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ENVIRONMENTAL MANAGEMENT **0680/22**

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.

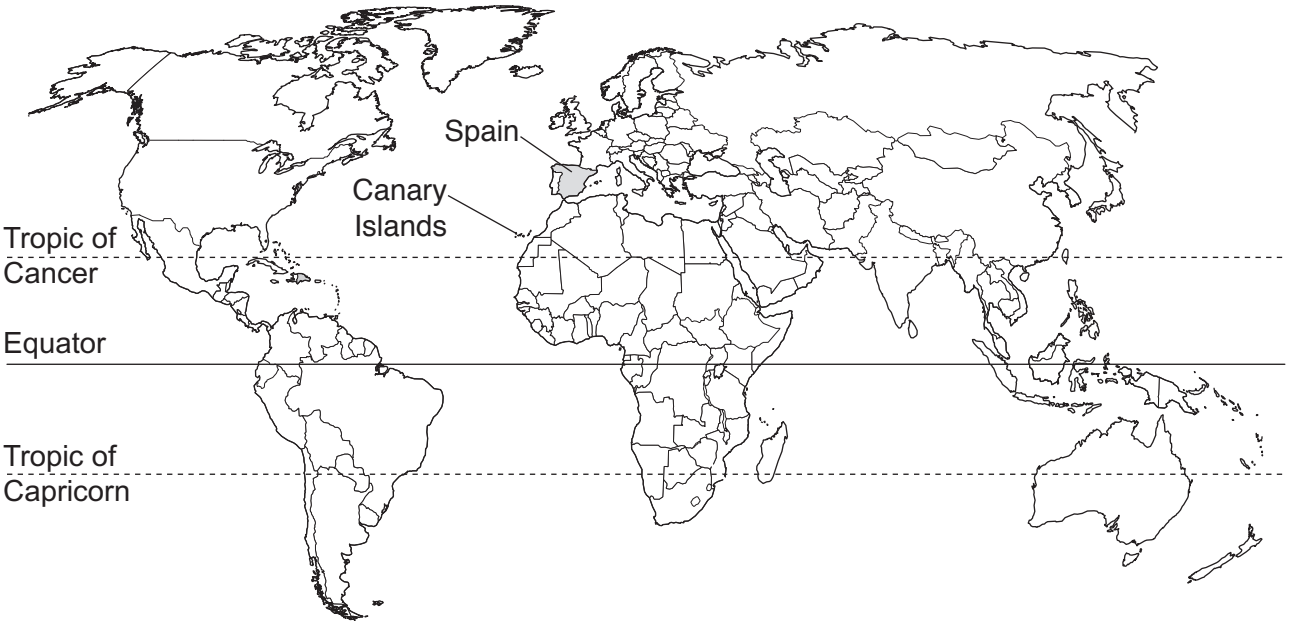
INFORMATION

- 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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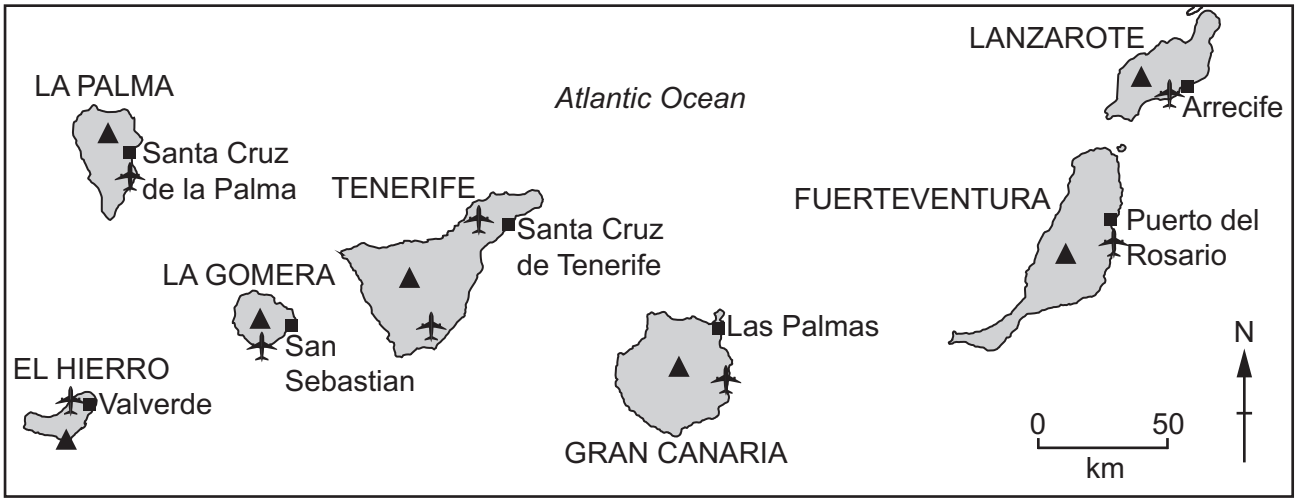
world map showing the location of Spain and the Canary Islands



map of the Canary Islands

Key

- ■ major city
- ▲ volcano
- ✈ airport



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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.

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[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.

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..... [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]

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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.

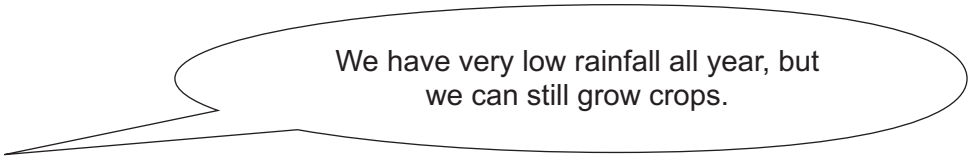
..... km^2 [1]

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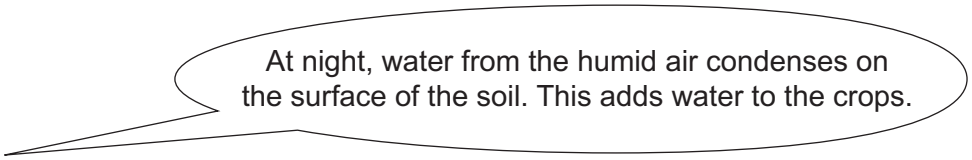
[Turn over

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

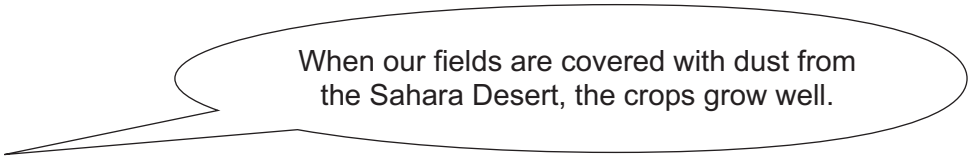
First farmer:



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

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

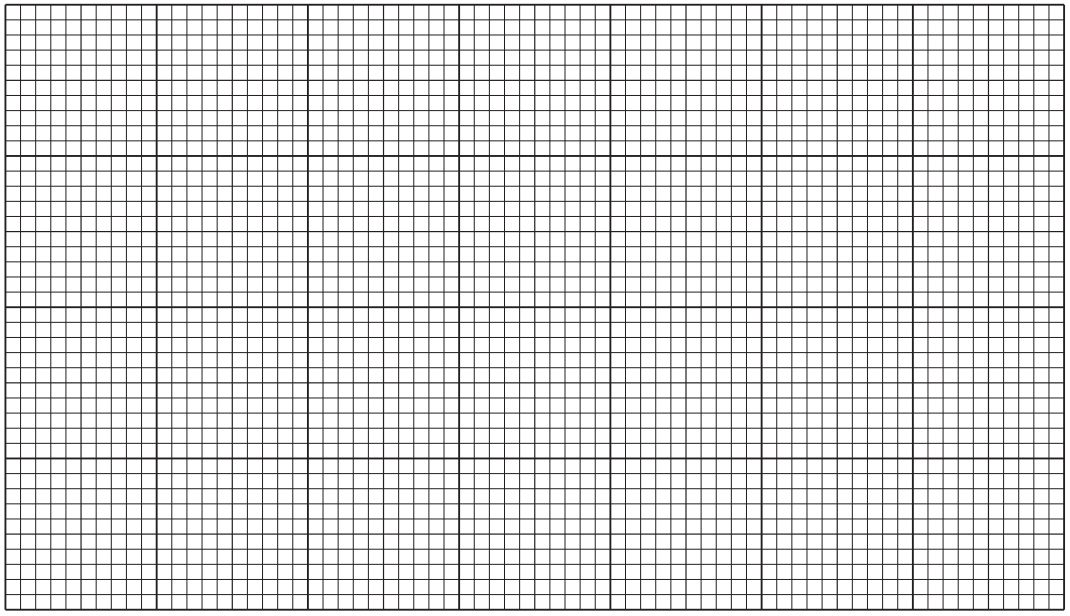
independent variable .....

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.

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.....

..... [2]

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

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..... [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.

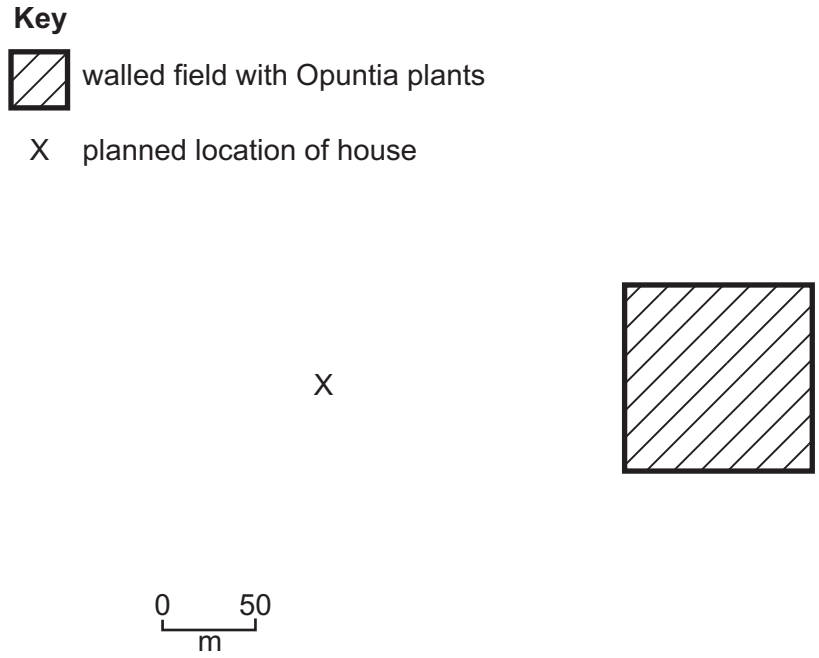
Calculate the distance from the wall that has reduced wind speeds across the soil.

..... 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.

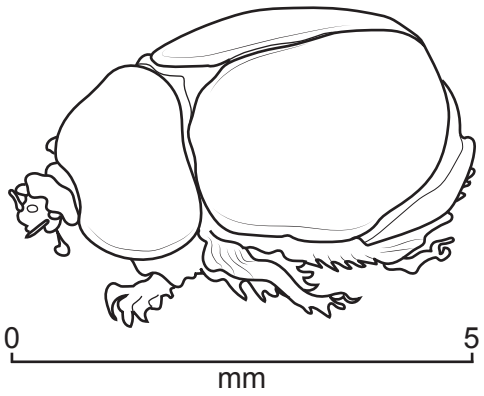
Show your working.

.....

..... [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.

.....

.....

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..... [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.

.....

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..... [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.

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..... [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]

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(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.

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..... [2]

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

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..... [2]

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(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.

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..... [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]

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[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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