goods

Negative impacts:

Country Y and Z will have reduced energy security as flow may be affected by X.

Villages may need to be moved to build the dam which is a big expense for country X.

Country X may need to borrow money to build the dam.

Mark awarded = 6 out of 6

Examiner comment

The candidate has been awarded full marks for an excellent answer. The candidate has structured their answer to indicate which are positive and negative impacts. In addition, they have specified the country in every statement, so it is clear which country the impact applies to. Each statement is thorough and gives a detailed explanation of the impact.

This question assesses both AO1 and AO2. Understanding the management of energy security is AO1 knowledge, whereas using the information in the question is an AO2 skill.

Common mistakes

Candidates often omit to make it clear which impacts are positive and which are negative. This can make it very difficult to interpret the statements.

Total mark awarded = 11 out of 12

Question 4

Question 4(a)(i)

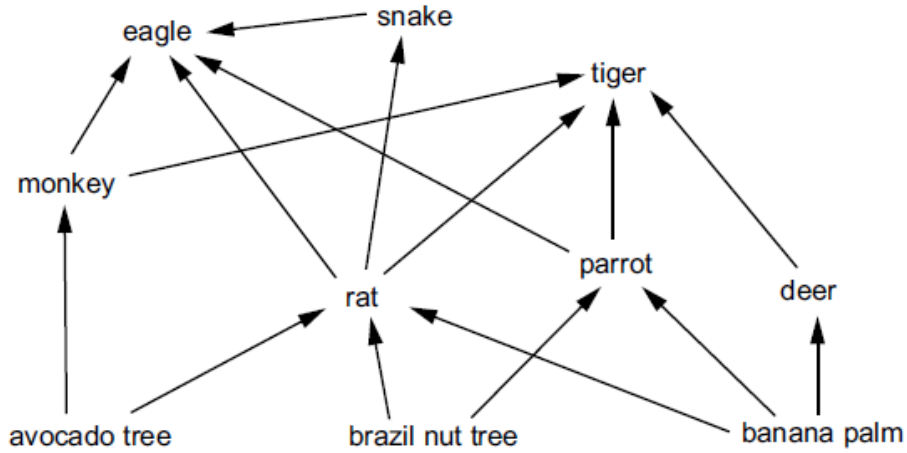**4** **(a)** Fig. 4.1 is a food web that shows some feeding relationships in a rainforest.
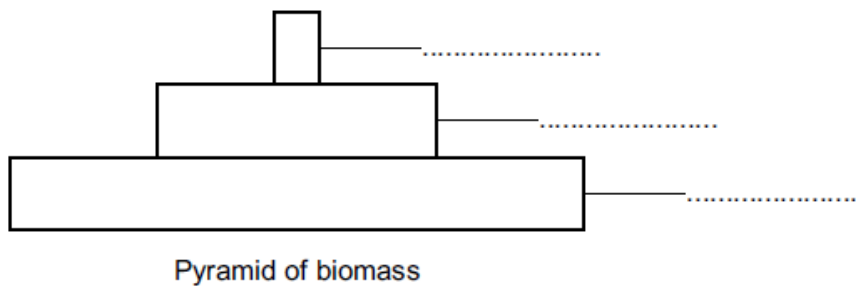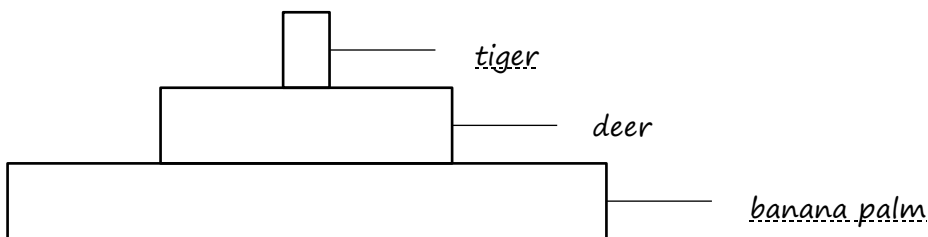

Fig. 4.1

(i) Label the pyramid of biomass using an organism from each trophic level in a food chain within this food web.

Pyramid of biomass

Specimen answer

Mark awarded = 2 out of 2

Examiner comment

The candidate has selected one food chain and labelled the pyramid correctly, with the producer at the base of the pyramid and a primary consumer followed by a secondary consumer.

This question assesses AO2 skills because it requires a food web to be interpreted and then applied to the pyramid of biomass.

Common mistakes

Some candidates do not read the question carefully enough and name three organisms at the correct trophic level, but not from the same food chain. For instance, labelling the pyramid: brazil nut tree, parrot and snake would be awarded one mark for labelling a producer at the base of the pyramid in trophic level one. The snake is not part of the food chain containing the brazil nut tree and the parrot.

Question 4(a)(ii)

(ii) Explain the shape of the pyramid of biomass shown in (a)(i).

Specimen answer

It is a typical pyramid shape because there is less biomass at each trophic level.

Mark awarded = 1 out of 3

Examiner comment

The candidate has given one explanation for the shape, but the question is worth three marks so additional points are required. Energy, and hence biomass, is lost at each trophic level due to heat loss, respiration, excretion, movement, excretory waste and death.

This question assesses AO1 knowledge.

Common mistakes

Some candidates describe the shape of the pyramid in detail but do not go on to explain the shape. Marks are not awarded for describing the shape. The command words of 'describe' and 'explain' are frequently confused by candidates. Candidates should practice questions using the full range of command words given in the syllabus.

Question 4(b)(i)

(b) Table 4.1 shows data on productivity.

Table 4.1

type of land	average annual net primary productivity / $g\,m^{-2}$
tropical rainforest	2200
agricultural	650

(i) Tropical rainforest is an example of an ecosystem.

Define ecosystem productivity.

Specimen answer

The rate of production of biomass in an ecosystem.

Mark awarded = 1 out of 1

Examiner comment

The candidate has given a clear definition and is awarded the mark.

This question assesses AO1 knowledge.

Common mistakes

Candidates often understand a concept but give definitions that are too vague or do not use scientific terminology. In this question, it's important to state rate of production and not just production, as rate implies a time factor.

Question 4(b)(ii)

(ii) Suggest **one** reason why the productivity of the agricultural land is much smaller than the tropical rainforest.

Specimen answer

The land may have been depleted of nutrients.

Mark awarded = 1 out of 1

Examiner comment

The candidate has been awarded the mark but the response could have been improved by making it clear that the statement was referring to agricultural land. The object of the question was agricultural land so the response was deduced to be referring to agricultural land.

This question assesses AO2 skills as candidates have to give a reasoned explanation for a relationship.

Common mistakes

Candidates often rush questions worth one mark. Regardless of the number of marks, candidates should make sure their responses are as accurate and detailed as possible.

Question 4(c)(i)

(c) A student visits a farm within an area of tropical rainforest. The farm grows a variety of plants.

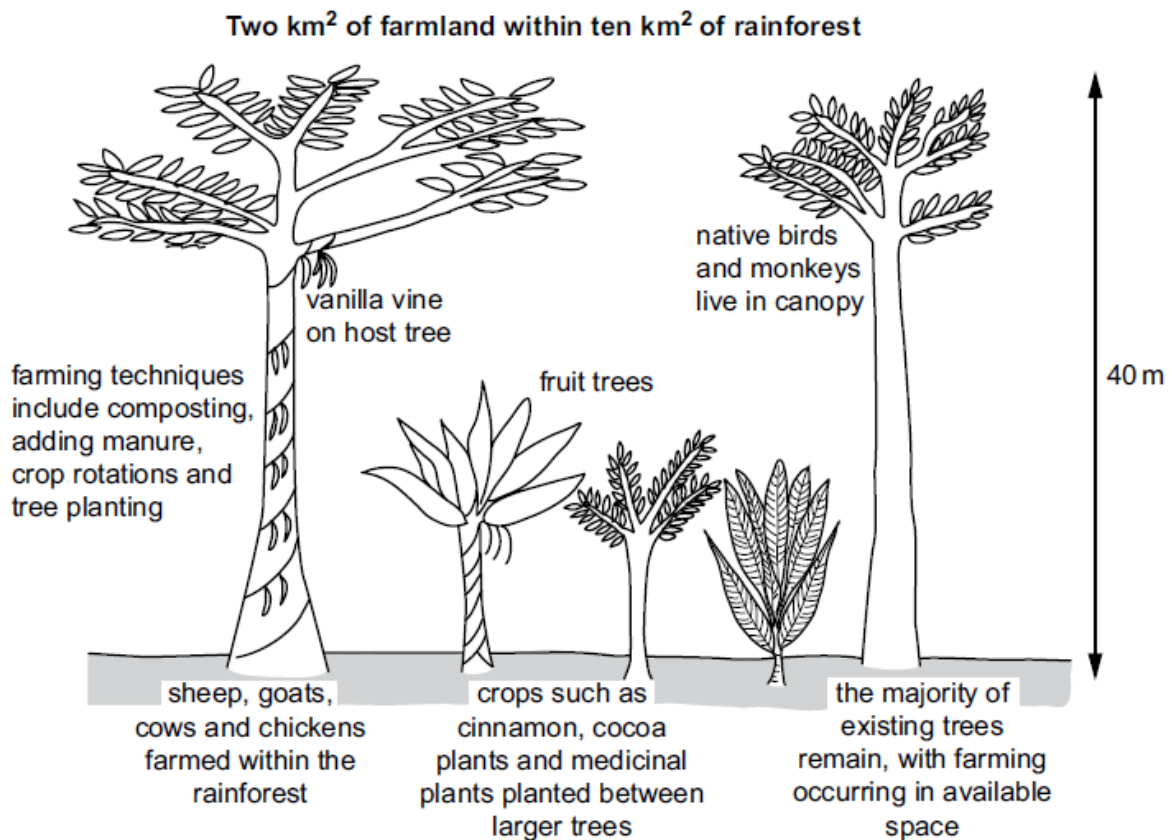Fig. 4.2 shows the student's annotated sketch of the farm.

Two km² of farmland within ten km² of rainforest

native birds
and monkeys
live in canopy

vanilla vine
on host tree

fruit trees

40 m

farming techniques
include composting,
adding manure,
crop rotations and
tree planting

sheep, goats,
cows and chickens
farmed within the
rainforest

crops such as
cinnamon, cocoa
plants and medicinal
plants planted between
larger trees

the majority of
existing trees
remain, with farming
occurring in available
space

Fig. 4.2

(i) Explain how the farming strategies in Fig. 4.2 manage the impacts of farming in this tropical rainforest.

Specimen answer

The farmer has left many trees from the rainforest. These form a habitat for birds and monkeys, so biodiversity is maintained. Crops are planted between the rainforest trees so the technique is more likely to be sustainable. In addition, the rainforest trees add organic matter to the soil and their roots bind the soil so water runs off slower and soil erosion is reduced. The farmer also uses other sustainable techniques. For instance, crop rotation ensures the soil doesn't become depleted of any one mineral ion and tree planting helps reduce soil erosion and captures carbon.

Mark awarded = 6 out of 6

Examiner comment

The mark scheme indicates that a candidate can score a maximum of three marks for identifying techniques given in the question. The remaining three marks are for explaining how these techniques manage the impacts. The response has clearly identified three techniques and then explained how they manage the impacts on the rainforest. The candidate has been awarded full marks but additional details would have been

of benefit, particularly when explaining tree planting. A stronger response would have stated that growing trees rapidly photosynthesise so they trap and store large amounts of carbon. This removes carbon dioxide from the atmosphere and helps to mitigate climate change.

This question assesses both AO1 and AO2. Understanding the impacts of farming is AO1, whereas using the information in the question is an AO2 skill.

Common mistakes

Some candidates rush questions requiring longer answers. After reading the question carefully, candidates should plan their response, taking note of the number of marks available. This allows them to produce a response that is clear and contains the correct level of detail.

Question 4(c)(ii)

(ii) The student noticed that some of the large trees on the farm have dense, broad leaves that shade the forest floor.

Very few plants grow under these trees.

Explain why.

Specimen answer

The large trees shade the ground so there is insufficient light for plants to grow on the forest floor. Also, the large trees out-compete the small plants for mineral ions, so they grow poorly.

Mark awarded = 2 out of 3

Examiner comment

The candidate has identified the lack of light and has been awarded one mark. However, the response does not give any additional explanation of why light is needed. Stronger responses describe the fact that the chlorophyll in plants on the forest floor cannot absorb enough light energy so the rate of photosynthesis is low and therefore growth is inhibited.

This question assesses both AO1 and AO2. Knowledge of photosynthesis is AO1, whereas using the information in the question is an AO2 skill.

Total mark awarded = 13 out of 16

Question 5

Question 5(a)

5 Ozone (O_3) is a gas found in the stratosphere. Ozone depletion is caused by chlorofluorocarbons (CFCs).

(a) Outline how ozone depletion occurs.

Specimen answer

CFCs from aerosols do not break down in the troposphere because they are stable molecules so they eventually end up in the stratosphere which is where the ozone layer is located. The CFCs are broken down by UV light and this releases chlorine atoms. These chlorine atoms cause ozone to break down to oxygen.

Mark awarded = 4 out of 4

Examiner comment

The candidate has produced a good description of ozone depletion and has been awarded full marks. A more complete response would also have stated that the chlorine atoms are left behind so the reaction that breaks down ozone can continue.

This question assesses AO1 knowledge.

Common mistakes

Questions that require a detailed process to be described require the use of key terminology. In this question, key terms include stable, ultraviolet light, chlorine atoms and break down. Using these terms allows a process to be described clearly and with the correct terminology. Occasionally, candidates confuse ozone depletion and the enhanced greenhouse effect.

Question 5(b)

(b) In the 1970s, scientists Rowland and Molina proposed this main hypothesis:

'CFCs will cause significant ozone depletion.'

Explain why this hypothesis was **not** initially accepted by the scientific community.

Specimen answer

There was insufficient evidence for the theory to be accepted.

Mark awarded = 0 out of 1

Examiner comment

The candidate has given a general statement explaining why a hypothesis might not be accepted, but it doesn't fully explain why the Rowland and Molina hypothesis was rejected. The hypothesis was rejected because the experimental evidence suggested that CFCs were stable.

This question assesses AO1 knowledge.

Question 5(c)

(c) State **two** impacts of ozone depletion.

Specimen answer

1 cancer

2 degradation of clothing

Mark awarded = 1 out of 2

Examiner comment

The candidate has correctly stated that an impact of ozone depletion is the degradation of clothing. Other suitable answers include decreased crop yield and loss of biodiversity. Cancer cannot be allowed because it is not specific enough.

This question assesses AO1 knowledge.

Common mistakes

Candidates often assume that the ozone layer protects humans from all cancers. The ozone layer protects humans from skin cancer, not all cancers.

Question 5(d)

(d) The use of CFCs has been banned in many countries. Some alternative substances to CFCs are greenhouse gases.

Outline **two** possible problems when new laws on managing atmospheric pollution are introduced.

Specimen answer

1 Not all countries can afford to replace CFCs with new, expensive alternatives so the economy of the country will be affected.

2 Managing atmospheric pollution requires all countries to participate, otherwise it doesn't work as pollution can move freely. Therefore, somehow the countries need to be monitored.

Mark awarded = 2 out of 2

Examiner comment

The candidate described two suitable problems and described them in sufficient detail.

This question assesses AO1 knowledge.

Common mistakes

In the first point, the candidate used the word 'affected'. This should be avoided because it does not explain how the economy is affected. A stronger response would state that the economy of the country is likely to decrease.

Total mark awarded = 7 out of 9