Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

2344507302

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

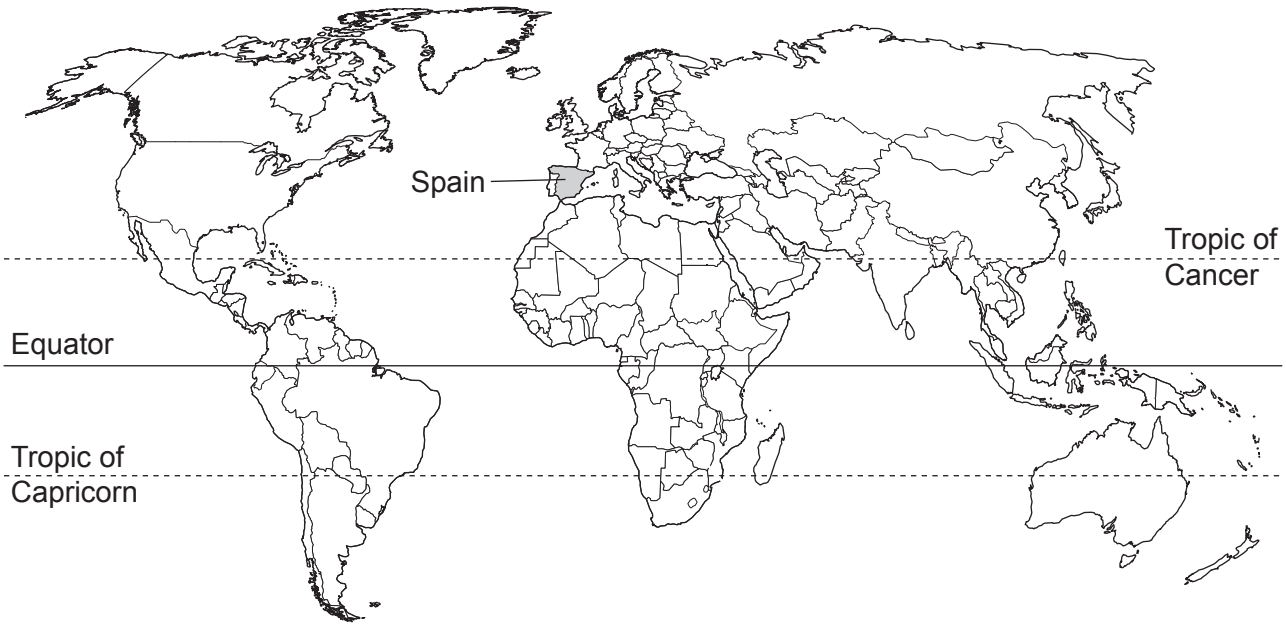
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction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

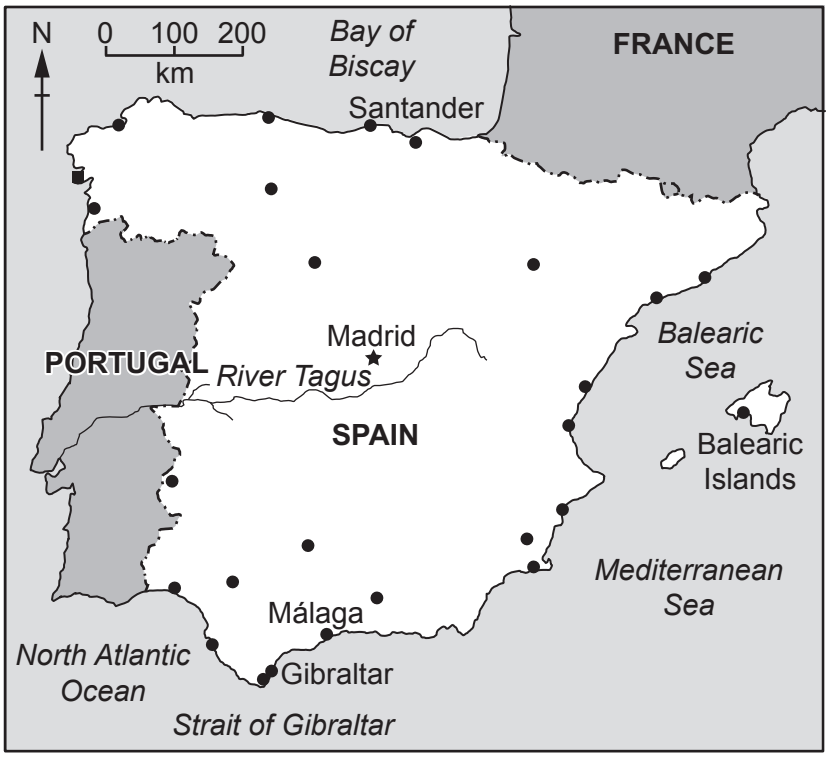
world map showing the location of Spain



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.

[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.

.....

.....

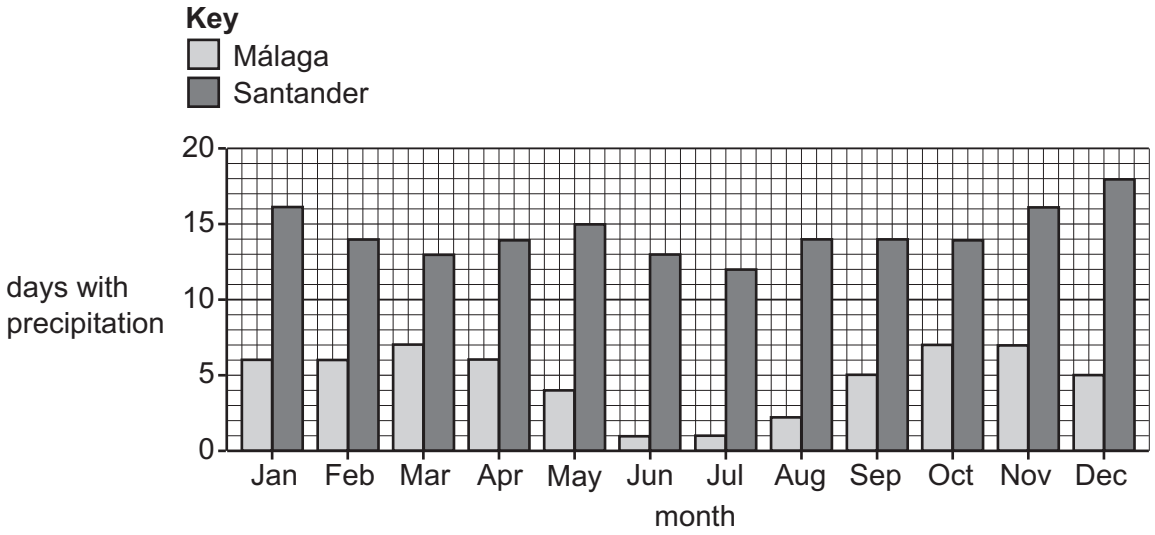
.....

.....

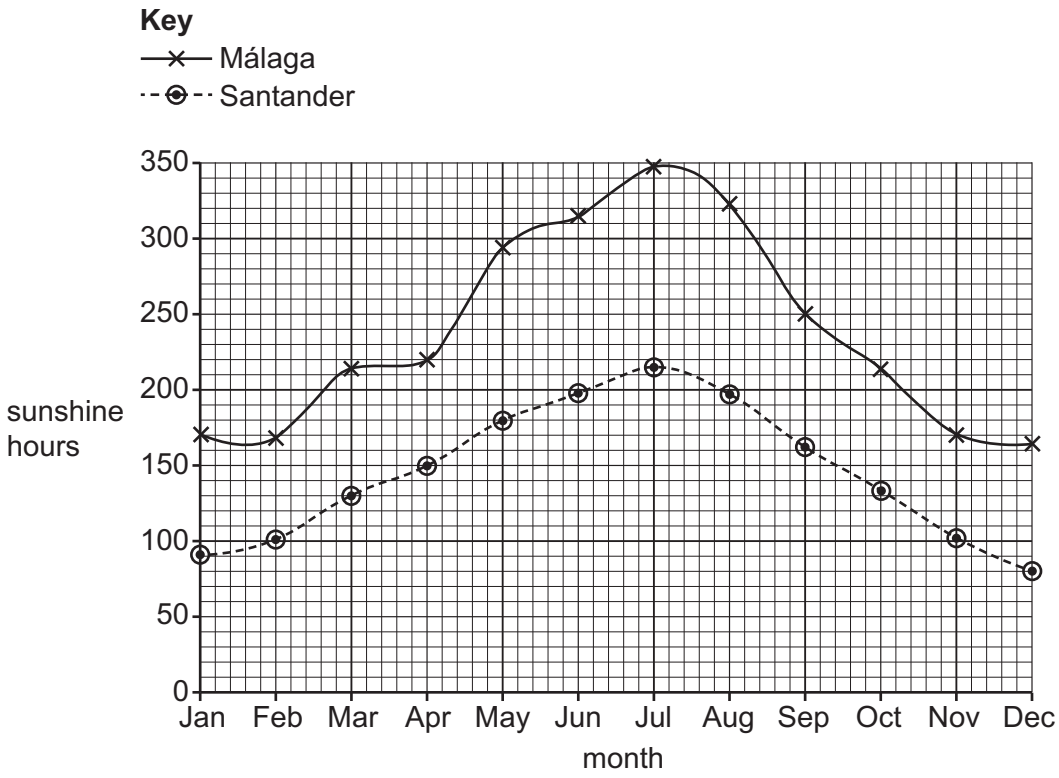
.....

..... [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]

(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	....

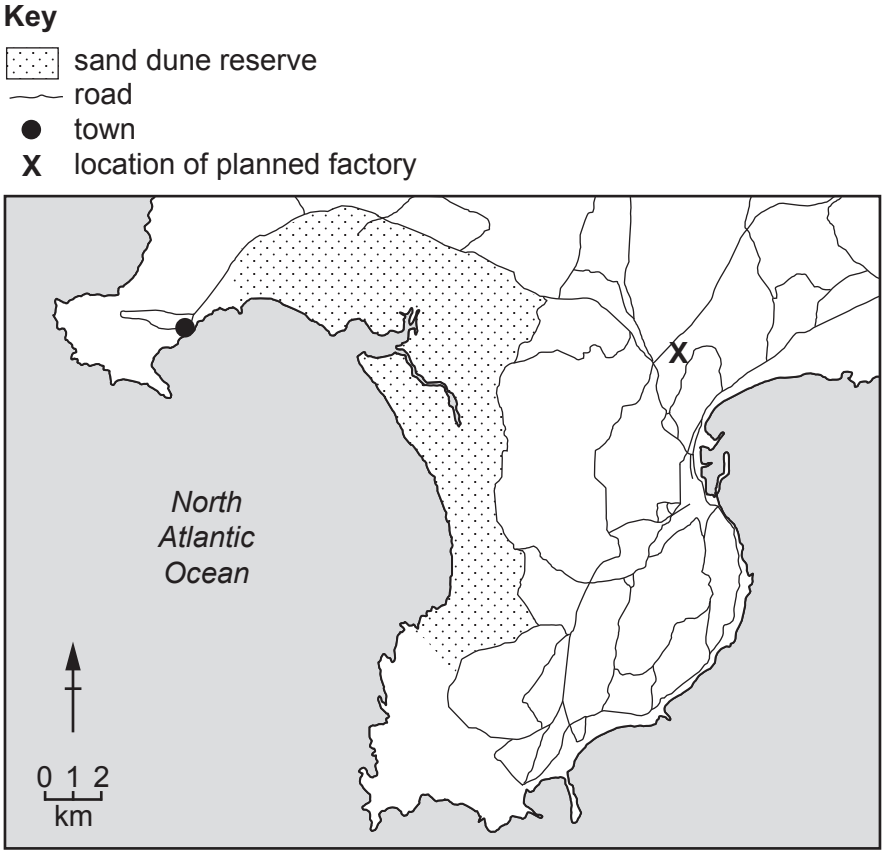
[3]

[Total: 15]

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.

.....

.....

.....

.....

.....

.....

.....

..... [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]

(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]

(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.

.....

.....

.....

.....

.....

.....

.....

..... [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.

.....

.....

.....

.....

.....

..... [3]

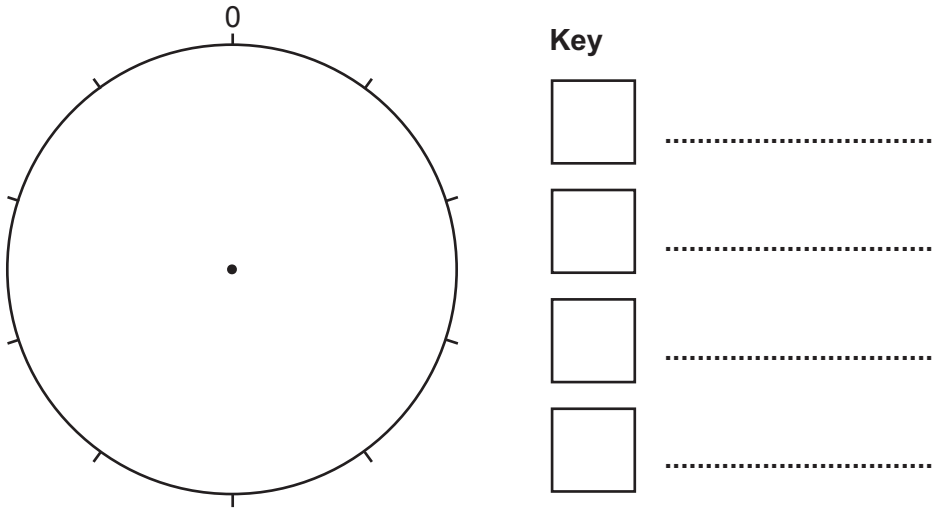
[Total: 23]

BLANK PAGE

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.

.....

.....

.....

..... [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 .....

.....

.....

.....

.....

disadvantages .....

.....

.....

.....

.....

[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.

.....

.....

.....

.....

.....

..... [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.

.....

.....

.....

.....

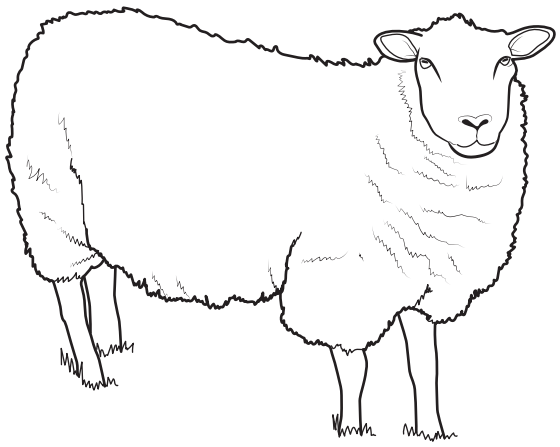
.....

..... [4]

[Total: 20]

BLANK PAGE

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.

.....

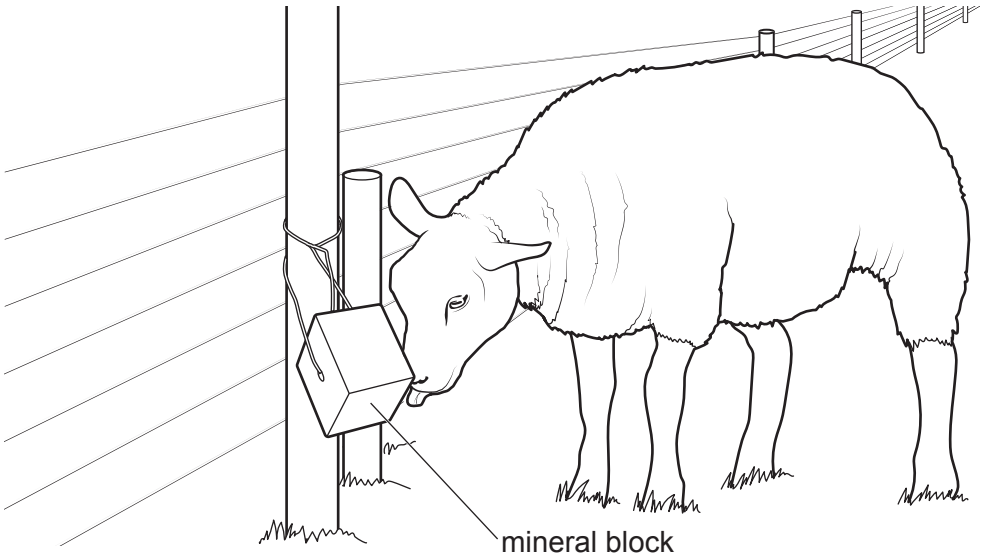
.....

.....

..... [2]

(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.

.....

.....

.....

.....

.....

.....

.....

..... [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.

.....

.....

.....

.....

.....

.....

.....

..... [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.

.....

.....

.....

.....

.....

.....

.....

..... [4]

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

.....

.....

.....

..... [2]

[Total: 22]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

ENVIRONMENTAL MANAGEMENT **0680/21**

Paper 2 Management in Context **October/November 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 October/November 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level 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)	272 899.8 / 272 900;	**1**
1(b)	*any three from:* hot / warm / high temperatures (for growth); high rainfall (for growth); (conditions suitable for) photosynthesis / stated equation / to produce glucose; irrigation / water can be stored;	**3**
1(c)	Malaga **AND** more or twice number of sunshine hours ; **OR** Santander **AND** rain all year round / Málaga has little rain in June and July ;	**1**
1(d)(i)	**C**;	**1**
1(d)(ii)	**E**;	**1**
1(d)(iii)	**F AND** low concentration or less of all three ions / not fertile / not suitable for agriculture;	**1**
1(d)(iv)	71;	**1**
1(d)(v)	160 ÷ 6 **or** 26.6 / 26.7 26.67; 27;	**2**
1(d)(vi)	fertiliser / organic matter / crop rotation / plant legumes;	**1**
1(d)(vii)	*ease of cultivation*: easy / quickly loses nutrients / low nutrient value; *drainage*: quick / fast / good / high / does not hold water; *air content*: high / good / holds a lot of air;	**3**

Question	Answer	Marks
2(a)(i)	*any two from:* trampling / dunes could collapse ; kills or disturbs, plants / animals; loss of habitat(s) ; loss of some species / extinctions; may drop litter; introduces invasive species; AVP;	**2**
2(a)(ii)	*any one from:* salt-tolerant; drought-tolerant / plants conserve or store water; wind-resistant; deep roots / wide roots; fast growing, plants / roots ;	**1**
2(a)(iii)	*any four from:* increase temperatures; leads to melting of ice caps / increased sea level; leads to flooding / sea covers sand dunes / dunes drown ; leads to (conditions that favour) invasive species extreme weather; leads to stronger winds / storms; leads to increased waves; erosion of sand; more salt on plants; greater competition (for resources); can't adapt fast enough / conditions are too extreme;	**4**
2(a)(iv)	compromised the ability of future generations to meet their own needs / didn't leave sand for future (generations) ;	**1**

Question	Answer	Marks
2(b)(i)	T AND V ticked;	**1**
2(b)(ii)	(scale is) 1 km = 0.4 (cm) OR 2 km = 0.8 (cm) OR (in cm **X** to nearest sand dune) = range 1.7 to 1.9 (cm) (distance is) range 4.2 to 5.0 (km);	**2**
2(b)(iii)	*any two from:* only women questioned / not a representative sample ; leads to biased results; too much data; will be expensive to conduct / analyse;	**2**
2(b)(iv)	*any one from:* easier / quicker, to collect or analyse or process answers; consistency of answer; limits possible answers;	**1**
2(b)(v)	*any two from:* employment; improvement in local or national economy; improvement in facilities / infrastructure;	**2**

Question	Answer	Marks
2(c)(i)	*any four from:* *use of transect and quadrat:* divide the transect, systematically / in equal distances / stated distances; defined size of quadrat, e.g. 25 cm × 25 cm, 50 cm × 50 cm, 1 m × 1 m; count the number of plant species, every stated distance / in quadrat; *recording and processing data:* record the results, in a table / using a tally; use a book to identify species; repeat **and** take a mean;	**4**
2(c)(ii)	*any three from:* the method only covers five (small) areas; five transects are not representative; lot of sand dune not sampled; plants not evenly distributed; longer transect needed (across whole area); AVP;	**3**

Question	Answer	Marks
3(a)(i)	sectors in clockwise rank order; largest first starting at 'noon'; correct plotting ±4°; key competed and matches sector shading;	**4**
3(a)(ii)	*any two from:* cannot meet demand due to increased population; cost / shortage, of fossil fuels; lack, of renewables; cheaper to import than to generate;	**2**
3(a)(iii)	*any one from:* economic impact / cost; lack of energy security or described;	**1**
3(a)(iv)	*max [3] advantages or disadvantages* renewable; does not emit CO_2 (at point of use); so does not contribute to climate change; does not emit SO_2 / NOx; so does not contribute to acid rain; land around wind turbines can still be used; *disadvantages:;* not suitable if no wind or not strong / powerful enough; wind needs back up generation; turbines in area of natural beauty / visual / noise pollution;	**4**

Question	Answer	Marks
3(b)(i)	*any four from:* buried in landfill takes up takes space; oil, leakage / spillage; toxic (to humans/animals); named toxin: benzene / lead / chromium / arsenic / dioxins / heavy metals; burning produces atmospheric pollution; named pollutant CO_2 / NOx / VOCs, / SO_2 / hydrocarbons / CO / smoke / particulates; named effect on human health, e.g. cancer risk / damage liver / respiratory problems / skin irritation ; (oil) contaminates / pollutes, land / soil / water animals, suffocate / covered in oil or reduces development of animals; disrupts, food supply / food chain / ecosystems;	**4**
3(b)(ii)	900 (litres);	**1**
3(c)	*any four from:* reduce consumption; by turning off electrical devices; insulation of homes / name example; use energy efficient devices / vehicles; educate people on energy consumption; invest in / use more, renewables; increase taxes on fossil fuels; recycle to reduce energy use / stated example; generating electricity from waste products;	**4**

Question	Answer	Marks
4(a)	(plants in field) **P** / clover AND grass (best diet); sheep had greatest mass; **OR** (plants in field) **Q** / grass only (worst diet); sheep had least mass;	**2**
4(b)(i)	already had sufficient minerals in their diet (so not licking block) / did not use lick / already fully grown do not grow any bigger;	**1**
4(b)(ii)	*any one from:* no **AND** limited increase in mass /no effect on some sheep; yes **AND** all but two / most, sheep increased in mass; AVP;	**1**
4(b)(iii)	*any one from:* sheep, become ill / die / stop growing; mass, decreases / stops increasing ;	**1**
4(b)(iv)	select (two) sheep with the greatest mass; breed the sheep; choose offspring with the greatest mass; repeat / breed these offspring;	**4**
4(c)(i)	*any three from:* timber extraction / logging; roads; urbanisation / homes / industry; rock / mineral extraction; fuel;	**3**

Question	Answer	Marks
4(c)(ii)	*any four from:* reduction in photosynthesis; (trees act as) carbon sink or store; fewer young or growing trees to remove / fewer mature trees store so more CO_2 or carbon ; change in decomposition (of leaves); change in carbon added to the ground; (deforestation leads to) increased carbon dioxide in atmosphere ; imbalance between respiration and photosynthesis; AVP;	**4**
4(d)(i)	*any four from:* populations dispersed / isolated areas; small areas can only support small populations; no safe corridors between populations; leads to limited breeding; limited numbers / limited gene pool; reduced habitat / deforestation; leads to limited food sources; (illegal) hunting; limited protected areas / protection laws not enforced; disease; climate change and stated impact, e.g. lack of food	**4**
4(d)(ii)	*any two from:* young less likely to die from disease / access to vaccination; other stated medical support; breeding support / increased gene pool; no threat from predators / hunting / poaching ; not released into the wild until mature / strong; no lack food / good food supply; AVP;	**2**