



**Cambridge Assessment**  
International Education

# Example Candidate Responses

## Paper 2

**Cambridge IGCSE™**  
**Environmental Management 0680**

**Cambridge O Level**  
**Environmental Management 5014**

For examination from 2019



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## Introduction

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The main aim of this booklet is to exemplify standards for those teaching Cambridge IGCSE Environmental Management 0680 and Cambridge O Level Environmental Management 5014, and to show how different levels of candidates' performance (high, middle and low) relate to the subject's curriculum and assessment objectives.

In this booklet candidate responses have been chosen from June 2019 scripts to exemplify a range of answers.

For each question, the response is annotated with a clear explanation of where and why marks were awarded or omitted. This is followed by examiner comments on how the answer could have been improved. In this way, it is possible for you to understand what candidates have done to gain their marks and what they could do to improve their answers. There is also a list of common mistakes candidates made in their answers for each question.

This document provides illustrative examples of candidate work with examiner commentary. These help teachers to assess the standard required to achieve marks beyond the guidance of the mark scheme. Therefore, in some circumstances, such as where exact answers are required, there will not be much comment.

The questions and mark schemes and pre-release material used here are available to download from the School Support Hub. These files are:

**June 2019 Question Paper 22**  
**June 2019 Paper 22 Mark Scheme**

Past exam resources and other teacher support materials are available on the School Support Hub:

[www.cambridgeinternational.org/support](http://www.cambridgeinternational.org/support)



## How to use this booklet

This booklet goes through the paper one question at a time, showing you the high-, middle- and low-level response for each question. The candidate answers are set in a table. In the left-hand column are the candidate answers, and in the right-hand column are the examiner comments.

Example Candidate Response – Question 1, high	Examiner comments
<p style="text-align: center;">↑ airport</p> <p>(i) Use the map to suggest reasons why 80% of the island is uninhabited.</p> <p>1 because there is permanent ice and snow in some areas making it difficult to build on and live there. There are also no roads connecting the coast coast to the inland. making it hard to travel and transport.</p>	<p>1 The reference to permanent ice achieves one mark. No roads connecting the coast to the inland (centre of island) achieves one mark. The idea that the non-coastal areas do not have fishing</p> <p><b>Examiner comments</b> are alongside the answers. These explain where and why marks were awarded. This helps you to interpret the standard of Cambridge exams so you can help your learners to refine their exam technique.</p>
<p><b>Answers</b> are by real candidates in exam conditions. These show you the types of answers for each level. Discuss and analyse the answers with your learners in the classroom to improve their skills.</p>	<p><b>Examiner comments</b> are alongside the answers. These explain where and why marks were awarded. This helps you to interpret the standard of Cambridge exams so you can help your learners to refine their exam technique.</p>

## How the candidate could have improved their answer

- In general, the candidate was less confident interpreting data and would have benefited from practising Assessment Objective 2 (Information handling and analysis) data-type questions.
- (e)(i)** The candidate's value was just outside of the accepted range. The dash markers on the pie chart should have been used to help interpret pie charts such as this.

This section explains how the candidate could have improved each answer. This helps you to interpret the standard of Cambridge exams and helps your learners to refine their exam technique.

## Common mistakes candidates made in this question

- (a)(i)** Low achieving responses simply stated that people lived near the coast but did not give a reason for this.
- (a)(iii)** A list of population for multiple bars without relating this to the overall population distribution was not enough for credit at this level.

Often candidates were not awarded marks because they misread or misinterpreted the questions.

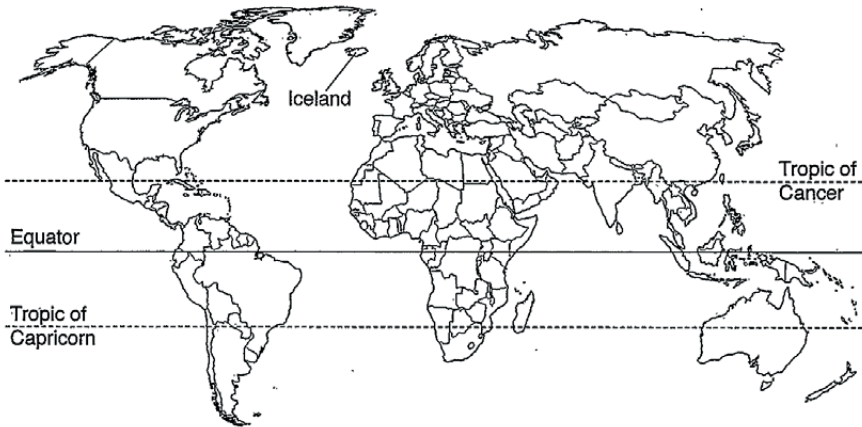
Lists the common mistakes candidates made in answering each question. This will help your learners to avoid these mistakes and give them the best chance of achieving the available marks.

## Question 1

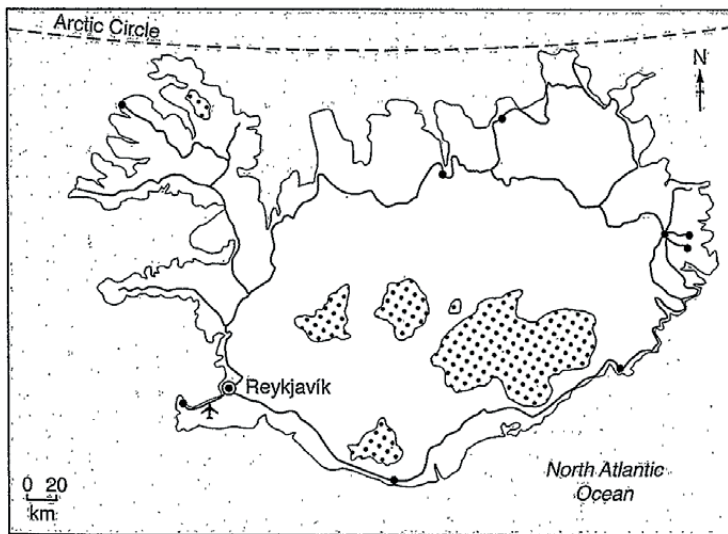
### Example Candidate Response – high

### Examiner Comments

world map showing the location of Iceland



map of Iceland



**Key**

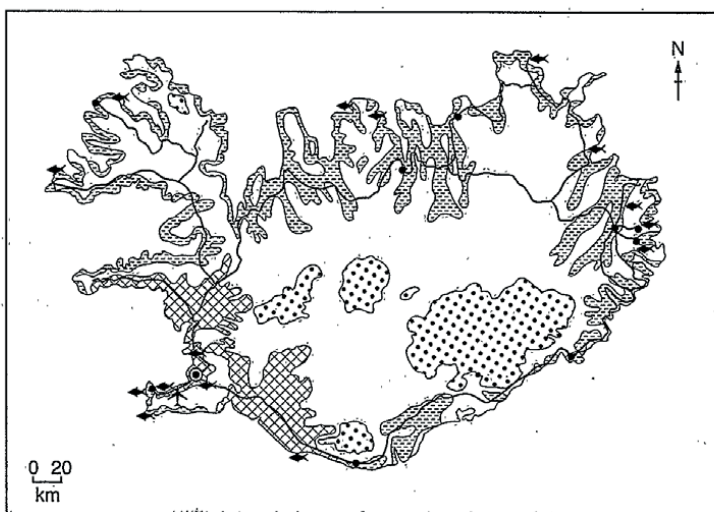
- capital city
- town
- road
- ✈ airport
- ⊞ glacier

Example Candidate Response – high, continued	Examiner Comments
<p><b>Area of Iceland:</b> 103000km<sup>2</sup></p> <p><b>Population:</b> 335878 (in 2017)</p> <p><b>Children per woman:</b> 2.01</p> <p><b>Life expectancy:</b> 83 years</p> <p><b>Currency:</b> Icelandic Krona (108.45 ISK = 1 USD)</p> <p><b>Language:</b> Icelandic</p> <p><b>Climate of Iceland:</b> temperate, moderated by North Atlantic current, cold, windy winters; damp, cool summers</p> <p><b>Terrain of Iceland:</b> mostly volcanic plateau with some mountain peaks, volcanoes, glaciers, coastal bays</p> <p><b>Main exports of Iceland:</b> fish and fish products, aluminium and ferrosilicon</p> <p>Iceland is an island in the North Atlantic Ocean. 80% of the island is uninhabited. Half of the population are located in the capital city, with smaller towns along the coast. The economy depends heavily on fishing. Since 2010, tourism has become the main economic growth area for the island, with the number of tourists each year reaching 4.5 times the Icelandic population. The island makes use of geothermal and hydro-electric power, which are available in large quantities.</p>	

Example Candidate Response – high, continued

Examiner Comments

1 (a) The map shows how some of the land in Iceland is used.



- Key**  
 land use  
 ▨ arable agriculture  
 ▩ pastoral agriculture  
 ● permanent ice and snow  
 □ unused land  
 ★ fishing port and processing centre  
 ● capital city  
 • town  
 ~ road  
 ↑ airport

(i) Use the map to suggest reasons why 80% of the island is uninhabited.

1

because there is permanent ice and snow in some areas, making it difficult to build on and live. There are also no roads connecting the coast to the inland, making it hard to travel and transport resources. The non-coastal areas also do not have access to the fishing ports for food, making it hard to survive due to the limited amount of livestock in the cold climate. [3]

1 The reference to permanent ice achieves one mark. No roads connecting the coast to the inland (centre of island) achieves one mark. The idea that the non-coastal areas do not have fishing ports achieves one mark. Three marks are awarded.

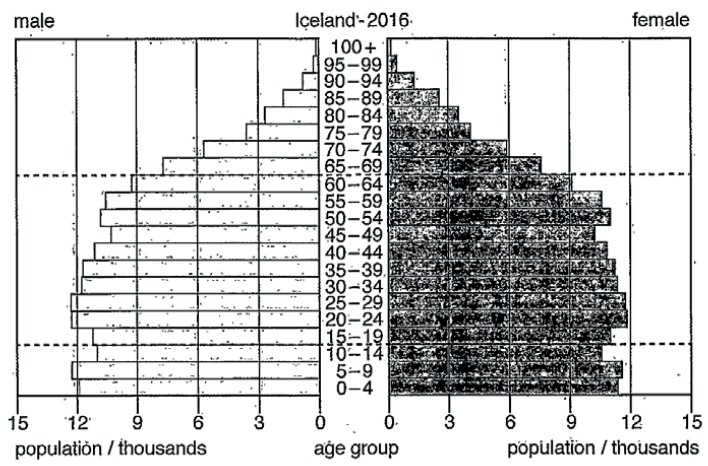
Mark for (a)(i) = 3 out of 3

**Example Candidate Response – high, continued** **Examiner Comments**

2 (ii) Estimate the population of the capital city of Iceland.  

$$\frac{335878}{2} = 167939$$
 [1]

(iii) The diagram shows the population pyramid for Iceland in 2016.



Describe the age distribution of Iceland's population in 2016.

3 There are a lot of young people from age 0-14, this is also true for ages 15-64, but the population from ages 29-64 it begins to decrease. If the amount of people begins to decrease. There is also a lot less elderly people aged 65-100. There is overall a higher male population, except from 65-100. [3]

(iv) The population of Iceland is expected to increase. Migration into the country is one reason for this.

4 State two factors affecting migration.  
 1. Amount Job opportunity  
 2. Family War [2]

2 As the estimate is within the range 167 000 to 168 000, this response achieves one mark. Although this particular question is worth one mark only and no credit is awarded for working, it is good examination technique to show how an answer is obtained. Mark for (a)(ii) = 1 out of 1

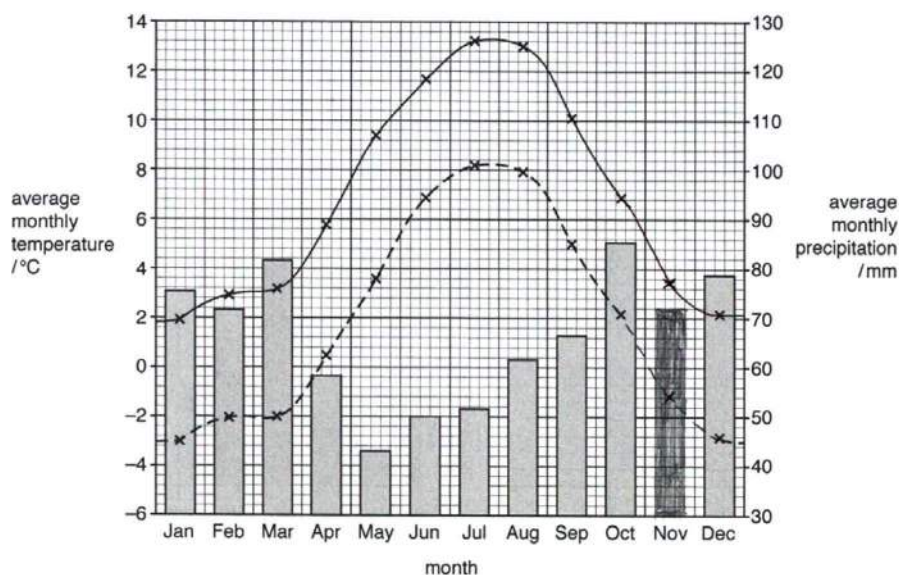
3 The observation that a lot of the population are between 15-64 achieves one mark. The observation that there are fewer elderly people beyond 64 achieves one mark. The observation that there is an overall higher male population achieves one mark. Three marks are awarded. Mark for (a)(ii) = 3 out of 3

4 The response 'job opportunities' (employment) achieves one mark. Similarly, the response 'war' (conflict) receives one mark. Two marks are awarded. Mark for (a)(iv) = 2 out of 2

Example Candidate Response – high, continued

Examiner Comments

(b) The graph shows climate data for a weather station near the capital city of Iceland.



**Key**  
 - - - minimum average monthly temperature /°C  
 — maximum average monthly temperature /°C  
 □ average monthly precipitation /mm

(i) The table shows the climate data for November.

month	average monthly minimum temperature /°C	average monthly maximum temperature /°C	average monthly precipitation /mm
November	-1.2	3.4	72

5

Complete the graph using the climate data for November.

[2]

5 The maximum temperature is plotted correctly. The minimum temperature is plotted correctly. Together, these achieve one mark. The precipitation plotting is correct; the shading matches the key and the width of the bar matches other bars. These achieve the other available mark. Two marks are obtained.

Mark for (b)(i) = 2 out of 2



## Example Candidate Response – high, continued

## Examiner Comments

- (ii) Using information from the graph, explain why there is limited crop production in Iceland.

6 The low temperatures only allow for ~~some~~ small amounts of climatized plants to grow. There is also ~~or~~ fairly low precipitation in Iceland, so it ~~can~~ only sustain a certain amount of plants getting ~~a~~ climatized. Crops can be expensive and the low temperatures cause a low growth rate. [3]

- (c) Iceland imports a large number of bananas each year.

It is possible to grow bananas in greenhouses in Iceland. The greenhouses need artificial lighting because there are only 5 hours of daylight during the winter months. It takes 1.5 to 2 years to produce a crop from each banana plant in Iceland compared with a few months in tropical countries.

- (i) Suggest reasons why Iceland does **not** export bananas to other countries to sell.

7 because it ~~cannot make grower~~ takes a long time to grow, so they cannot make a lot of profit. ~~Since they~~ It can also be expensive to build ~~more~~ greenhouses for the bananas and use more energy to ~~light~~ ~~the~~ give them light. Other countries are a more reliable and fast source. [3]

- (ii) A controlled environment, such as a greenhouse, is one way to increase agricultural yields.

Describe **two** other techniques to improve agricultural yields.

- 8
- 1 Use fertilizer to increase the ions and minerals needed for plant growth
  - 2 Use genetically ~~modify~~ modified organisms to ~~we~~ have ~~the~~ drought resistant crops and a larger output of fruit or grain. [2]

6 The following responses achieve one mark each: low temperature, low growth rate, low precipitation. Three marks are achieved.

Mark for (b)(ii) = 3 out of 3

7 The following points achieve a mark each: the crop takes a long time to grow; there is limited profit – that is to say the produce cannot be competitively priced; greenhouses use more energy. Three marks are achieved.

Mark for (c)(i) = 3 out of 3

8 Two techniques are identified and described: the use of fertiliser and the use of genetically modified organisms. They achieve one mark each. Two marks are awarded.

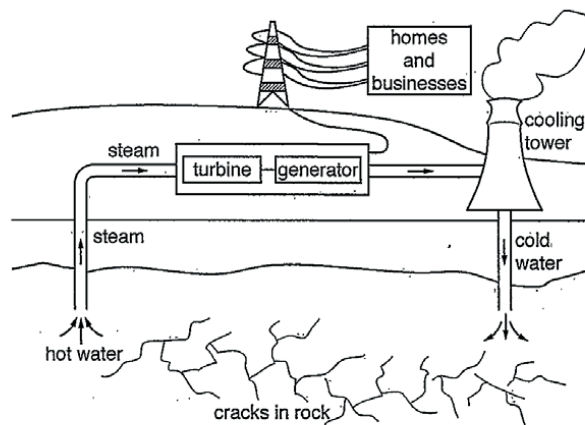
Mark for (c)(ii) = 2 out of 2

Example Candidate Response – high, continued

Examiner Comments

(d) Geothermal power is used to heat greenhouses and to generate electricity in Iceland.

The diagram shows how geothermally heated ground water is used to generate electricity.



(i) Use the diagram to describe how geothermally heated ground water is used to generate electricity.

9

The cold water is pushed into the ground, heated by the earth and flows through cracks to be sucked out as hot water and then steam. The steam turns the turbine which turns it into mechanical energy, which is then turned to electrical energy by the generator before the water is cooled and pumped into the Earth again. [4]

9 The candidate identifies and describes four points: cold water is pushed (forced) into (under) the ground; it is heated in the earth and flows through the cracks; the hot water then becomes steam and the steam turns the turbines. The response achieves all four marks.

Mark for (d)(i) = 4 out of 4

(ii) Geothermal power is a renewable energy resource.

State one other renewable energy resource.

10

Solar power [1]

10 The response 'solar power' achieves one mark.

Mark for (d)(ii) = 1 out of 1

(iii) 'Using geothermal power for electricity generation is less harmful to the environment than using fossil fuels.'

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

11

I partially agree, because it doesn't produce carbon dioxide or sulfur dioxide, preventing acid rain and not adding to the enhanced greenhouse effects, preventing global warming and any of sea level rise. However, the area where the plant needs to be built destroys habitats. The pumping and extraction of water also has the chance to cause earthquakes. [4]

11 The candidate explains that geothermal power does not produce carbon dioxide and does not produce sulfur dioxide. It does not therefore contribute to acid rain or add to the greenhouse effect. All four marks are awarded.

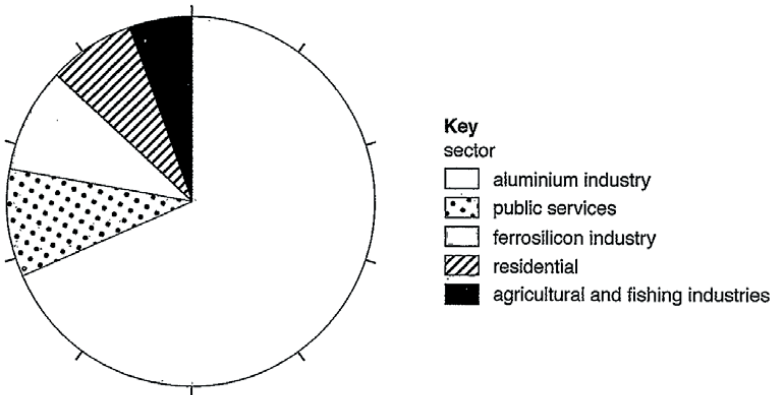
Mark for (d)(iii) = 4 out of 4



Example Candidate Response – high, continued

Examiner Comments

(e) The pie chart shows the percentage electricity consumption for different sectors in Iceland for 2013.



(i) Determine the total percentage electricity consumption for all the sectors of industry in Iceland.

12

5 + 68 + 8 = 81

81 .....% [1]

(ii) The agricultural and fishing industries have the lowest percentage electricity consumption for the industry sector.

Suggest reasons why this information cannot be used to predict the economic importance of these two industries.

13

because fishing boats and agricultural machinery do not normally use electricity and instead use gasoline or diesel, so it doesn't accurately show the amount of energy they use. [2]

12 The candidate has not calculated the correct answer; 81 is outside of the accepted range of 82–83. Therefore, no credit is given.

Mark for (e)(i) = 0 out of 1

13 The candidate notes that fishing boats use gasoline or diesel instead of electricity but does not explain why this information cannot be used to predict economic importance. One mark is achieved.

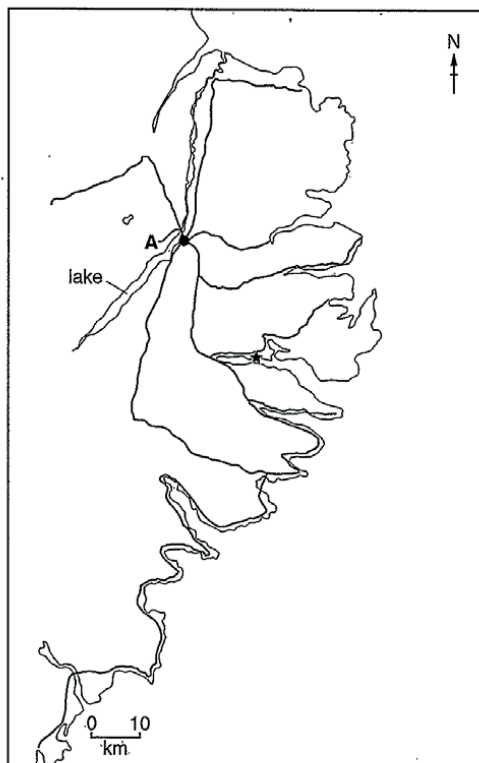
Mark for (e)(ii) = 1 out of 2

Example Candidate Response – high, continued

Examiner Comments

- (f) A company wants to expand the aluminium industry in Iceland by building a new aluminium smelter. The smelter requires a large supply of fresh water and electricity.

The map shows a proposed location, A, for the smelter near the east coast of Iceland.



- Key**  
 — road  
 ★ port  
 A proposed location of the smelter  
 ● town

- 14 (i) Estimate the distance by road from the port to the proposed location of the smelter.  
 ..... 45 ..... km [1]
- (ii) Suggest how the new smelter could be supplied with the fresh water it needs.  
 They can use the nearby lake.  
 ..... [1]
- 15 (iii) Explain why an environmental impact assessment is needed before the smelter can be built.  
 So the environmental impact of the smelter  
 can be monitored and if it needs to be removed,  
 they know how to rehabilitate the area.  
 ..... [2]

- 14 This estimation of 45 is outside the accepted range of 32–38. Therefore, no credit is awarded. Mark for (f)(i) = 0 out of 1
- 15 The response ‘from the lake’ gains one mark. Mark for (f)(ii) = 1 out of 1
- 16 The candidate correctly explains that the environmental impact will need to be monitored to see if it needs to be removed (demonstrating their knowledge of the idea of safeguarding once operating). They also point out that it may be necessary to know how to rehabilitate the area (i.e. the idea of remediation). Both marks are achieved. Mark for (f)(iii) = 2 out of 2

Example Candidate Response – high, continued

Examiner Comments

(iv) The company decided to use a questionnaire to find out people's views on expanding the aluminium industry.

Part of the questionnaire is shown.

	percentage response		
	yes	no	do not know
1. Would you like more employment opportunities in Iceland?	63	23	14
2. Are you in favour of Iceland becoming a wealthier country?	75	15	10
3. Do you think Iceland should rely mainly on fishing and tourism for its economy?	36	52	12

The company used information from the questionnaire to conclude that people did not object to expanding the aluminium industry in Iceland.

17

Do you agree with their conclusion? Give reasons for your answer.

No, because they did not ask them about the aluminium industry specifically and did not ask them about any of the environmental risks that come with the industry. [2]

(v) The company selected people who work in the aluminium industry in Iceland to complete the questionnaire.

Suggest two limitations of this sampling method.

18

1 It doesn't allow the general public to ~~work~~ complete the questionnaire  
 2 It doesn't allow young people or retired people to ~~be~~ complete the questionnaire. [2]

17 The candidate observes that recipients are not asked about the aluminium industry but did not state that either the questions are biased, leading or unclear. Only one mark is therefore achieved. Mark for (f)(iv) = 1 out of 2

18 The candidate makes one correct observation that the sample choice does not allow the general public to complete the questionnaire (that it is therefore not representative of the population). Their second limitation is a subset of the first, rather than a further point. One mark is achieved. Mark for (f)(v) = 1 out of 2

Example Candidate Response – high, continued

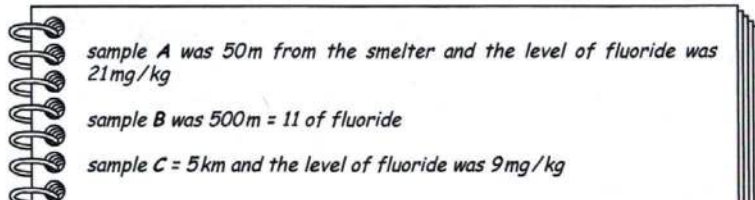
Examiner Comments

(g) Fluorides are gaseous chemicals produced during the smelting of aluminium.

A cattle farmer living near an aluminium smelter is concerned about the level of fluorides in the crops that the cattle eat.

The farmer tests samples of the crops at different distances from the aluminium smelter.

The farmer records the results in a notebook.



(i) Present the results in a suitable table.

	distance (m)	amount of fluoride, <del>mg</del> mg/kg
Sample A	50	21
Sample B	500	11
sample C	5000	9

19

19 Full marks are achieved for this question. The table has column/row headings; the units are correct with m for distance and mg/kg for level of fluoride; the 3 sets of data are correct, including the conversion of 5 km to 5000 m. Three marks are achieved. Mark for (g)(i) = 3 out of 3

[3]

(ii) The permitted safe level of fluorides in crops for cattle is 30 mg/kg.

Is the farmer right to be concerned about the level of fluorides in the crops? Give a reason for your answer.

20

~~Yes, because 21 mg/kg is very close to~~  
~~3~~ No, because even the closest crop only have 21 mg/kg. [1]

[Total: 43]

20 A correct conclusion and reason are given. The answer is 'no' and there is reference to the maximum level. One mark is achieved.

Mark for (g)(ii) = 1 out of 1

**Total mark awarded = 38 out of 43**

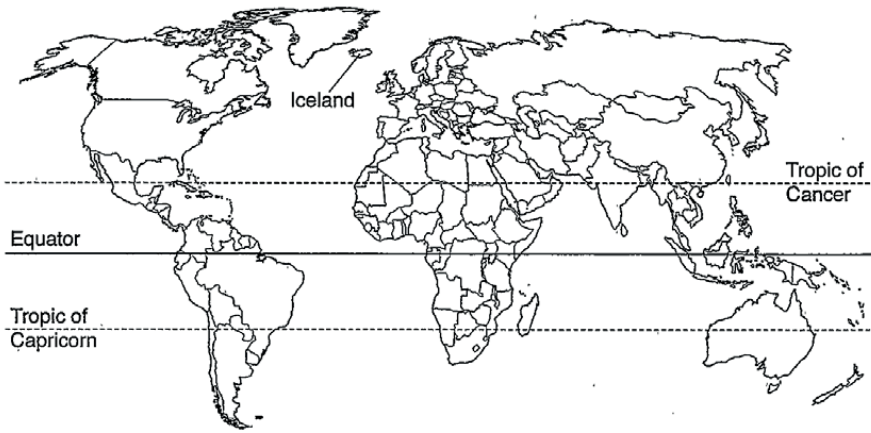
## How the candidate could have improved their answer

- In general, the candidate was less confident interpreting data and would have benefited from practising Assessment Objective 2 (Information handling and analysis) data-type questions.
- **(e)(i)** The candidate's value was just outside of the accepted range. The dash markers on the pie chart should have been used to help interpret pie charts such as this.
- **(e)(ii)** The candidate only provided one comment for a two-mark question. It was important to read questions carefully to identify the command word and other instructions in the question. This question asked the candidate to suggest reasons.
- **(f)(i)** The candidate was not confident interpreting a scale drawing and their response was significantly outside the accepted range of 32–38.
- **(f)(iii)** The candidate has been awarded a mark for the idea of safeguarding once the smelter was in operation. Their response could have been clearer by including a more specific named safeguard such as monitoring waste or emissions.
- **(f)(iv)** The candidate could have referenced the leading questions. The candidate's response 'not asking about environmental risks' was a reverse argument of their first answer 'did not ask them about the aluminium industry'. The question asked the candidate to 'give reasons' for their answer. One reason developed could not achieve two marks.
- **(f)(v)** The candidate's second response was a repeat of their first limitation. A valid suggestion would have been that the people questioned had a vested interest or there was no information on the number of people being questioned.

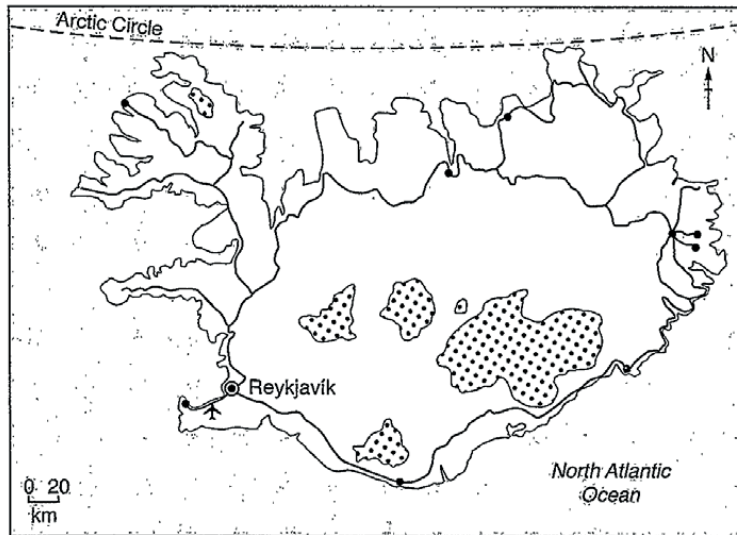
Example Candidate Response – middle

Examiner Comments

world map showing the location of Iceland



map of Iceland



Key

- ⊙ capital city
- town
- road
- ✈ airport
- ⊃ glacier

Examiner Comments

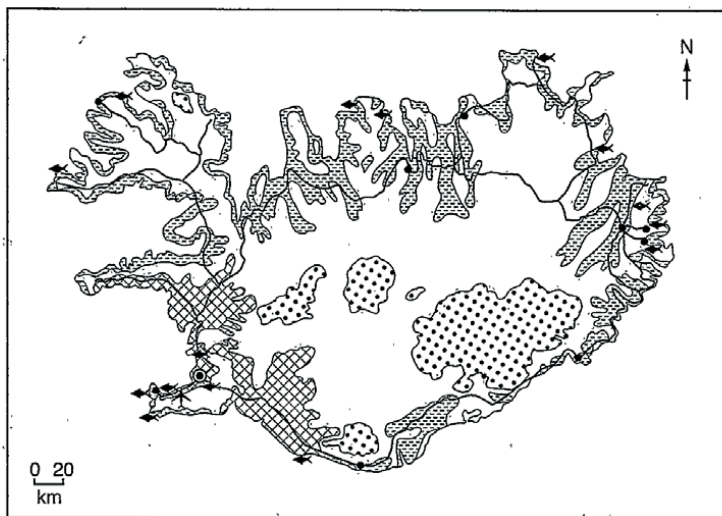
Example Candidate Response – middle, continued	Examiner Comments
<p><b>Area of Iceland:</b> 103 000 km<sup>2</sup></p> <p><b>Population:</b> 335 878 (in 2017)</p> <p><b>Children per woman:</b> 2.01</p> <p><b>Life expectancy:</b> 83 years</p> <p><b>Currency:</b> Icelandic Krona (108.45 ISK = 1 USD)</p> <p><b>Language:</b> Icelandic</p> <p><b>Climate of Iceland:</b> temperate, moderated by North Atlantic current, cold, windy winters; damp, cool summers</p> <p><b>Terrain of Iceland:</b> mostly volcanic plateau with some mountain peaks, volcanoes, glaciers, coastal bays</p> <p><b>Main exports of Iceland:</b> fish and fish products, aluminium and ferro-silicon</p> <p>Iceland is an island in the North Atlantic Ocean. 80% of the island is uninhabited. Half of the population are located in the capital city, with smaller towns along the coast. The economy depends heavily on fishing. Since 2010, tourism has become the main economic growth area for the island, with the number of tourists each year reaching 4.5 times the Icelandic population. The island makes use of geothermal and hydro-electric power, which are available in large quantities.</p>	



Example Candidate Response – middle, continued

Examiner Comments

1 (a) The map shows how some of the land in Iceland is used.



- Key**
- land use
  - arable agriculture
  - pastoral agriculture
  - permanent ice and snow
  - unused land
  - fishing port and processing centre
  - capital city
  - town
  - road
  - airport

(i) Use the map to suggest reasons why 80% of the island is uninhabited.

1

This is because of the never melting permanent ice and snow which lead to people being forced not to live near it as the surroundings would be really cold and would make it difficult for the people to live there. Most of the land near the inhabited area is used for agriculture which would lead to lack of water. [3]

1 The candidate correctly identifies the permanent ice as a reason. However, the suggestion that there would be insufficient water as a result of its use in agriculture, is not relevant to the question and did not gain credit. One mark is gained.

Mark for (a)(i) = 1 out of 3



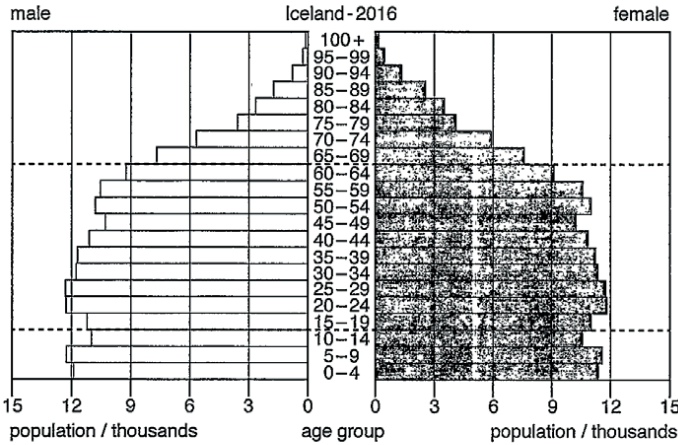
Example Candidate Response – middle, continued

Examiner Comments

(ii) Estimate the population of the capital city of Iceland.

2 .....16,000..... [1]

(iii) The diagram shows the population pyramid for Iceland in 2016.



Describe the age distribution of Iceland's population in 2016.

3 In 2016, most of the population of ages ~~are~~ from 25 to 34 have a population of around the 12,000 mark. The age group from 15 to 64 tend to ~~be~~ be higher population than the ages from 65 to 100+. This is because they get old and they have less energy & get sick and die. people of the <sup>[3]</sup> ave age of 15 to 64 tend to ~~be~~ have a higher population as they more healthy.

(iv) The population of Iceland is expected to increase. Migration into the country is one reason for this.

4 State two factors affecting migration.  
 1 Lack of jobs. So they migrate to another country.  
 2 Weather climate. Racism. Inequality. Education. [2]

2 The estimated figure is incorrect. No marks are achieved. Mark for (a)(ii) = 0 out of 1

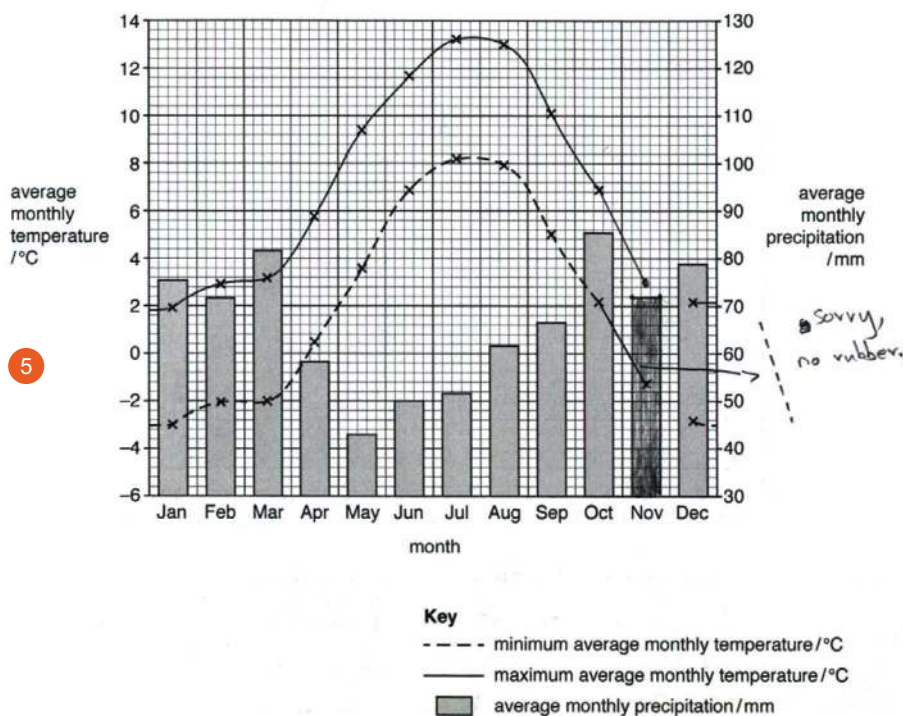
3 The candidate makes one correct observation that most of the population fall between 15–64. One mark is achieved. Mark for (a)(ii) = 1 out of 3

4 Both available marks are attained in this response. One mark for the lack of jobs (employment) and another for education. Weather, climate and racism are ignored as they do not contradict the accepted response. Mark for (a)(iv) = 2 out of 2

Example Candidate Response – middle, continued

Examiner Comments

(b) The graph shows climate data for a weather station near the capital city of Iceland.



5

5 The maximum temperature is plotted correctly. The minimum temperature is plotted correctly. The precipitation plotting is correct and the shading matches the key. The width of the bar matches the other bars. All available marks are achieved.

Mark for (b)(i) = 2 out of 2

(i) The table shows the climate data for November.

month	average monthly minimum temperature /°C	average monthly maximum temperature /°C	average monthly precipitation /mm
November	-1.2	3.4	72

Complete the graph using the climate data for November.

[2]

**Example Candidate Response – middle, continued** **Examiner Comments**

(ii) Using information from the graph, explain why there is limited crop production in Iceland.

6 This is because of not having enough rain during the months, as the highest monthly precipitation was only around 85 mm which is quite less. If crop production is needed to be done, lack of rain leads to limited crop production. During the months of May to July they witness the least rainfall. [3]

6 While the reason given is that there is not enough rain, there is no reference to how the lack of rain limits crop growth. The rest of the response is a repeat of the information in the question 'limited crop production'. Only one mark is achieved.

Mark for (b)(ii) = 1 out of 3

(c) Iceland imports a large number of bananas each year.

It is possible to grow bananas in greenhouses in Iceland. The greenhouses need artificial lighting because there are only 5 hours of daylight during the winter months. It takes 1.5 to 2 years to produce a crop from each banana plant in Iceland compared with a few months in tropical countries.

(i) Suggest reasons why Iceland does not export bananas to other countries to sell.

7 Iceland's main exports are fish, fish products, aluminium and ferro-silicon. Due to less daylight in Iceland during winter, it makes it difficult for them to grow bananas and as the no. of tourists increase 4.5 times each year, the demand for such things increases and the government cannot take a risk and export them. [3]

7 Although not on the mark scheme, the reference to 'less daylight making it difficult to grow bananas' is creditworthy as it explicitly states cause and effect and is a valid reason. One mark is achieved.

Mark for (c)(i) = 1 out of 3

(ii) A controlled environment, such as a greenhouse, is one way to increase agricultural yields.

Describe two other techniques to improve agricultural yields.

8 1 Irrigation - Planting of more plants to produce crops. ~~and fish~~  
2 .....  
..... [2]

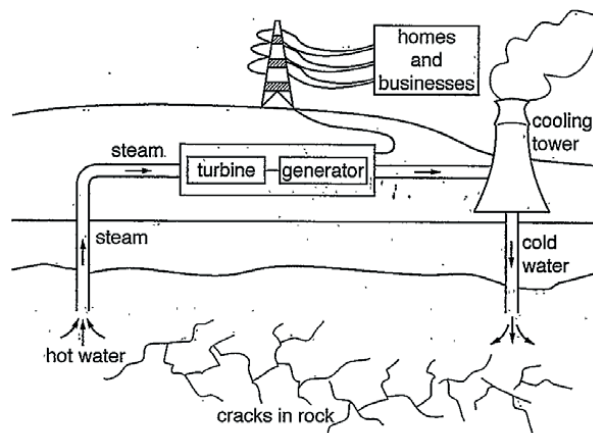
8 Irrigation is one creditworthy technique. One mark is achieved.  
Mark for (c)(ii) = 1 out of 2

Example Candidate Response – middle, continued

Examiner Comments

(d) Geothermal power is used to heat greenhouses and to generate electricity in Iceland.

The diagram shows how geothermally heated ground water is used to generate electricity.



(i) Use the diagram to describe how geothermally heated ground water is used to generate electricity.

The hot water underground that is being heated geothermally is gone into the tunnel containing steam and this way the water would get more heated/warmer as steam is mixed with it. This then goes to the turbine where electricity is produced. The turbine is connected to a generator that would generate the electricity to the homes and send some of the steam to the cooling tower where it gets cooled and the cold water goes underground.

(ii) Geothermal power is a renewable energy resource. and fills the cracks in rocks.

State one other renewable energy resource.

Solar Energy, Wind, Tidal [1]

(iii) 'Using geothermal power for electricity generation is less harmful to the environment than using fossil fuels.'

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

I agree with this statement because using fossil fuels to generate electricity would be harmful as when it is burned it releases toxic gases into the surroundings which would obviously destroy the land and people & animals living nearby would have breathing problems/asthma. The animals would get sick by breathing in the gas and furthermore die. Using fossil fuels isn't a good choice as it takes millions of years to produce it again.

9 The candidate correctly refers to cold water going underground. This achieves one mark. The processes in the rest of the response are poorly described. Mark for (d)(i) = 1 out of 4

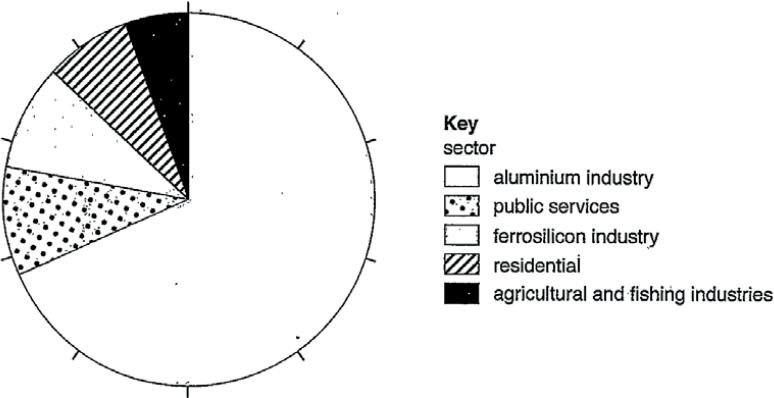
10 This response is valid as a suggested alternative energy resource. One mark is achieved. Mark for (d)(ii) = 1 out of 1

11 The response is not specific enough at this level and contains no creditworthy reasons. No marks are achieved. Mark for (d)(iii) = 0 out of 4

Example Candidate Response – middle, continued

Examiner Comments

(e) The pie chart shows the percentage electricity consumption for different sectors in Iceland for 2013.



(i) Determine the total percentage electricity consumption for all the sectors of industry in Iceland.

12

.....100.....% [1]

(ii) The agricultural and fishing industries have the lowest percentage electricity consumption for the industry sector.

Suggest reasons why this information cannot be used to predict the economic importance of these two industries.

13

This is because the Aluminium industry has the highest consumption of electricity (around 67%) and predicting the economic importance of these 2 industries would be a bad idea and instead add the economic importance of the aluminium industry also as it covers a large part. [2]

12 This is an incorrect value. No marks are achieved.

Mark for (e)(i) = 0 out of 1

13 No valid reasons are given. No marks are achieved.

Mark for (e)(ii) = 0 out of 2

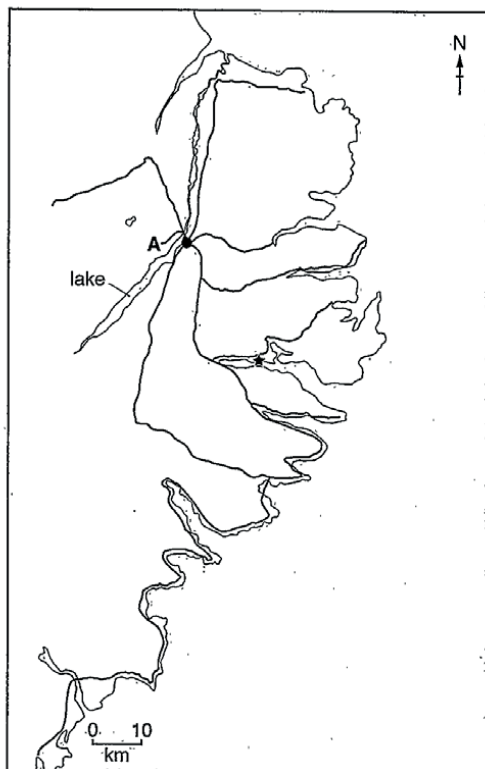


Example Candidate Response – middle, continued

Examiner Comments

- (f) A company wants to expand the aluminium industry in Iceland by building a new aluminium smelter. The smelter requires a large supply of fresh water and electricity.

The map shows a proposed location, A, for the smelter near the east coast of Iceland.



- Key**  
 — road  
 ★ port  
 A proposed location of the smelter  
 ● town

- (i) Estimate the distance by road from the port to the proposed location of the smelter.

14

..... 3 ..... km [1]

14 This is an incorrect value. No marks are achieved.

Mark for (f)(i) = 0 out of 1

- (ii) Suggest how the new smelter could be supplied with the fresh water it needs.

15

The fresh water could be supplied through water pumps from underground. [1]

15 This response of 'water pumps from underground' (ground water), is a valid response. One mark is achieved.

Mark for (f)(ii) = 1 out of 1

- (iii) Explain why an environmental impact assessment is needed before the smelter can be built.

16

Building a new smelter would require machinery and this would lead to noise and air pollution and as there is a town located nearby people living there might get affected by it. There is also a lake nearby which might get contaminated by the dust that would be produced during construction. [2]

16 The response 'noise and air pollution' receives one mark. The reference to the lake getting contaminated is not awarded credit as it is the same 'idea' as the first answer 'example of how the smelter might affect the local environment'.

Mark for (f)(iii) = 1 out of 2

Example Candidate Response – middle, continued

Examiner Comments

(iv) The company decided to use a questionnaire to find out people's views on expanding the aluminium industry.

Part of the questionnaire is shown.

	percentage response		
	yes	no	do not know
1. Would you like more employment opportunities in Iceland?	63	23	14
2. Are you in favour of Iceland becoming a wealthier country?	75	15	10
3. Do you think Iceland should rely mainly on fishing and tourism for its economy?	36	52	12

The company used information from the questionnaire to conclude that people did not object to expanding the aluminium industry in Iceland.

Do you agree with their conclusion? Give reasons for your answer.

17

Yes I do, because most of the people agreed on the country providing more employment opportunities and ~~is~~ Iceland of becoming a wealthier country. Both of these could be achieved when the aluminium industry is expanded. [2]

(v) The company selected people who work in the aluminium industry in Iceland to complete the questionnaire.

Suggest two limitations of this sampling method.

18

1. Random sampling - The company could choose people randomly. [1]  
 2. The company could choose every 3rd person working in the aluminium industry. [2]

17 The answer that most people agreed they wanted more wealth or employment opportunities achieves one mark.

Mark for (f)(iv) = 1 out of 2

18 This is an incorrect response. No marks are awarded.

Mark for (f)(v) = 0 out of 2

Example Candidate Response – middle, continued

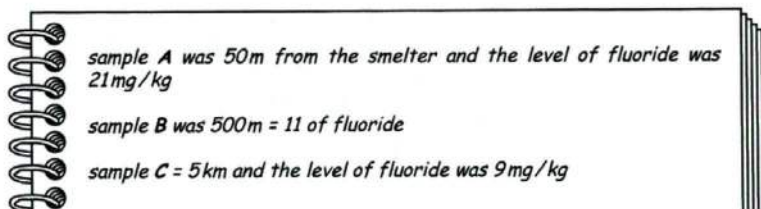
Examiner Comments

(g) Fluorides are gaseous chemicals produced during the smelting of aluminium.

A cattle farmer living near an aluminium smelter is concerned about the level of fluorides in the crops that the cattle eat.

The farmer tests samples of the crops at different distances from the aluminium smelter.

The farmer records the results in a notebook.



(i) Present the results in a suitable table.

19

Samples	Distance(m/km)	Level of fluoride (mg/kg)
Sample A	50m	21mg/kg
Sample B	500m	11mg/kg
Sample C	5 km	9mg/kg

[3]

(ii) The permitted safe level of fluorides in crops for cattle is 30mg/kg.

Is the farmer right to be concerned about the level of fluorides in the crops? Give a reason for your answer.

20

No, because the samples B & C which are 500m & 5km away have a level of fluoride of just 11 & 9mg/kg (1)  
 And sample A which is closest (50m) has 21mg/kg which is not close to 30mg/kg. [Total: 43]

19 In this response, the table is drawn with column/row headings achieving one mark. However, the candidate uses mixed units in their column headings (m / km) and therefore cannot be awarded credit for units. Three sets of data are recorded in the table – in this case, the mark is awarded as the error is carried forward from their incorrect use of mixed units. Two marks are achieved.

Mark for (g)(i) = 2 out of 3

20 This response gives the correct reason for saying 'no' by referring to the safe limit in comparison to the actual values. One mark is achieved.

Mark for (g)(ii) = 1 out of 1

**Total mark awarded = 17 out of 43**



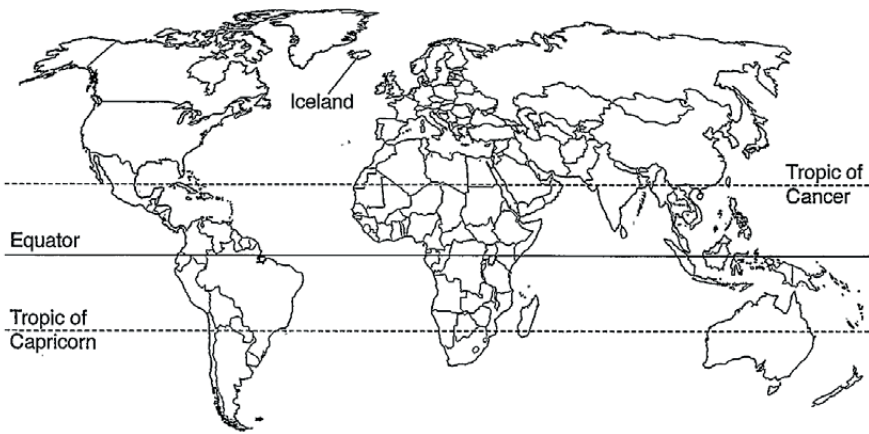
## How the candidate could have improved their answer

- **(a)(i)** The candidate provided two answers to a three-mark question. Every question should have been read carefully paying attention to the command word, other key words and the mark allocation (shown in square brackets). The command word was 'suggest'; 'reasons' was a key word and there were three marks available. Three ideas were needed for three marks.
- **(a)(iii)** Credit was not awarded for the comparison to the 65 to 100+ age group as the candidate did not make it clear that the trend in population was decreasing after 65. They attempted to give a reason for the higher population in 15–64; this was not what the question asked for. The candidate may have benefited from underlining the key aspects of the question. There was a glossary of command words in the syllabus which all candidates should have been familiar with.
- **(a)(iv)** In the second line of the response, the candidate gave a list of factors and did not follow the rubric of the question to 'State two'. In this case, the other factors could have been ignored as they did not contradict the correct answer. Candidates should have avoided giving more than the stated number of responses, as an incorrect answer could have contradicted a previously correct one.
- **(b)(i)** The candidate did not join the plots for temperature using a smooth curve. In this case, the question did not require the candidate to do so. However, as the rest of the graph had a smooth trend line, it would have been good practice to include one.
- **(b)(ii)** Careful reading of the question, including looking at the number of marks, may have helped the candidate to write about three ideas that could have explained why there was limited crop production in Iceland.
- **(c)(i)** The candidate could have improved their answer by stating that the lack of daylight limits photosynthesis. Careful reading of the question may have helped the candidate to suggest three reasons to access the three marks available.
- **(c)(ii)** The candidate left the second technique blank. It was advisable to attempt all parts of the question paper as blank spaces could not achieve marks.
- **(d)(ii)** The candidate did not follow the rubric of the question, as more than the required number of resources was provided. This should have been avoided as an incorrect response may have contradicted a previously correct one.
- **(d)(iii)** There was no reference to the type of 'toxic gas' released. The reference to fossil fuels taking millions of years to develop showed that the candidate had an idea of non-renewability, but they did not go on to explicitly state this. Careful reading the question, paying attention to the command word and the number of marks available, may have helped the candidate give four reasons.
- **(e)(i)** The dash markers on the pie chart should have been used to help interpret pie charts such as this.
- **(e)(ii)** The candidate repeated the information in the stem of the question without adding additional comment.
- **(e)(iv)** The candidate did not reference the third question in their response.
- **(g)(i)** The candidate used mixed units in their table. It was poor tabular practice to include the units in each cell. Units should have been in the column headings and all data values should have had the same unit and, if necessary, the data should have been converted to account for this. In this case, 5 km should have been converted to 5000 m.

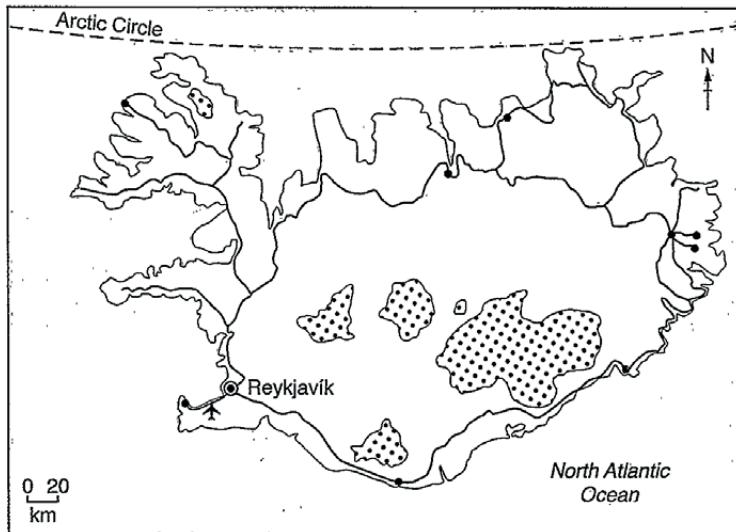
Example Candidate Response – low

Examiner Comments

world map showing the location of Iceland



map of Iceland



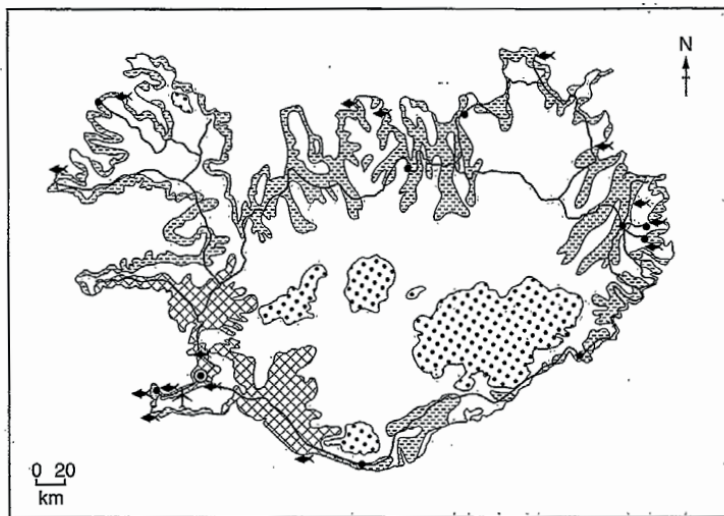
- Key**
- ⊙ capital city
  - town
  - road
  - ✈ airport
  - ⊞ glacier

Example Candidate Response – low, continued	Examiner Comments
<p><b>Area of Iceland:</b> 103000km<sup>2</sup></p> <p><b>Population:</b> 335 878 (in 2017)</p> <p><b>Children per woman:</b> 2.01</p> <p><b>Life expectancy:</b> 83 years</p> <p><b>Currency:</b> Icelandic Krona (108.45 ISK = 1 USD)</p> <p><b>Language:</b> Icelandic</p> <p><b>Climate of Iceland:</b> temperate, moderated by North Atlantic current, cold, windy winters; damp, cool summers</p> <p><b>Terrain of Iceland:</b> mostly volcanic plateau with some mountain peaks, volcanoes, glaciers, coastal bays</p> <p><b>Main exports of Iceland:</b> fish and fish products, aluminium and ferrosilicon</p> <p>Iceland is an island in the North Atlantic Ocean. 80% of the island is uninhabited. Half of the population are located in the capital city, with smaller towns along the coast. The economy depends heavily on fishing. Since 2010, tourism has become the main economic growth area for the island, with the number of tourists each year reaching 4.5 times the Icelandic population. The island makes use of geothermal and hydro-electric power, which are available in large quantities.</p>	

Example Candidate Response – low, continued

Examiner Comments

1 (a) The map shows how some of the land in Iceland is used.



- Key**
- land use
  - ▨ arable agriculture
  - ▩ pastoral agriculture
  - ⬤ permanent ice and snow
  - unused land
  - ⚓ fishing port and processing centre
  - ⊙ capital city
  - town
  - road
  - ✈ airport

(i) Use the map to suggest reasons why 80% of the island is uninhabited.

1 That is because most of area of the island is unusable. Volcanic or geologically active land and also some of land is covered in snow.

.....

.....

..... [3]

1 The answer is not specific enough to gain credit, as there is no reference to the central area being unusable or covered with snow. No marks are achieved. Mark for (a)(i) = 0 out of 3

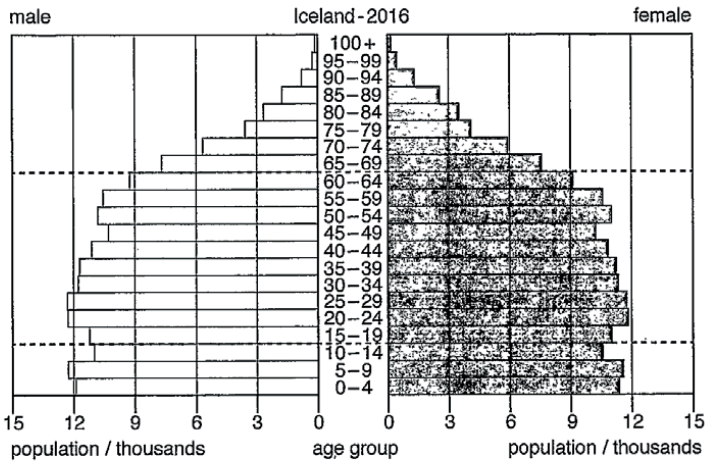
Example Candidate Response – low, continued

Examiner Comments

(ii) Estimate the population of the capital city of Iceland.

2 ..... 30,000 people ..... [1]

(iii) The diagram shows the population pyramid for Iceland in 2016.



Describe the age distribution of Iceland's population in 2016.

3 The population of Iceland in 2016 is not ageing but is young. This is concluded from the graph. It shows that a large portion of the population is below 65 years old. [3]

(iv) The population of Iceland is expected to increase. Migration into the country is one reason for this.

State two factors affecting migration.

4 1 The political atmosphere  
2 The quality of jobs [2]

2 This is an incorrect estimate. No marks are achieved. Mark for (a)(ii) = 0 out of 1

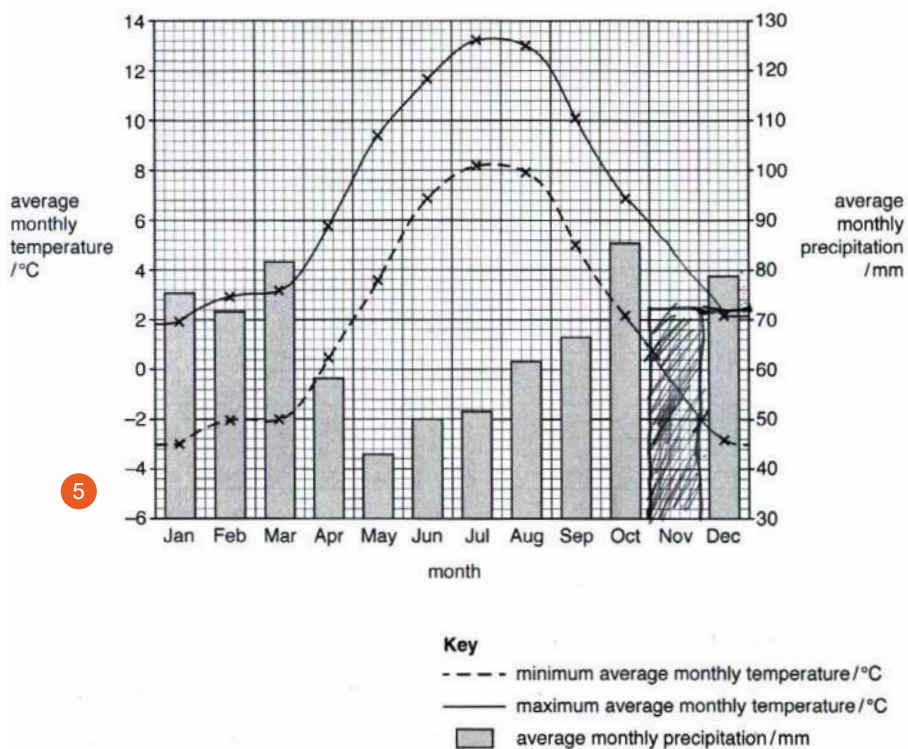
3 The candidate correctly observes that the population is young. Credit is also awarded for the idea that most of the population is below 65. Two marks are achieved. Mark for (a)(ii) = 2 out of 3

4 The answer 'political atmosphere' is not on the mark scheme but is a creditworthy response. The answer 'jobs' (employment) is correct. Two marks are awarded. Mark for (a)(iv) = 2 out of 2

Example Candidate Response – low, continued

Examiner Comments

(b) The graph shows climate data for a weather station near the capital city of Iceland.



(i) The table shows the climate data for November.

month	average monthly minimum temperature /°C	average monthly maximum temperature /°C	average monthly precipitation /mm
November	-1.2	3.4	72

Complete the graph using the climate data for November.

[2]

5 The bar plot is wider than the other bars already plotted. An attempt is made to shade the bar in the same manner as the key. The maximum and minimum temperatures are not plotted in the correct position. No marks are achieved.

Mark for (b)(i) = 0 out of 2



**Example Candidate Response – low, continued** **Examiner Comments**

(ii) Using information from the graph, explain why there is limited crop production in Iceland.

6 The limited crop production is caused by the cold climate which is not suitable for many crops.

..... [3]

6 The cold climate (temperature) is one valid answer. One mark is achieved.  
Mark for (b)(ii) = 1 out of 3

(c) Iceland imports a large number of bananas each year.

It is possible to grow bananas in greenhouses in Iceland. The greenhouses need artificial lighting because there are only 5 hours of daylight during the winter months. It takes 1.5 to 2 years to produce a crop from each banana plant in Iceland compared with a few months in tropical countries.

(i) Suggest reasons why Iceland does **not** export bananas to other countries to sell.

7 That is because bananas are hard to grow in Iceland and that requires a lot of energy to produce a crop. Then Iceland is already importing them.

..... [3]

7 The candidate is correct that bananas require a lot of energy to grow, (greenhouses need a large amount of energy). One mark is achieved.  
Mark for (c)(i) = 1 out of 3

(ii) A controlled environment, such as a greenhouse, is one way to increase agricultural yields.

Describe **two** other techniques to improve agricultural yields.

8 1. Improving soil fertility.  
2. altering the soil pH values.

..... [2]

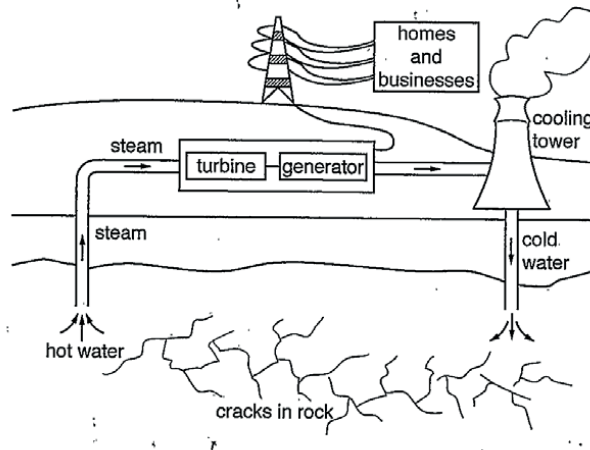
8 No creditworthy response has been recorded here. No marks are achieved.  
Mark for (c)(ii) = 0 out of 2

Example Candidate Response – low, continued

Examiner Comments

(d) Geothermal power is used to heat greenhouses and to generate electricity in Iceland.

The diagram shows how geothermally heated ground water is used to generate electricity.



(i) Use the diagram to describe how geothermally heated ground water is used to generate electricity.

9 first cold water is pumped into the crack in the rock. The water gets heated then the steam is pumped up into generator turbine which spins. The generator produces electrical energy. The generator transmits electricity into line. Then the steam is moved into cooling tower.

9 The candidate correctly identifies that cold water is pumped into rock, the water gets heated in the cracks and turned into steam for three marks. Mark for (d)(i) = 3 out of 4

(ii) Geothermal power is a renewable energy resource.

State one other renewable energy resource.

10 hydroelectric power

10 'Hydroelectric' is a correct response. One mark is achieved. Mark for (d)(ii) = 1 out of 1

(iii) 'Using geothermal power for electricity generation is less harmful to the environment than using fossil fuels.'

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

11 I do agree to that statement to a high extent, because the geothermal energy produces little to no greenhouse gases and is less environmentally while burning fossil fuels produce a lot of greenhouse gases.

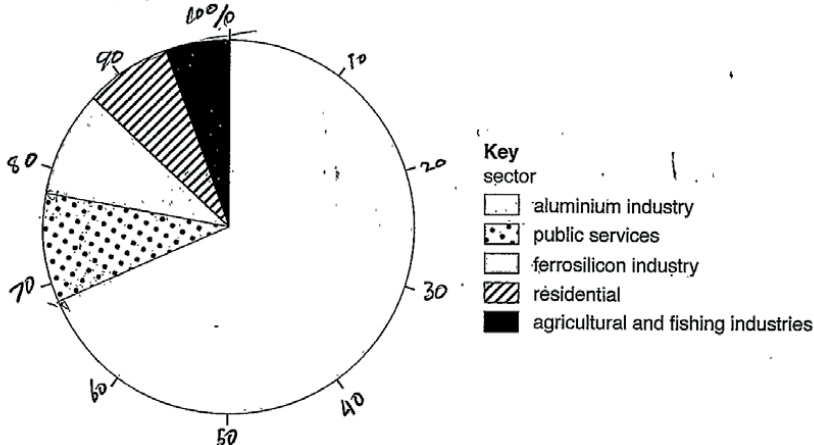
11 The candidate writes that they agree because there are no greenhouse gases produced. One mark is achieved. Mark for (d)(iii) = 1 out of 4



Example Candidate Response – low, continued

Examiner Comments

(e) The pie chart shows the percentage electricity consumption for different sectors in Iceland for 2013.



(i) Determine the total percentage electricity consumption for all the sectors of industry in Iceland.

12

$7 + 8 + 9 + 6 = 2$   
 $\frac{78}{100} = 78\%$   
 ..... 92 .....% [1]

12 This is an incorrect value. No marks are achieved. Mark for (e)(i) = 0 out of 1

(ii) The agricultural and fishing industries have the lowest percentage electricity consumption for the industry sector.

Suggest reasons why this information cannot be used to predict the economic importance of these two industries.

13

That is because the electricly consumption has no  
 correlation to importance of the sector or sectors.  
 No ..... [2]

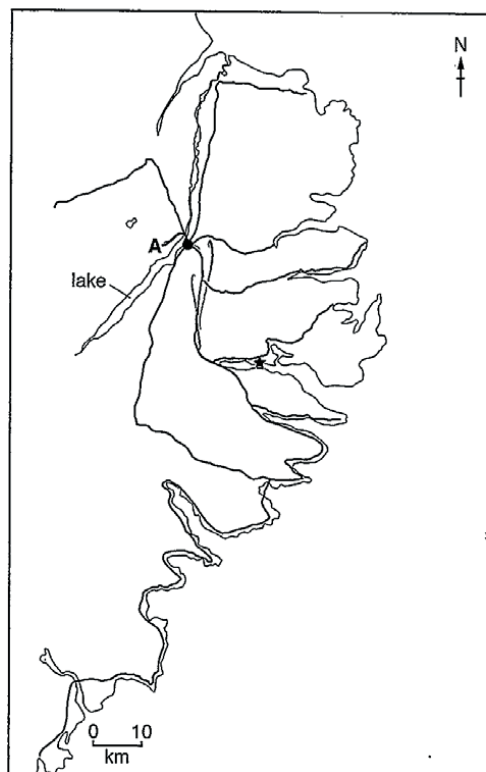
13 No creditworthy response. No mark is achieved. Mark for (e)(ii) = 0 out of 2

Example Candidate Response – low, continued

Examiner Comments

- (f) A company wants to expand the aluminium industry in Iceland by building a new aluminium smelter. The smelter requires a large supply of fresh water and electricity.

The map shows a proposed location, A, for the smelter near the east coast of Iceland.



- Key**  
 — road  
 ★ port  
 A proposed location of the smelter  
 ● town

- 14 (i) Estimate the distance by road from the port to the proposed location of the smelter.  
 ..... 30 ..... km [1]

- (ii) Suggest how the new smelter could be supplied with the fresh water it needs.  
 They can get water from the lake or filter sea water ..... [1]

- 15 (iii) Explain why an environmental impact assessment is needed before the smelter can be built.  
 It is to know how much of an impact it would have on the environment ..... [2]

14 No marks are achieved as the value is outside the accepted range of 32–38.  
 Mark for (f)(i) = 0 out of 1

15 The reference to the lake, although spelled incorrectly, is credited. One mark is achieved.  
 Mark for (f)(ii) = 1 out of 1

16 One mark is achieved for stating that assessment is needed in order to ‘know the impact on the environment’.  
 Mark for (f)(iii) = 1 out of 2

**Example Candidate Response – low, continued** **Examiner Comments**

(iv) The company decided to use a questionnaire to find out people's views on expanding the aluminium industry.

Part of the questionnaire is shown.

	percentage response		
	yes	no	do not know
1. Would you like more employment opportunities in Iceland?	63	23	14
2. Are you in favour of Iceland becoming a wealthier country?	75	15	10
3. Do you think Iceland should rely mainly on fishing and tourism for its economy?	36	52	12

The company used information from the questionnaire to conclude that people did not object to expanding the aluminium industry in Iceland.

Do you agree with their conclusion? Give reasons for your answer.

17 Yes, I think the conclusion is reliable, but because the questionnaire show that people do not object to expanding aluminium industry. [2]

(v) The company selected people who work in the aluminium industry in Iceland to complete the questionnaire.

Suggest two limitations of this sampling method.

18 1 The range of delivery  
2 It is not always answered honestly [2]

17 The candidate has not directly addressed the question and simply repeats information already supplied in the question. Mark for (f)(iv) = 0 out of 2

18 No creditworthy suggestion is supplied. No marks are achieved. Mark for (f)(v) = 0 out of 2

Example Candidate Response – low, continued

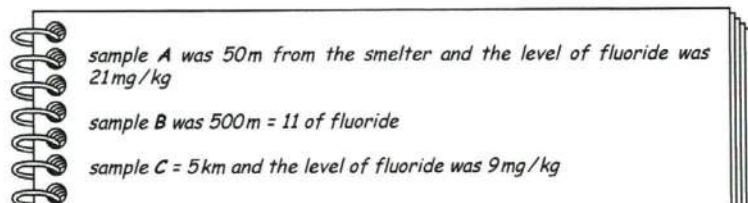
Examiner Comments

(g) Fluorides are gaseous chemicals produced during the smelting of aluminium.

A cattle farmer living near an aluminium smelter is concerned about the level of fluorides in the crops that the cattle eat.

The farmer tests samples of the crops at different distances from the aluminium smelter.

The farmer records the results in a notebook.



(i) Present the results in a suitable table.

distance from smelter	concentration of fluoride in mg/kg
Sample A 50m	21mg/kg
Sample B 500m	11mg/kg
5km Sample C	9mg/kg

19

[3]

(ii) The permitted safe level of fluorides in crops for cattle is 30mg/kg.

Is the farmer right to be concerned about the level of fluorides in the crops? Give a reason for your answer.

20

Yes, because some times the level of fluoride could be higher than permitted level. [1]

[Total: 43]

19 The table is drawn with column and row headings for one mark. No credit is awarded for units as two different sets of units are used for distance. Only m or km should be used. The candidate is awarded credit for three sets of data, even although the 5 km is not converted into metres. This mark is awarded as an error carried forward from the incorrect use of mixed units. The candidate has already been assessed on their use of units. Two marks are achieved.

Mark for (g)(i) = 2 out of 3

20 The candidate makes an incorrect conclusion. No marks are achieved.

Mark for (g)(ii) = 0 out of 1

**Total mark awarded = 15 out of 43**

## How the candidate could have improved their answer

- **(a)(iii)** The candidate did not make three separate comments on the age distribution and was not guided by the mark allocation of three. Looking carefully at the mark allocation (shown in square brackets) and the answer space provided should have ensured candidates accessed all the marks available for a question.
- **(b)(i)** The candidate needed more practice in graphical skills. The bar plot should have been the same width as the other bars and the shading should have matched the key. A sharp pencil and ruler should have been used to draw bars.
- **(b)(ii)** The candidate only gave one explanation to a three-mark question.
- **(c)(i)** The candidate was awarded credit for their reference to ‘requiring a lot of energy’, but the response would have been stronger if they had included a reason for this, for example, ‘greenhouses require a lot of energy’.
- **(c)(ii)** The response did not include a description of ‘how’ to improve soil fertility or pH values. The candidate may have benefited if they had underlined key aspects of the questions to help focus their response to answering the question.
- **(d)(i)** The candidate narrowly missed out on the final mark as they did not refer to the turbine or generator.
- **(d)(iii)** Only one reason was offered to this four-mark question. By reading the question, looking at the space available and the mark allocation, the candidate might have realised that a more detailed answer was required to access the four marks available.
- **(e)(ii)** The candidate repeated the information in the question without adding further comment; this approach rarely achieves credit.
- **(f)(ii)** The candidate misspelt lake.
- **(f)(iii)** The response would have been clearer by including more specific, named safeguards such as monitoring waste or emissions.
- **(f)(v)** Candidates found this a challenging question and in general, sampling methods and their limitations were not well known.
- **(g)(i)** The candidate used mixed units in their table. It was poor tabular practice to include the units in each cell. Units should have been in the column headings and all data values should have had the same unit and, if necessary, the data should have been converted to account for this. In this case, 5 km should have been converted to 5000 m.

## Common mistakes candidates made in this question

- **(a)(i)** Low achieving responses simply stated that people lived near the coast but did not give a reason for this.
- **(a)(iii)** A list of population for multiple bars without relating this to the overall population distribution was not enough for credit at this level.
- **(a)(iv)** It was not enough to state ‘push and pull’ factors without qualifying with examples.
- **(b)(i)** Many candidates were not confident in their graph plotting skills. The bar was often not the same width as the other bars and was not shaded to match the existing bars. The values for temperature were often incorrectly plotted.
- **(c)(ii)** There were a number of responses that gave more than the two techniques required by the question. This should have been avoided as candidates could have contradicted a previously correct answer.
- **(d)(i)** The conversion of hot water from the cracks in the rocks into steam was poorly described.
- **(e)(ii)** Many responses only repeated the question.
- **(f)(i)** Candidates appeared to be unfamiliar with using a scale to determine actual distances.
- **(f)(ii)** Some candidates suggested the ocean but as the question asked for freshwater, it was necessary to state that the water was desalinated in order to be awarded credit for this approach.
- **(f)(iv)** A significant number of responses did not follow the instruction in the question to give reasons. Simply agreeing or disagreeing with a point of view was not enough at this level. Reasons or explanations were the areas candidates should have focused on in their answer.
- **(f)(v)** It was rare to see responses that used the syllabus terminology of random and systematic sampling in a correct and meaningful way.
- **(g)(i)** A common error was to include 5 km without converting this to 5000m. Often units were either missing or included in every cell of the table.
- **(g)(ii)** Some candidates did not appear confident drawing a conclusion from the numerical data. Equal numbers of candidates thought the levels were unsafe as those that correctly explained they were safe as they were below the safe level of 30 mg/kg.
- Some candidates were not confident interpreting data to reach a conclusion; this was seen in both the Assessment Objective 2 (Information handling and analysis) data-type questions and the Assessment Objective 3 (Investigation skills and making judgements) ‘drawing conclusions/suggest’ type questions.

## Question 2

### Example Candidate Response – high

### Examiner Comments

- 2 (a) Iceland is situated on the Mid-Atlantic Ridge plate boundary. The two plates, the North American plate and the Eurasian plate, are slowly moving apart. This means Iceland becomes bigger every year, as the plates move apart and magma fills the middle of the island.

The map shows the plates, the Mid-Atlantic Ridge and the location of Iceland's major volcanoes.



#### Key

- capital city
- ✈ airport
- △ major volcano
- ▭ Mid-Atlantic Ridge

- (i) Mark with an X on the map where the youngest rocks are located on Iceland. [1]

- (ii) State the type of plate boundary that occurs in Iceland.

constructive/divergent

[1]

- (iii) Use the map to describe the distribution of major volcanoes in Iceland.

major volcanoes are generally on the ridge or at least most 20 km away from it. They are mostly on the south part of Iceland, nearby where the ridge meets the ocean. [2]

- 1 The X is clearly marked on the mid-Atlantic ridge. One mark is achieved.

Mark for (a)(i) = 1 out of 1

- 2 'Constructive' is correct for one mark.

Mark for (a)(ii) = 1 out of 1

- 3 The candidate receives two marks for identifying 'on the ridge' and 'most in south'.

Mark for (a)(iii) = 2 out of 2



## Example Candidate Response – high, continued

## Examiner Comments

- (b) Surtsey island is an island nature reserve off the southern coast of Iceland.

The island and coastline are protected from the impact of humans by a marine buffer zone. No one is allowed onto the island and boats are not allowed to enter the marine buffer zone.

Suggest **two** reasons why the marine buffer zone might **not** be enough to protect Surtsey island from the impact of humans.

- 1 The airport isn't too far (~80 km) away from the island, hence planes are flying by it all the time, emitting harmful gases just above it.
- 2 There are lots of volcanoes nearby which attract tourists which brings in human activity (using cars, burning fossil fuels) nearby the island and all of these activities emit more harmful gases that will travel to the island via wind!

- (c) In April 2010, Eyjafjallajökull volcano erupted in the south of Iceland. The eruption continued for 6 weeks.

A large ash cloud spread across Iceland, the Atlantic Ocean and the European mainland. The ash cloud disrupted air traffic all around the world and approximately 100 000 flights were cancelled.

The ash fall caused considerable damage to farmland used for crops and grazing animals.

The volcano is under a glacier and the eruption caused rapid melting of snow and ice. This resulted in flooding of river valleys, which also damaged farmland.

- (i) Discuss how this volcanic eruption affected Iceland.

The melting of the snow and ice would've flooded nearby areas, damaged property and ruined land for agriculture by depleting it ~~of~~ from nutrients. The volcanic debris would've put lives at risk and also damaged property. ~~Even~~ Disease would've been spread if the melted snow water got contaminated ~~in rivers~~ like cholera could've been spread. Economically Iceland would've had to face the issue of repairing all the damaged property & less crops ~~and~~ would've been sold. <sup>and</sup> The damage to farms could have caused famine which would've affected the people of Iceland negatively.

4 The candidate uses underlining to help them identify the key requirements of the question. This often helps candidates answer the question that has been set, rather than writing about something else. It is useful to be familiar with the glossary of command words that is provided in the syllabus.

5 The candidate correctly identifies air pollution from planes as an impact caused by humans. The impact of volcanoes is not a human impact and so cannot be credited. One mark is achieved. Mark for (b) = 1 out of 2

6 Although not on the mark scheme, a named disease (cholera) that has been brought about by flooding is creditworthy. Damaged property is another valid effect, as is the loss of income for farmers (less crops sold) and famine (lack of food). Four marks are achieved.

Mark for (c)(i) = 4 out of 4

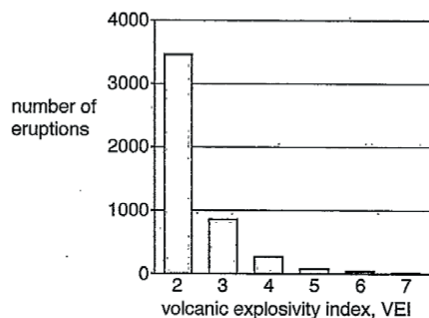


Example Candidate Response – high, continued

Examiner Comments

(ii) The volcanic explosivity index, VEI, is a measure of the explosiveness of volcanic eruptions. A VEI value of 0 is the least explosive and a VEI value of 8 is the most explosive.

The graph shows the VEI value for some eruptions around the world.



Describe what the graph shows about these volcanic eruptions.

7

most volcanic eruptions have a VEI of 2 (around 3500). However less than 1000 have a VEI of 3. ~~Higher VEI's are~~ Higher VEI's are less common. [2]

7 The statement that most eruptions have a VEI 2 is correct for one mark. The statement that around 3500 / less than 1000 have VEI 3 (quoted data) is also correct for a second mark. Two marks are awarded.

Mark for (c)(ii) = 2 out of 2

**Example Candidate Response – high, continued** **Examiner Comments**

(iii) The table compares two volcanic eruptions, in 2010.

volcanic eruption	A	B
country	Indonesia	Iceland
location	Mount Merapi	Eyjafjallajökull
number of deaths	353	0
VEI value	4	4
economic status of country	LEDC	MEDC

Suggest reasons why the number of deaths from the Mount Merapi eruption was higher than the Eyjafjallajökull eruption.

8 Even though the VEIs of the 2 eruptions were the same, more people died from ~~the~~ eruption <sup>A</sup> because given that the country is an LEDC it is presumed that there was less likely to be management done before and after the explosion. People probably lived closer to the volcano, the eruption was probably unexpected and the people couldn't evacuate. Health officials were probably not as educated as the ones in Iceland which probably led to a higher loss of lives. This is because LEDCs [4] have a lower income and can not develop their society to be as safe as MEDCs can.

(iv) Suggest reasons why people live near active volcanoes, even though they know the volcano may erupt again.

9 There are good opportunities for employment within the fields of tourism (tour guides, hotel officials), the volcanic ash delivers nutrients to farmland and enriches the soil. It is probably cheap to live by an active volcano as the surrounding places are generally rural and ~~not expensive~~. ~~So~~ there isn't a high demand on houses nearby [3] making it even cheaper.

[Total: 19]

8 The candidate provides four valid reasons as requested. Marks are gained by stating that in Indonesia: there is less management before the eruption (i.e. the idea of no disaster plan); more people lived closer to the volcano; the eruption was unexpected (no monitoring); health officers were not as educated (on what to do during an eruption). All four marks are achieved.

Mark for (c)(iii) = 4 out of 4

9 The two reasons supplied; employment and the delivery of nutrients to farmland are both creditworthy. Two marks are achieved.

Mark for (c)(iv) = 2 out of 3

**Total mark awarded = 17 out of 19**

**How the candidate could have improved their answer**

- (a)(ii) The candidate gave two responses for this one-mark answer. In this case, both answers were correct but it was advisable to avoid giving a list of answers as an incorrect response could have directly contradicted a correct one.
- (b) The candidate was correct, that emissions from volcanoes would have entered the buffer zone, but as this was not a human impact, their response could not be credited. It was important that candidates answered the question that had been set.
- (c)(iv) The candidate gave two creditworthy responses to a three-mark question.

Example Candidate Response – middle

Examiner Comments

2 (a) Iceland is situated on the Mid-Atlantic Ridge plate boundary. The two plates, the North American plate and the Eurasian plate, are slowly moving apart. This means Iceland becomes bigger every year, as the plates move apart and magma fills the middle of the island.

The map shows the plates, the Mid-Atlantic Ridge and the location of Iceland's major volcanoes.



- Key**
- capital city
  - ✈ airport
  - △ major volcano
  - ▬ Mid-Atlantic Ridge

(i) Mark with an X on the map where the youngest rocks are located on Iceland. [1]

2

(ii) State the type of plate boundary that occurs in Iceland. [1]

*Diverging*

(iii) Use the map to describe the distribution of major volcanoes in Iceland.

3

*Major volcanoes located near and on the Mid-Atlantic Ridge. Mainly located in the South-West and North-West of ~~the~~ on Iceland.* [2]

1 The candidate's X just touches the mid-Atlantic ridge to gain a credit. One mark is achieved. Mark for (a)(i) = 1 out of 1

2 The syllabus term is 'constructive' but 'diverging' is also an acceptable term. One mark is achieved. Mark for (a)(ii) = 1 out of 1

3 The candidate successfully identifies that volcanoes are located on the mid-Atlantic ridge. However, the reference to the north-west is incorrect. One mark is achieved. Mark for (a)(iii) = 1 out of 2

## Example Candidate Response – middle, continued

## Examiner Comments

- (b) Surtsey island is an island nature reserve off the southern coast of Iceland.

The island and coastline are protected from the impact of humans by a marine buffer zone. No one is allowed onto the island and boats are not allowed to enter the marine buffer zone.

Suggest **two** reasons why the marine buffer zone might **not** be enough to protect Surtsey island from the impact of humans.

- 4
- 1 ~~A record must be kept and it must make~~  
~~sure~~ Illegally boats may enter if record not <sup>kept</sup>
- 2 The marine buffer zone is not strictly followed. [2]

- (c) In April 2010, Eyjafjallajökull volcano erupted in the south of Iceland. The eruption continued for 6 weeks.

A large ash cloud spread across Iceland, the Atlantic Ocean and the European mainland. The ash cloud disrupted air traffic all around the world and approximately 100 000 flights were cancelled.

The ash fall caused considerable damage to farmland used for crops and grazing animals.

The volcano is under a glacier and the eruption caused rapid melting of snow and ice. This resulted in flooding of river valleys, which also damaged farmland.

- (i) Discuss how this volcanic eruption affected Iceland.

- 5
- The eruption affected the economy and affected the possession and lives.  
 Eruption caused flights to cancel and agriculture, crops were destroyed this caused the decline in economy of Iceland. The eruption caused melting of glaciers and increase in water level ~~lead~~ leading to floods. [4]  
 Flooding affected people's lives and agriculture

- 4 The response 'illegal boats may enter' (i.e. that people ignore the rules) is correct. The second reason is a repeat, with different wording, of the candidate's first reason. One mark is achieved.

Mark for (b) = 1 out of 2

- 5 The candidate provides two reasons: one is the effect on the economy due to cancelled flights. Credit is also given for the implied effect of flooding on the livelihood of farmers. Two marks are achieved.

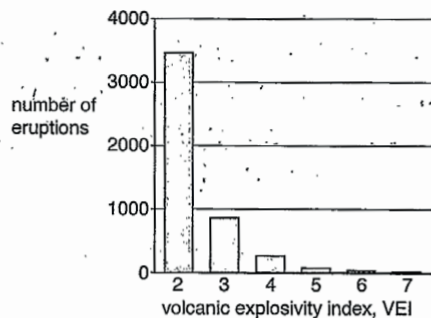
Mark for (c)(i) = 2 out of 4

Example Candidate Response – middle, continued

Examiner Comments

(ii) The volcanic explosivity index, VEI, is a measure of the explosiveness of volcanic eruptions. A VEI value of 0 is the least explosive and a VEI value of 8 is the most explosive.

The graph shows the VEI value for some eruptions around the world.



Describe what the graph shows about these volcanic eruptions.

6

There are less volcanoes which have high volcanic explosivity index and there are more volcanoes which have low volcanic explosivity index around the world.

6 The candidate correctly identifies that there are fewer volcanoes with high VEI for one mark.

Mark for (c)(ii) = 1 out of 2



Example Candidate Response – middle, continued

Examiner Comments

(iii) The table compares two volcanic eruptions, in 2010.

volcanic eruption	A	B
country	Indonesia	Iceland
location	Mount Merapi	Eyjafjallajökull
number of deaths	353	0
VEI value	4	4
economic status of country	LEDC	MEDC

Suggest reasons why the number of deaths from the Mount Merapi eruption was higher than the Eyjafjallajökull eruption.

7 Eyjafjallajökull ~~is~~ is located in the south of Iceland ~~to~~ away from the capital city where no one lived, hence there ~~were~~ were no deaths ~~by~~ caused by the eruption. Many Most of the ~~poputa~~ population ~~to~~ of Indonesia was located near the Mount Merapi, hence caused death.

(iv) Suggest reasons why people live near active volcanoes, even though they know the volcano may erupt again.

8 People may own their lands near volcanoes. Most of the extraction mines are located near volcanoes as there are more minerals and precious ~~rocks~~ rocks formed there, people live there for job which is employed better than other jobs. unskilled jobs [Total: 19]

7 The candidate correctly identifies that in Iceland the volcano is located 'where no one lived' unlike that in Indonesia for one mark.

Mark for (c)(iii) = 1 out of 4

8 One reason is given, 'more minerals'. The reference to jobs is not qualified. One mark is achieved.

Mark for (c)(iv) = 1 out of 3

**Total mark awarded = 9 out of 19**

How the candidate could have improved their answer

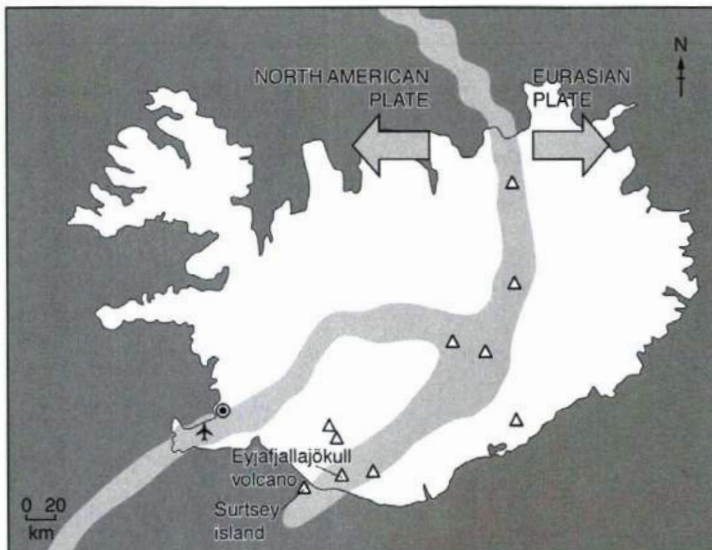
- (a)(i) The X was only just touching the mid-Atlantic ridge. To ensure clarity, all of the X should have been within the shaded area.
- (b) The candidate gave a second reason which was a repeat of their first point, with slightly different wording. This could not be credited.
- (c)(i) The candidate gave two valid answers to a four-mark question. They repeated some of the text from the question without adding any additional detail. This approach was unlikely to achieve credit.
- (c)(ii) The candidate was only able to be awarded one mark as their second response was the reverse argument of their first. In order to improve, an independent comment was needed, e.g. there is no VEI 8.
- (c)(iii) The candidate only provided one reason for a four-mark question asking for reasons.

Example Candidate Response – low

Examiner Comments

2 (a) Iceland is situated on the Mid-Atlantic Ridge plate boundary. The two plates, the North American plate and the Eurasian plate, are slowly moving apart. This means Iceland becomes bigger every year, as the plates move apart and magma fills the middle of the island.

The map shows the plates, the Mid-Atlantic Ridge and the location of Iceland's major volcanoes.



1

1 The candidate has left this question blank. No marks are awarded.

Mark for (a)(i) = 0 out of 1

(i) Mark with an X on the map where the youngest rocks are located on Iceland. [1]

2

(ii) State the type of plate boundary that occurs in Iceland.  
Divergent..... [1]

2 Constructive is the syllabus term but divergent is also correct. One mark is achieved.

Mark for (a)(ii) = 1 out of 1

(iii) Use the map to describe the distribution of major volcanoes in Iceland.  
Most of the volcanoes are on the mid-atlantic ridge and there are more volcanoes near the edge of the island..... [2]

3

3 The candidate correctly identifies that most volcanoes are on the mid-Atlantic ridge. One mark is achieved.

Mark for (a)(iii) = 1 out of 2



**Example Candidate Response – low, continued** **Examiner Comments**

(b) Surtsey island is an island nature reserve off the southern coast of Iceland.

The island and coastline are protected from the impact of humans by a marine buffer zone. No one is allowed onto the island and boats are not allowed to enter the marine buffer zone.

Suggest **two** reasons why the marine buffer zone might **not** be enough to protect Surtsey island from the impact of humans.

4 1 The island is ~~not~~ far away from the Iceland  
so it could still be impacted  
2  
[2]

(c) In April 2010, Eyjafjallajökull volcano erupted in the south of Iceland. The eruption continued for 6 weeks.

A large ash cloud spread across Iceland, the Atlantic Ocean and the European mainland. The ash cloud disrupted air traffic all around the world and approximately 100 000 flights were cancelled.

The ash fall caused considerable damage to farmland used for crops and grazing animals.

The volcano is under a glacier and the eruption caused rapid melting of snow and ice. This resulted in flooding of river valleys, which also damaged farmland.

(i) Discuss how this volcanic eruption affected Iceland.

5 The volcano eruption ~~caused~~ hurt the Iceland's economy as a lot of flights were cancelled and a lot of damage was dealt to the farmlands used for ~~crop~~ crops and animal grazing. The environment around Iceland was also ~~impacted~~ by the melting of glaciers. ~~and to~~  
[4]

4 The response is not creditworthy. No marks are awarded.

Mark for (b) = 0 out of 2

5 The candidate copies information provided in the question without adding any extra comment. The response receives no credit.

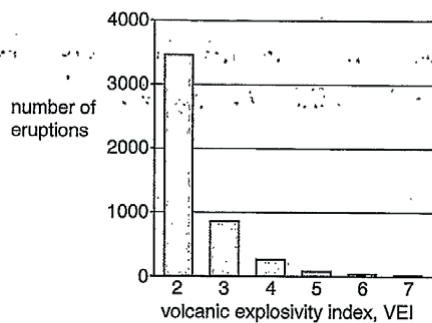
Mark for (c)(i) = 0 out of 4

Example Candidate Response – low, continued

Examiner Comments

(ii) The volcanic explosivity index, VEI, is a measure of the explosiveness of volcanic eruptions. A VEI value of 0 is the least explosive and a VEI value of 8 is the most explosive.

The graph shows the VEI value for some eruptions around the world.



Describe what the graph shows about these volcanic eruptions.

6

Most volcanic eruptions are on 2 on VEI and that it is statistically rare for volcanoes to erupt with a high VEI

[2]

6 The candidate identifies that most eruptions are VEI 2 and that it is rare for volcanoes to erupt with a high VEI. Two marks are awarded.

Mark for (c)(ii) = 2 out of 2

Example Candidate Response – low, continued

Examiner Comments

(iii) The table compares two volcanic eruptions, in 2010.

volcanic eruption	A	B
country	Indonesia	Iceland
location	Mount Merapi	Eyjafjallajökull
number of deaths	353	0
VEI value	4	4
economic status of country	LEDC	MEDC

Suggest reasons why the number of deaths from the Mount Merapi eruption was higher than the Eyjafjallajökull eruption.

7 Mount merapi's eruption was in a LEDC where they have not only less resources to deal with a volcanic eruption, but they also have a much higher population density compared to ~~islands~~ Iceland. [4]

(iv) Suggest reasons why people live near active volcanoes, even though they know the volcano may erupt again.

8 living near a volcano is dangerous but the chances of it erupting are actually low. It is also because ~~the~~ soil near volcanoes are very fertile and suitable for agriculture. [3]

[Total: 19]

7 The candidate correctly observes that the volcano in Indonesia was near a higher population density. This achieves one mark.

Mark for (c)(iii) = 1 out of 4

8 Although not directly on the mark scheme, it is valid to suggest as a reason that the chances of an eruption are low – this is given credit. Fertile soil is another valid reason. Two marks are achieved.

Mark for (c)(iv) = 2 out of 3

**Total mark awarded = 7 out of 19**

### How the candidate could have improved their answer

- **(a)(i)** The candidate did not attempt this question. It was possible they skipped over the question, as there was no response line. The requirement for this question was to mark the diagram with an X.
- **(a)(iii)** The reference to 'edge' was not specific enough at this level. A north arrow was provided on the diagram and the candidate should have used the terms north, south, east or west, or coastline in their response.
- **(b)** The response provided was not a reason why the island might not be protected by the marine buffer zone from the impact of humans. The candidate may have benefited from underlining key aspects of the question to help focus their answer. In this case, the candidate had only attempted one reason, when two were asked for.
- **(c)(iii)** The response the candidate gave was correct. However, the question was a four-mark question and required four separate reasons.
- **(c)(iv)** Only two responses were given to this three-mark question.

### Common mistakes candidates made in this question

- **(a)(i)** This was often left blank; suggesting that some candidates did not read the question carefully enough and did not appreciate an answer was required on the map.
- **(a)(iii)** It was common to see vague directions such as 'in the middle', 'right', 'left', 'up' and 'down'.
- **(c)(i)** Weaker answers were a direct copy of the text in the question. These candidates did not add any additional comment or interpretation.

## Question 3

### Example Candidate Response – high

### Examiner Comments

3 (a) There are very few trees or forests in Iceland as a result of deforestation.

(i) One impact of deforestation is climate change.

Explain how forests are involved in both carbon capture and carbon storage.

1 carbon capture ... A growing forest takes in more carbon dioxide for photosynthesis than it releases for respiration. Therefore it is a carbon capture.

carbon storage ... A mature forest takes in carbon dioxide for photosynthesis and releases the same amount in respiration so it is a carbon storage. [2]

(ii) Deforestation may lead to soil erosion.

State two other human activities that can lead to soil erosion.

2 1 Overgrazing

2 Overcultivation [2]

(iii) Describe the impacts of soil erosion.

3 Soil washed down by rain and blown by wind. Farming cannot be done and animals are unable to graze. Rivers and streams can become polluted if soil washes down. Furthermore air pollution can also come from heavy wind. [3]

1 The candidate gives two explanations: the fact that growing forests capture carbon and that a 'mature forest ... is a carbon store'. Both marks are awarded. Mark for (a)(i) = 2 out of 2

2 The candidate provides two valid human activities: overgrazing and over cultivation for two marks. Mark for (a)(ii) = 2 out of 2

3 One impact given by the candidate is that animals are unable to graze. This achieves one mark. However, the other impact describes: 'rivers become polluted' is not specific enough as there is no mention of the silting of rivers or leaching of the soil. The suggestion of 'air pollution' is not creditworthy. One mark is achieved. Mark for (a)(iii) = 1 out of 3


Example Candidate Response – high, continued

Examiner Comments

(b) The Alaskan lupine plant was introduced into Iceland in the 1960s.  
The fact sheet shows some information about the Alaskan lupine plant.

**Fact sheet about the Alaskan lupine plant**

The Alaskan lupine plant grows well in Iceland's cold climate.



It has a wide-spreading root structure. The Alaskan lupine plant puts nitrogen compounds back into the soil.

The Alaskan lupine is planted in areas where soil erosion has occurred.

It is used by some people for making a herbal drink to use as medicine.

The Alaskan lupine plant grows 40 to 60 cm high and has a spread of 25 to 30 cm wide. The tall lupines create a shady canopy over shorter native plants (plants that grow naturally in Iceland).

The Alaskan lupine plant has a bitter taste compared to many native plants and is not eaten by sheep and goats. They prefer to graze on the sweeter tasting native plants.

Explain the benefits and possible negative impacts of introducing the Alaskan lupine plant to Iceland.

4 The benefits are it's can root can bind soil to prevent erosion. Nitrogen compounds it can provide can be used by other plants for growth and also it has medicinal benefits. The tall lupines can decrease amount of sunlight reach the shorter plants. Sheep and goats would have to search other plants for source of food. [4]

4 The candidate provides two benefits: the lupine plants will bind soil and add nitrogen to the soil which is then used by other plants. Two negative impacts are also identified: lupine plants can decrease the available sunlight for shorter plants and sheep and goats need another source of food. Four marks are awarded. Mark for (b) = 4 out of 4

**Example Candidate Response – high, continued** **Examiner Comments**

(c) (i) A student wants to estimate the population of Alaskan lupine plants in a field.

The student has:

- a 50m length of string
- small wooden markers
- a tape measure
- notebook and pencil.

5 Describe how the student could use this equipment to estimate the population of Alaskan lupine plants in the field.

Use the 50m length of string to measure distance and area of the field. Use the tape measure to measure the width of some trees. Mark an area, record the number of wooden markers. Calculate an average for number of trees in a small area in your notebook. [3]

(ii) Abiotic factors affect the growth of Alaskan lupine plants.

State two abiotic factors the student could measure during the investigation.

6 1 Sunlight Temperature [2]  
2 pH of soil

(iii) Suggest how the student could estimate the total number of Alaskan lupine plants in Iceland.

7 Use quadrats and separate regions according to A.C.F.O.B. (A. abundant, C. common, etc.) further transects can estimate the number of plants in each region. [2]

[Total: 18]

5 The candidate left out the necessary details in their description of the method and the word transect is not used. The string should be in a straight line, the plants along the transect should be counted, the results recorded in a table and the transect repeated. No marks are awarded.

Mark for (c)(i) = 0 out of 3

6 A mark is achieved for each of these answers. Two marks are achieved.

Mark for (c)(ii) = 2 out of 2

7 Here, the response provided is not creditworthy because the reference to using quadrats and transects does not give details about 'how' the total number of lupines could be estimated. No marks are awarded.

Mark for (c)(iii) = 0 out of 2

**Total mark awarded = 11 out of 18**

**How the candidate could have improved their answer**

- (a)(iii) The candidate did not give enough detail in their second and third impacts. These could have been improved by stating how rivers become polluted e.g. by silting or leaching of nutrients. The 'farming cannot be done' could have been improved with reference to plants not growing and/or food shortages.
- (c)(i) Many candidates were not confident in the description and use of a transect line or a quadrat. Candidates who had practical, hands-on experience with how both were used in investigations were likely to have produced better answers to this type of question. Getting the order correct was important when writing about using equipment in investigations.
- (c)(iii) The candidate needed to suggest that the number of lupine plants per unit area should have been multiplied by the area of Iceland, rather than discuss the use of quadrats or transects.



Example Candidate Response – middle

Examiner Comments

3 (a) There are very few trees or forests in Iceland as a result of deforestation.

(i) One impact of deforestation is climate change.

Explain how forests are involved in both carbon capture and carbon storage.

1 carbon capture plants and flora use carbon dioxide in the process of photosynthesis, thus capturing CO<sub>2</sub>.

carbon storage Carbon can also be stored due to animals producing it as from respiration and plants offsetting their emissions by using the respired CO<sub>2</sub> in photosynthesis [2]

(ii) Deforestation may lead to soil erosion.

State two other human activities that can lead to soil erosion.

2 1 Agriculture (overgrazing) arable farming  
2 Agriculture (flooding) [2]

(iii) Describe the impacts of soil erosion.

3 Soil erosion can potentially result in loss of life and fertile soil. making land useless for pastoral and arable farming which can have economic impacts. Soil erosion would also cause much of the still present flora to die out, increasing carbon emissions and reduce annual precipitation. [3]

1 The reference to carbon dioxide in photosynthesis achieves one mark. There is no mention of mature forests or older trees storing carbon for the second mark. One mark is achieved.

Mark for (a)(i) = 1 out of 2

2 Overgrazing is a valid response gaining one mark. Flooding is not a creditworthy answer.

Mark for (a)(ii) = 1 out of 2

3 The 'loss of fertile soil' response gains a mark. The candidate suggests that flora would die out, this is creditworthy as a reference to loss of biodiversity. Two marks are achieved.

Mark for (a)(iii) = 2 out of 3

Example Candidate Response – middle, continued


Examiner Comments

(b) The Alaskan lupine plant was introduced into Iceland in the 1960s.

The fact sheet shows some information about the Alaskan lupine plant.

**Fact sheet about the Alaskan lupine plant**

The Alaskan lupine plant grows well in Iceland's cold climate.



It has a wide-spreading root structure. The Alaskan lupine plant puts nitrogen compounds back into the soil.

The Alaskan lupine is planted in areas where soil erosion has occurred.

It is used by some people for making a herbal drink to use as medicine.

The Alaskan lupine plant grows 40 to 60 cm high and has a spread of 25 to 30 cm wide. The tall lupines create a shady canopy over shorter native plants (plants that grow naturally in Iceland).

The Alaskan lupine plant has a bitter taste compared to many native plants and is not eaten by sheep and goats. They prefer to graze on the sweeter tasting native plants.

Explain the benefits and possible negative impacts of introducing the Alaskan lupine plant to Iceland.

4 ~~Can~~ benefits: • has a wide-spreading root structure, which prevents soil erosion  
 • aids in nitrogen compounds back in soil  
 • can be <sup>putting</sup> used for medicines

Negative impacts: • creates shade over shorter plants (which are common in Iceland), so making light absorption difficult  
 • not eaten by cattle (may cause overgrazing of native plants) [4]

4 The candidate suggests benefits that are copied from the text provided in the question. The candidate has not added any additional knowledge or interpretation to this. One mark is achieved for the idea about the plants creating a shade, making light absorption difficult. Another creditworthy point is that lupines are not eaten by cattle so their excess may cause overgrazing of native plants. Two marks are awarded.

Mark for (b) = 2 out of 4

Example Candidate Response – middle, continued	Examiner Comments
<p>(c) (i) A student wants to estimate the population of Alaskan lupine plants in a field.</p> <p>The student has:</p> <ul style="list-style-type: none"> <li>• a 50 m length of string</li> <li>• small wooden markers</li> <li>• a tape measure</li> <li>• notebook and pencil.</li> </ul> <p>Describe how the student could use this equipment to estimate the population of Alaskan lupine plants in the field.</p> <p>5 The student can estimate the amount of Lupine plants per <del>square</del> square metre, after which they can estimate the size of the complete field <del>to saving time</del>. The data collected can be stored in the notebook. The square metres can be found by making use of the tape measure. [3]</p> <p>(ii) Abiotic factors affect the growth of Alaskan lupine plants.</p> <p>State two abiotic factors the student could measure during the investigation.</p> <p>6 1 <del>The</del> Temperature 2 <del>pH of soil</del> salinity of soil [2]</p> <p>(iii) Suggest how the student could estimate the total number of Alaskan lupine plants in Iceland.</p> <p>7 The total number of fields present can be multiplied by the number of <del>the</del> Lupine plants present in each field on average, thus allowing us to <del>find</del> estimate the total number of Lupine plants. [2]</p> <p>[Total: 18]</p>	<p>5 The candidate is describing a quadrat method, so one mark for the description of the quadrat. Further detail of the method could have been added to achieve the remaining marks, for instance, counting the plants. One mark is achieved.</p> <p>Mark for (c)(i) = 1 out of 3</p> <p>6 Temperature and salinity are both valid answers gaining both available marks.</p> <p>Mark for (c)(ii) = 2 out of 2</p> <p>7 The candidate has not made reference to determining the number of lupines per unit area and then multiplying by the area of Iceland. No marks are awarded.</p> <p>Mark for (c)(iii) = 0 out of 2</p> <p><b>Total mark awarded = 9 out of 18</b></p>

### How the candidate could have improved their answer

- (a)(iii) The candidate provided two impacts of soil erosion when three marks were available.
- (b) The negative impacts were well developed, and the candidate added their own interpretation of the information given in the text. This approach would have improved their response to the benefits of using lupine plants.
- (c)(i) The candidate did not count the plants and described how the number of plants in the field could have been determined by taking an average and scaling for the whole field.
- (c)(ii) Candidates found this a challenging question. This candidate focused on the number of fields, which did not take into account the differing area of each field.

Example Candidate Response – low

Examiner Comments

3 (a) There are very few trees or forests in Iceland as a result of deforestation:

(i) One impact of deforestation is climate change.

Explain how forests are involved in both carbon capture and carbon storage.

1 carbon capture ... it takes the carbon to keep and store it for future use

carbon storage ... Trees stores carbon to make carbon dioxide for us to breath

[2]

(ii) Deforestation may lead to soil erosion.

State two other human activities that can lead to soil erosion.

2 1. Deforestation  
2. Building of new houses. Mining

[2]

(iii) Describe the impacts of soil erosion.

3 loss of habitats and trees  
The ground loses nutrients and it becomes dry and gully

[3]

1 It is not clear what 'it' refers to in this answer. The response 'trees stores carbon' does not explain how they do this. No marks are awarded.

Mark for (a)(i) = 0 out of 2

2 The response 'Deforestation' is ignored as it is a repeat of content already in the question. The response 'building of new houses' is valid and achieves a mark as does 'mining'. Two marks are achieved.

Mark for (a)(ii) = 2 out of 2

3 The response 'loss of habitat' achieves one mark. The response 'ground loses nutrients' (infertile soil) also achieves a mark. Two marks are achieved.

Mark for (a)(iii) = 2 out of 3


Example Candidate Response – low, continued

Examiner Comments

(b) The Alaskan lupine plant was introduced into Iceland in the 1960s.  
The fact sheet shows some information about the Alaskan lupine plant.

**Fact sheet about the Alaskan lupine plant**

The Alaskan lupine plant grows well in Iceland's cold climate.



It has a wide-spreading root structure. The Alaskan lupine plant puts nitrogen compounds back into the soil.

The Alaskan lupine is planted in areas where soil erosion has occurred.

It is used by some people for making a herbal drink to use as medicine.

The Alaskan lupine plant grows 40 to 60 cm high and has a spread of 25 to 30 cm wide. The tall lupines create a shady canopy over shorter native plants (plants that grow naturally in Iceland).

The Alaskan lupine plant has a bitter taste compared to many native plants and is not eaten by sheep and goats. They prefer to graze on the sweeter tasting native plants.

4 Explain the benefits and possible negative impacts of introducing the Alaskan lupine plant to Iceland.

It can help the problem of soil erosion and is great for herbal drinks and medicine, it can also provide shade for other plants in Iceland.

Although it is bitter so animals won't be able to consume it and it grows up to 60cm high and has a wide spread taking up a lot of space

[4]

4 The point concerning 'help with problem of soil erosion' (reduces soil erosion) is valid and achieves one mark. The rest of the response is copied from the fact sheet and achieves no further marks. One mark is achieved.

Mark for (b) = 1 out of 4



Example Candidate Response – low, continued	Examiner Comments
<p>(c) (i) A student wants to estimate the population of Alaskan lupine plants in a field.</p> <p>The student has:</p> <ul style="list-style-type: none"> <li>• a 50 m length of string</li> <li>• small wooden markers</li> <li>• a tape measure</li> <li>• notebook and pencil.</li> </ul> <p>Describe how the student could use this equipment to estimate the population of Alaskan lupine plants in the field.</p> <p>5 The wooden markers would be used as the Alaskan lupine and the string as its roots. The tape measure is to measure how much space and how long the plant is going to be.</p> <p>..... [3]</p> <p>(ii) Abiotic factors affect the growth of Alaskan lupine plants.</p> <p>State <b>two</b> abiotic factors the student could measure during the investigation.</p> <p>6 1 .....</p> <p>2 ..... [2]</p> <p>(iii) Suggest how the student could estimate the <b>total</b> number of Alaskan lupine plants in Iceland.</p> <p>7 The student could count the number of plants or measure the distance it takes up and calculate the total number.</p> <p>..... [2]</p> <p style="text-align: right;">[Total: 18]</p>	<p>5 The response does not give any detail of how to use the equipment to estimate the lupine population. No marks are achieved.</p> <p>Mark for (c)(i) = 0 out of 3</p> <p>6 No response is provided. No marks are achieved.</p> <p>Mark for (c)(ii) = 0 out of 2</p> <p>7 The suggestion given does not give an estimate of the total lupine plants. No marks are achieved.</p> <p>Mark for (c)(iii) = 0 out of 2</p> <p><b>Total mark awarded = 5 out of 18</b></p>

### How the candidate could have improved their answer

- **(a)(ii)** The candidate gave ‘deforestation’ as a response. This was ignored as it was a direct lift from the question. This approach was unlikely to achieve credit.
- **(b)** The candidate needed to add explanations to the fact sheet information. For example, ‘can be used for herbal drinks that can be sold so has an economic benefit.’ Four impacts were required for this four-mark question. Separating the response into benefits and negatives may have helped the candidate structure their answer.
- **(c)(i) and (iii)** The candidate did not describe a method that would have given the desired outcome. Candidates who had practical, hands-on experiment of this kind of investigation were likely to be able to apply the methodology in the unfamiliar contexts. Methods should have been described in a logical order.

### Common mistakes candidates made in this question

- **(a)(i)** Candidates found this question particularly challenging. Carbon capture, respiration and photosynthesis were often confused. Very few were able to suggest how forests were involved in carbon storage.
- **(a)(ii)** Fertilisers and pesticides were common, incorrect answers.
- **(a)(iii)** Many answers described what eroded soil looked like; these did not answer the question.
- **(b)** It was common to see large sections of the text repeated in answers and this approach rarely achieved credit.
- **(c)(i)** Candidates were not confident describing the use of the equipment in the investigation. Descriptions were frequently irrelevant or confused. This question was often left blank.
- **(c)(iii)** Very few candidates were able to suggest how the total number of plants in Iceland could be estimated. This question was often left blank.



Cambridge Assessment International Education  
The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA, United Kingdom  
t: +44 1223 553554  
e: [info@cambridgeinternational.org](mailto:info@cambridgeinternational.org) [www.cambridgeinternational.org](http://www.cambridgeinternational.org)

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