Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

0758106475

ENVIRONMENTAL MANAGEMENT **5014/21**

Paper 2 Management in context **May/June 2019**

1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **24** printed pages.

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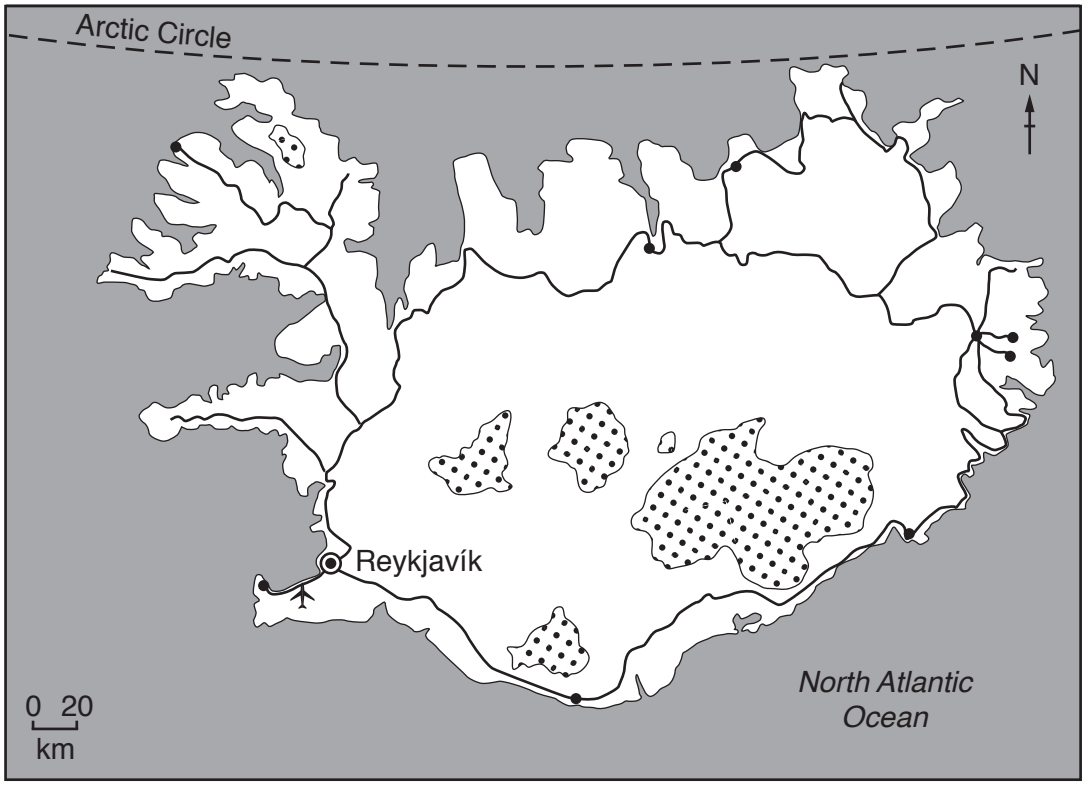
world map showing the location of Iceland

map of Iceland



Key

- capital city
- town
- road
- airport
- glacier

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Area of Iceland: 103 000 km^2

Population: 335 878 (in 2017)

Children per woman: 2.01

Life expectancy: 83 years

Currency: Icelandic Krona (108.45 ISK = 1 USD)

Language: Icelandic

Climate of Iceland: temperate, moderated by North Atlantic current, cold, windy winters; damp, cool summers

Terrain of Iceland: mostly volcanic plateau with some mountain peaks, volcanoes, glaciers, coastal bays

Main exports of Iceland: fish and fish products, aluminium and ferrosilicon

Iceland is an island in the North Atlantic Ocean. 80% of the island is uninhabited. Almost half of the population are located in and around 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.

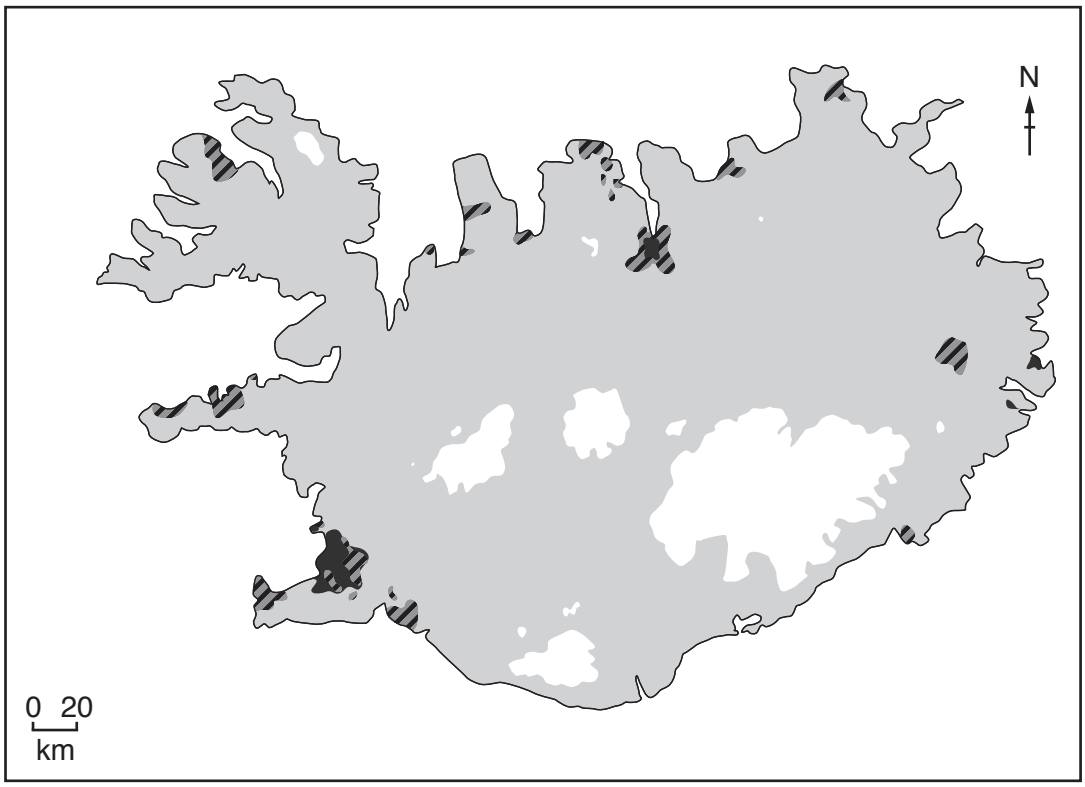
1 **(a)** **(i)** Calculate the area of land that is uninhabited in Iceland.

.....km^2 [1]

(ii) Calculate the number of tourists that visited Iceland in 2017.

..... [1]

(b) The map shows the population density of Iceland.



Key
people per km^2

- 0
- 1 – 25
- 26 – 250
- > 250

(i) Describe the population density of Iceland.

.....

.....

.....

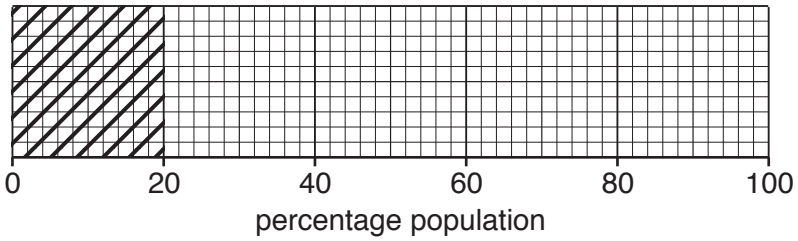
.....

.....

..... [3]

(ii) The table and divided bar chart show the percentage age distribution for the population of Iceland in 2017.

age range	percentage population
under 15 years old	20
between 15 and 65 years old	67
over 65 years old	13



Key
age range
under 15 years old
between 15 and 65 years old
over 65 years old

Complete the key and the divided bar chart. [2]

(iii) State **two** factors that affect death rate.

1 .....

2 .....
[2]

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

month	average monthly minimum temperature / °C	average monthly maximum temperature / °C	average number of days with precipitation
January	–3.0	1.9	13
February	–2.1	2.8	13
March	–2.0	3.2	14
April	0.4	5.7	12
May	3.6	9.4	10
June	6.7	11.7	11
July	8.3	13.3	10
August	7.9	13.0	12
September	5.0	10.1	12
October	2.2	6.8	15
November	–1.3	3.4	13
December	–2.8	2.2	14

(i) Identify the month with the highest average number of days with precipitation.

..... [1]

(ii) The range for the monthly temperature is the difference between the maximum and minimum value.

Calculate the temperature range for November.

..... °C [1]

(iii) Suggest the problems the climate of Iceland causes for growing crops.

.....

.....

.....

.....

.....

..... [3]

(d) The people of Iceland eat more bananas than people in many other countries.

The bananas are grown in greenhouses heated using geothermal power.

(i) Complete the word equation for photosynthesis.

..... + ... $\longrightarrow$ glucose + oxygen [1]

(ii) The average number of hours of daylight in Iceland for January is 5.4 hours and for June it is 20.5 hours.

Explain why artificial lighting is used in greenhouses for part of the year.

.....

.....

.....

..... [2]

(e) Geothermal power is also used to generate electricity.

An engineer described the process of generating electricity by geothermal power with this list of statements.

A steam is produced

B water is heated

C steam turns a turbine

D a generator produces electricity

E a turbine drives a generator

The engineer has written the correct statements but they are presented in the wrong order.

(i) Using letters **A** to **E**, complete the boxes to show the correct order of statements that describe generating electricity by geothermal power.

One has been done for you.

.....	.....	.....	.....	**D**

[2]

(ii) Explain the advantages of using geothermal power compared with fossil fuels for electricity generation.

.....

.....

.....

.....

.....

..... [3]

(iii) State **one** other energy resource used to generate electricity, other than geothermal energy or fossil fuels.

..... [1]

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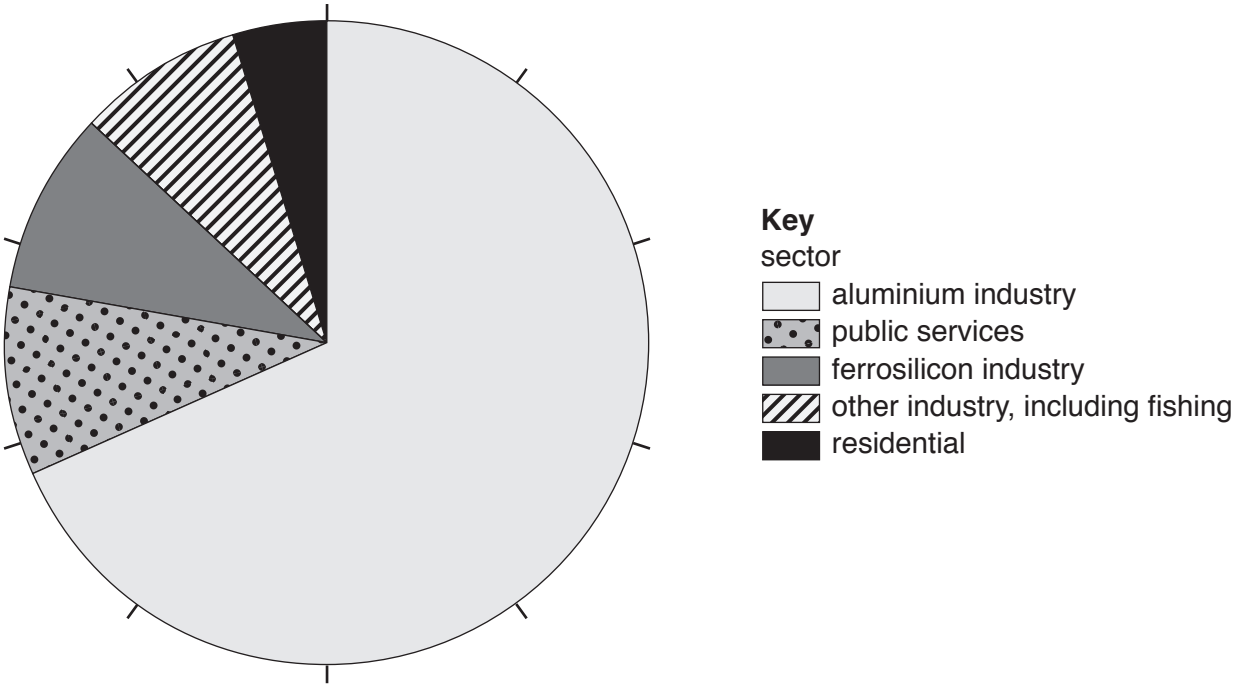
(f) The pie chart shows the percentage electricity consumption for different sectors in Iceland for 2013.



(i) Determine the total percentage electricity consumption for the ferrosilicon and aluminium industries.

.....% [1]

(ii) The fishing industry accounts for 40% of Iceland's exports.

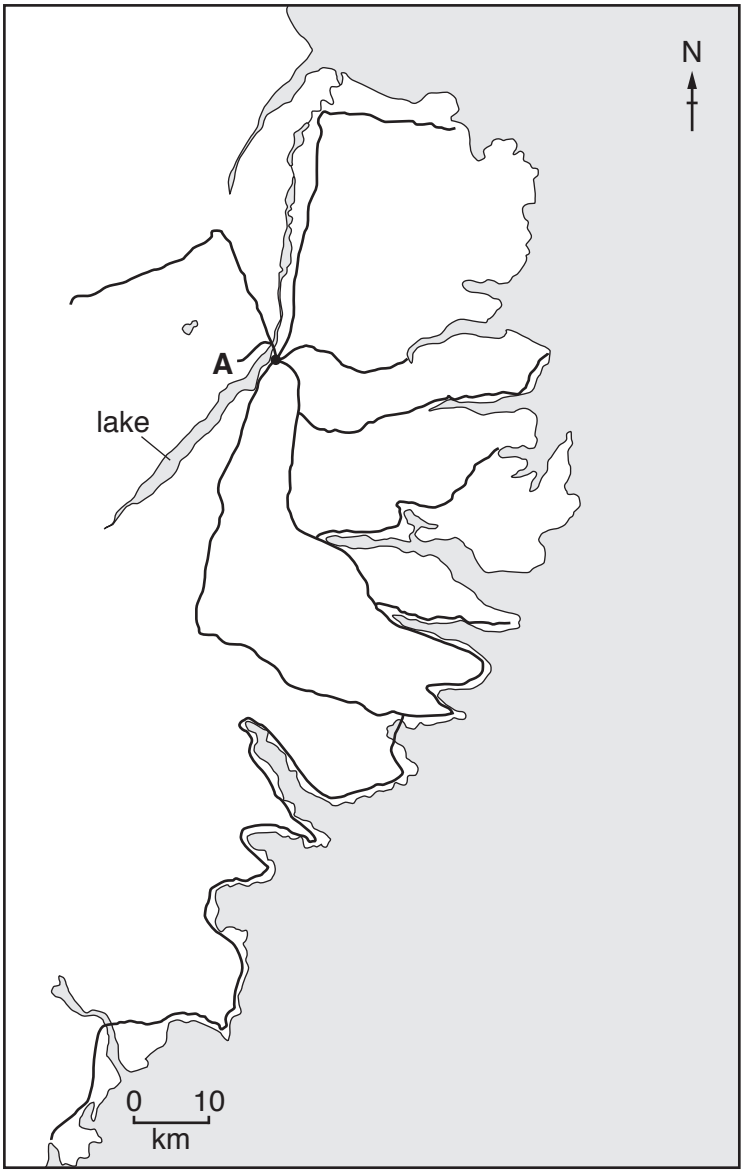
Suggest why the fishing industry only has a low percentage electricity consumption.

.....

..... [1]

(g) 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

A proposed location of smelter

• town

(i) Suggest **two** reasons why the proposed location might be suitable for this smelter.

1 .....

.....

2 .....

.....

[2]

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

Part of the questionnaire is shown.

	yes	**no**	**do not know**
1. Do you think expanding the aluminium industry will create more jobs for local people?			
2. Do you think the new smelter will improve transport links in the local area?			

Suggest **two** other suitable questions the company could use to find out people's views on expanding the aluminium industry in Iceland.

1 .....

.....

2 .....

.....

[2]

(iii) The company who want to expand the aluminium industry in Iceland are based in China. The people selected to complete the questionnaire work for the company and live in China.

Suggest **three** limitations of this sampling method.

1 .....

.....

2 .....

.....

3 .....

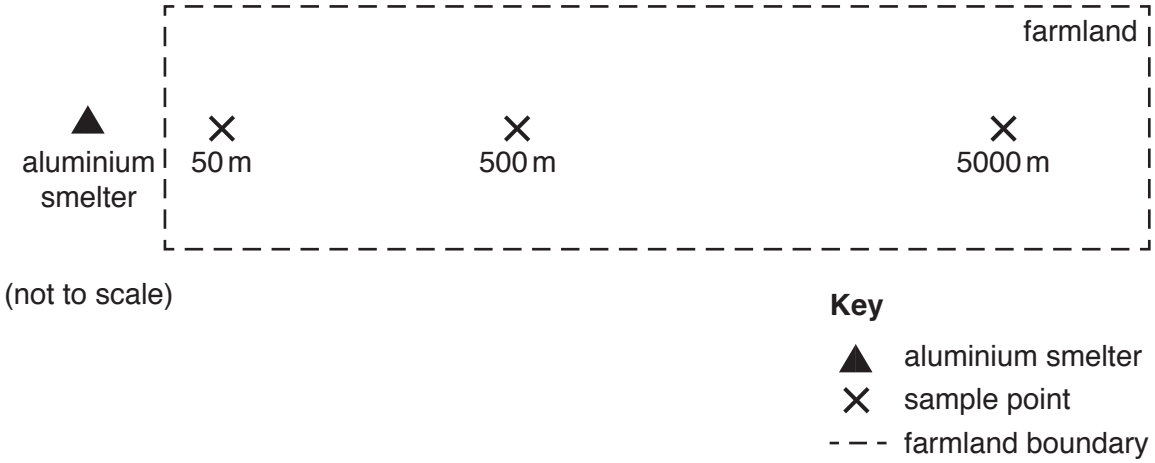
.....

[3]

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

A farmer living near an aluminium smelter is concerned about the level of fluorides in the farm's crops.

The farmer tests samples of the crops at different distances from the aluminium smelter, as shown in the diagram.



The table shows the results.

distance from aluminium smelter / m	level of fluorides in the crop sample / mg per kg
50	29
500	13
5000	6

Suggest why the level of fluorides in the crops was higher at 50 m from the aluminium smelter than at 5000 m.

.....

..... [1]

(v) The farmer uses the crops to feed cattle and goats.

The table shows the permitted safe levels of fluorides in crops for cattle and goats.

animal	safe level of fluorides in the crop sample / mg per kg
cattle	30
goats	50

Is it safe for the farmer to let the goats eat the crops? Give a reason for your answer.

.....

..... [1]

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(h) **(i)** Bauxite, the ore from which aluminium is obtained, is imported into Iceland. Bauxite is extracted by surface mining. Surface mines often cover a large area of land.

State **two** impacts of surface mining.

1 .....

.....

2 .....

.....
[2]

(ii) Other than environmental impacts, suggest why bauxite might **not** be extracted from an area, even if there is a large deposit of accessible ore available.

.....

.....

.....

..... [2]

(iii) Describe how the landscape can be restored after a surface mine closes.

.....

.....

.....

.....

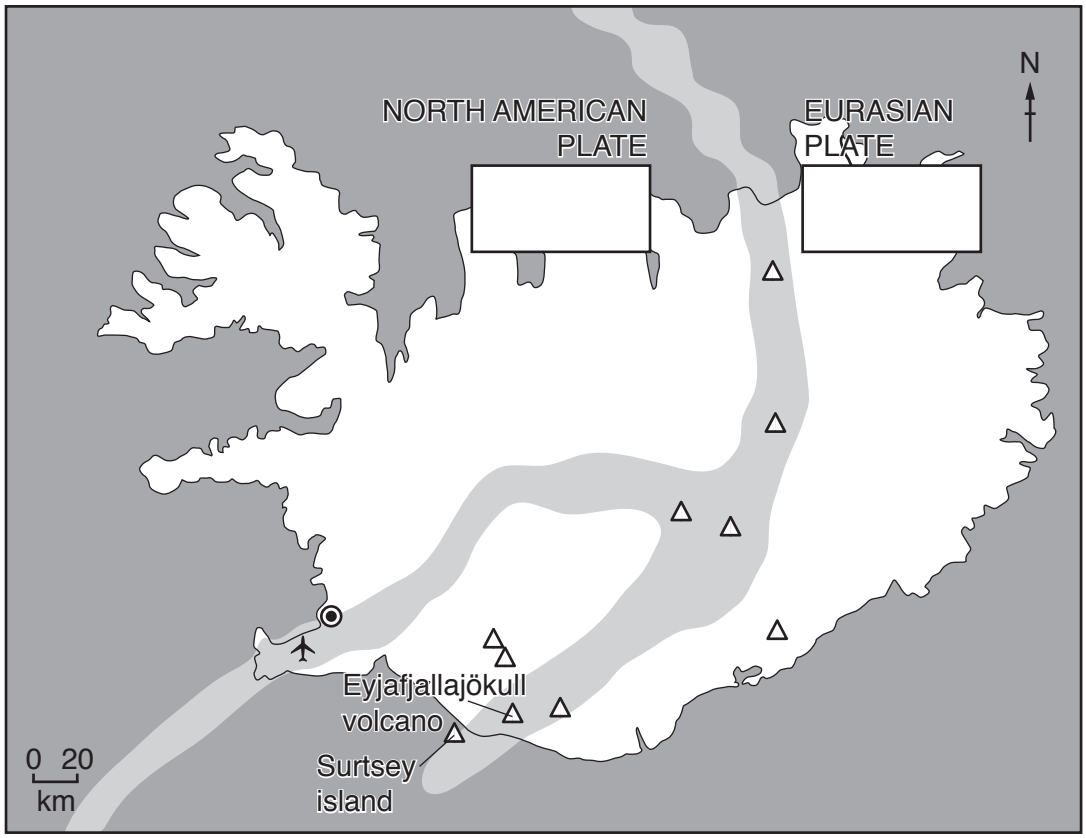
.....

..... [3]

[Total: 41]

2 Iceland is situated on the Mid-Atlantic Ridge plate boundary.

(a) 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) The Mid-Atlantic Ridge is a constructive plate boundary.

Draw arrows in the boxes **on the diagram** to show the direction of plate movement. [1]

(ii) Surtsey is a volcanic island off the southern coast of Iceland. It was formed by an underwater volcanic eruption that started in 1963 and ended in 1967.

Explain how volcanic eruptions can form new islands.

.....

.....

.....

..... [2]

(iii) Surtsey island was declared a nature reserve in 1965. The island and surrounding sea is a protected area. Only scientists are allowed to visit the island.

Scientists study the colonisation of the island by plants and animals. Colonisation is the process in biology by which a species spreads to new areas.

Suggest reasons why Surtsey island is a good place to study colonisation.

.....

.....

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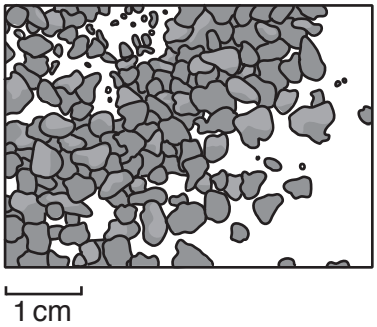
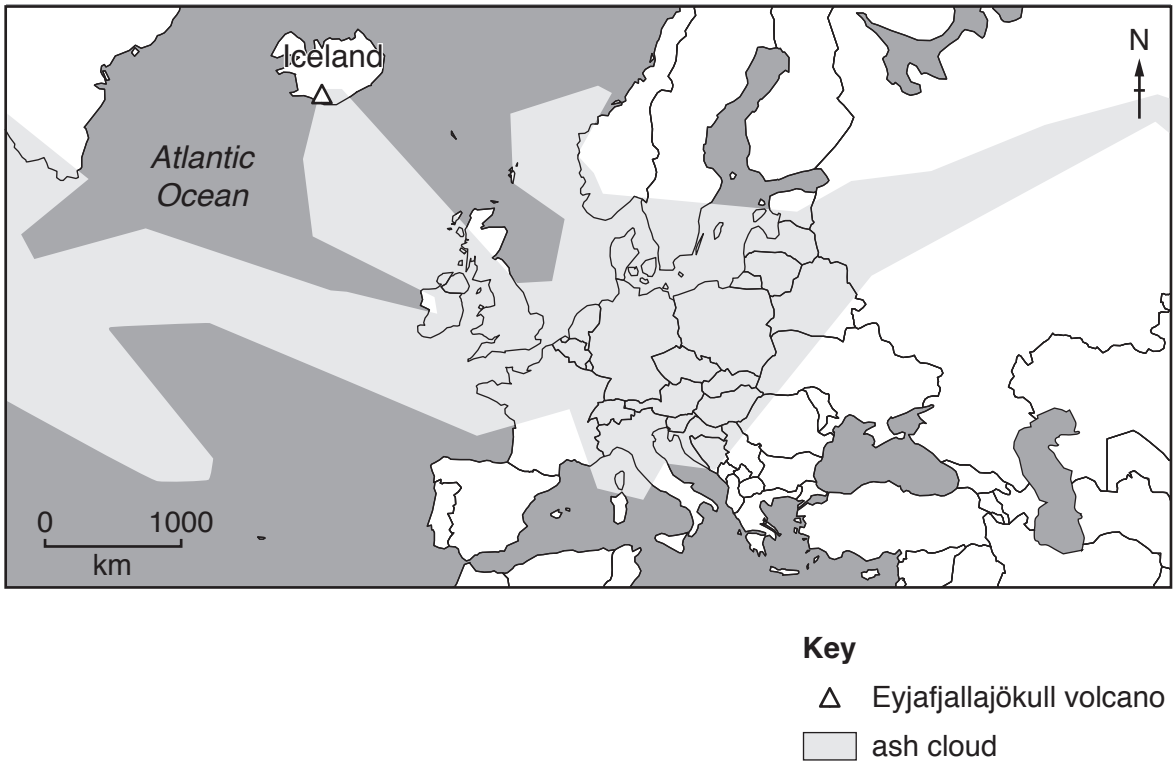
..... [3]

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

The ash from the eruption contained fine particles and larger solids. The diagram shows a sample of ash from the ash cloud.



The map shows the extent of the ash cloud 6 days after the eruption started.



Explain why the eruption caused widespread disruption to air travel, with over 100 000 flights cancelled.

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..... [4]

(c) Iceland experiences a major volcanic eruption approximately every 5 years.

(i) The table shows the number of deaths due to volcanic activity in Iceland for 9 eruptions.

volcano	number of deaths	year of eruption
Oraefajökull	200	1362
Laki	10 000	1783
Eldfell	1	1973
Grimsvötn	0	1983
Hekla	0	2000
Grimsvötn	0	2004
Eyjafjallajökull	0	2010
Grimsvötn	0	2011
Bardarbunga	0	2015

How successful is Iceland's management of the impact of volcanic activity on loss of life? Give a reason for your answer.

.....

..... [1]

(ii) Describe the opportunities presented by living near a volcano.

.....

.....

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..... [3]

(d) Sulfur dioxide is emitted when volcanoes erupt.

Describe how sulfur dioxide can cause environmental pollution.

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.....

.....

.....

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.....

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..... [4]

[Total: 18]

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3 **(a)** The photograph shows an area of Iceland that has become deforested.

(i) Explain how deforestation can cause soil erosion.

.....

.....

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.....

.....

..... [3]

(ii) One strategy to reduce soil erosion is to improve the soil structure by planting vegetation and maintaining forests.

Describe **two** other strategies to reduce soil erosion.

1 .....

.....

2 .....

.....
[2]

(iii) Deforestation can also result in loss of biodiversity.

Describe strategies for conserving the biodiversity of natural ecosystems.

.....

.....

.....

.....

.....

..... [3]

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

Fact sheet about the Alaskan lupine plant

The Alaskan lupine plant has been introduced into deforested areas of Iceland to improve soil structure.

Many deforested areas of Iceland now have plants growing on them, which has helped to reduce road closures due to dust storms.

The Alaskan lupine plant has grown quickly in Iceland and out-competes many 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.

'Introducing the Alaskan lupine plant to Iceland has been a great success.'

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

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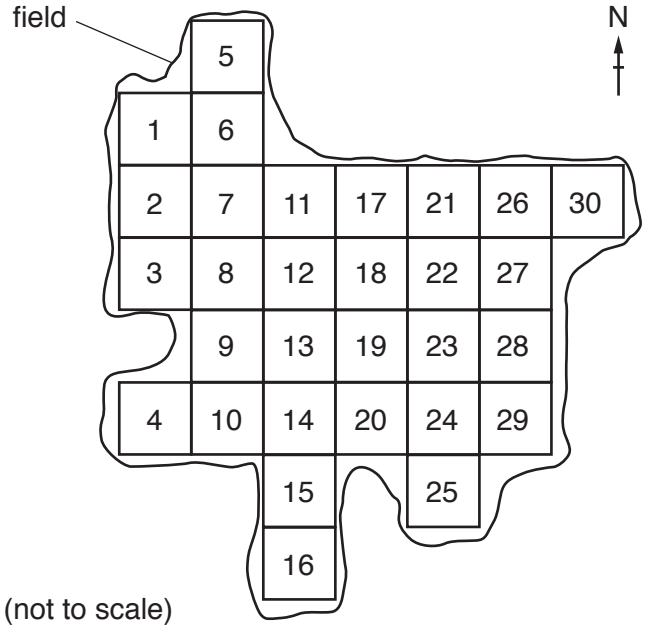
..... [4]

(c) A student investigated the number of Alaskan lupine plants in a field using a quadrat.
The student divided the field into numbered regions.



The student used a random number generator to select the regions of the field to sample.

14	24	5	1
24	28	16	23
13	9	28	4
25	21	23	21
20	~~16~~	20	5
7	29	27	20
27	28	4	14
30	12	10	21
27	16	23	12
16	5	8	7
18	11	3	30
15	5	29	22
1	10	17	25
29	25	2	29
8	12	17	19

The student used the following process to select the numbers.

1. Start with the first number.
2. Count five numbers down.
3. Circle this number.
4. Count five numbers down.
5. If the number has already been selected, cross through the number and move to the next number.
6. Circle this number.
7. Repeat steps 4 to 7 until 10 numbers are selected.

The student recorded the results as a tally chart.

region of field	number of Alaskan lupine plants
20	||
16	|
8	~~||||~~ |||
29	||
11	.....
5	||||
27	~~||||~~ ||
3	|||
.....	|||
.....	||||

Key

~~\|\|\|\|~~ = 5 plants

(i) Determine the last **two** regions of the field to sample. Write your answer in the tally chart. [2]

(ii) Complete the tally chart to show there are 6 Alaskan lupine plants in region 11 of the field. You should use the tally system. [1]

(iii) State the region of the field that has the largest number of Alaskan lupine plants.

..... [1]

(iv) Estimate the total number of Alaskan lupine plants in the field. Use the data in the tally chart to calculate your estimate.

..... [1]

(v) The student concluded that the conditions in the north east of the field were the best for growing Alaskan lupine plants.

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

.....

.....

.....

.....

.....

..... [3]

(vi) The student used the average number of Alaskan lupine plants found in the field to estimate the total number of these plants in Iceland.

Suggest why the student should have sampled more fields to make this estimate.

.....

..... [1]

[Total: 21]

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