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ENVIRONMENTAL MANAGEMENT **0680/21**

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.

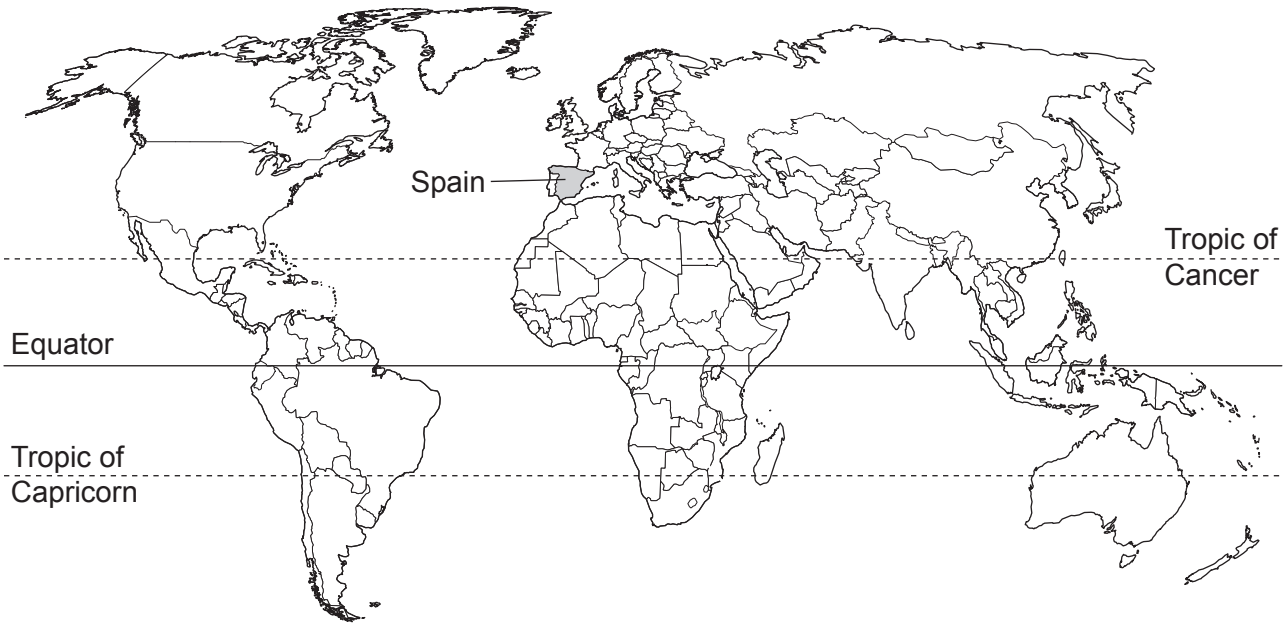
INFORMATION

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

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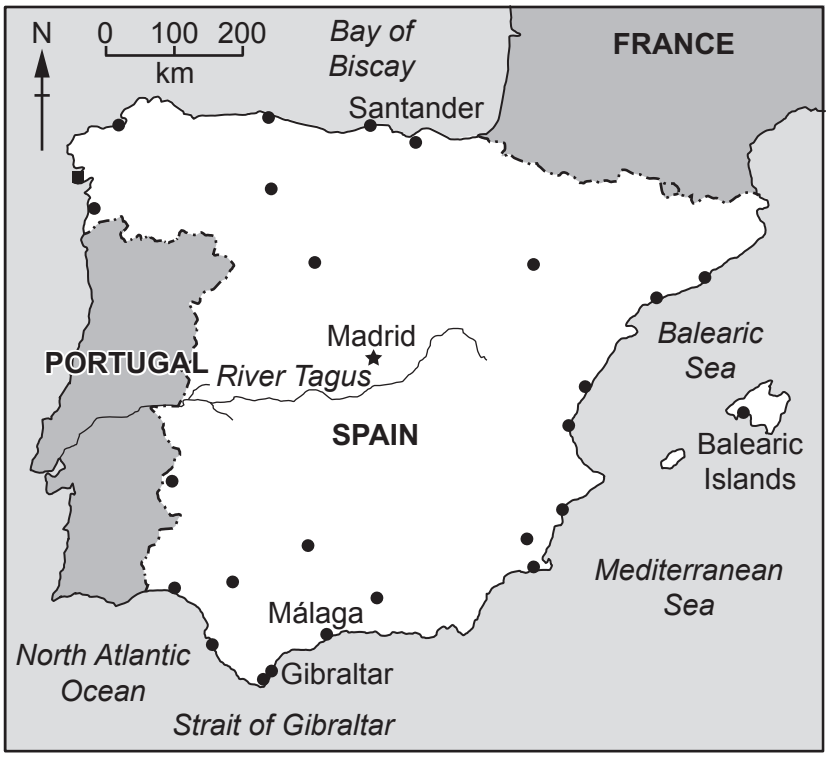
world map showing the location of Spain



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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[Turn over

1 Spain produces many types of food, including vegetables and citrus fruits.

(a) Calculate the area of land used for agriculture in Spain.

..... km^2 [1]

(b) Explain why the climate of Spain is suitable for growing vegetables.

.....

.....

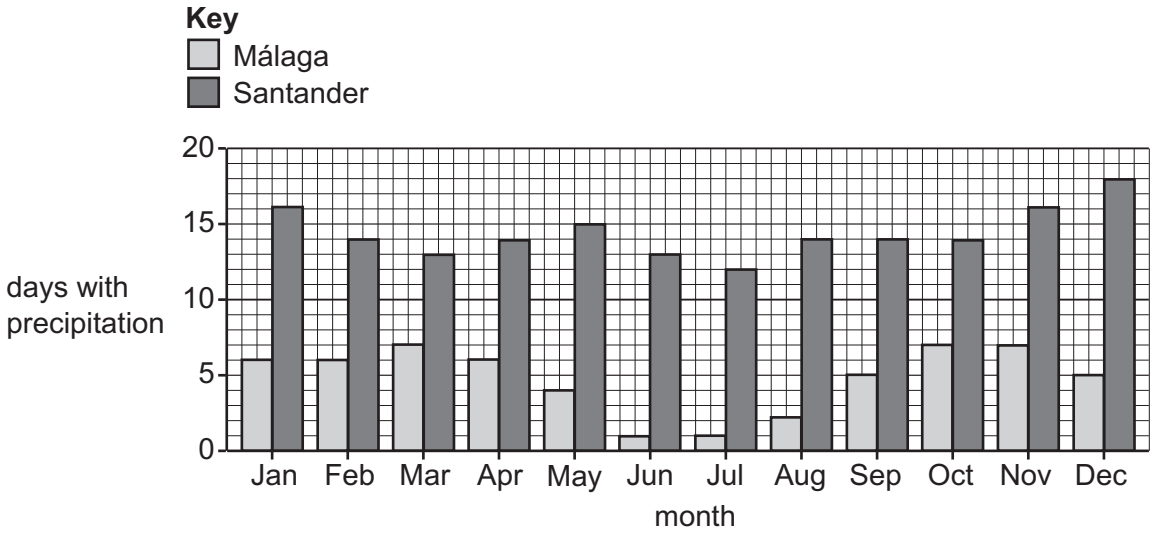
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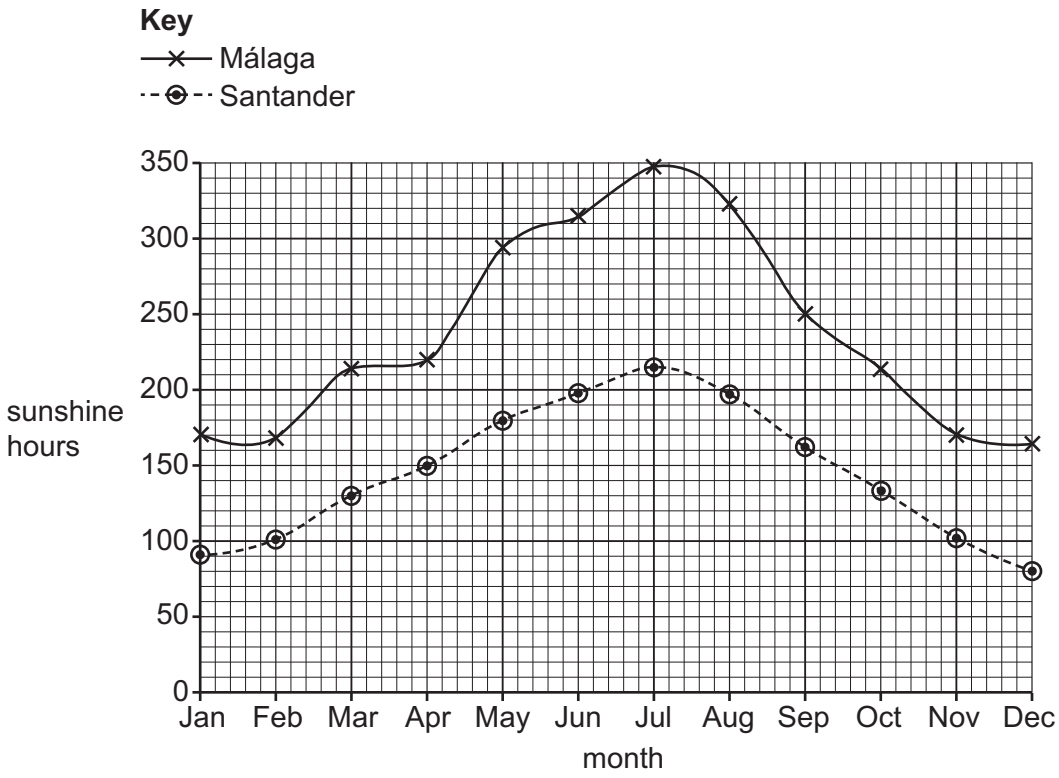
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..... [3]

(c) The bar chart shows the average number of days with precipitation for two locations, Málaga and Santander, in Spain.



The graph shows the average number of sunshine hours per month in the two locations.



Suggest which location, Málaga or Santander, is best suited to growing vegetables.

Use the data to give a reason for your answer.

location .....

reason .....

.....

[1]

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

Soil samples from six locations, A, B, C, D, E and F, were analysed for three mineral ions.

The table shows the concentration of the three mineral ions in parts per million, ppm, for each location.

	concentration of mineral ion / ppm		
location	**nitrate**	**phosphate**	**potassium**
A	14	22	101
B	34	62	63
C	57	33	79
D	28	41	62
E	15	55	71
F	12	21	30

The concentration of mineral ions in soil can be categorised into low, medium or high concentration.

The table shows these three categories.

	concentration of mineral ion / ppm		
	nitrate	**phosphate**	**potassium**
low	0–15	0–25	0–60
medium	16–30	26–50	61–100
high	>30	>50	>100

(i) Corn requires a high concentration of nitrogen in the soil.

State which location, A, B, C, D, E or F, is **best** for growing corn.

..... [1]

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

State which location, A, B, C, D, E or F, is **best** for growing flowering plants.

..... [1]

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(iii) Suggest which location, A, B, C, D, E or F, is **best** for building a factory.

Give a reason for your answer.

location .....

reason .....
[1]

(iv) Calculate the range for the concentration of potassium ions in the soils at the six locations, A, B, C, D, E and F.

..... ppm [1]

(v) Calculate the average nitrate ion concentration of the soils at the six locations, A, B, C, D, E and F.

Give your answer to the nearest whole ppm.

..... ppm [2]

(vi) State how the concentration of mineral ions can be improved in soils.

..... [1]

(vii) Location D has a sandy soil.

Complete the table to describe the characteristics of sandy soil.

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

[3]

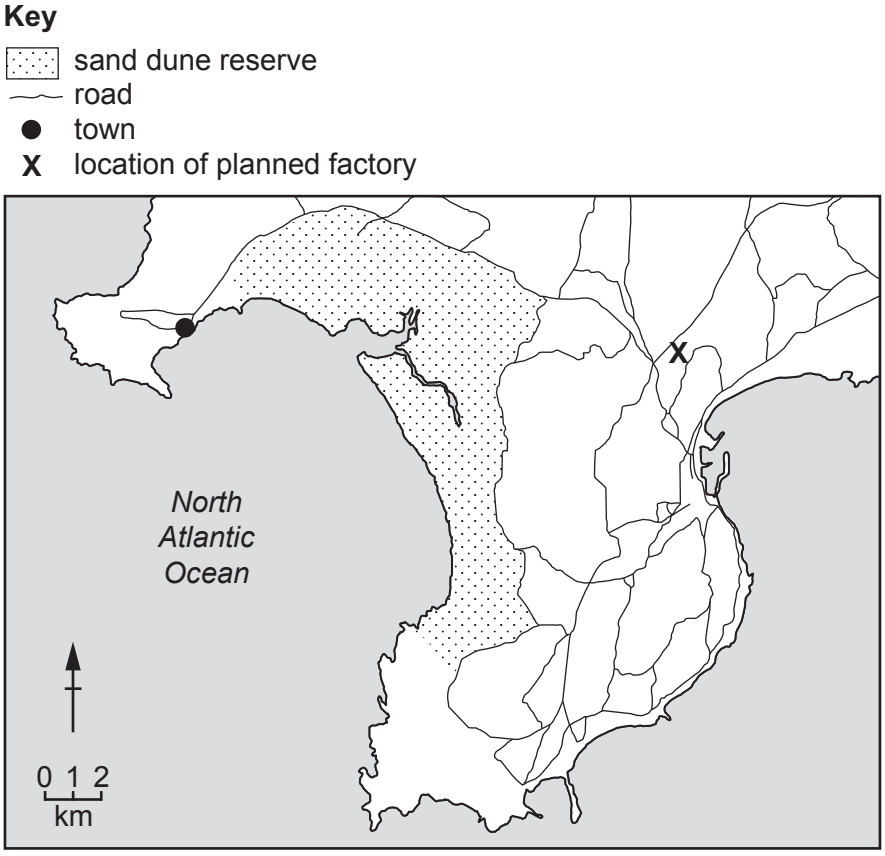
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2 The photograph shows a large sand dune. A sand dune is a hill of sand.



Sand dunes are a barrier between the ocean and the land. They provide a habitat for plants and animals.

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



(a) (i) The sand dune reserve is a 10 km^2 protected area.

People are not allowed to walk on the sand dunes and can be fined 6000 euros if they break this rule.

Suggest reasons why people are **not** allowed to walk on the sand dunes.

.....

.....

.....

..... [2]

(ii) The plants that grow on the sand dunes are adapted to living in this environment.

Suggest how plants are adapted to growing in the sand dunes.

.....

..... [1]

(iii) Explain how climate change is a threat to the sand dunes.

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..... [4]

(iv) In the past, sand was removed from the sand dunes to be used in many different industries.

State why this was **not** a sustainable practice.

.....

..... [1]

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(b) (i) Sandstone is a type of sedimentary rock.

The table shows the characteristics of three rocks, T, U and V.

Tick (✓) all the rocks that are sedimentary.

rock	characteristic	sedimentary rock tick (✓)
T	contains fossils	
U	contains small crystals	
V	contains layers	

[1]

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

The factory must be a distance more than 3.5 km from the sand dune reserve.

Show by calculation why the factory can be built at location **X**.

.....

..... [2]

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

The company sends the questionnaire to every woman within 100 km of the planned factory location.

Describe the limitations of this method.

.....

.....

.....

..... [2]

(iv) All the questions on the questionnaire require a yes or no answer.

Explain why yes or no answers are used on questionnaires.

.....

..... [1]

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(v) The results of the questionnaire indicate that most local people want the new factory to be built.

However, some local people are concerned the factory will damage the ecosystem of the sand dunes.

Suggest why most local people want the factory to be built even though it may damage the ecosystem of the sand dunes.

.....

.....

.....

..... [2]

(c) A scientist uses a 10-metre transect line to investigate biodiversity of plants in the sand dune reserve.

(i) Describe a method the scientist can use to determine the number of plant species along the 10-metre transect line in the sand dune reserve.

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..... [4]

(ii) The scientist samples five transect lines.

The results are shown in the table.

transect line	number of species recorded
1	8
2	9
3	7
4	6
5	5
average	7

Suggest reasons why using the data in the table is likely to give an underestimate of the total number of species in the 10 km^2 sand dune reserve.

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..... [3]

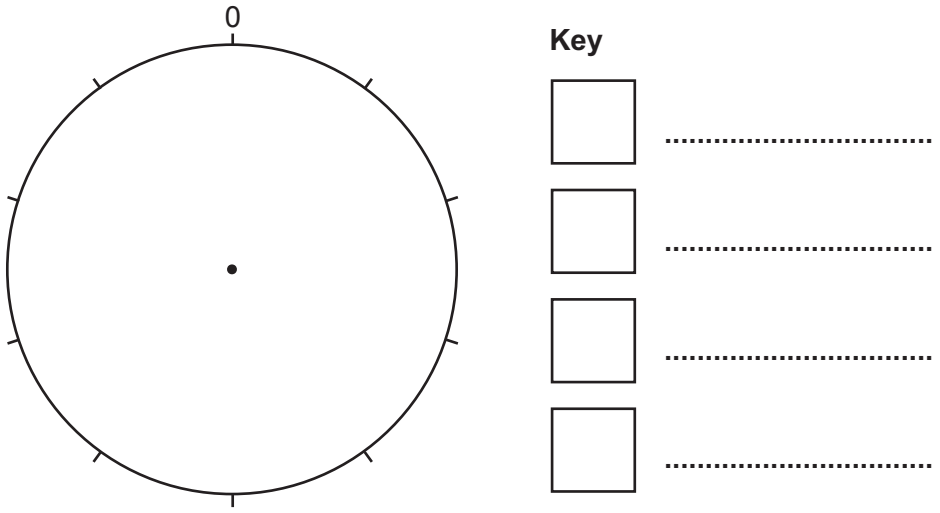
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3 **(a)** The table shows data about resources used to generate electricity in Spain.

resource	percentage generated
fossil fuel	47
hydroelectric	14
nuclear	7
other renewable	32

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



[4]

(ii) In 2019, Spain imported 21.85 billion kWh of electricity.

Suggest reasons why countries import electricity.

.....

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..... [2]

(iii) Suggest **one** disadvantage of importing electricity.

.....

..... [1]

(iv) The photograph shows a wind turbine used to generate electricity.



Describe advantages and disadvantages of using wind turbines to generate electricity compared with using fossil fuels.

advantages .....

.....

.....

.....

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disadvantages .....

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[4]

(b) Globally, 23 million tonnes of waste oil are produced a year. 95% of this oil is burned or buried in landfill sites.

(i) Suggest the problems with disposing of waste oil.

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..... [4]

(ii) A machine converts waste oil into useful fuel.

This machine processes 1000 litres of waste oil a day.

1 litre of waste oil produces 0.9 litres of useful fuel.

Determine the volume of useful fuel that the machine produces in one day.

..... litres [1]

(c) Describe strategies for the efficient management of existing energy resources.

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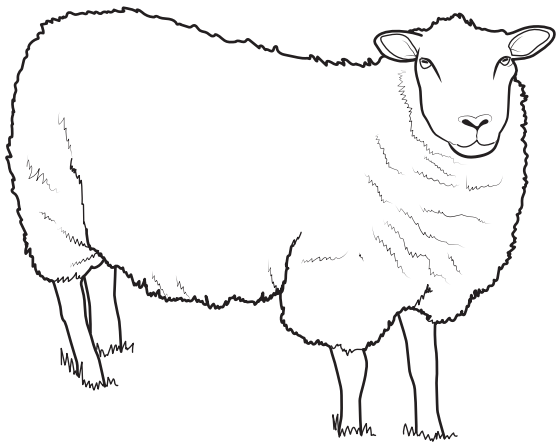
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[Total: 20]

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4 Sheep are farmed in Spain.



(a) A farmer investigates the best diet for sheep.

The farmer puts an equal number of sheep into three equal-sized fields, P, Q and R.

Each field contains plants that the sheep graze for food.

The average mass of sheep in each field after one year is shown in the table.

field	plants in field	average mass of sheep / kg
P	clover and grass	98
Q	grass	45
R	alfalfa and grass	72

Write a conclusion for this investigation.

.....

.....

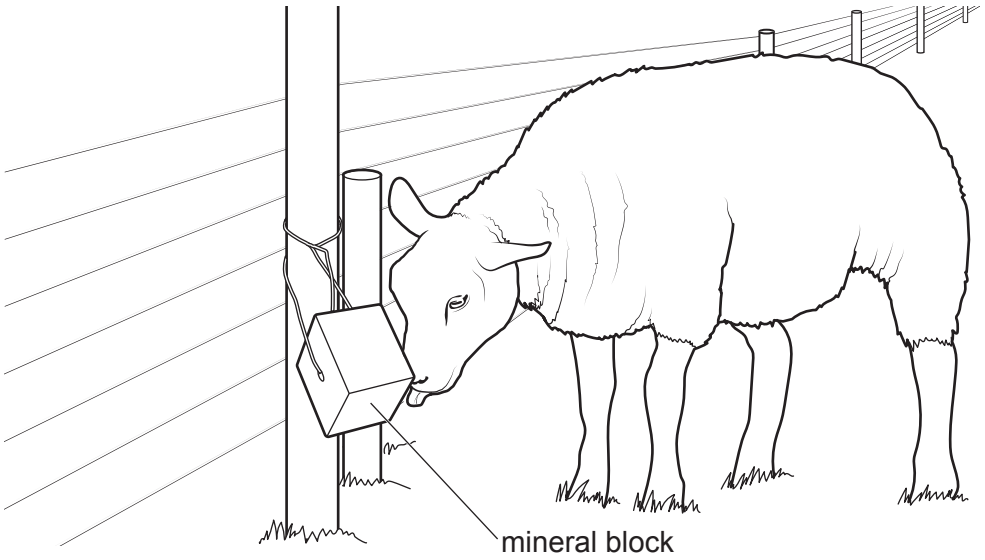
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(b) The farmer wants to investigate the effect of using a mineral block as part of the sheep's diet.

Mineral blocks are licked by the sheep.



The farmer uses six sheep in the investigation.

At the start of the investigation, the six sheep graze in the same field. A mineral block is then added to their diet for one year in the same field.

The results are shown in the table.

sheep	mass of sheep at start of investigation / kg	mass of sheep after mineral block added / kg
1	32	40
2	75	75
3	101	101
4	47	49
5	59	61
6	23	42

(i) Suggest a reason for the results for sheep 2 and sheep 3.

.....

..... [1]

(ii) Suggest whether the farmer should use a mineral block for **all** sheep.

Use data from the table to give a reason for your answer.

.....

..... [1]

(iii) Copper is toxic to sheep.

Suggest what happens to the sheep if copper is included in the mineral block.

..... [1]

(iv) Describe a selective breeding method to increase the mass of sheep.

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..... [4]

(c) The photograph shows an area of deforested land in northern Spain.



(i) One cause of deforestation is sheep farming.

State **three** other causes of deforestation.

1 .....

2 .....

3 .....

[3]

(ii) Explain the impacts of deforestation on the carbon cycle.

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..... [4]

(d) Approximately 200 European brown bears live in the mountains of northern Spain.

European brown bears can live for 30 years, but their average life expectancy in the wild is only 6 years. The bears are protected by law in most European countries but are still a threatened species.

The map shows the location and population of brown bears in Europe.

Content removed due to copyright restrictions.

(i) Suggest reasons for the decreasing numbers of European brown bears.

Use the map to support your answer.

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..... [4]

(ii) Describe how captive breeding programmes can increase the number of European brown bears.

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..... [2]

[Total: 22]

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