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ENVIRONMENTAL MANAGEMENT **0680/22**

Paper 2 Management in Context **October/November 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.

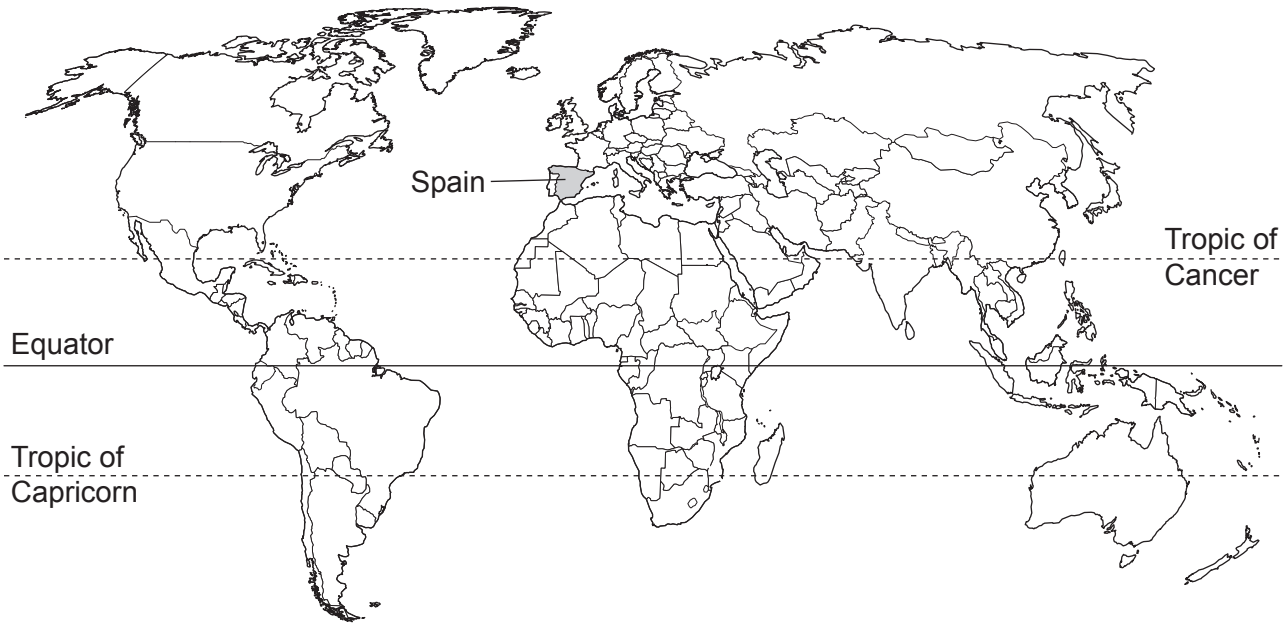
INFORMATION

- 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 **28** pages. Any blank pages are indicated.

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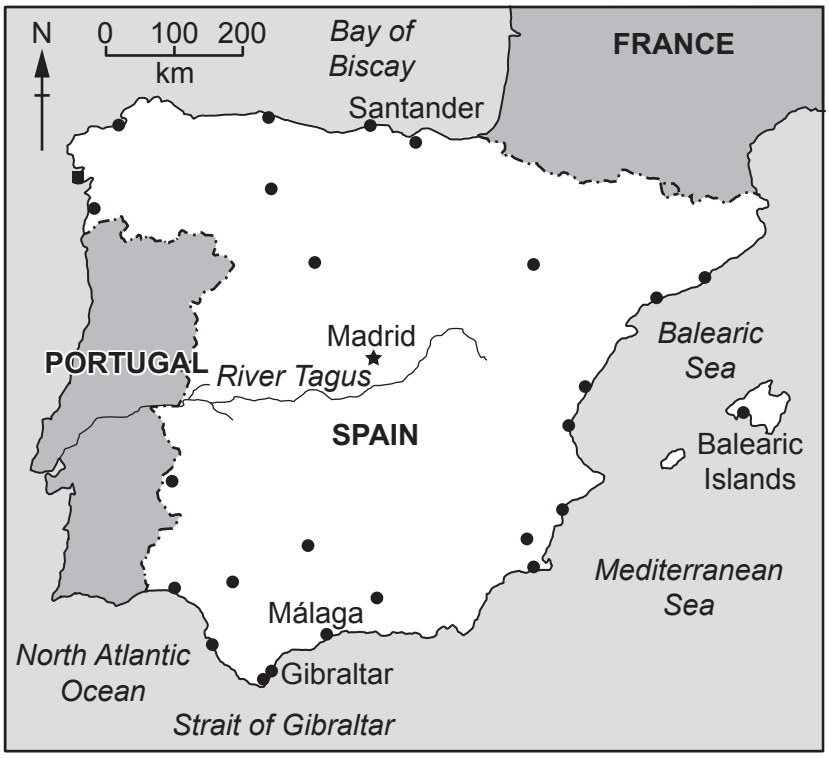
world map showing the location of Spain



map of Spain

Key

- ★ capital city
- ● major city
- ■ sand dune reserve
- river
- international boundary



Area of Spain: 505 370 km^2

Population of Spain: 50 million (in 2020)

Children per woman: 1.51 (in 2020)

Life expectancy: 82 years

Currency: euro (0.92 euro = 1 USD)

Language: Spanish, Catalan, Galician, Basque and other regional languages

Climate of Spain: the north has warm summers with high precipitation and cool winters; the centre has hot, dry summers and cold winters with little precipitation; the south has hot, dry summers and cool winters with high precipitation

Terrain of Spain: large area of high, flat land, surrounded by hills; mountains in the north

Main economic activities of Spain: food production, tourism, metal manufacture, motor vehicles, medicines

Spain suffered severe economic hardship that began in 2008. Since then, the economy has grown, helped by increased exports. Unemployment has fallen but still remains high. 100% of the population have access to electricity. Of the total area of land, 36% is forested and 54% is used for agriculture.

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1 **(a)** In 2020, there were 2 100 000 people working in the agricultural industry in Spain.

(i) Calculate the percentage of the population working in the agricultural industry in 2020.

..... % [1]

(ii) In 2020, 40.4 million people lived in urban areas of Spain.

The rate of urbanisation is increasing by 0.33% each year.

Determine the expected number of people living in urban areas of Spain in 2021.

..... [2]

(iii) Suggest the effects of increasing urbanisation on the agricultural industry.

.....

.....

.....

.....

.....

..... [3]

(iv) People in urban and rural areas of Spain have access to safe drinking water (potable water).

Explain why access to safe drinking water (potable water) is important.

.....

.....

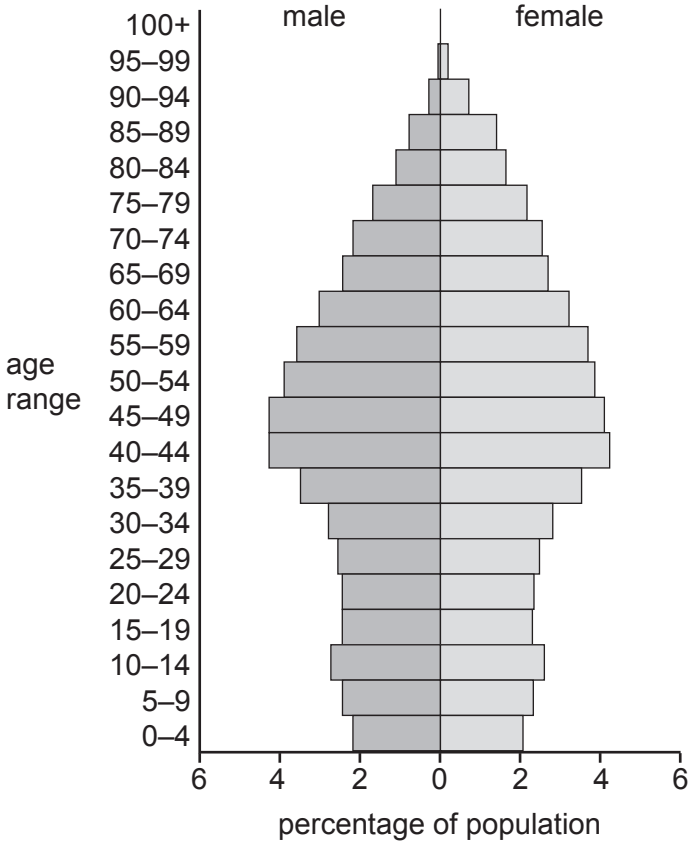
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..... [3]

(b) The diagram shows the population pyramid for Spain in 2020.



(i) Use the population pyramid to compare the population of males and females.

.....

.....

.....

..... [2]

(ii) The population pyramid has a wide middle and a narrow base.

Explain what this shows about the population.

wide middle .....

.....

narrow base .....

.....

[2]

(iii) In the past, Spain had a national population policy that financially rewarded large families and made birth control illegal.

Describe the effect this type of policy has on a population.

.....

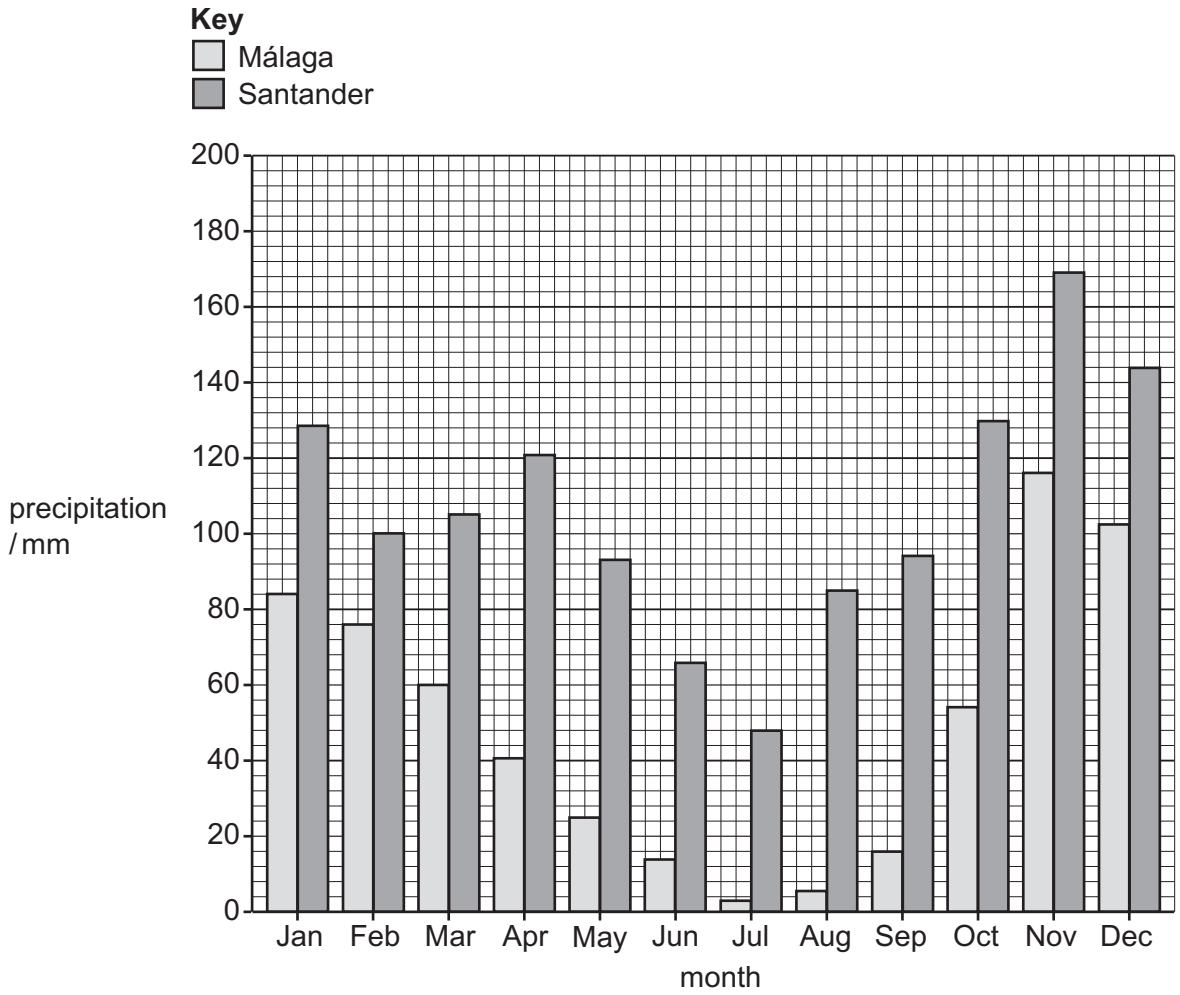
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..... [2]

[Total: 15]

2 **(a)** The bar chart shows the average monthly precipitation over one year for two locations, Málaga and Santander, in Spain.



(i) Suggest reasons why it is difficult to grow vegetables in Málaga throughout the year.

.....

.....

.....

.....

.....

..... [3]

(ii) Calculate the range for precipitation in the Santander location.

..... mm [1]

(iii) The precipitation data are given as averages for each month.

Suggest why averages are used rather than values for each day.

.....

..... [1]

(iv) Soil quality is an important factor in plant growth.

Suggest **one** factor, other than soil quality, that may limit the growth of vegetables at the Santander location.

.....

..... [1]

(b) A farmer analyses two soils, A and B, to find the concentration of mineral ions in parts per million, ppm.

	concentration of mineral ion / ppm		
soil	**nitrate**	**phosphate**	**potassium**
A	14	22	101
B	27	62	63

The concentration of mineral ions in soil is categorised as low if the concentration is within the range shown in the table.

	concentration of mineral ion / ppm		
	nitrate	**phosphate**	**potassium**
low	0–15	0–25	0–60

The farmer has three fertilisers, which contain different percentage compositions of mineral ions.

fertiliser	percentage composition of mineral ion		
	nitrate	**phosphate**	**potassium**
1	34	6	60
2	56	39	5
3	26	28	46

(i) State the **best** fertiliser to use on soil A.

..... [1]

(ii) Phosphorus is needed for plants to flower. A high concentration of nitrogen in the soil prevents plants from flowering.

The farmer grows flowers for export in soil B.

Explain why fertiliser 1 should **not** be used on soil B.

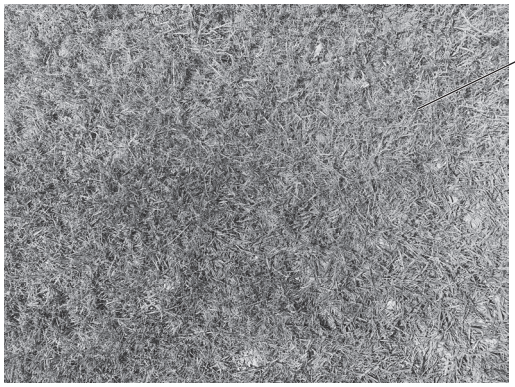
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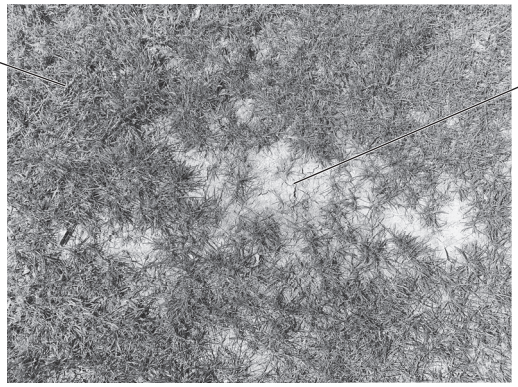
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(iii) The photographs show an area of grass before and after fertiliser is added.

before fertiliser



after fertiliser



Suggest **one** reason for the difference in the appearance of the grass **after** the fertiliser is added.

.....

..... [1]

(iv) Soil B is a clay soil.

Complete the table to describe the characteristics of a clay soil.

characteristic	description
ease of cultivation	....
drainage	....
air content	....

[3]

(c) Trickle drip irrigation is a strategy for sustainable agriculture.

Explain why trickle drip irrigation is an efficient strategy for adding water to the soil.

.....

.....

.....

.....

.....

..... [3]

(d) Some areas of Spain experience regular flooding.

Explain the possible agricultural benefits of regular flooding.

.....

.....

.....

..... [2]

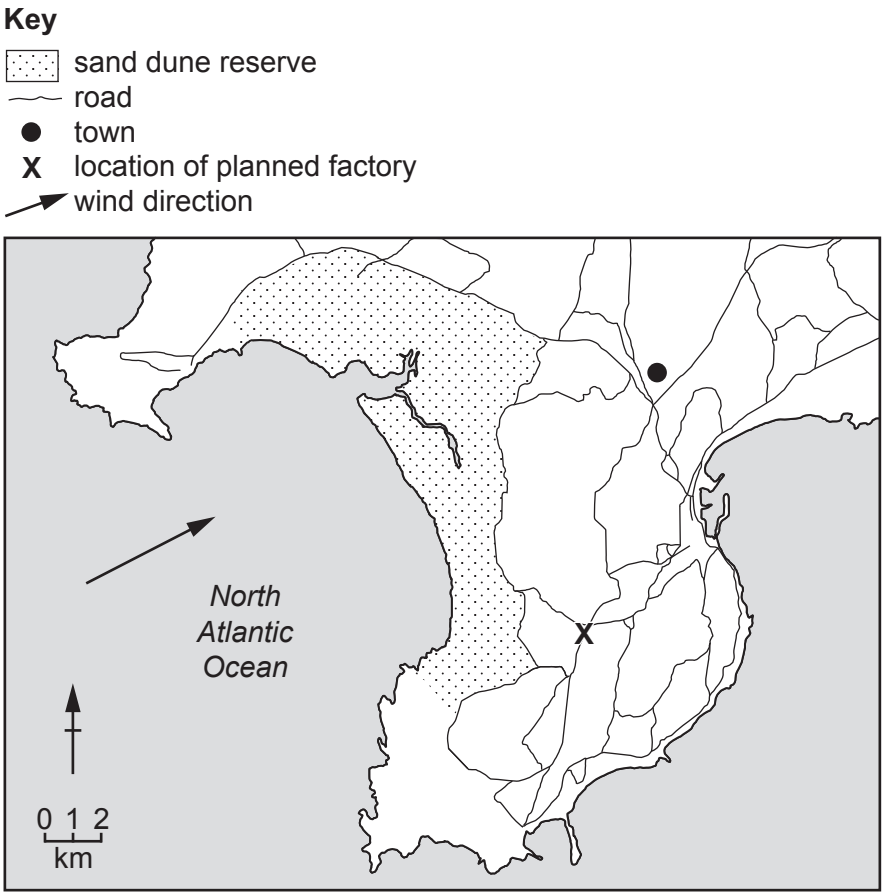
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3 A sand dune is a hill of sand.

The map shows the location of a sand dune reserve between the ocean and land in north west Spain. The reserve is a protected area.

The sand dunes in the reserve reach a height of 20 m above sea level between the sea and the town shown on the map.



(a) (i) A company wants to build a factory at position **X**, shown on the map.

The factory must **not** be closer than a distance of 3.5 km from the sand dune reserve.

Show by calculation why the factory **cannot** be built at position **X**.

.....

..... [2]

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(ii) The company uses a questionnaire to find out local people's views about a new factory.

The company selects 100 people within 15 km of the planned factory.

Describe how the people can be selected using a systematic sampling method.

.....

..... [1]

(iii) Part of the questionnaire the company uses is shown.

	response		
question	**yes**	**no**	**do not know**
Do you want the local area to have better facilities?			
Do you want more money invested in the local area?			

Suggest the limitations of these questions.

.....

.....

.....

..... [2]

(iv) The company must carry out an environmental impact assessment before building any new factories. Part of this assessment is to report local people's views.

State **two** other factors an environmental impact assessment should report on.

1 .....

2 .....
[2]

(b) The photographs show sand dunes at two locations between the sea and the town shown on the map. The photographs were taken on the same day.

location P
10 m inland from the sea



location Q
100 m inland from the sea



The sand dune at location Q has more vegetation cover than the sand dune at location P.

Suggest reasons for this difference.

.....

.....

.....

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.....

..... [3]

(c) Suggest benefits that the sand dune reserve provides to the town shown on the map.

.....

.....

.....

..... [2]

[Total: 12]

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4 **(a)** In 2019, Spain's annual electricity consumption was 239.5 billion kWh. Its electricity production was 258.6 billion kWh.

Suggest a reason why there is a difference in the values for electricity consumption and electricity production.

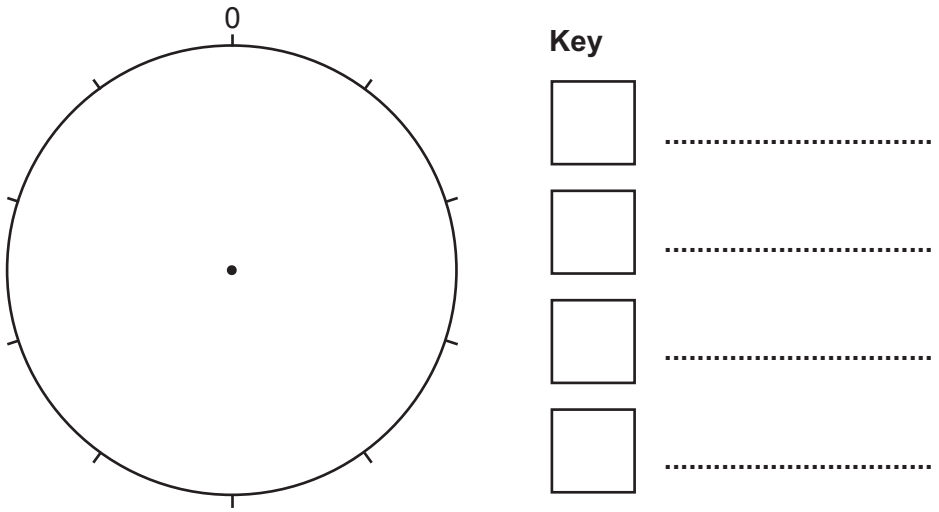
.....

..... [1]

(b) The table shows data about resources used to generate electricity in Spain.

resource	percentage generated
wind power	51
hydroelectric	30
solar	14
thermal	5

(i) Draw a pie chart for this data and complete the key.



[4]

(ii) The photograph shows solar panels used to generate electricity.



Describe the advantages and disadvantages of using solar energy to generate electricity compared with using fossil fuels.

advantages .....

.....

.....

.....

.....

disadvantages .....

.....

.....

.....

.....

[4]

(c) Energy can be obtained from waste cooking oil.

(i) A restaurant uses a machine to convert waste cooking oil into electricity.

1 litre of waste cooking oil provides 0.004 MW of power.

In one week, a restaurant produces 550 litres of waste cooking oil.

Calculate the power provided by the machine in one week at the restaurant.

..... MW [1]

(ii) Explain why using waste cooking oil to generate electricity is a sustainable strategy for managing energy resources.

.....

.....

.....

.....

.....

..... [3]

(d) Most of the oil found in sedimentary rocks north of Madrid has been extracted.

(i) Describe the formation of oil.

.....

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.....

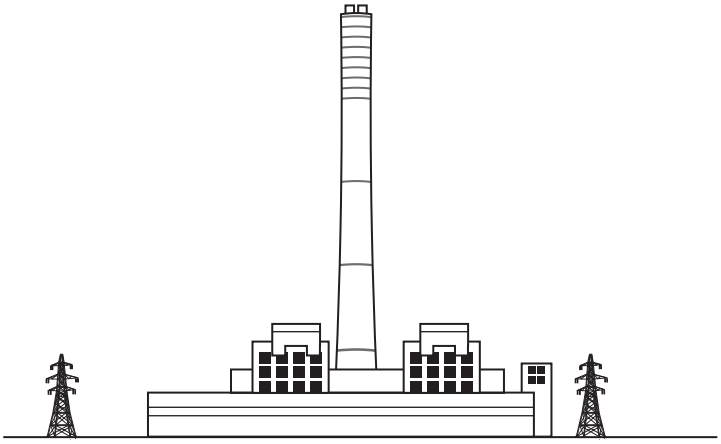
..... [4]

(ii) Oil can contain sulfur impurities.

Name the toxic gas produced from the sulfur impurities in oil when the oil burns.

..... [1]

(iii) The diagram shows a factory burning oil.



Explain why a country 300 km away from the factory is affected by the toxic gas produced from the sulfur impurities.

.....

.....

.....

..... [2]

[Total: 20]

5 Forests cover 36% of the land of Spain.

(a) The photograph shows an area of land that has been cleared of forest for electricity power lines.



State **two** other reasons why land is cleared of forest.

1 .....

2 .....

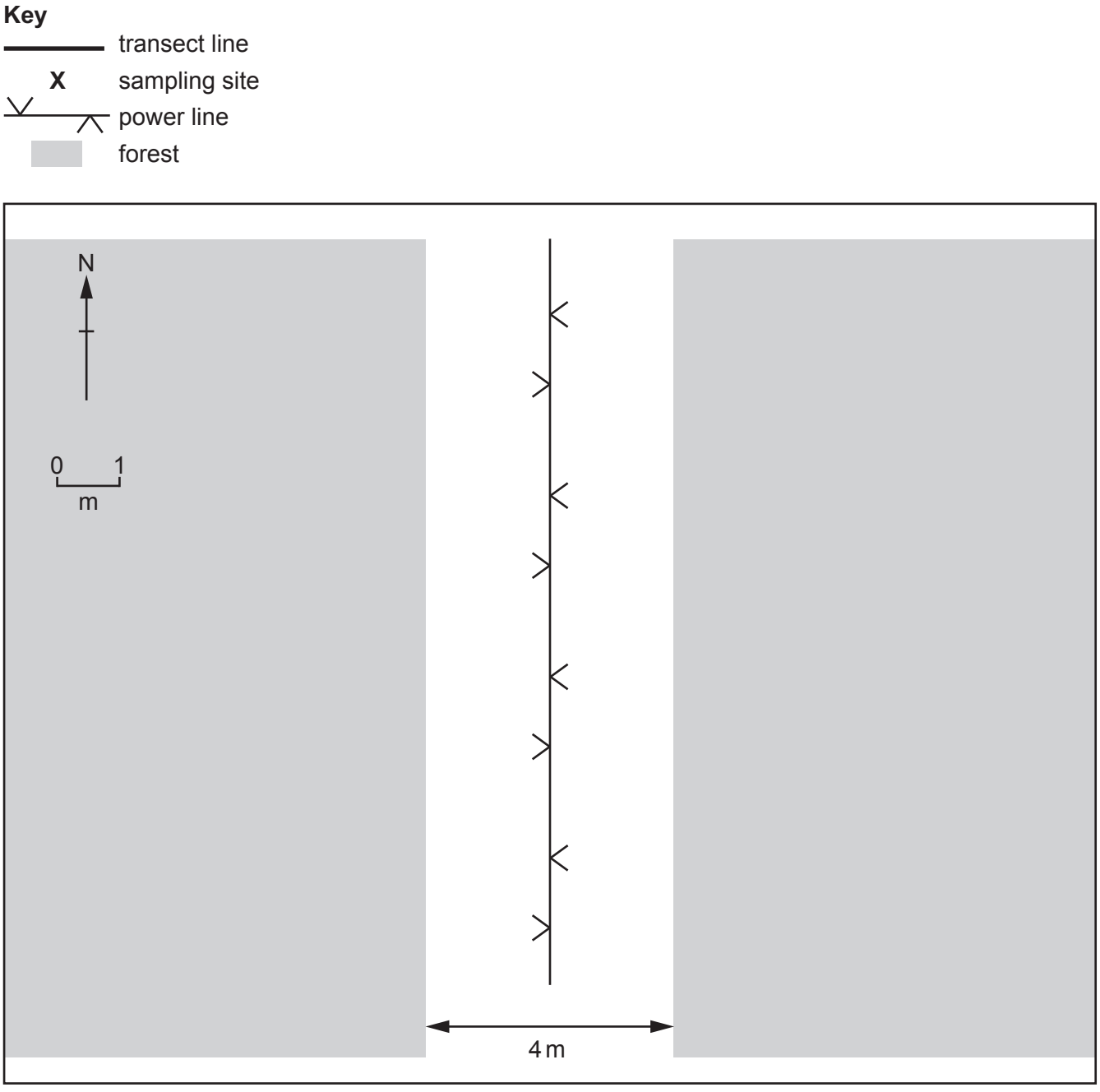
[2]

(b) A scientist wants to investigate if cutting down trees affects the biodiversity of plants.

The scientist:

- makes a 10-metre transect line with a measuring tape
- marks 10 sampling site distances along the transect line
- counts the number of different species of plant that touch the transect line at each mark
- records the number of different species in a table using a tally system.

The diagram shows a plan of the area.



(i) **On the diagram**, draw a suitable position for the transect line.

Use the key to show the position of the sampling sites along the transect line. [3]

(ii) The scientist repeats the investigation with a second transect line.

Some of the results are shown in the table.

Complete the table to show that there are:

- 19 different plant species for transect line 2, sampling site 3
- 3 different plant species for transect line 2, sampling site 7.

	number of different plant species	
sampling site	**transect line 1**	**transect line 2**
1	𝍸 𝍸 𝍸	𝍸 𝍸 𝍸 𝍸 𝍸 II
2	𝍸 𝍸 𝍸	𝍸 𝍸 𝍸 𝍸 𝍸
3	𝍸 𝍸 IIII	
4	𝍸 III	𝍸 II
5	𝍸 III	𝍸 I
6	III	II
7	I	
8	𝍸 𝍸 𝍸	𝍸 𝍸 𝍸 II
9	𝍸 𝍸 𝍸 IIII	𝍸 𝍸 𝍸 𝍸 𝍸 II
10	𝍸 𝍸 𝍸 𝍸	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 II

[2]

(iii) Calculate the average number of different plant species for transect line 1.

Give your answer to **two** significant figures.

..... [2]

(iv) Explain why the investigation should be repeated with more transect lines.

.....

..... [1]

(v) Suggest **one** limitation of using a transect line to determine the number of **animal** species.

.....

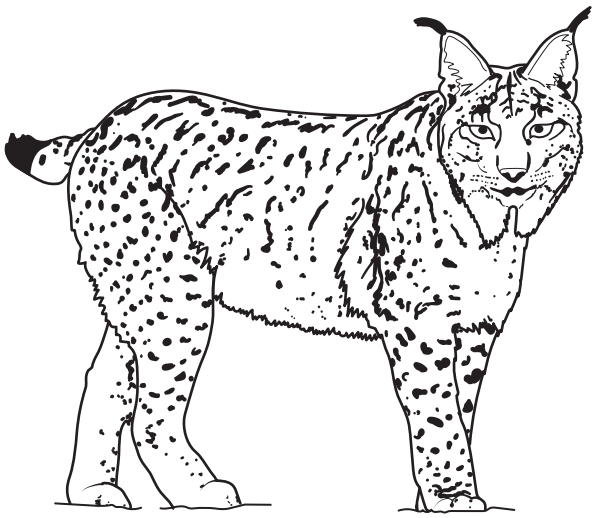
..... [1]

(vi) Suggest **one** limitation of using a pitfall trap to determine the number of **animal** species.

.....

..... [1]

(c) The Iberian lynx is the world's most endangered species of cat.



In 2002, the population of Iberian lynx in the wild was estimated to be 100.

In 2020, this population was estimated to be 955.

(i) Suggest a strategy used to increase the population of wild Iberian lynx.

Explain how this strategy increased the population.

strategy .....

explanation .....

.....

.....

.....

[3]

(ii) Suggest why strategies to increase the population of endangered species must have international agreement to be successful.

.....

..... [1]

[Total: 16]

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