Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

0587832696

ENVIRONMENTAL MANAGEMENT **0680/21**

Paper 2 Management in Context **May/June 2022**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

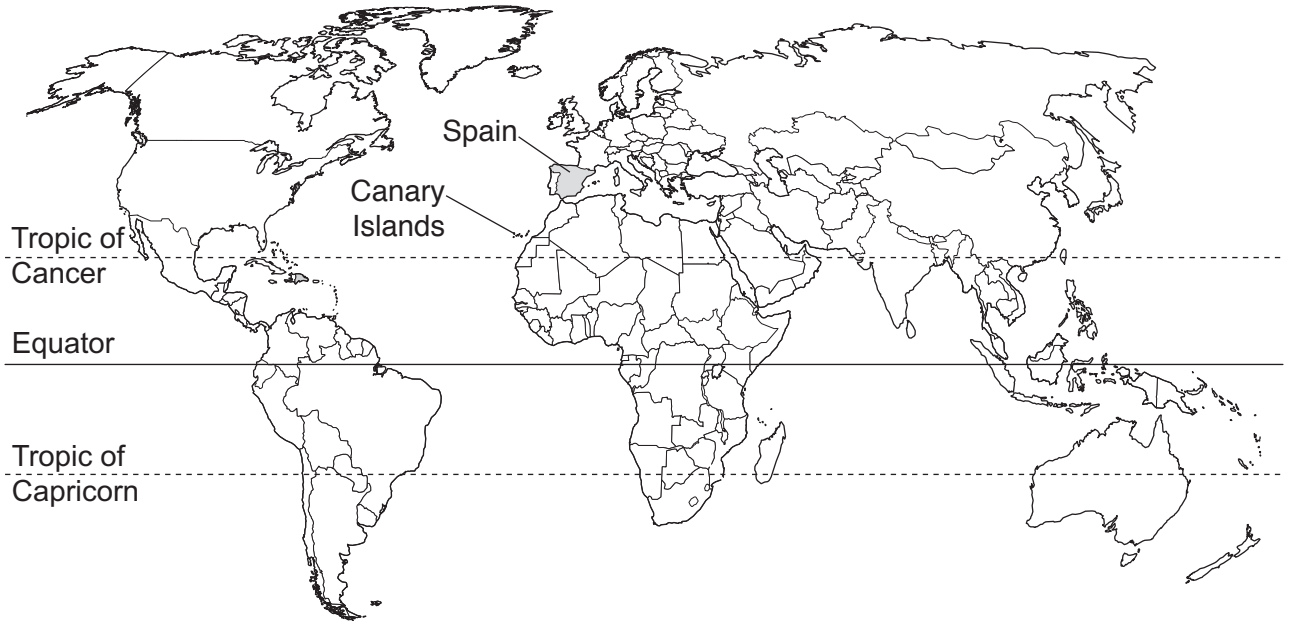
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **24** pages. Any blank pages are indicated.

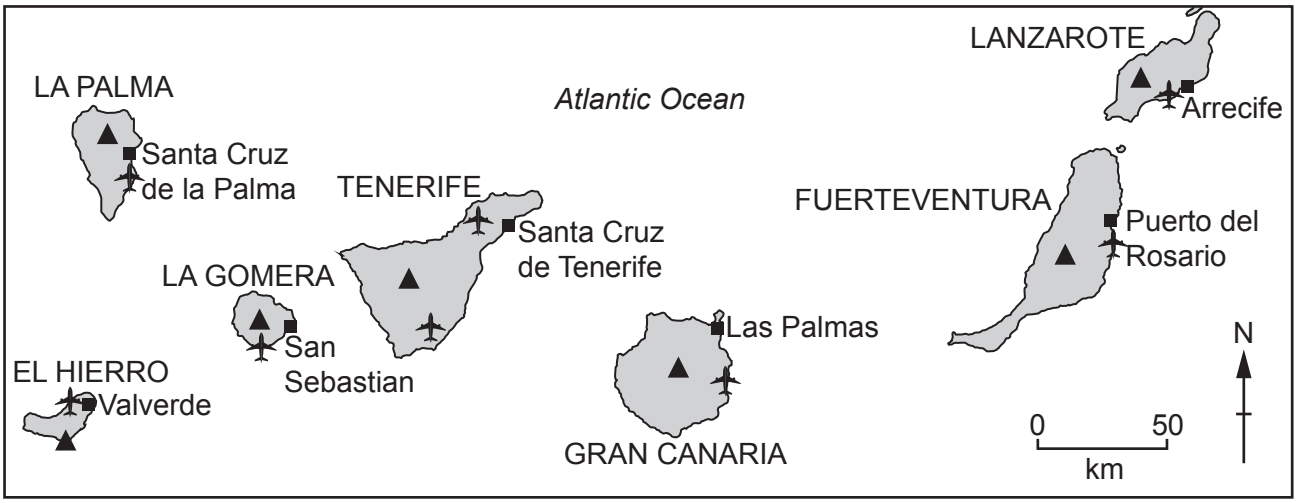
world map showing the location of Spain and the Canary Islands



map of the Canary Islands

Key

- ■ major city
- ▲ volcano
- ✈ airport



Area of the Canary Islands: 7493 km^2

Population: 2.15 million (in 2019)

Children per woman: 1.33

Life expectancy: 82.8 years

Currency: euro (1 EUR = 1.22 USD)

Language: Spanish

Climate of the Canary Islands: subtropical cooled by a cold ocean current and a wind that blows from the north-east most of the time

Terrain of the Canary Islands: volcanic mountains and narrow coastal plains

Main economic activities of the Canary Islands: tourism, shipping services, fishing, agricultural production including bananas and sugar

The Canary Islands are a part of Spain. They are located 100 km west of North Africa. They are a chain of islands formed by volcanic activity between 3 and 68 million years ago.

[Turn over

1 The Canary Islands are volcanic islands.

(a) (i) Describe what causes a volcano to erupt.

.....

.....

.....

.....

.....

..... [3]

(ii) Granite is a rock formed by volcanic activity.

State the name of **one** other rock formed by volcanic activity.

..... [1]

(iii) Suggest reasons why each island in the Canary Islands is smaller than when it first formed millions of years ago.

.....

.....

.....

..... [2]

(b) A student reads a newspaper article about a possible landslide at La Palma.

Landslide at La Palma could cause a tsunami

Recently, low-magnitude earthquakes have been recorded under the island of La Palma. These earthquakes had magnitudes of between 1.5 and 2.7.

Local people are worried that the earthquakes could cause one side of La Palma's volcano to collapse into the sea. This landslide could then cause a tsunami.

Similar-sized earthquakes have been recorded beneath the islands of El Hierro and Tenerife. However, no high-magnitude earthquakes have occurred in recent years on these islands.

(i) State the meaning of tsunami.

..... [1]

(ii) State the name of the scale used to record the magnitude of an earthquake.

..... [1]

(iii) Some scientists think there is only a low risk of a large-scale landslide at La Palma.

Suggest reasons why.

.....

.....

.....

..... [2]

[Turn over

(iv) Describe the possible impacts of a landslide and tsunami on the island of La Palma.

.....

.....

.....

.....

.....

..... [3]

(v) State **three** strategies for managing the impacts of a tsunami.

1 .....

2 .....

3 .....

[3]

[Total: 16]

2 **(a)** The Canary Islands are 100 km west of North Africa.

Much of North Africa is covered by the Sahara Desert.

A wind from the east blows dust from the Sahara Desert to the Canary Islands. The dust increases the fertility of the soil on the islands.

(i) State the name of the Canary Island that is **first** to receive dust from the Sahara Desert when the wind blows from the east.

..... [1]

(ii) The dust from the Sahara Desert adds phosphorus to the soil of the Canary Islands.

State the name of **one** other important mineral found in a fertile soil.

..... [1]

(iii) Only 30% of the total land area of the Canary Islands is suitable for farming.

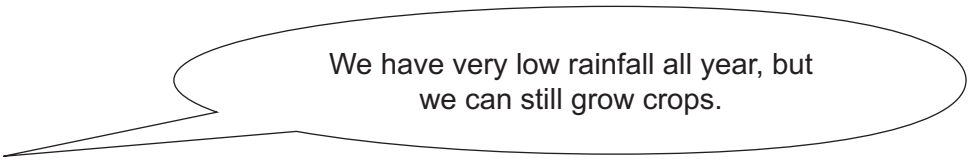
Calculate the area of the Canary Islands that is suitable for farming.

..... km^2 [1]

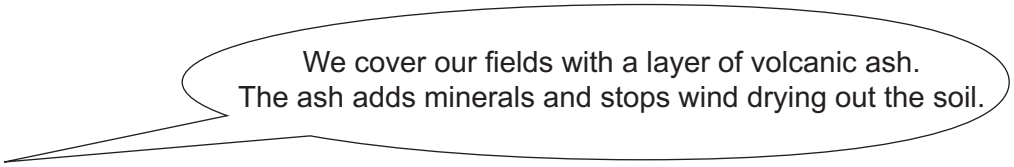
[Turn over

(b) A student talks to three farmers from the Canary Islands.

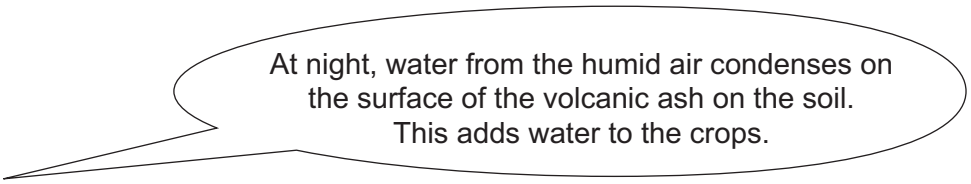
First farmer:



Second farmer:



Third farmer:



The student investigates if adding volcanic ash to soil improves plant growth.

The student:

- collects seeds from one species of wild plant growing on the Canary Islands
- fills three trays, A, B and C, with soil
- places 20 seeds in each tray
- does **not** add volcanic ash to tray A
- adds 1.0 g of volcanic ash to tray B
- adds 2.0 g of volcanic ash to tray C
- waits 15 days for the seeds to grow into seedlings
- records the number of seedlings with a minimum of two leaves in each tray every three days.

The results are shown in the table.

		number of days after planting					
		15	18	21	24	27	30
number of seedlings with a minimum of two leaves	tray A no ash	0	1	5	9	13	18
	tray B 1.0 g ash	0	4	9	14	19	20
	tray C 2.0 g ash	0	6	13	19	20	20

(i) State **two** factors the student needs to keep the same in this investigation.

1 .....

2 .....
[2]

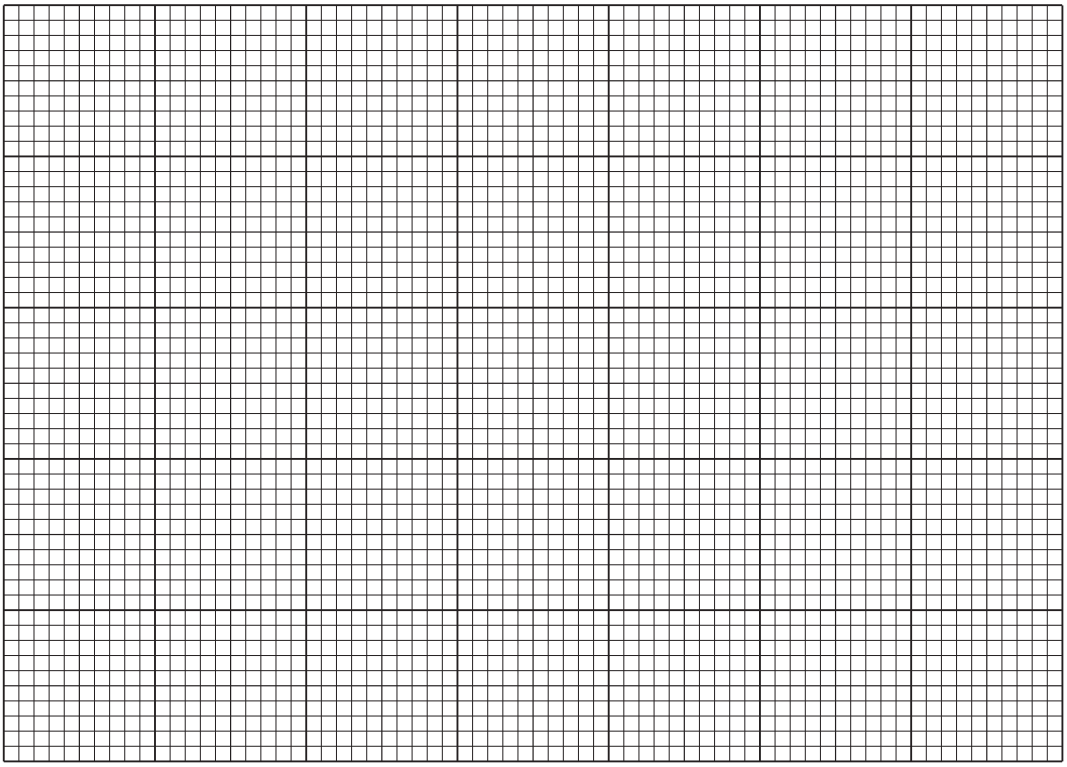
(ii) State why the student includes tray A in this investigation.

..... [1]

(iii) On the grid, plot a graph of number of seedlings with a minimum of two leaves (*y*-axis) against number of days after planting for tray B and for tray C.

Draw a straight line between each plotted point for tray B and for tray C.

Label the graphs as tray B and tray C.



[5]

(iv) Describe the difference in the trends shown in the graph.

.....

.....

.....

..... [2]

(v) Suggest a suitable conclusion for this investigation.

.....

..... [1]

(vi) Suggest **one** way the student could develop this investigation to find out more about the effect of volcanic ash on plant growth.

.....

..... [1]

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(c) The photograph shows Opuntia plants growing in a field in the Canary Islands.

The field is divided into small areas by low stone walls.

The low stone walls protect the Opuntia plants from strong winds.

The low stone walls reduce the wind speed across the soil.

The wind speed is reduced across the soil for a distance that is ten times the height of the wall.

(i) The height of the low stone wall is 85 cm.

Calculate the distance from the wall that has reduced wind speed across the soil.

..... cm [1]

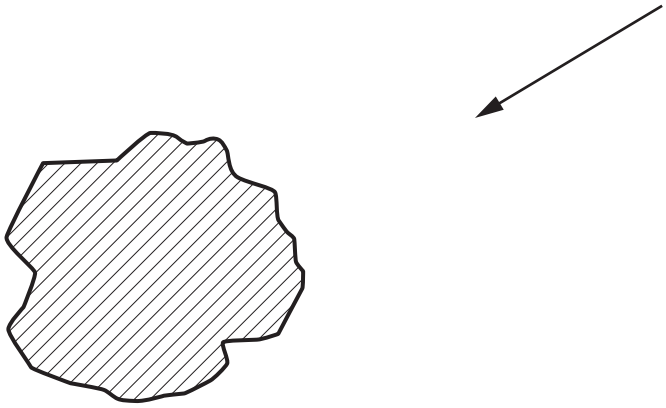
(ii) The diagram shows a field for growing Opuntia plants.

Key

field with Opuntia plants

wind direction

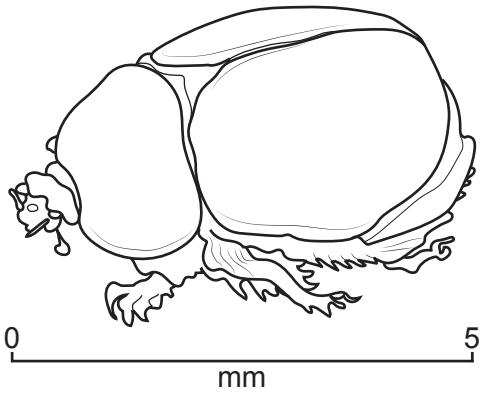
low stone wall



Draw on the diagram **one** low stone wall to protect the Opuntia plants from the strong winds. [2]

(d) The diagram shows a cochineal beetle.

The Opuntia plant is a food source for the cochineal beetle.



A red dye, called cochineal, is made from these beetles.

The following method is used to obtain the red dye.

- Farmers infect Opuntia plants with eggs of the cochineal beetle.
- The eggs hatch into larvae that feed on the Opuntia plant.
- 90 days after infection, the larvae change into beetles that have a red body.
- The farmers collect the beetles and extract the red dye.

(i) Explain why the cochineal beetle is a primary consumer.

..... [1]

(ii) Determine how many times cochineal beetles can be harvested in one year.

.....[1]

(iii) Explain why farmers call the red dye a cash crop.

.....

..... [1]

(iv) The farmers only need Opuntia plants and a supply of cochineal beetle eggs to produce the red dye.

Suggest why this farming of cochineal beetles is an example of sustainable farming.

.....

.....

.....

..... [2]

BLANK PAGE

(e) The photograph shows three fields for growing lemons on a steep slope in the Canary Islands.

(i) Use the photograph to explain why this is an example of good agricultural practice.

.....

.....

.....

.....

.....

..... [3]

(ii) Soils are classified according to their particle size.

There are three main particle sizes. Clay is one particle size.

State the names of the **two** other particle sizes.

1 .....

2 .....
[2]

(iii) Clay soil can become waterlogged.

Explain the impact of waterlogged soil on crop production.

.....

.....

.....

.....

.....

..... [3]

[Total: 31]

3 **(a)** The photograph shows one location in the Canary Islands that is **not** used for tourism.

(i) State **three** uses of the land shown in the photograph.

1 .....

2 .....

3 .....

[3]

(ii) Suggest why food production **cannot** be increased at the location shown in the photograph.

.....

.....

.....

..... [2]

(iii) Up to 90% of the food needed in the Canary Islands is imported.

Suggest **one** other item that needs to be imported.

..... [1]

(b) (i) The government wants to use wind power to generate electricity on the Canary Islands.

An environmental impact assessment is needed at each possible wind turbine location before building can begin.

Explain why an environmental impact assessment is needed.

.....

.....

.....

..... [2]

(ii) Wind power is a renewable energy resource.

Describe other benefits of using wind power to generate electricity.

.....

.....

.....

..... [2]

(iii) Suggest **two** other renewable energy resources that can be used on the Canary Islands.

1 .....

2 .....
[2]

(c) The population of each island of the Canary Islands in 2019 is shown in the table.

island	population /1000
El Hierro	11
Fuerteventura	117
Gran Canaria	850
La Gomera	21
La Palma	82
Lanzarote	151
Tenerife	918

(i) Complete the table to show the population of each island from highest to lowest.

island	population /1000
Tenerife	918
La Gomera	21

[2]

(ii) The table shows the number of tourists that visited four of the Canary Islands in 2019.

island	**number of tourists / million**
Tenerife	5.89
Gran Canaria	4.27
Lanzarote	3.07
Fuerteventura	2.02
total	.....

Complete the table to show the total number of tourists that visited these four Canary Islands in 2019. [1]

(d) In 2019, Tenerife was visited by 5.89 million tourists.

Some people think tourism is damaging the environment and a tourist tax should be introduced. The money from the tourist tax could then be used to support environmental projects.

A questionnaire was used to survey tourists about their views on a tourist tax.

	percentage response	
question	**yes**	**no**
Would you pay a tax of 1 euro each night to stay on Tenerife?	60	40
Do you agree with the idea of a tourist tax?	50	50

(i) Write **one** other question to survey tourists about their views on a tourist tax.

.....

..... [1]

(ii) The questionnaire was used at both the north airport **and** the south airport.

Suggest why the questionnaire was used at both airports.

.....

..... [1]

(iii) Describe a suitable method for selecting tourists to answer the questionnaire.

.....

.....

.....

..... [2]

(iv) Describe **one** benefit of using the questionnaire when tourists arrive **and** when tourists leave the island.

.....

.....

.....

..... [2]

(v) The average length of stay for tourists in Tenerife is nine days.

Calculate the total money raised in 2019 for a tourist tax of one euro per night.

..... million euros [1]

(vi) Money raised from a tourist tax can be used to invest in sustainable tourism.

Explain ways tourism can be made a sustainable activity.

.....

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..... [4]

(e) Discuss whether tourism contributes to climate change.

Give reasons for your point of view.

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.....

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.....

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.....

.....

..... [5]

(f) Suggest why people living on small islands are very worried about climate change.

.....

.....

.....

..... [2]

[Total: 33]

Cambridge Assessment International Education

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ENVIRONMENTAL MANAGEMENT **0680/21**

Paper 2 Management in Context **May/June 2022**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2022 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

[Turn over

PUBLISHED

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct / valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Science-Specific Marking Principles

1	Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.
2	The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
3	Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
4	The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.
5	‘List rule’ guidance For questions that require ***n*** responses (e.g. State **two** reasons …): • The response should be read as continuous prose, even when numbered answer spaces are provided. • Any response marked *ignore* in the mark scheme should not count towards ***n***. • Incorrect responses should not be awarded credit but will still count towards ***n***. • Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response. • Non-contradictory responses after the first ***n*** responses may be ignored even if they include incorrect science.

6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

Question	Answer	Marks
1(a)(i)	*any three from:* (tectonic) plates move / at plate boundaries; pressure of magma; Earth's crust is thin; magma rises ; comes out / breaks through the, crust / cracks / vents; (as) molten lava / ash ;	**3**
1(a)(ii)	basalt;	**1**
1(a)(iii)	*any two from:* erosion; erosion by (sea) water / wind; sea level rise;	**2**
1(b)(i)	a large wave ;	**1**
1(b)(ii)	Richter / Moment Magnitude (scale);	**1**
1(b)(iii)	*any two from:* earthquakes are only low on the scale / between 1.5–2.7; valid comment about magnitude needed to increase the risk / eq; AVP; e.g. terraces reduce risk of landslide	**2**
1(b)(iv)	*any three from:* flooding; death / injury; from drowning / rocks falling; evacuation; damage to buildings; damage to agriculture, e.g. crops, farmland, livestock; damage to infrastructure, e.g. communications, transport networks; loss of jobs / damage to the economy ; AVP's;; e.g. cholera / typhoid / water borne disease *OR* loss of biodiversity	**3**

Question	Answer	Marks
1(b)(v)	*any three from:* monitoring stations; warning systems; evacuation (plan); (evacuation) drills; (emergency) rescue teams; (emergency) shelters; stores of food and water; medical aid ; AVP e.g. build seawalls / only build on high ground	**3**

Question	Answer	Marks
2(a)(i)	Lanzarote;	**1**
2(a)(ii)	nitrogen / nitrate / potassium;	**1**
2(a)(iii)	2248 (km^2);	**1**
2(b)(i)	*any two from:* light (intensity); (volume / frequency, of) water added; temperature; spacing of seeds in tray; same size of tray; pH (of soil); (volume / mass / type, of) soil;	**2**
2(b)(ii)	as a control experiment / for comparison;	**1**
2(b)(iii)	both axes labelled; sensible linear scales such that data covers at least half the grid; correct plots tray B; correct plots tray C; plots joined point-to-point with a **straight** line AND both graph lines labelled; **do not allow any lines crossing between plots**	**5**

Question	Answer	Marks
2(b)(iv)	C has a steeper gradient / faster (rate of) growth than B; C reaches the maximum first / at 27 days whereas B is at 30 days;	2
2(b)(v)	the plants grow faster when volcanic ash is added;	**1**
2(b)(vi)	repeat the experiment using other plant species / use more values of mass for the ash / more plants / AVP;	**1**
2(c)(i)	850 (cm);	**1**
2(c)(ii)	one wall that is not parallel to wind direction; use of the wall symbol from the key;	**2**
2(d)(i)	(the larvae / beetle) eats the producer / plants;	**1**
2(d)(ii)	4;	**1**
2(d)(iii)	it is not used on the farm / it is sold (for money);	**1**
2(d)(iv)	*any two from:* it can continue for a long time / multi-generational / beetles can reproduce; no degrading of soil / eq; no use of, fertilisers / pesticides; AVP; e.g. beetle dung is a fertiliser	**2**
2(e)(i)	*any three from:* terraced fields; trees / vegetation hold soil / prevent erosion; prevent soil erosion; maintain fertility; irrigation used; by gravity / without need for pumps / using bunds / walls; bunds / walls used; prevent (wind) erosion / help, shelter trees / vegetation;	**3**
2(e)(ii)	sand ; silt;	**2**

Question	Answer	Marks
2(e)(iii)	*any three from:* reduces (oxygen concentration in) air spaces; roots cannot respire; kills (roots of) crops / drowns crops; causes plants to become shallow-rooted; causing salinization; and compacts soil; reduces crop yields; soil is washed away; minerals are lost from the soil; decreases fertility; kills worms and other organisms in soil; AVP; e.g. roots cannot take up minerals / nutrients	**3**

Question	Answer	Marks
3(a)(i)	*any three from:* housing / businesses / shops / named example; recreational; roads; small fields / agricultural; forest / wild / conservation areas;	**3**
3(a)(ii)	*any two from:* many steep slopes / mountainous; without soil / infertile; machinery cannot be used; infertile soil / no soil to anchor roots; most suitable land already used / named example of use; AVP;	**2**

Question	Answer	Marks
3(a)(iii)	*any one from:* (fossil) fuel; building materials; manufactured goods, e.g. cars; medical supplies; AVP;	**1**
3(b)(i)	*any two from:* to find out people's views on building; to survey the wildlife; will lose habitat; check no endangered species to protect local activities such as farming; AVP; e.g. safety comment	**2**
3(b)(ii)	*any two from:* no carbon emissions / GHG's / does not contribute to global warming; no acid rain gases; reduces need to import, fossil fuels / oil; readily available / lots of wind on islands;	**2**
3(b)(iii)	*any two from:* solar; wave; tidal; geothermal; hydro power / HEP; biomass;	**2**

Question	Answer	Marks
3(c)(i)	Gran Canaria 850 Lanzarote 151 Fuenteventura 117 La Palma 82 El Heirro 11 arranged highest to lowest in correct order; all numbers correct;	**2**
3(c)(ii)	15.25 (million);	**1**
3(d)(i)	yes-no question about tourist tax, e.g. should the tourist tax be used to fund environmental projects?;	**1**
3(d)(ii)	to make sure a wide range of tourists is surveyed;	**1**
3(d)(iii)	random or systematic specified; correct description matching method specified, e.g. use a random number generator, ask every fifth tourist;	**2**
3(d)(iv)	*any two from:* to see if their opinions have changed; to decide when to charge the tourist tax; to check if the findings are similar to the sample of people arriving at the airport; AVP; e.g. tourist more / less willing to pay the tax	**2**
3(d)(v)	(5.89 × 9 =) 53.01 (million euros);	**1**

Question	Answer	Marks
3(d)(vi)	*any four from:* developing sewage treatment; offsetting carbon emissions; encouraging ecotourism; using renewable energy resources; recycling waste caused by tourism, e.g. plastic bottles / litter collection; educating, local people / tourists; employing environmental guides / wardens; funding to maintain natural beauty areas, e.g. forest, beaches; (create a) national park / nature reserve / eq; AVP; e.g. bikes / electric cars / laws against littering / prevent hunting;	**4**
3(e)	*any five from: allow a mixed answer or one point of view* *Yes* transport, e.g. planes and cars; (combustion of fossil fuel) produces CO2 / GHG's; construction of materials for hotels, e.g. cement; more energy / electricity (used on luxury items, e.g. swimming pools, saunas); land is cleared for buildings; fewer, trees / plants; so less photosynthesis / eq; e.g. less carbon dioxide absorbed destruction of carbon stores / sinks; (intensive) farming practices to supply food for tourists; increased methane from cattle; AVP; e.g. burning more fossil fuels *No* tourists would release similar amounts of C in their own country; if they have enough money they will consume goods that may have contributed to climate change in their manufacture anyway; AVP;	**5**

Question	Answer	Marks
3(f)	*any two effects of climate change linked to small island context:* (small) **sea**-level rise / extreme weather / hurricanes limited land available so effects of climate change more pronounced; causing flooding (of coastal plains); loss of homes; forced migration; loss of farmland; contamination of fresh water sources; must move inland (near volcanoes);	**2**

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CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

6669628035

ENVIRONMENTAL MANAGEMENT **0680/22**

Paper 2 Management in Context **May/June 2022**

1 hour 45 minutes

You must answer on the question paper.

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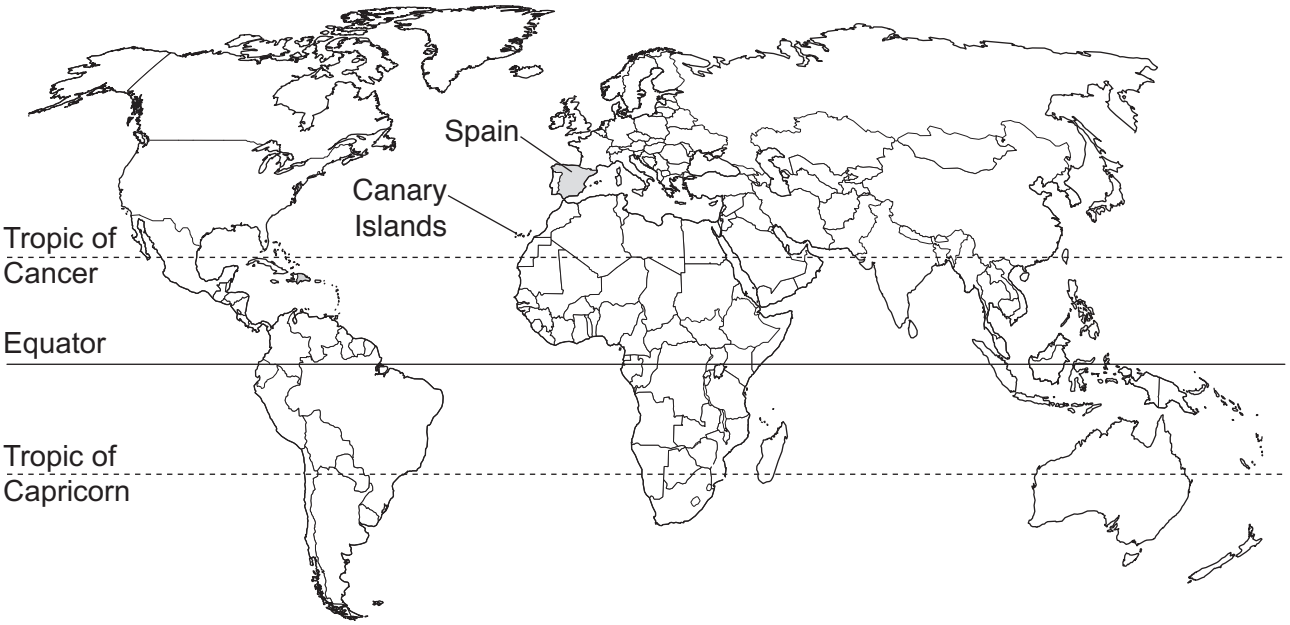
This document has **24** pages. Any blank pages are indicated.

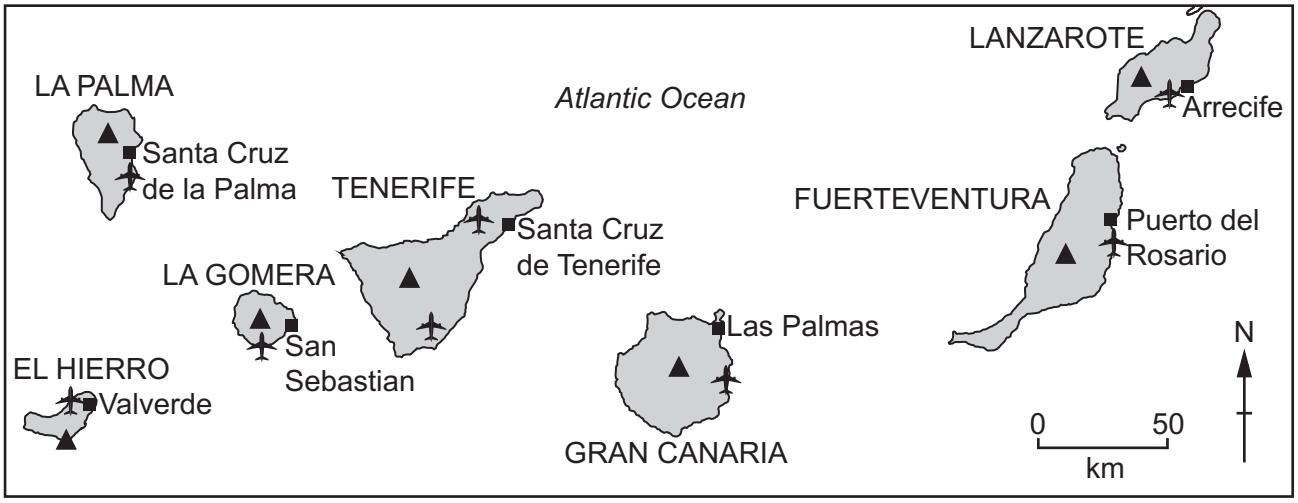
world map showing the location of Spain and the Canary Islands



map of the Canary Islands

Key

- ■ major city
- ▲ volcano
- ✈ airport



Area of the Canary Islands: 7493 km^2

Population: 2.15 million (in 2019)

Children per woman: 1.33

Life expectancy: 82.8 years

Currency: euro (1 EUR = 1.22 USD)

Language: Spanish

Climate of the Canary Islands: subtropical cooled by a cold ocean current and a wind that blows from the north-east most of the time

Terrain of the Canary Islands: volcanic mountains and narrow coastal plains

Main economic activities of the Canary Islands: tourism, shipping services, fishing, agricultural production including bananas and sugar

The Canary Islands are a part of Spain. They are located 100 km west of North Africa. They are a chain of islands formed by volcanic activity between 3 and 68 million years ago.

[Turn over

1 The Canary Islands are volcanic islands.

(a) (i) Basalt is a rock formed by volcanic activity.

State the name of **one** other rock formed by volcanic activity.

..... [1]

(ii) Scientists have identified a suitable location to develop a source of geothermal energy on the island of Gran Canaria.

State **one** benefit of geothermal energy.

..... [1]

(iii) Describe how geothermal energy is used to generate electricity.

.....

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.....

..... [4]

(b) A student reads a newspaper article about an earthquake in Gran Canaria and Tenerife.

Earthquake in Gran Canaria and Tenerife

People living on Gran Canaria and Tenerife are used to small earthquakes with a magnitude between 1 and 2 on the Richter scale.

On the morning of 18 January 2019, people felt an earthquake with a magnitude of 4.4.

Many people were worried that volcanic activity might follow.

Scientists think the earthquake was caused by tectonic activity 5 km below the islands.

(i) Describe how people knew that an earthquake occurred on the morning of 18 January 2019.

.....

..... [1]

(ii) Suggest reasons why people are **not** worried about earthquakes that have a magnitude of less than 2 on the Richter scale.

.....

.....

.....

..... [2]

(iii) Describe how tectonic activity can cause an earthquake.

.....

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..... [3]

(iv) Describe the possible impacts of a high-magnitude earthquake on the islands of Gran Canaria and Tenerife.

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..... [4]

[Total: 16]

2 **(a)** The Canary Islands are 100 km west of North Africa.

Much of North Africa is covered by the Sahara Desert.

A wind from the east blows dust from the Sahara Desert to the Canary Islands. The dust increases the fertility of the soil on the islands.

(i) State the name of the Canary Island that is **last** to receive dust from the Sahara Desert when the wind blows from the east.

..... [1]

(ii) The dust from the Sahara Desert adds potassium to the soil of the Canary Islands.

State the name of **one** other important mineral found in a fertile soil.

..... [1]

(iii) Only 30% of the total land area of the Canary Islands can be used for farming.

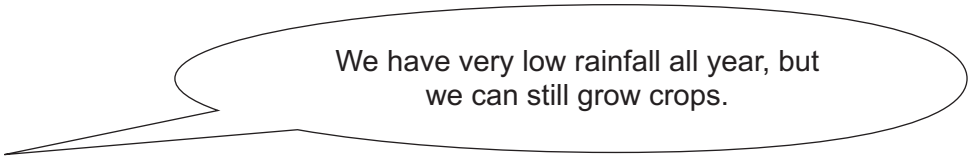
Calculate the area of the Canary Islands that **cannot** be used for farming.

..... km^2 [1]

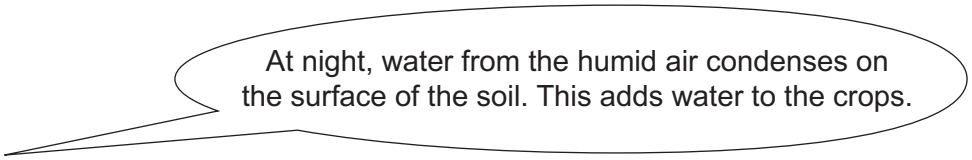
[Turn over

(b) A student talked to three farmers from the Canary Islands.

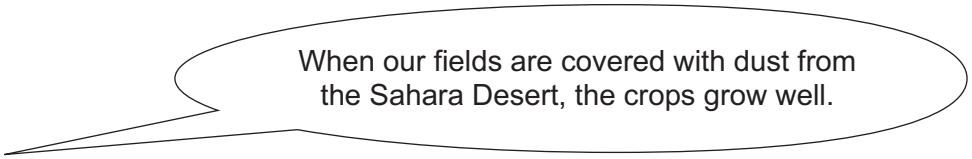
First farmer:



Second farmer:



Third farmer:



The student investigates whether adding dust from the Sahara Desert to soil improves plant growth.

The student:

- collects seeds from one species of wild plant growing on the Canary Islands
- fills three trays, A, B and C, with soil
- places 20 seeds in each tray
- does **not** add dust to tray A
- adds 1.0 g of dust to tray B
- adds 2.0 g of dust to tray C
- waits 15 days for the seeds to grow into seedlings
- records the average height of the seedlings in each tray every three days.

The results are shown in the table.

		number of days after planting					
		15	18	21	24	27	30
average height of seedlings / cm	tray A no dust	1.2	1.7	3.0	4.1	5.0	6.2
	tray B 1.0 g dust	1.1	1.9	3.3	4.8	5.7	7.3
	tray C 2.0 g dust	1.3	2.0	3.4	4.8	5.6	7.2

(i) State the independent variable and the dependent variable in this investigation.

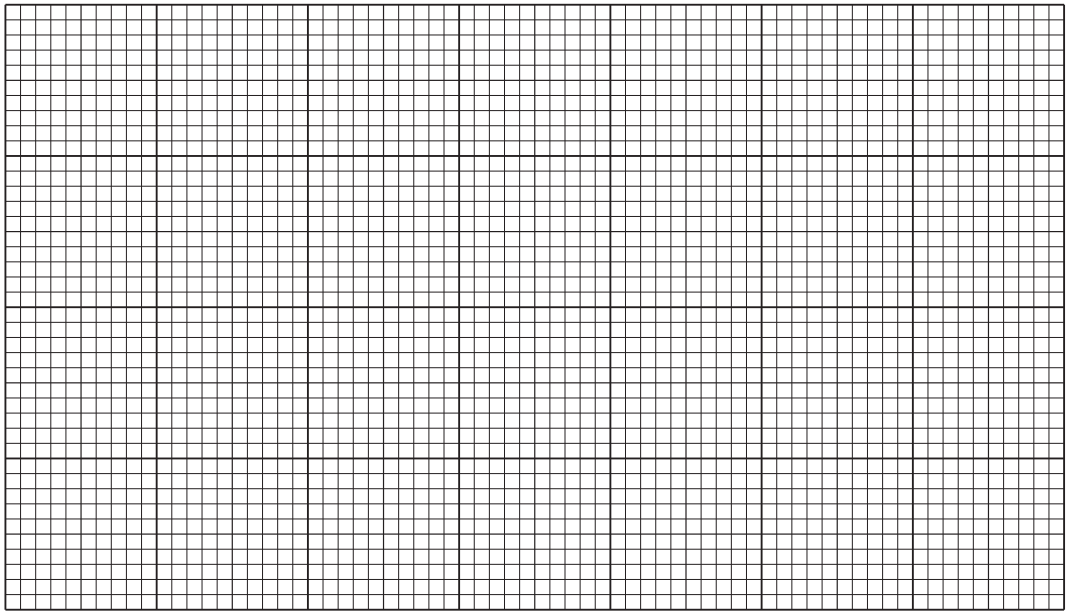
independent variable .....

dependent variable .....
[2]

(ii) On the grid, plot a graph of average height of seedlings (*y*-axis) against number of days after planting for tray A and for tray B.

Draw a straight line between each plotted point for tray A and for tray B.

Label the graphs as tray A and tray B.



[5]

(iii) Describe the difference in the trends shown in the graph.

.....

..... [1]

(iv) Use the results to suggest a suitable conclusion for this investigation.

.....

.....

.....

..... [2]

(v) Suggest **one** reason why the student decides to repeat the investigation with seeds of different plant species.

.....

..... [1]

(c) The photograph shows Opuntia plants growing in a field in the Canary Islands.

The field is divided into small areas by low stone walls.

The low stone walls protect the Opuntia plants from strong winds.

The low stone walls reduce the wind speed across the soil.

The wind speed is reduced across the soil for a distance that is ten times the height of the wall.

(i) The height of the low stone wall in this field is 65 cm.

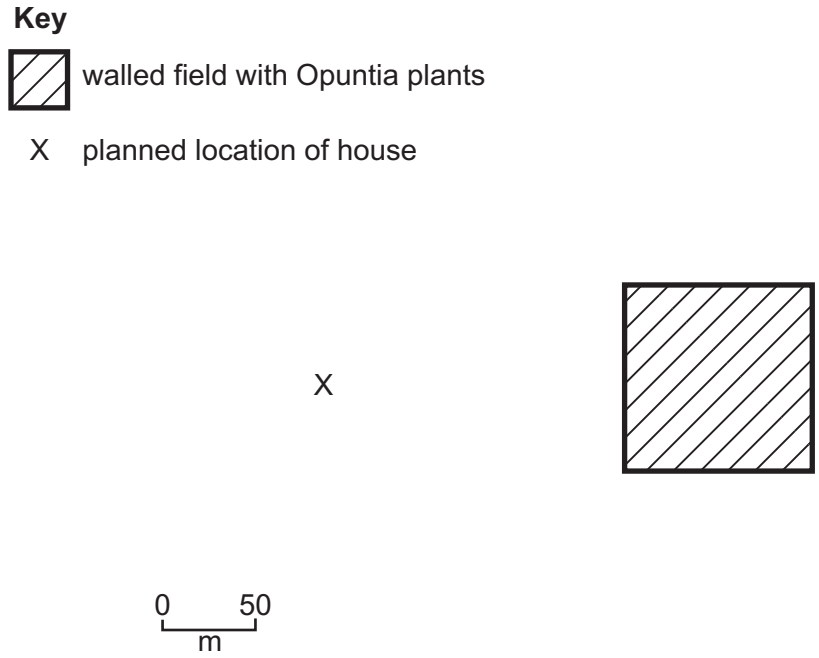
Calculate the distance from the wall that has reduced wind speeds across the soil.

..... cm [1]

(ii) A farmer plans to build a house.

The diagram shows the planned location X of the house.

The house must **not** be more than 200 m from the wall surrounding the field.



Use a calculation to determine whether the house can be built at location X.

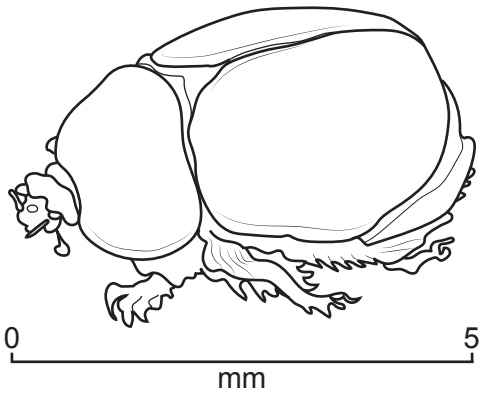
Show your working.

.....

..... [2]

(d) The diagram shows a cochineal beetle.

The Opuntia plant is a food source for the cochineal beetle.



A red dye, called cochineal, is made from these beetles.

The following method is used to obtain the red dye.

- Farmers infect Opuntia plants with eggs of the cochineal beetle.
- The eggs hatch into larvae that feed on the Opuntia plant.
- 90 days after infection, the larvae change into beetles that have a red body.
- The farmers collect most of the beetles and extract the red dye.

(i) Explain why the Opuntia plant is a producer.

.....

.....

.....

..... [2]

(ii) Suggest why the farmers do **not** collect all the beetles to make the red dye.

..... [1]

(iii) Explain why farming cochineal beetles for dye is an example of commercial farming.

.....

.....

.....

..... [2]

(e) The photograph shows three terraced fields with lemon trees on a steep slope in the Canary Islands.

(i) Suggest agricultural techniques that can be used to make the farming of terraced fields sustainable.

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..... [4]

(ii) Soils are classified according to their particle size.

There are three main particle sizes. Sand is one particle size.

State the names of the **two** other particle sizes.

1 .....

2 .....
[2]

(iii) Bunds help prevent soil erosion.

Describe how bunds help prevent soil erosion.

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 32]

3 **(a)** The population of each island of the Canary Islands in 2019 is shown in the table.

island	population / 1000
El Hierro	11
Fuerteventura	117
Gran Canaria	850
La Gomera	21
La Palma	82
Lanzarote	151
Tenerife	918

(i) Calculate the percentage of the total population of the Canary Islands living on Lanzarote in 2019.

..... % [2]

(ii) The table shows information about the population of four of the Canary Islands.

Complete the table.

island	population / 1000	area / km^2	population density / people per km^2
Fuerteventura	117	1660	70
Gran Canaria	850	1560	545
Lanzarote	151	846	.....
Tenerife	918	2034	451

[1]

(b) Some tourists visit Lanzarote to catch blue marlin fish for sport. They hire boats and use a rod and line to catch the fish.

Blue marlin fish take up to four years to reach maturity.

A food chain for blue marlin fish is shown.

phytoplankton → zooplankton → herring fish → tuna fish → blue marlin fish

(i) Suggest what might happen to the numbers of tuna fish and herring fish if tourists catch too many blue marlin fish. Give a reason for your answer.

tuna fish .....

.....

herring fish .....

.....

[2]

(ii) State **four** ways the government can control the number of blue marlin fish caught by tourists each year for sport.

1 .....

2 .....

3 .....

4 .....

[4]

(c) In 2019, 3.07 million tourists visited Lanzarote.

Some people think tourism is damaging the environment and a tourist tax should be introduced. The money from this tax could then be used to support environmental projects.

A questionnaire was used to find out the views of tourists and the views of local people about tourism on Lanzarote.

	percentage response			
	tourists		**local people**	
question	**yes**	**no**	**yes**	**no**
Do you think there should be a limit to the number of blue marlin fish caught each day?	21	79	37	63
Do you think there should be a limit to the number of tourists visiting Lanzarote?	18	82	32	68
Do you think tourists should pay a tax of one euro each night to stay on the island?	40	60	65	35

(i) Suggest **two** conclusions that can be written in a report to the government about the responses to the questionnaire.

.....

.....

.....

..... [2]

(ii) Describe a systematic method for selecting **local people** on Lanzarote to answer the questionnaire.

.....

.....

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..... [2]

(iii) Discuss whether a tourist tax should be introduced in Lanzarote.

Give reasons for your point of view.

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..... [5]

(d) The photograph shows land use at one location on the island of Lanzarote.

Use the photograph to suggest why this location is **not** developed for tourists.

Give reasons for your answer.

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..... [4]

(e) The photograph shows a desalination plant on the island of Lanzarote.

The desalination plant produces potable fresh water that is piped to all parts of Lanzarote.

(i) Describe the process of desalination.

.....

.....

.....

..... [2]

(ii) Potable fresh water is also available from wells dug into the volcanic rock. This water is supplied in plastic bottles.

Suggest **one** reason why people choose to drink bottled water from the wells rather than piped water from the desalination plant.

.....

..... [1]

[Turn over

(f) The government wants to invest in solar power.

(i) Suggest factors that must be considered before installing solar panels.

.....

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..... [3]

(ii) Solar power is a renewable energy resource.

Describe other environmental benefits of solar power.

.....

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..... [3]

(iii) Suggest **one** other renewable energy resource that can be used on the Canary Islands.

..... [1]

[Total: 32]

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Cambridge Assessment International Education

Cambridge IGCSE™

ENVIRONMENTAL MANAGEMENT **0680/22**

Paper 2 Management in Context **May/June 2022**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2022 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **11** printed pages.

PUBLISHED

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Science-Specific Marking Principles

1	Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.
2	The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
3	Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
4	The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.
5	‘List rule’ guidance For questions that require ***n*** responses (e.g. State **two** reasons …): • The response should be read as continuous prose, even when numbered answer spaces are provided. • Any response marked *ignore* in the mark scheme should not count towards ***n***. • Incorrect responses should not be awarded credit but will still count towards ***n***. • Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response. • Non-contradictory responses after the first ***n*** responses may be ignored even if they include incorrect science.

6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

Question	Answer	Marks
	in general ignore the follow if unqualified: *pollution* *land pollution* *death* *harms health* *harms the environment* *not environmentally friendly* *affects environment / people* *standard of living* *resources* ***accept** alternate wording* *underlined terms are specially required for the marking point, although accept phonetic spellings* **accept** CH_4 for methane **accept** CO2 CO^2 Co2 co2	
1(a)(i)	granite / igneous;	**1**
1(a)(ii)	*any one from:* renewable / not finite; does not, emit carbon dioxide or greenhouse gases / contribute to climate change or global warming or (enhanced) greenhouse effect;	**1**
1(a)(iii)	(cold) water forced, underground / rocks / cracks; water heated / water turns to steam; (steam) turns / drives / moves / runs a turbine; turbine, turns / drives / moves / runs a generator (which produces electricity);	**4**
1(b)(i)	*any one from:* (feel or see) moving / shaking / vibration; idea damage (to buildings); low rumbling / noise; early warning / prediction or monitoring system;	**1**

Question	Answer	Marks
1(b)(ii)	*any two from:* low damage / not destructive / few deaths / low number of injuries; no associated volcanic eruptions in the past; idea of buildings being earthquake strengthened;	**2**
1(b)(iii)	*any three from:* plates, move / collide / slide / converge or diverge / plates are convergent or divergent; due to convection currents; friction (at plate boundaries); build-up of, pressure / energy (at plate boundaries); idea of release of pressure or energy (due to a sudden movement at plate boundaries);	**3**
1(b)(iv)	*any four from:* damage to (home) buildings / homelessness; food shortages/ damage to, agriculture / food supplies / livestock / crops; damage to infrastructure; (drinking) water shortages / (drinking) water contamination / water related diseases / stated disease e.g. cholera / typhoid; fires; tsunami / flooding / landslides; economic impact e.g. loss of jobs / business close / decrease in tourism / repairs / flights cancelled ;	**4**

Question	Answer	Marks
2(a)(i)	(El) Hierro;	**1**
2(a)(ii)	nitrate / phosphate (ion);	**1**
2(a)(iii)	5245 (km^2);	**1**
2(b)(i)	*independent*: mass of dust (added); *dependent*: (average) height (of seedlings);	**2**

Question	Answer	Marks
2(b)(ii)	axes labelled AND *y*-axis with unit; sensible linear scale AND **plots** cover at least half the grid; 5–6 correct plots A; 5–6 correct plot B; plots joined point-to-point with a straight line AND both graph lines labelled;	**5**
2(b)(iii)	B has, steeper gradient / faster rate of growth / more (average) height;	**1**
2(b)(iv)	*any two from:* dust increased growth / dust allows plants to grow more; dust makes soil fertile; no / small difference, between trays B and C; idea of 'additional' dust has, little or no effect;	**2**
2(b)(v)	*any one from:* to find out if the dust has a similar effect on other plants; to find best conditions for other plants / different species need different nutrients; identify anomalous results; AVP;	**1**
2(c)(i)	650 (cm);	**1**
2(c)(ii)	measurement of distance on question: 3.9 to 4.3 cm; (actual 4.1) implication of yes AND 150 to 179 (m from wall);	**2**
2(d)(i)	makes its own food; uses photosynthesis;	**2**
2(d)(ii)	(allow for) reproduction / lay new eggs / maintain the population;	**1**
2(d)(iii)	product to sell / sold; for a profit / to earn money;	**2**

Question	Answer	Marks
2(e)(i)	*any four from:* (improved) irrigation / stated example e.g. trickle-drip / rainwater harvesting; organic fertiliser / crop residue / manure; crop rotation / mixed cropping / intercropping / low density planting; drought-resistant crops / GM crops; graze animals; biological control; wind breaks / bunds / contour ploughing;	**4**
2(e)(ii)	silt; clay;	**2**
2(e)(iii)	*any four from:* reduce wind speed / creates a wind break; retain water / reduce speed of water flow / reduces water flow; reduce, run-off / leaching; reduce wind or water erosion / prevents water or wind removing soil; reduces loss of, top soil / organic matter;	**4**

Question	Answer	Marks
3(a)(i)	151 ÷ 2150 / 151 000 ÷ 2 150 000 7;	**2**
3(a)(ii)	178;	**1**
3(b)(i)	*tuna fish:* increase AND not eaten by, blue marlin fish / predator; *herring fish*: decrease AND are eaten by, tuna fish / predator;	**2**

Question	Answer	Marks
3(b)(ii)	*any four from:* limit number of fishing days / closed seasons / ban during breeding season; quotas / limit quantity / ban tourist or sport fishing; limit number of boats / limited number of people fishing (on boats); limit size of boats; no fish zones / protected areas; licences / permits / payment to fish; tax; limit number of rods / length of line; patrols / monitoring / fines;	**4**
3(c)(i)	*any two from:* *both*: no limits to fishing; *both*: no limit on number of tourists ; *tourists*: not to pay tourist tax / ora;	**2**
3(c)(ii)	*any two from:* *where to sample:* different areas / regions / neighbourhoods; *who / how many, to sample:* ask every nth household / ask n people from every household / nth person in different professions; *when to sample:* same time period;	**2**

Question	Answer	Marks
3(c)(iii)	*any five from:* *for:* *stated economic benefit to pay for:* regulation / inspections; hotels; road / infrastructure; waste disposal / cleaning beaches; transport; energy; environmental projects / stated example e.g. afforestation; local projects / stated example e.g. hospitals / help farmers; pay off debts / increase government income / increase GDP / improve economy / raise 3.07 million; clear idea of reinvesting in tourist facilities *against:* discourage tourists visiting / no affect on numbers; stated negative economic impact: e.g. loss of jobs / businesses lose money / recession (if tourists don't visit);	**5**
3(d)	*any four from:* transport problems / limited access e.g. no harbour / few roads / no airport; difficult terrain / steep or hilly / risk of rock fall or landslide; no hotels / no places to stay; no hospitals; no recreational facilities / limited visual appeal / no tourist attractions e.g. golf course / no beach; no (flat) land for development / small area / already developed / land already used / only agriculture;	**4**
3(e)(i)	reverse osmosis / distillation; *any one from:* sea water passed through a membrane; sea water heated or evaporated AND cooled or condensed;	**2**
3(e)(ii)	*any one from:* don't like taste / smell / appearance of desalinated water; don't like mineral content ; don't trust desalination process / concern over safety or quality;	**1**

Question	Answer	Marks
3(f)(i)	*any three from:* number of sunshine hours / performance of panels when not sunny / is area sunny / efficiency of panels; economic reason; ease of connection, to grid / to homes; storage of energy; visual pollution; availability of land; availability of alternative sources / need a back-up energy source; stated pollution e.g. during manufacture of panels or batteries / disposal of panels or batteries local expertise or knowledge for installation environmental impact assessment / EIA	**3**
3(f)(ii)	*any three environmental benefits from:* no carbon (dioxide) or greenhouse gas emissions (at point of use); no contribution to climate change / global warming / (enhanced) greenhouse effect; no contribution to stated air pollution e.g. smog / acid rain / SO_2 / NOx implied decrease use of fossil fuels; extends lifetime of fossil fuel reserves;	**3**
3(f)(iii)	*any one from:* wind; geothermal; wave; tidal; biomass; hydroelectric / HEP	**1**

Cambridge Assessment International Education

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CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

6655639795 5

ENVIRONMENTAL MANAGEMENT **0680/23**

Paper 2 Management in Context **May/June 2022**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **24** pages. Any blank pages are indicated.

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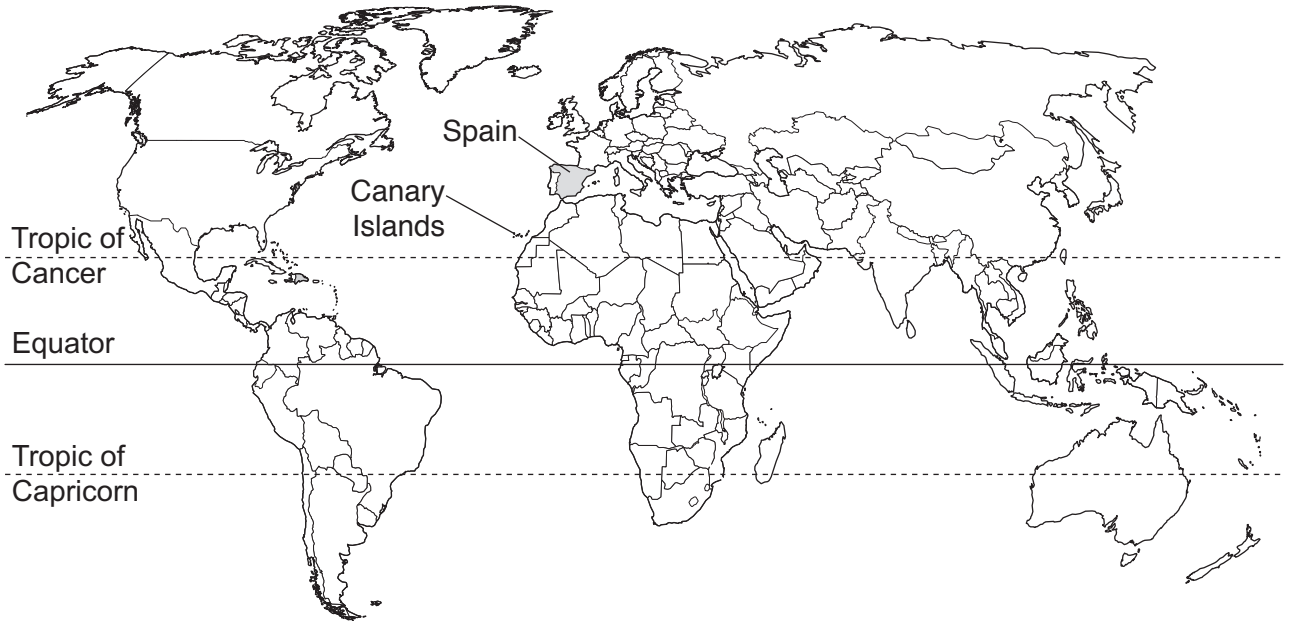
[Turn over

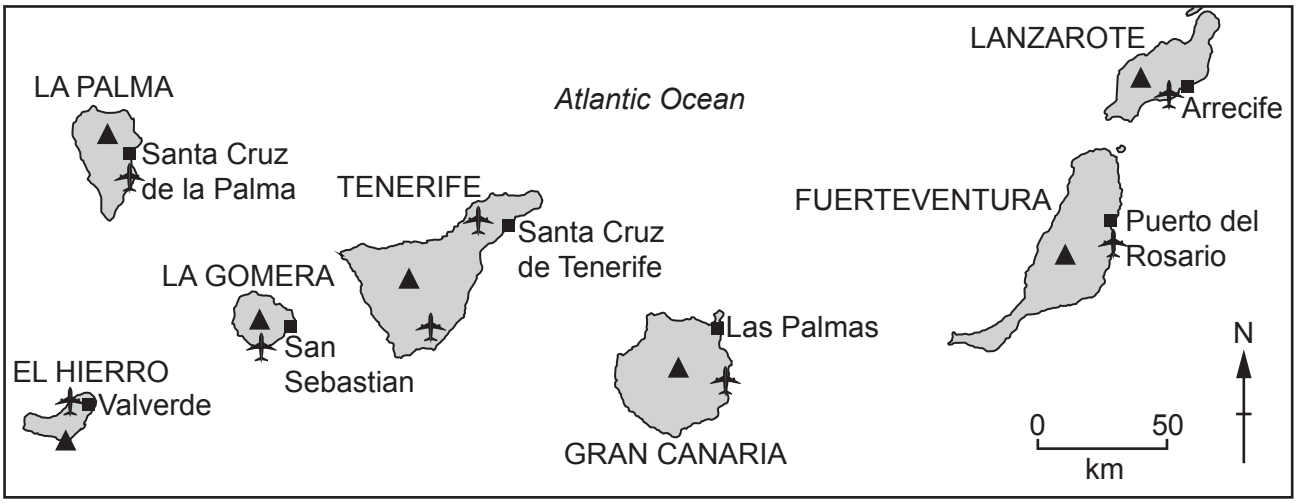
world map showing the location of Spain and the Canary Islands



map of the Canary Islands

Key

- ■ major city
- ▲ volcano
- ✈ airport



Area of the Canary Islands: 7493 km^2

Population: 2.15 million (in 2019)

Children per woman: 1.33

Life expectancy: 82.8 years

Currency: euro (1 EUR = 1.22 USD)

Language: Spanish

Climate of the Canary Islands: subtropical cooled by a cold ocean current and a wind that blows from the north-east most of the time

Terrain of the Canary Islands: volcanic mountains and narrow coastal plains

Main economic activities of the Canary Islands: tourism, shipping services, fishing, agricultural production including bananas and sugar

The Canary Islands are a part of Spain. They are located 100 km west of North Africa. They are a chain of islands formed by volcanic activity between 3 and 68 million years ago.

[Turn over

1 The Canary Islands are volcanic islands.

(a) (i) Describe what causes a volcano to erupt.

.....

.....

.....

.....

.....

..... [3]

(ii) Granite is a rock formed by volcanic activity.

State the name of **one** other rock formed by volcanic activity.

..... [1]

(iii) Suggest reasons why each island in the Canary Islands is smaller than when it first formed millions of years ago.

.....

.....

.....

..... [2]

(b) A student reads a newspaper article about a possible landslide at La Palma.

Landslide at La Palma could cause a tsunami

Recently, low-magnitude earthquakes have been recorded under the island of La Palma. These earthquakes had magnitudes of between 1.5 and 2.7.

Local people are worried that the earthquakes could cause one side of La Palma's volcano to collapse into the sea. This landslide could then cause a tsunami.

Similar-sized earthquakes have been recorded beneath the islands of El Hierro and Tenerife. However, no high-magnitude earthquakes have occurred in recent years on these islands.

(i) State the meaning of tsunami.

..... [1]

(ii) State the name of the scale used to record the magnitude of an earthquake.

..... [1]

(iii) Some scientists think there is only a low risk of a large-scale landslide at La Palma.

Suggest reasons why.

.....

.....

.....

..... [2]

[Turn over

(iv) Describe the possible impacts of a landslide and tsunami on the island of La Palma.

.....

.....

.....

.....

.....

..... [3]

(v) State **three** strategies for managing the impacts of a tsunami.

1 .....

2 .....

3 .....
[3]

[Total: 16]

2 **(a)** The Canary Islands are 100 km west of North Africa.

Much of North Africa is covered by the Sahara Desert.

A wind from the east blows dust from the Sahara Desert to the Canary Islands. The dust increases the fertility of the soil on the islands.

(i) State the name of the Canary Island that is **first** to receive dust from the Sahara Desert when the wind blows from the east.

..... [1]

(ii) The dust from the Sahara Desert adds phosphorus to the soil of the Canary Islands.

State the name of **one** other important mineral found in a fertile soil.

..... [1]

(iii) Only 30% of the total land area of the Canary Islands is suitable for farming.

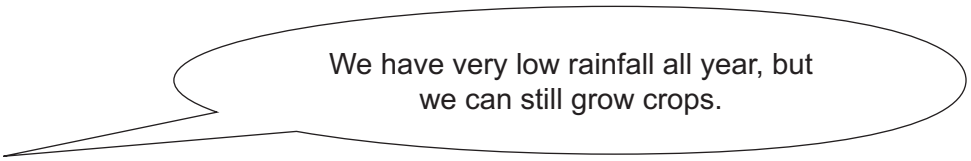
Calculate the area of the Canary Islands that is suitable for farming.

..... km^2 [1]

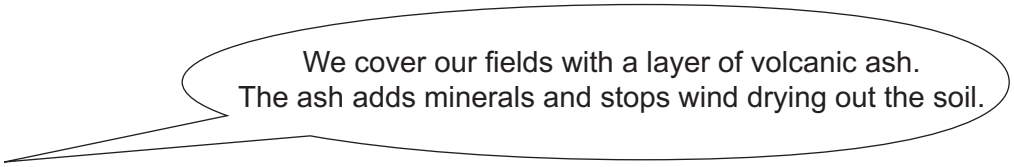
[Turn over

(b) A student talks to three farmers from the Canary Islands.

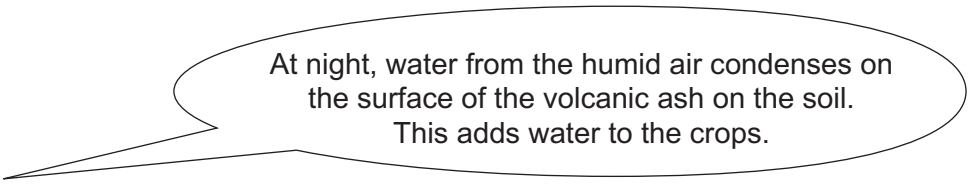
First farmer:



Second farmer:



Third farmer:



The student investigates if adding volcanic ash to soil improves plant growth.

The student:

- collects seeds from one species of wild plant growing on the Canary Islands
- fills three trays, A, B and C, with soil
- places 20 seeds in each tray
- does **not** add volcanic ash to tray A
- adds 1.0 g of volcanic ash to tray B
- adds 2.0 g of volcanic ash to tray C
- waits 15 days for the seeds to grow into seedlings
- records the number of seedlings with a minimum of two leaves in each tray every three days.

The results are shown in the table.

		number of days after planting					
		15	18	21	24	27	30
number of seedlings with a minimum of two leaves	tray A no ash	0	1	5	9	13	18
	tray B 1.0 g ash	0	4	9	14	19	20
	tray C 2.0 g ash	0	6	13	19	20	20

(i) State **two** factors the student needs to keep the same in this investigation.

1 .....

2 .....
[2]

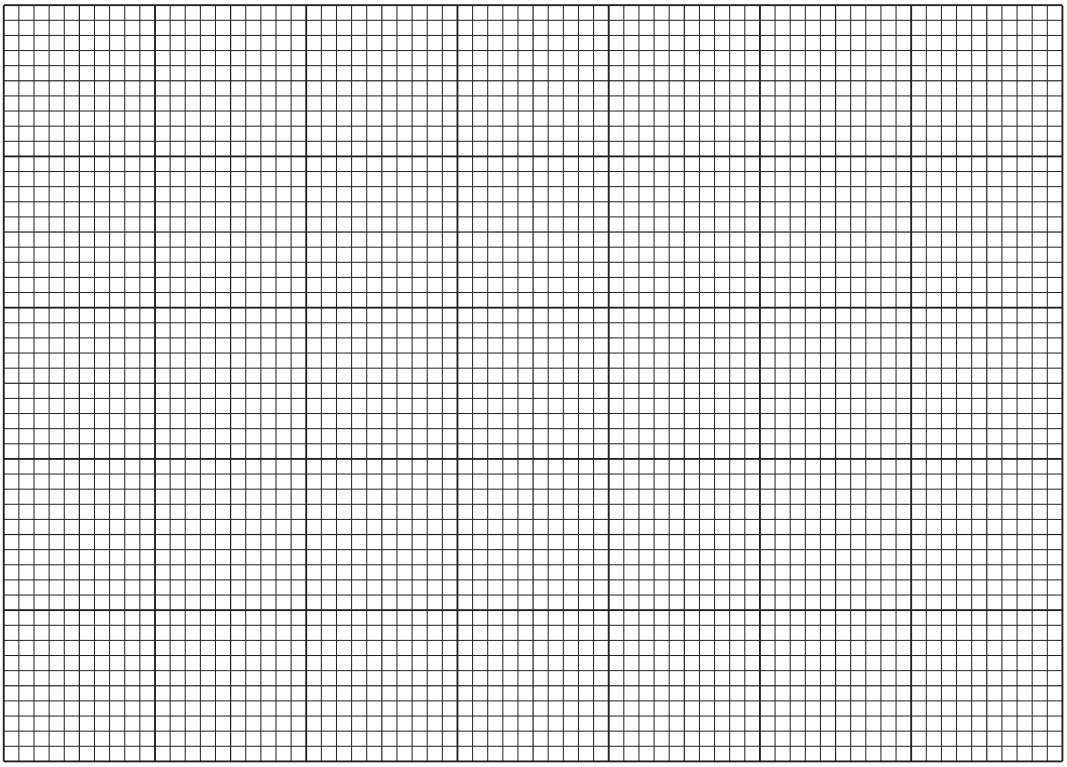
(ii) State why the student includes tray A in this investigation.

..... [1]

(iii) On the grid, plot a graph of number of seedlings with a minimum of two leaves (*y*-axis) against number of days after planting for tray B and for tray C.

Draw a straight line between each plotted point for tray B and for tray C.

Label the graphs as tray B and tray C.



[5]

(iv) Describe the difference in the trends shown in the graph.

.....

.....

.....

..... [2]

(v) Suggest a suitable conclusion for this investigation.

.....

..... [1]

(vi) Suggest **one** way the student could develop this investigation to find out more about the effect of volcanic ash on plant growth.

.....

..... [1]

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(c) The photograph shows Opuntia plants growing in a field in the Canary Islands.

The field is divided into small areas by low stone walls.

The low stone walls protect the Opuntia plants from strong winds.

The low stone walls reduce the wind speed across the soil.

The wind speed is reduced across the soil for a distance that is ten times the height of the wall.

(i) The height of the low stone wall is 85 cm.

Calculate the distance from the wall that has reduced wind speed across the soil.

..... cm [1]

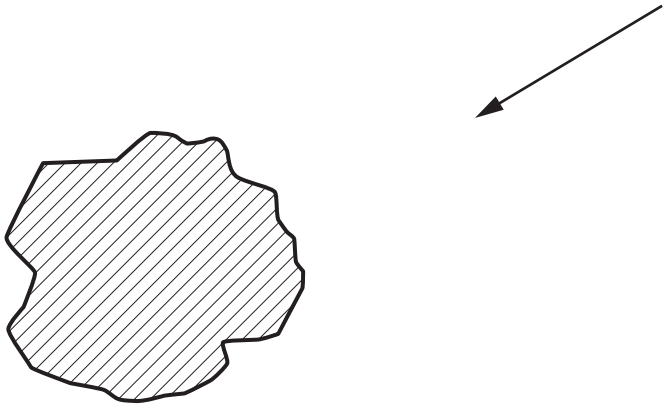
(ii) The diagram shows a field for growing Opuntia plants.

Key

field with Opuntia plants

wind direction

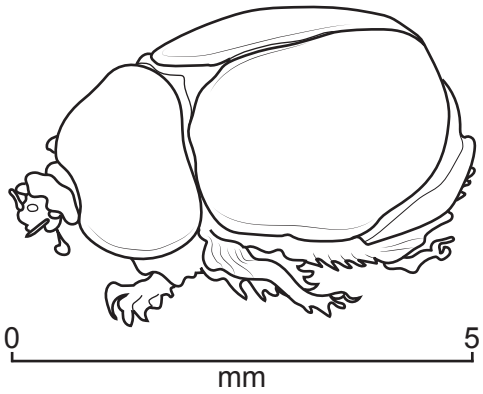
low stone wall



Draw on the diagram **one** low stone wall to protect the Opuntia plants from the strong winds. [2]

(d) The diagram shows a cochineal beetle.

The Opuntia plant is a food source for the cochineal beetle.



A red dye, called cochineal, is made from these beetles.

The following method is used to obtain the red dye.

- Farmers infect Opuntia plants with eggs of the cochineal beetle.
- The eggs hatch into larvae that feed on the Opuntia plant.
- 90 days after infection, the larvae change into beetles that have a red body.
- The farmers collect the beetles and extract the red dye.

(i) Explain why the cochineal beetle is a primary consumer.

..... [1]

(ii) Determine how many times cochineal beetles can be harvested in one year.

.....[1]

(iii) Explain why farmers call the red dye a cash crop.

.....

..... [1]

(iv) The farmers only need Opuntia plants and a supply of cochineal beetle eggs to produce the red dye.

Suggest why this farming of cochineal beetles is an example of sustainable farming.

.....

.....

.....

..... [2]

BLANK PAGE

(e) The photograph shows three fields for growing lemons on a steep slope in the Canary Islands.

(i) Use the photograph to explain why this is an example of good agricultural practice.

.....

.....

.....

.....

.....

..... [3]

(ii) Soils are classified according to their particle size.

There are three main particle sizes. Clay is one particle size.

State the names of the **two** other particle sizes.

1 .....

2 .....

[2]

(iii) Clay soil can become waterlogged.

Explain the impact of waterlogged soil on crop production.

.....

.....

.....

.....

.....

..... [3]

[Total: 31]

3 **(a)** The photograph shows one location in the Canary Islands that is **not** used for tourism.

(i) State **three** uses of the land shown in the photograph.

1 .....

2 .....

3 .....

[3]

(ii) Suggest why food production **cannot** be increased at the location shown in the photograph.

.....

.....

.....

..... [2]

(iii) Up to 90% of the food needed in the Canary Islands is imported.

Suggest **one** other item that needs to be imported.

..... [1]

(b) (i) The government wants to use wind power to generate electricity on the Canary Islands.

An environmental impact assessment is needed at each possible wind turbine location before building can begin.

Explain why an environmental impact assessment is needed.

.....

.....

.....

..... [2]

(ii) Wind power is a renewable energy resource.

Describe other benefits of using wind power to generate electricity.

.....

.....

.....

..... [2]

(iii) Suggest **two** other renewable energy resources that can be used on the Canary Islands.

1 .....

2 .....
[2]

(c) The population of each island of the Canary Islands in 2019 is shown in the table.

island	population /1000
El Hierro	11
Fuerteventura	117
Gran Canaria	850
La Gomera	21
La Palma	82
Lanzarote	151
Tenerife	918

(i) Complete the table to show the population of each island from highest to lowest.

island	population /1000
Tenerife	918
La Gomera	21

[2]

(ii) The table shows the number of tourists that visited four of the Canary Islands in 2019.

island	**number of tourists / million**
Tenerife	5.89
Gran Canaria	4.27
Lanzarote	3.07
Fuerteventura	2.02
total	.....

Complete the table to show the total number of tourists that visited these four Canary Islands in 2019. [1]

(d) In 2019, Tenerife was visited by 5.89 million tourists.

Some people think tourism is damaging the environment and a tourist tax should be introduced. The money from the tourist tax could then be used to support environmental projects.

A questionnaire was used to survey tourists about their views on a tourist tax.

	percentage response	
question	**yes**	**no**
Would you pay a tax of 1 euro each night to stay on Tenerife?	60	40
Do you agree with the idea of a tourist tax?	50	50

(i) Write **one** other question to survey tourists about their views on a tourist tax.

.....

..... [1]

(ii) The questionnaire was used at both the north airport **and** the south airport.

Suggest why the questionnaire was used at both airports.

.....

..... [1]

(iii) Describe a suitable method for selecting tourists to answer the questionnaire.

.....

.....

.....

..... [2]

(iv) Describe **one** benefit of using the questionnaire when tourists arrive **and** when tourists leave the island.

.....

.....

.....

..... [2]

(v) The average length of stay for tourists in Tenerife is nine days.

Calculate the total money raised in 2019 for a tourist tax of one euro per night.

..... million euros [1]

(vi) Money raised from a tourist tax can be used to invest in sustainable tourism.

Explain ways tourism can be made a sustainable activity.

.....

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..... [4]

(e) Discuss whether tourism contributes to climate change.

Give reasons for your point of view.

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..... [5]

(f) Suggest why people living on small islands are very worried about climate change.

.....

.....

.....

..... [2]

[Total: 33]

Cambridge Assessment International Education

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ENVIRONMENTAL MANAGEMENT **0680/23**

Paper 2 Management in Context **May/June 2022**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2022 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **11** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct / valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Science-Specific Marking Principles

1	Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.
2	The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
3	Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
4	The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.
5	'List rule' guidance For questions that require ***n*** responses (e.g. State **two** reasons …): • The response should be read as continuous prose, even when numbered answer spaces are provided. • Any response marked *ignore* in the mark scheme should not count towards ***n***. • Incorrect responses should not be awarded credit but will still count towards ***n***. • Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response. • Non-contradictory responses after the first ***n*** responses may be ignored even if they include incorrect science.

6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

Question	Answer	Marks
1(a)(i)	*any three from:* (tectonic) plates move / at plate boundaries; pressure of magma; Earth's crust is thin; magma rises ; comes out / breaks through the, crust / cracks / vents; (as) molten lava / ash ;	**3**
1(a)(ii)	basalt;	**1**
1(a)(iii)	*any two from:* erosion; erosion by (sea) water / wind; sea level rise;	**2**
1(b)(i)	a large wave ;	**1**
1(b)(ii)	Richter / Moment Magnitude (scale);	**1**
1(b)(iii)	*any two from:* earthquakes are only low on the scale / between 1.5–2.7; valid comment about magnitude needed to increase the risk / eq; AVP; e.g. terraces reduce risk of landslide	**2**
1(b)(iv)	*any three from:* flooding; death / injury; from drowning / rocks falling; evacuation; damage to buildings; damage to agriculture, e.g. crops, farmland, livestock; damage to infrastructure, e.g. communications, transport networks; loss of jobs / damage to the economy ; AVP's;; e.g. cholera / typhoid / water borne disease *OR* loss of biodiversity	**3**

Question	Answer	Marks
1(b)(v)	*any three from:* monitoring stations; warning systems; evacuation (plan); (evacuation) drills; (emergency) rescue teams; (emergency) shelters; stores of food and water; medical aid ; AVP e.g. build seawalls / only build on high ground	**3**

Question	Answer	Marks
2(a)(i)	Lanzarote;	**1**
2(a)(ii)	nitrogen / nitrate / potassium;	**1**
2(a)(iii)	2248 (km^2);	**1**
2(b)(i)	*any two from:* light (intensity); (volume / frequency, of) water added; temperature; spacing of seeds in tray; same size of tray; pH (of soil); (volume / mass / type, of) soil;	**2**
2(b)(ii)	as a control experiment / for comparison;	**1**
2(b)(iii)	both axes labelled; sensible linear scales such that data covers at least half the grid; correct plots tray B; correct plots tray C; plots joined point-to-point with a **straight** line AND both graph lines labelled; **do not allow any lines crossing between plots**	**5**

Question	Answer	Marks
2(b)(iv)	C has a steeper gradient / faster (rate of) growth than B; C reaches the maximum first / at 27 days whereas B is at 30 days;	2
2(b)(v)	the plants grow faster when volcanic ash is added;	**1**
2(b)(vi)	repeat the experiment using other plant species / use more values of mass for the ash / more plants / AVP;	**1**
2(c)(i)	850 (cm);	**1**
2(c)(ii)	one wall that is not parallel to wind direction; use of the wall symbol from the key;	**2**
2(d)(i)	(the larvae / beetle) eats the producer / plants;	**1**
2(d)(ii)	4;	**1**
2(d)(iii)	it is not used on the farm / it is sold (for money);	**1**
2(d)(iv)	*any two from:* it can continue for a long time / multi-generational / beetles can reproduce; no degrading of soil / eq; no use of, fertilisers / pesticides; AVP; e.g. beetle dung is a fertiliser	**2**
2(e)(i)	*any three from:* terraced fields; trees / vegetation hold soil / prevent erosion; prevent soil erosion; maintain fertility; irrigation used; by gravity / without need for pumps / using bunds / walls; bunds / walls used; prevent (wind) erosion / help, shelter trees / vegetation;	**3**
2(e)(ii)	sand ; silt;	**2**

Question	Answer	Marks
2(e)(iii)	*any three from:* reduces (oxygen concentration in) air spaces; roots cannot respire; kills (roots of) crops / drowns crops; causes plants to become shallow-rooted; causing salinization; and compacts soil; reduces crop yields; soil is washed away; minerals are lost from the soil; decreases fertility; kills worms and other organisms in soil; AVP; e.g. roots cannot take up minerals / nutrients	**3**

Question	Answer	Marks
3(a)(i)	*any three from:* housing / businesses / shops / named example; recreational; roads; small fields / agricultural; forest / wild / conservation areas;	**3**
3(a)(ii)	*any two from:* many steep slopes / mountainous; without soil / infertile; machinery cannot be used; infertile soil / no soil to anchor roots; most suitable land already used / named example of use; AVP;	**2**

Question	Answer	Marks
3(a)(iii)	*any one from:* (fossil) fuel; building materials; manufactured goods, e.g. cars; medical supplies; AVP;	**1**
3(b)(i)	*any two from:* to find out people's views on building; to survey the wildlife; will lose habitat; check no endangered species to protect local activities such as farming; AVP; e.g. safety comment	**2**
3(b)(ii)	*any two from:* no carbon emissions / GHG's / does not contribute to global warming; no acid rain gases; reduces need to import, fossil fuels / oil; readily available / lots of wind on islands;	**2**
3(b)(iii)	*any two from:* solar; wave; tidal; geothermal; hydro power / HEP; biomass;	**2**
3(c)(i)	Gran Canaria 850 Lanzarote 151 Fuenteventura 117 La Palma 82 El Heirro 11 arranged highest to lowest in correct order; all numbers correct;	**2**

Question	Answer	Marks
3(c)(ii)	15.25 (million);	**1**
3(d)(i)	yes-no question about tourist tax, e.g. should the tourist tax be used to fund environmental projects?;	**1**
3(d)(ii)	to make sure a wide range of tourists is surveyed;	**1**
3(d)(iii)	random or systematic specified; correct description matching method specified, e.g. use a random number generator, ask every fifth tourist;	**2**
3(d)(iv)	*any two from:* to see if their opinions have changed; to decide when to charge the tourist tax; to check if the findings are similar to the sample of people arriving at the airport; AVP; e.g. tourist more / less willing to pay the tax	**2**
3(d)(v)	(5.89 × 9 =) 53.01 (million euros);	**1**
3(d)(vi)	*any four from:* developing sewage treatment; offsetting carbon emissions; encouraging ecotourism; using renewable energy resources; recycling waste caused by tourism, e.g. plastic bottles / litter collection; educating, local people / tourists; employing environmental guides / wardens; funding to maintain natural beauty areas, e.g. forest, beaches; (create a) national park / nature reserve / eq; AVP; e.g. bikes / electric cars / laws against littering / prevent hunting;	**4**

Question	Answer	Marks
3(e)	*any five from: allow a mixed answer or one point of view* *Yes* transport, e.g. planes and cars; (combustion of fossil fuel) produces CO2 / GHG's; construction of materials for hotels, e.g. cement; more energy / electricity (used on luxury items, e.g. swimming pools, saunas); land is cleared for buildings; fewer, trees / plants; so less photosynthesis / eq; e.g. less carbon dioxide absorbed destruction of carbon stores / sinks; (intensive) farming practices to supply food for tourists; increased methane from cattle; AVP; e.g. burning more fossil fuels *No* tourists would release similar amounts of C in their own country; if they have enough money they will consume goods that may have contributed to climate change in their manufacture anyway; AVP;	**5**
3(f)	*any two effects of climate change linked to small island context:* (small) **sea**-level rise / extreme weather / hurricanes limited land available so effects of climate change more pronounced; causing flooding (of coastal plains); loss of homes; forced migration; loss of farmland; contamination of fresh water sources; must move inland (near volcanoes);	**2**