Cambridge Assessment
International Education

Example Responses – Paper 1

Cambridge IGCSE™
Environmental Management 0680

Cambridge O Level
Environmental Management 5014

For examination from 2022

Cambridge Pathway

Contents

Introduction

The main aim of this booklet is to exemplify standards for those teaching Cambridge IGCSE / O Level Environmental Management 0680 / 5014.

This booklet contains responses to all questions from June 2022 Paper 12, which have been written by a Cambridge examiner. Responses are accompanied by a brief commentary highlighting common errors and misconceptions where they are relevant.

The question papers and mark schemes are available to download from the School Support Hub.

2022 Question Paper 12

2022 Mark Scheme 12

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

Question 1

1 Rocks and minerals needed for building can be extracted from the ground by open-pit mining.

(a) State **one** environmental impact of open-pit mining.

Loss of habitat .... [1]

Examiner comment

- There was a wide range of potential correct answers to this introductory question.
- The most common error was a lack of precision in the use of the term 'pollution'.
- Candidates were expected to define the type of pollution such as visual, or noise pollution.

(b) Describe how rock and mineral extraction can benefit the local community.

Mineral extraction might mean that there are extra employment ....

opportunities for locals. The development of the mine might also mean ......

that roads and communication are improved too. ....

.... [2]

Examiner comment

- This response identified two distinct ways the extraction of rock and mineral mine would benefit the local community.
- The mark scheme contains a wide range, including employment in associated service industries in addition to employment in the mine itself.

(c) The photograph shows an area of land that was used for open-pit mining.

The land has been restored.

Use the photograph to describe how this land has been restored.

The area has been landscaped with the planting of trees in the area. A lake has also been created on the site.

[2]

[Total: 5]

Examiner comment

- Two distinct activities were identified; planting of trees and the formation of a lake. The response noted that the area was landscaped which would also be awarded a mark.
- The question required the answer to be linked to the photograph, so tested candidates' ability to interpret this image.

Question 2

2   **(a)**   The photograph shows bycatch on a prawn-fishing boat.

basket of prawns

Explain what the fisherman is doing with the bycatch in the photograph.

The fisherman is sweeping the bycatch back into the sea. The bycatch

is the unwanted fish as the fisherman is only fishing for prawns and is

returning all the other items back into the sea.

.... [2]

Examiner comment

- The response correctly interpreted the photograph and stated that the bycatch was being returned to the sea.
- Candidates addressed the active verb for this question 'explain' by defining the term 'bycatch'.

(b) (i) Describe the environmental impacts of overfishing.

Overfishing could cause the decline in fish stocks which would have an impact on the food chain in the area with a reduced food supply for those items which feed on the fish.

[2]

Examiner comment

- Candidates identified the direct and immediate impact on the population of the fish as well as the impact this might have on predators' species. They summed this up effectively with the reference to the impact on the food chain.
- Common errors were to name other impacts of over-fishing such as loss of income. This is an economic impact and was not awarded a mark because it is not a valid environmental impact.

(ii) State **two** strategies that can be used to reduce overfishing.

1 *Increase the size of the mesh in nets to allow small fish to escape.*
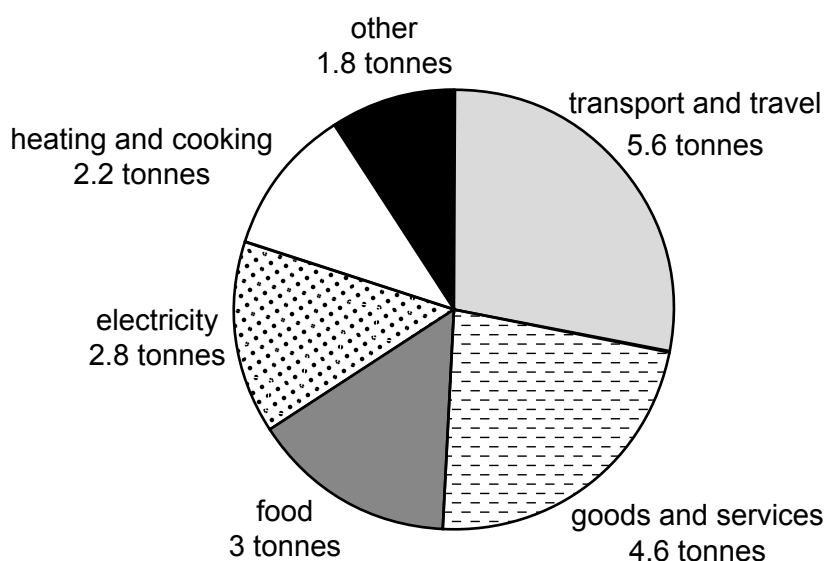
2 *Ban fishing in breeding seasons*

[2]

[Total: 6]

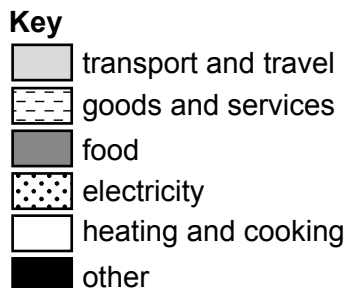## Examiner comment

- The command verb for this question is 'state', requiring short statements rather than more detailed comments.
- Two distinct reasons were provided.
- There was sometimes confusion regarding the size of the net mesh and the size of the net itself.
- This response identified the need to ban fishing during breeding seasons, other examples of bans could include exclusion zones.

Question 3

3 **(a)** The pie chart shows the annual carbon footprint for the average U.S. citizen by sector.

Key

transport and travel
goods and services
food
electricity
heating and cooking
other

other
1.8 tonnes

transport and travel
5.6 tonnes

heating and cooking
2.2 tonnes

electricity
2.8 tonnes

food
3 tonnes

goods and services
4.6 tonnes

   (i) State which sector makes the largest contribution to the annual carbon footprint.

   Transport and travel .... [1]

Examiner comment

This was an accessible question. The candidate demonstrated they were able to interpret the pie chart.

   (ii) Calculate the total annual carbon footprint in tonnes for the average U.S. citizen.

   (1.8 +5.6+ 4.6+ 3+ 2.8+ 2.2) tonnes [1]

   = 20 tonnes

Examiner comment

Here the working is shown, which was not necessary in this one-mark question, but is good practice that should be encouraged as when more than one mark is available there may be a mark available for the method used.

(iii) Calculate the percentage contribution of the electricity sector.

(2.8/20 x 100)

.... = 14% .... % [1]

Examiner comment

• One mark was available for this percentage calculation which used the data in the pie chart.
• If candidates had calculated the question incorrectly, this would have been used to mark this question to prevent them being unfairly penalised.

(b) Suggest strategies that individuals can use to reduce their carbon footprints.

The carbon footprint could be reduced by using public transport of walking instead of using a car. Another strategy could be to use more energy efficient appliances.

.... [2]

Examiner comment

• Two alternatives to car use were provided. Either of these were valid but were closely related and included in the same mark point on the mark scheme. Another distinct strategy with the use of more energy efficient devices was provided.
• The level of detail was sufficient to meet the requirements of the command verb 'suggest'.

Question 4

4   The map of Africa shows average life expectancy by country.

Key
- 70+ years
- 60–70 years
- 50–60 years

N

Tropic of Cancer

Equator

Tropic of Capricorn
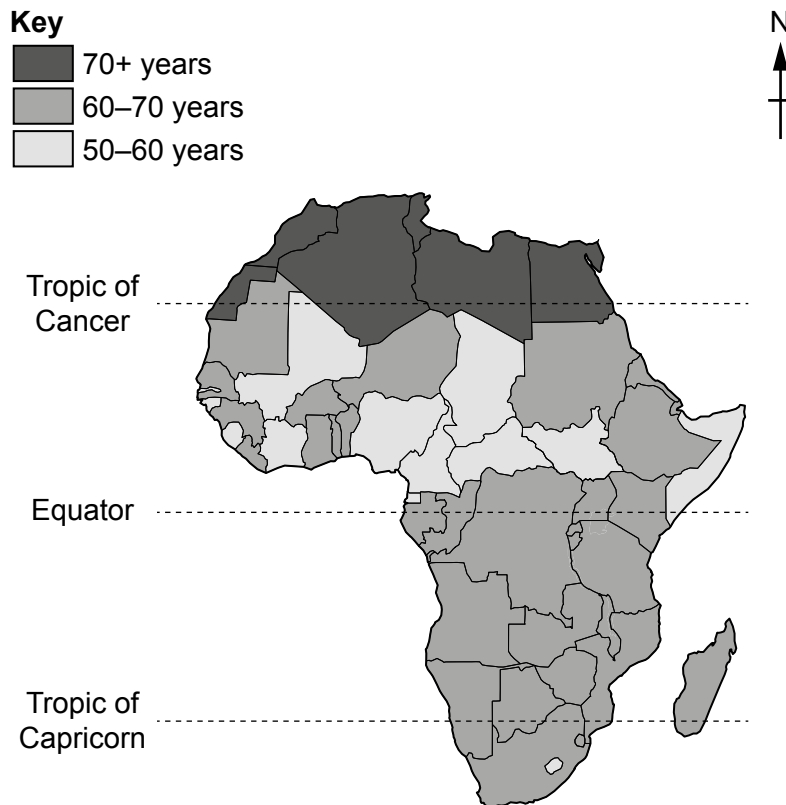
(a) Describe the distribution of average life expectancy in Africa.

The area to the North of Africa has the greatest life expectancy (70+)

years. Between the Equator and the Tropic of Cancer the life expectancy

is more varied with many countries having a life expectancy of 50-60

years. The majority of Africa has a life expectancy of 60-70 years.   [2]

Examiner comment

- This question required candidates to describe the distribution. It was expected that they would comment on the main trends. In this example, details were provided about the three age ranges and each were answered in different ways. All of these were valid. Two marks were available in this question, so they were awarded the marks for two accurate observations.

- Common errors within this type of question were to provide a detailed country by country commentary rather than the broader trends, or they did not use appropriate ordinal directions (North, South, etc.) and used terms such as 'above' or 'below' instead.

(b) Suggest why average life expectancy might change in the future.

The life expectancy might increase due to improvements in health care which might help prevent death through disease. Life expectancy might decrease due to the failure of crops causing famine.

.... [2]

[Total: 4]

Examiner comment

- This was another question with the command verb 'suggest', which required candidates to apply their knowledge to an unfamiliar situation.
- In this case, a valid reason why life expectancy might increase as well as a reason why it might decrease was provided, although there was no requirement in this question to provide one of each.
- The impact the change might have was also stated which provided additional clarity.

Question 5

5 The diagram shows a pitfall trap.
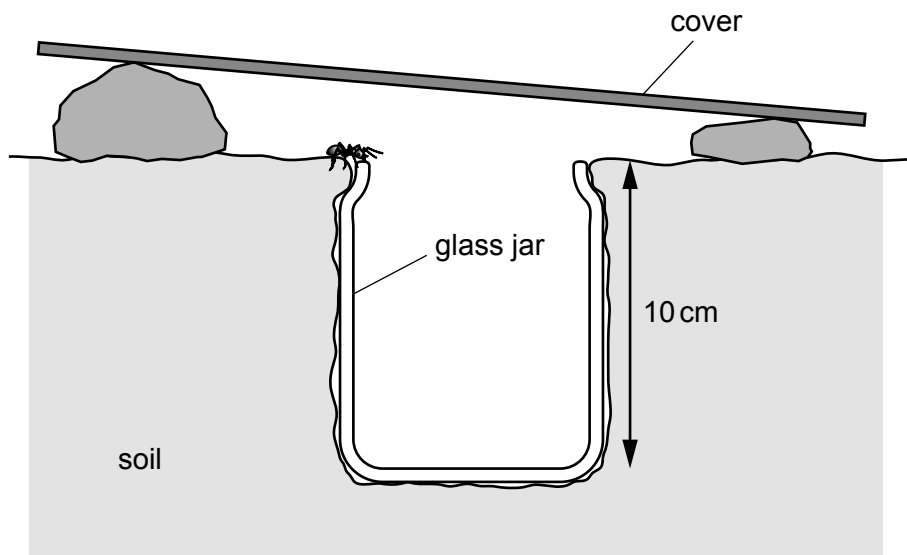
(a) (i) Describe how the pitfall trap shown in the diagram is used to sample organisms.

A jar is buried into the ground as a trap. It is covered to prevent the jar filling up with rain.

The insect falls into the trap and cannot escape because the sides of the glass jar are slippery, so they are unable to climb out.

....

.... [3]

Examiner comment

- Three marks were available in this question which required the candidate to describe the use of the trap.
- They used the diagram to help shape their answer and were awarded all three marks by observing that the jar was buried in the soil, the organism falls in and is unable to escape due to the smooth sides of the jar.
- The response would also be awarded a mark for correctly interpreting the use of the cover, although in this situation the maximum marks available have already been reached.

(ii) Suggest **two** limitations of using this pitfall trap to sample organisms.

1   *Some organisms might escape by flying out of the trap.*

    ....

2   *Organisms caught in the jar might eat each other.*

Examiner comment

- This was a slightly more challenging question, which required candidates to apply their knowledge of sampling to this specific scenario.
- In this response, two issues that could be awarded marks were identified; the risk of organisms flying out and the risk of predation within the jar.
- A wide range of responses were awarded marks. This question provided candidates with an opportunity to apply their experiences from completing practical investigations which are part of their course.

(b) The table shows organisms caught in five pitfall traps.

The table is **not** complete.

| organisms	number of organisms					
	trap 1	**trap 2**	**trap 3**	**trap 4**	**trap 5**	**total**
ants	18	8	12	9	14	*61*
beetles	1	4	0	2	0	7
centipedes	1	2	2	1	3	9
grasshoppers	0	1	1	0	1	3
spiders	2	3	4	3	3	15

(i) Complete the table to show the **total** number of ants.   [1]

Examiner comment

- This question required candidates to complete the missing data in the box by calculating the total of ants caught in the traps. This was done successfully.
- This style of question is common in this specification but is often missed by some candidates who do not read the question properly.

(ii) On the grid, plot a bar chart to show the number of each organism in **trap 2**.
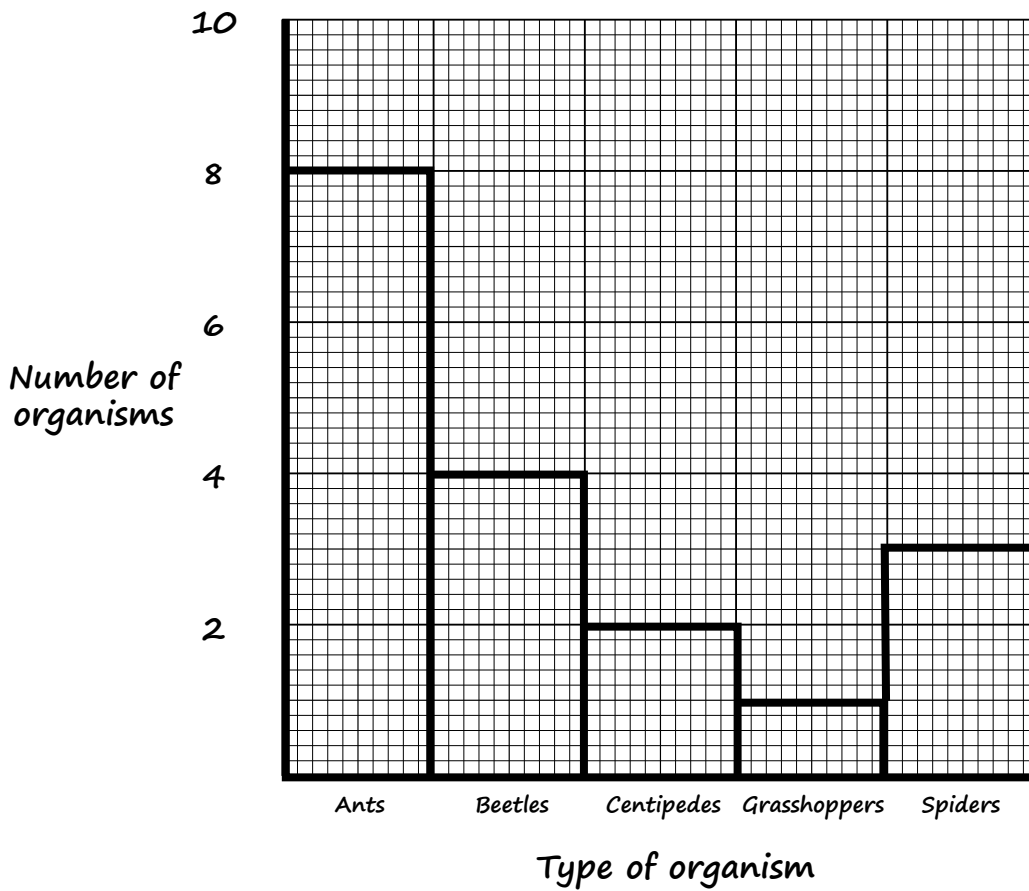

[4]

[Total: 10]

Examiner comment

- A common feature of these papers is the requirement to plot data in a range of formats. In this example, this was as a bar chart.
- It is extremely beneficial for candidates to use a ruler to construct the bar chart as this facilitates more accurate plotting of lines.

Question 6

6   (a)   The bar chart shows the leading countries for biofuel production in 2018 (in million tonnes of oil equivalent).
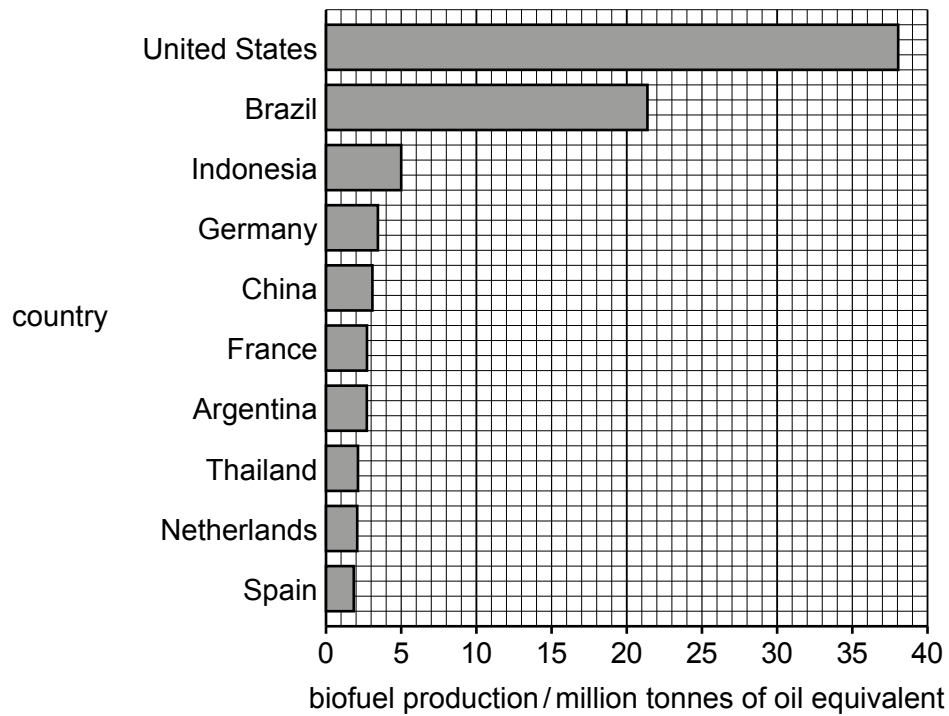
   (i)   Use the bar chart to determine the biofuel production for Indonesia.

.............................*5*............................. million tonnes of oil equivalent [1]

Examiner comment

Most candidates were able to interpret the bar chart provided and determine the correct information for Indonesia.

(ii) Suggest **two** advantages of using biofuel as an energy resource.

1 *Biofuels are renewable*

....

2 *Biofuels have a smaller carbon footprint*

....

[2]

Examiner comment

- In this example, two distinct advantages were provided which met the demand of the command verb 'suggest'.
- Many candidates were able to correctly identify that biofuels are renewable, however this second answer was seen more rarely. While many candidates understood the concept, they described it in an inappropriate way. It was incorrect to say that biofuels do not produce CO_2, as this is released when burnt.
- This answer was considered correct as these emissions are offset by the CO_2 absorbed during the growth of the crop, hence either a smaller carbon footprint or a description of net-zero.

(iii) Suggest **one** disadvantage of using biofuel as an energy resource.

One disadvantage of biofuels is that they need space to grow which could be used to grow food crops instead. [1]

Examiner comment

- This proved to be a more challenging question for many candidates.
- Some provided the opposite argument to Question 6(a)(ii) by saying that biofuels produced CO_2 which was not awarded the marks.
- A number of more successful answers identified the link to deforestation to produce the biofuel crop and the potential loss of biodiversity that may result, or made the link to the potential impact on food production as seen in this example.

(iv) It is predicted that the U.S. will use approximately 36 billion gallons of biofuels and 140 billion gallons of gasoline for transport in 2022.

Suggest whether biofuels are a realistic replacement for gasoline in transport. Give reasons for your answer.

I don't think that biofuels are a realistic replacement for gasoline at the moment. In 2022 only 36 billion of gallons of biofuel were used compared to 140 gallons of gasoline. This would mean an increase of 3.9 times the current production. People are used to using gasolene and not likely to change their habits. Even though biofuels might be able to be used in engines, they will still produce CO2 just as using gasoline does. [3]

Examiner comment

- This proved to be a more challenging question for many candidates, which required them to use the data and their knowledge to form an opinion, and to justify their decision.
- Three marks were available for this question. One mark is allocated for interpreting the data and identifying the difference between current biofuel and gasoline use. The other two marks are available for providing suitable reasons for their decision whether biofuels are a realistic replacement.
- This response gave two valid reasons why it might not be the case. One reason was based on changing the habits of the population and the other identified that CO_2 would still be produced.

(b) A student reads an internet article on electric vehicles.

> Worldwide, the use of electric vehicles has increased rapidly.
>
> In 2013, there were approximately 250 000 electric cars in the world.
>
> In 2018, there were more than 5.1 million electric cars in the world. The number of electric two-wheelers was 260 million, and there were 460 000 electric buses. In freight transport, there were 250 000 light-commercial vehicles (LCVs) and 1000 electric trucks.

(i) Present the data from the article in a suitable table to show the number of each type of electric vehicle in 2018.

Type of vehicle	Number of vehicles
Cars	5,100,000
Two wheelers	260,000,000
Buses	460,000
Light commercial vehicles (LCV)	250,000
Trucks	1,000

Examiner comment

- Candidates needed to read the article and present the information about electric vehicles in a table. This was completed by most candidates, although in a few cases where they did not read the instructions and some candidates attempted to draw another graph.
- In this example, all three marks were awarded; one for the use of appropriate column headings, one for listing all the types of vehicles correctly in the table, and the third for accurately recording the numbers.

(ii) Suggest why there has been a rapid increase in the worldwide use of electric vehicles.

There are a number of reasons. This may be due to a greater awareness of the damage that burning fossil fuels is doing to the atmosphere. This might mean there is an increase in demand to buy electric vehicles. Up until now electric vehicles have not been very convenient but improvements in range and greater availability of charging points means that people might be more likely to swap from their current vehicles. Governments might also encourage the switch to electric vehicles with the use of tax incentives and scrappage schemes to take older polluting vehicles off the road.

[4]

[Total: 14]

Examiner comment

- The response was detailed and demonstrated a thorough knowledge of the factors that were involved in the transition to electric vehicles. Many candidates used their knowledge from the syllabus and applied it to the specific scenario posed in this question.
- There was a general misconception that greater production of electric cars would be a reason for the increase in use, however this would not be the case if there was not an increase in demand.
- Candidates showed that a greater awareness of environmental damage probably increases the demand, which is also increased with government incentives and an increase to practicality with improvements to the technology and charging infrastructure. As a result, they were given four marks for this response.

Question 7

7 **(a)** Agriculture can be divided into three main types: arable, mixed and pastoral.

    (i) Complete the table using the words shown to match the descriptions to the types of agriculture.

arable   **mixed**   **pastoral**

description	type of agriculture
The farm grows crops.	*arable*
The farm raises animals.	*pastoral*
The farm grows crops and raises animals.	*mixed*

[1]

Examiner comment

- This was a straightforward one-mark question, testing candidates' knowledge of the definitions of three different styles of farming.
- Many candidates completed this task by using the term(s) familiar to them to reduce the options in such a table for those which they were finding more challenging.
- The most common error was to transpose arable and pastoral farming.

    (ii) Describe the difference between a commercial farm and a subsistence farm.

Commercial farming produces produce to sell for profit, whereas in subsistence farming produce is used to feed their own family. [1]

Examiner comment

- There were a wide variety of ways in which the differences between these two styles of farming could be described.
- Examiners awarded marks for a variety of different wording that covered a description of both types of farming with this meaning.
- Some candidates defined the difference as being whether the farm used machinery or not, which is not an accurate description. Similarly, while commercial farms may be larger, this is not always the case with some high-value specialist crops, so this was not given any marks.

(b) State **two** problems caused by mismanagement of irrigation.

1 *Waterlogging of soil* ....

2 *Leaching of nutrients* ....

[2]

Examiner comment

- This question required the candidate to state two problems, which they did correctly. The mark scheme contained a wide range of answers that were awarded marks. Those that mentioned waterlogging also referred to salinisation which was also awarded a mark.
- Despite the question referring to the mismanagement of irrigation, there were few examples given for situations where insufficient water had been applied.

(c) Describe how crop rotation and selective breeding of plants can be used to increase agricultural yield.

crop rotation *this involves planting different crops to follow on when the previous one has been harvested. This helps to ensure that pests or diseases that are in the soil will not be effective against the next crop as they are often specific to a certain type of plant.*

selective breeding *in selective breeding the farmer or scientist identifies important traits or characteristics in a plant and uses these plants to breed new varieties. The new plants will display these characteristics such as quicker to mature or resistance to poor weather.*

[4]

Examiner comment

- Four marks were available for this question, split across the two techniques. Candidates were able to describe a number of ways in which these techniques might increase yield.
- In some of the responses, it was unclear whether the first description related to crop rotation or mixed cropping (different crops in the plot at the same time). The example provided here clearly showed that they understood that one crop followed on from the other. They also gave an example of how this technique would increase yield (better control of pest and disease).
- With regards to selective breeding, candidates often correctly identified that the parents were chosen because of their beneficial traits and also provided an example of how this would increase yield such as earlier cropping or weather resistance.

(d) The factsheet contains information about the prickly pear cactus in Australia.
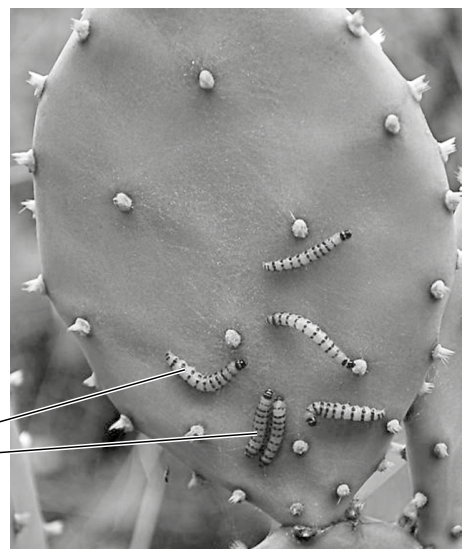
The prickly pear cactus

The prickly pear cactus is native to the Americas.

When it was brought to Australia, it spread rapidly, covering millions of hectares of farmland.

Farmers unsuccessfully tried several methods of controlling the cactus.

Eventually, the 'cactus moth' from South America was introduced.

The larvae of this moth ate the cacti and successfully reduced the cacti population.

cactus moth larvae

(i) Suggest why the prickly pear cactus spread so rapidly in Australia.

The prickly pear cactus is native to the Americas. It is likely that the weather conditions in Australia are similar and therefore favourable for the cactus to grow rapidly. As it is not native of Australia, it would probably have no natural predators there. [2]

Examiner comment

- While it was not expected that candidates would be familiar with the prickly pear cactus, they should be able to use their existing knowledge and apply it to the unfamiliar situation presented in the factsheet.
- Some candidates used the information in the factsheet to correctly conclude that it was resistant to many methods of control.
- The response above showed an understanding that cacti are adapted to hot, low rainfall environments and concluded that the conditions in Australia may be similar. As an introduced species, the response also concluded that there may not be any naturally occurring control organisms either.
- The command verb for this question was 'suggest', meaning that examiners would award marks for any logical conclusions.

(ii) Suggest the impact of the prickly pear cactus on the farmlands of Australia.

Competition with the cactus will mean there are less nutrients and water available to the crop which will mean a reduced yield. There may also be less grazing land available for livestock. As a result, the farmer will make less profit. [2]

Examiner comment

The question assumed that candidates would be able to apply their knowledge to this unfamiliar scenario. In this example, it is correctly identified that the increase in competition was likely to decrease the resultant yield. The response also identified the potential reduction in available farmland which would mean less grazing land for livestock. In either situation, this is likely to reduce the probability of the farm.

(iii) State the type of control used successfully by the farmers.

Biological control [1]

[Total: 13]

Examiner comment

Using the information in the factsheet, this question tested the candidate's knowledge of the term used for one of the methods of non-chemical control. This was the most common response, although a relatively large proportion of respondents gave the answer as 'cactus moth' which was the name of the organism, not the type of control.

Question 8

8   The photograph shows a location after a storm surge.

(a) Flooding is one impact of the storm surge.

(i) Describe **one** other impact of the storm surge that can be seen in the photograph.

Damage to houses. ....

.... [1]

Examiner comment

A wide range of potential answers could be given for this question, provided the answer was clearly shown within the photograph.

(ii) Suggest strategies to reduce the impacts of the flooding at this location.

Strategies could include the building of improved/ higher flood defences to allow for the storm surge. The government could also monitor the weather systems and provide warning to the population. Another strategy would be to rebuild houses in an area which is less likely to flood or build houses on stilts if it is essential for them to be at this location. [3]

Examiner comment

- The question asked for strategies relating to 'this location' which required candidates to refine their examples to fit the scenario shown.
- Three marks were available for this question which would imply that there were three distinct strategies needed within the answer.
- The response identified the need to protect the land more effectively, the need for better warning systems so the population could be evacuated and also the suggestion that replacement homes should be built elsewhere (land zoning) or designed to be less prone to flooding.
- Some potential strategies for reducing the impact of floods would not be suitable for the location in the photograph and therefore were not awarded marks.

(b) Tropical cyclones produce storm surges and flooding.

    (i) State **two** other causes of flooding.

      1 *Extreme rainfall*

      2 *Urbanisation*

[2]

Examiner comment

- This was a two-mark question which required two simple statements.
- One climate related cause and one man-made cause were provided here. This was not necessarily a requirement, provided the two answers were suitably distinct from each other.

(ii) Suggest why climate change may increase the impacts of tropical cyclones.

Climate change is causing ice caps to melt which is resulting in an increase in mean sea level. Warmer seas mean there is an increased area where cyclones are able to form.

Climate change is also changing weather patterns which means an increase in rainfall which causes flooding.

Many people live in coastal areas which are low lying, with the increase in sea level and more rain they are at greater risk.

[4]

Examiner comment

- This was a more challenging question, as many candidates lacked an understanding of the conditions needed for tropical cyclones. Where these conditions were known by the candidate, the precise requirements were often quoted.
- This response did not include the sea depth, sea temperature and latitude required, but still achieved full marks by thinking through the implications of climate change, and how a rise in sea level might impact the damage caused. This broader approach showed the ability of the candidate to draw conclusions from the information rather than simply memorising key facts.

Question 9

9 **(a)** In 2020, over 2 billion people did **not** have access to safe drinking water.

By 2050, the world population is predicted to increase by 2 billion people.

Suggest why an increase in world population will affect access to safe drinking water.

There would be an increase in demand for drinking water. The additional population will also lead to an increase in agricultural production and an increase in the volume of water needed for this crop production. There will be an increase in industry to meet the population's needs. This might result in an increase in water pollution from these industrial processes.

[3]

Examiner comment

- This answer correctly identified that there would be a far greater demand for drinking water. Unlike other responses, this one also made the link to the need for greater food production which will also put pressure on water supplies.
- Unlike some responses, this response also provided a context behind the idea that pollution would increase by providing information on where this pollution was likely to come from.
- This was a well-considered response covering a range of issues.

(b) Water samples are taken at three locations along a river.

The table shows the concentrations of some ions in the river water at each location.

ion	concentration of ion /mg per litre		
	location 1	location 2	location 3
iron	0.4	0.6	0.5
nitrate	5.4	5.8	33.0
phosphate	0.2	0.4	1.2
potassium	2.6	3.0	11.8
zinc	0.1	0.2	0.1

(i) State the location of the sample with the lowest concentration of iron.

Location 1 .... [1]

Examiner comment

Most candidates were able to interpret the numerical data and identify that location 1 had the lowest concentration of iron in the sample.

(ii) Calculate the range in concentration for potassium.

(11.8 – 2.6) = 9.2 ... mg per litre [1]

Examiner comment

- Many candidates were able to calculate the range. It was not required to show workings in this question, however for questions with higher marks some marks could be awarded for demonstrating the process even if there is an arithmetic process.
- The most common error was to state the highest and lowest values and not provide the final answer of the range calculation.

(iii) At one of the locations, the river flows through a farm that uses fertiliser.

State which location. Explain your answer.

location ...3...........................

explanation *location 3 has the highest levels of nitrate, phosphate and potassium. These ions are used in fertilisers to provide nutrients to plants.*

[2]

Examiner comment

- Candidates were not given a mark for the location they selected; the marks were awarded for the content of the explanation.
- Most candidates correctly identified that location 3 had the highest concentration of the ions, but some omitted to make the connection between N, P and K and their use in fertilisers.

(c) A student says:

> Building a dam is the best way to provide a constant water supply.

To what extent do you agree with this statement? Give reasons for your answer.

A dam can be a good way of providing a constant water supply but is not always the best way. A dam allows water to be stored until it is needed, which is useful in areas where rain does not happen throughout the year. During times of intense rain, the water can be captured, preventing it from being lost downstream where a large volume of water might cause flooding. The dam may also be used for recreation, irrigation of crops and for the generation of hydroelectric power (HEP). Dams will also mean local employment both in its running and in the supply of services during its construction. The disadvantages of using dams include the impact on the local community who may be displaced in the area to be flooded by the dam. The change in water flow may affect the migration and breeding of fish, and also the fertility of the land further downstream as the silt will build up in the dam (making it less effective). There is also a risk of severe flooding if the dam were to burst as seen in Laos and Brazil where people were killed as a result. Dams are also of limited use if the terrain of the area is not suitable or if there is insufficient rainfall. They are also expensive to build and lower cost alternatives might be more appropriate such as aquifers. In summary dams may be useful as part of a mix of strategies which may include the use of aquifers and desalination for coastal countries.

[6]

[Total: 13]

Examiner comment

- This question is designed so that candidates may write in detail, bringing in concepts and ideas from across the broader syllabus content.
- This was marked according to level descriptors or the overall quality of the answer. This means that candidates needed to plan their answer and ideally provide a conclusion to the question posed, which was typically whether they agreed or disagreed with the statement made.
- The response showed a logical structure and provided a balance of some of the advantages and disadvantages of using a dam. It also provided some supporting justification or examples from each viewpoint (e.g, the annual rainfall pattern) and also specific examples of dam failures in Laos and Brazil.
- The response also provided a lower cost solution to dam construction (use of aquifers), but also showed that the solution may be different in different locations depending on topography and geology.
- They showed a consideration of a range of factors and avoided the use of absolute statements, acknowledging that different situations may mean different solutions are required.