



CANDIDATE  
NAME

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CENTRE  
NUMBER

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CANDIDATE  
NUMBER

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## 0680/21

October/November 2023

**1 hour 45 minutes**

No additional materials are needed.

- 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.

- 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 the United Kingdom (UK)



### map of the United Kingdom (UK)

#### Key

- ★ capital city
- national border
- international border



**Area of the UK:** 243 610 km<sup>2</sup>

**Population of the UK:** 66 million (in 2021)

**Children per woman:** 1.86 (in 2021)

**Life expectancy:** 81.3 years

**Currency:** GBP (1 GBP = 1.39 USD)

**Language:** English, regional languages

**Climate of the UK:** cool, wet winters and warm, wet summers; wetter in the west, colder in the north

**Terrain of the UK:** hills and mountains in the north and west with lower land around the coast and in the south and east of England

**Main economic activities of the UK:** financial and business services, food production, manufacturing and tourism

The United Kingdom consists of four countries: England, Scotland, Wales and Northern Ireland. The UK is one of the largest economies in Europe. 100% of the country's population have access to good sanitation and electricity supply. In recent years, air pollution has improved but remains a concern in cities. Marine and coastal habitats are under threat from housing, tourism and industry.

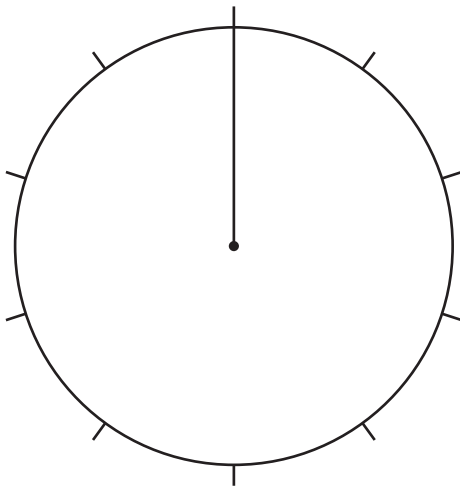
- 1 (a) The table shows the percentage of total land area for different types of land use in the UK.

land use	percentage of total land area of the UK
pasture	46
arable	25
forest	12
other	17

- (i) Calculate the total area of land in the UK used for pasture and arable.

..... km<sup>2</sup> [2]

- (ii) Plot the data in the table as a pie chart and complete the key.



**Key**



.....



.....



.....



.....

[4]

(b) Most farmers in the UK use intensive agricultural practices.

Approximately 2% of the working population are involved in agriculture.

Agricultural practices produce 60% of the UK's food needs.

(i) State **three** intensive agricultural practices.

1 .....

2 .....

3 .....

[3]

(ii) State the benefits and negative impacts of intensive agricultural practices.

benefits .....

.....

.....

.....

.....

negative impacts .....

.....

.....

.....

.....

[4]

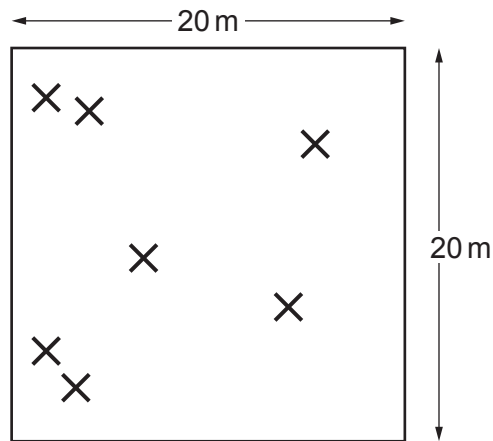
(c) A farmer is concerned about the mineral ion content of the soil in a field.

The farmer collects seven soil samples from the field.

The diagram shows the locations of the seven sampling points.

**Key**

✕ sampling point



State the type of sampling method shown in the diagram.

..... [1]

(d) The farmer uses this method to collect the seven soil samples:

- Record the weather conditions on the sampling day.
- Collect a 100 g soil sample.
- Pass the soil sample through a 2 mm sieve.
- Dry the soil sample.
- Put all seven soil samples into a large container and mix the samples together.
- Analyse the soil in the large container for mineral ion content.

(i) Suggest **one** reason why the soil samples are passed through a 2 mm sieve.

.....  
..... [1]

(ii) The soil samples are dried to remove the water.

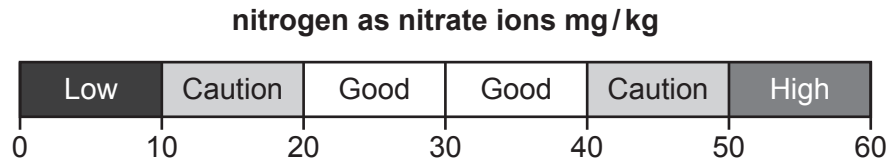
Suggest **one** reason why the water is removed.

.....  
..... [1]

(iii) Suggest **one** reason why all seven soil samples are put into the same large container before being analysed.

.....  
..... [1]

- (e) The diagram shows the chart the farmer uses to analyse the soil sample result for nitrate ions.



- (i) Describe the impact on the environment if a soil has a reading of 53 mg/kg for nitrate ions.

.....

.....

.....

.....

.....

..... [3]

- (ii) State the impact on agricultural yields if a soil has a reading of 5 mg/kg for nitrate ions.

.....

..... [1]



(f) The farmer writes a list of some of the components of soil.

Add **three** other components of soil to the list.

- mineral particles
- mineral ions
- .....
- .....
- .....

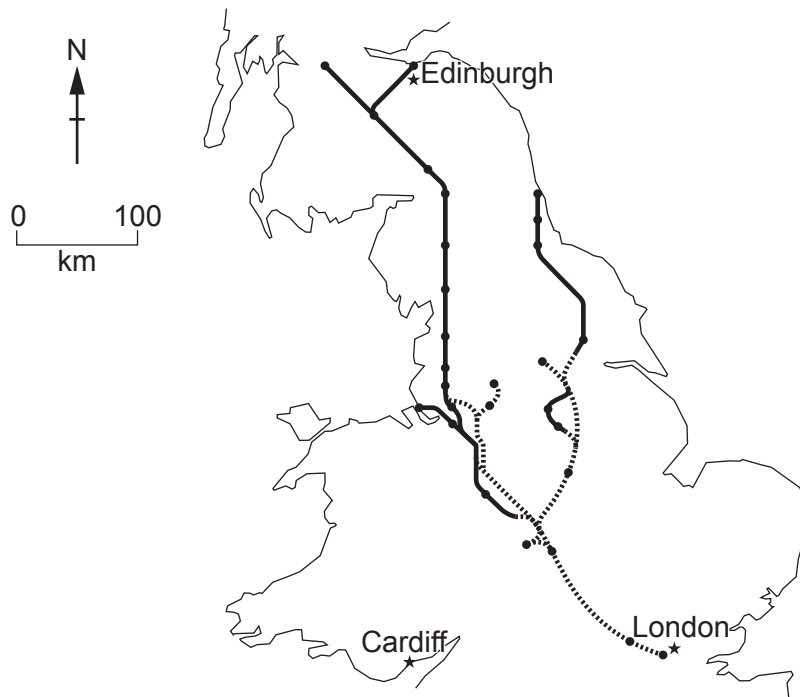
[3]

[Total: 24]

- 2 The map shows the planned route of HS2. HS2 is a railway track for high-speed trains in the UK.

**Key**

- ..... planned HS2 track
- existing track
- ★ capital city
- station



- (a) High-speed trains will travel on 249 km of HS2 tracks.

The government of the UK expects this to reduce carbon emissions in the UK.

- (i) Suggest other benefits of HS2 to people living in the UK.

.....

.....

.....

..... [2]

- (ii) The government estimates that 90 000 new houses will be built near the HS2 stations.

One impact of this construction is loss of natural habitat.

Suggest **two** other impacts of building a large number of houses near the HS2 stations. Give a reason for each impact.

impact 1 .....

reason .....

.....

impact 2 .....

reason .....

.....

[4]

- (b) The government estimates that travelling by HS2 will emit 17 times less carbon than travelling by aircraft and seven times less carbon than travelling by car.

Explain why emitting less carbon is important.

.....

.....

.....

.....

.....

..... [3]

- (c) Scientists are concerned that 108 mature forests are under threat due to the construction of HS2.

Explain how trees help to reduce carbon emissions.

.....

.....

.....

..... [2]

- (d) The HS2 company must make a 'green corridor' next to the track.

The green corridor replaces old habitats destroyed during construction with new habitats that are linked together.

Suggest why the green corridor must be made **before** construction of the track begins.

.....

..... [1]

- (e) Japanese knotweed is an invasive plant species. This means it is **not** native to the UK and does not grow naturally in the UK.

- (i) Suggest **one** reason why Japanese knotweed is removed from the green corridor.

.....

..... [1]

- (ii) Suggest **one** reason why vehicles in an area with Japanese knotweed must be washed before leaving the area.

.....

..... [1]

[Total: 14]

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- 3 The factsheet gives information about the Bechstein bat.

### The Bechstein bat



The Bechstein bat is very rare in the UK and has a population of only 21 000.

Bats are nocturnal, which means they are active at night. The Bechstein bat hunts and eats small flying insects.

The Bechstein bat hibernates during the winter months. Hibernation is a state of very little activity, similar to sleep. The Bechstein bat uses hibernation to conserve energy and survive the cold weather conditions and lack of food in winter.

- (a) Suggest **one** reason why some people are concerned that the construction of houses in the UK may cause some Bechstein bats to die from starvation.

.....  
..... [1]

(b) Bat population surveys often include information from local people.

A form is used to collect the information about different bat species.

name:	
date of survey:	survey location:
species of bat:	type of sighting: in flight / roost / swarming / bat box
<b>Key</b> in flight      bat observed in flight roost          bat observed emerging from a roost (resting place), such as a building or tree swarming      large number of bats observed in flight bat box        bat observed emerging from an artificial nest	

(i) Suggest a reason why the survey should be carried out between sunset and sunrise.

.....  
 ..... [1]

(ii) Suggest a reason why this type of survey can result in an overestimate of the bat population.

.....  
 ..... [1]

(iii) Suggest **four** benefits of asking **local people** to complete bat population surveys.

1 .....  
 .....  
 2 .....  
 .....  
 3 .....  
 .....  
 4 .....  
 ..... [4]

- (c) The table shows temperature data for one year from an area of the UK where the Bechstein bat lives.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
monthly temperature / °C	max	6	6	8	12	15	18	21	20	18	14	9	7
	min	1	1	2	4	7	10	12	12	10	7	4	3

- (i) Determine the temperature range for this area.

..... °C [1]

- (ii) The Bechstein bat hibernates from the beginning of November to the end of May.

Calculate the average **maximum** (max) temperature during this hibernation period.

..... °C [1]

- (iii) Suggest a reason why climate change could shorten the length of time that Bechstein bats hibernate.

.....  
 ..... [1]



(d) A food chain for the Bechstein bat is shown.

evening primrose plant → white ermine moth → Bechstein bat → tawny owl bird

(i) State the name of the primary consumer in this food chain.

..... [1]

(ii) Suggest the short-term impact of a reduction in Bechstein bat numbers on the tawny owl bird.

Give a reason for your answer.

impact .....

reason ..... [1]

(e) Some species of bat are good pollinators.

State **two** other ways pollination can occur.

1 .....

2 ..... [2]

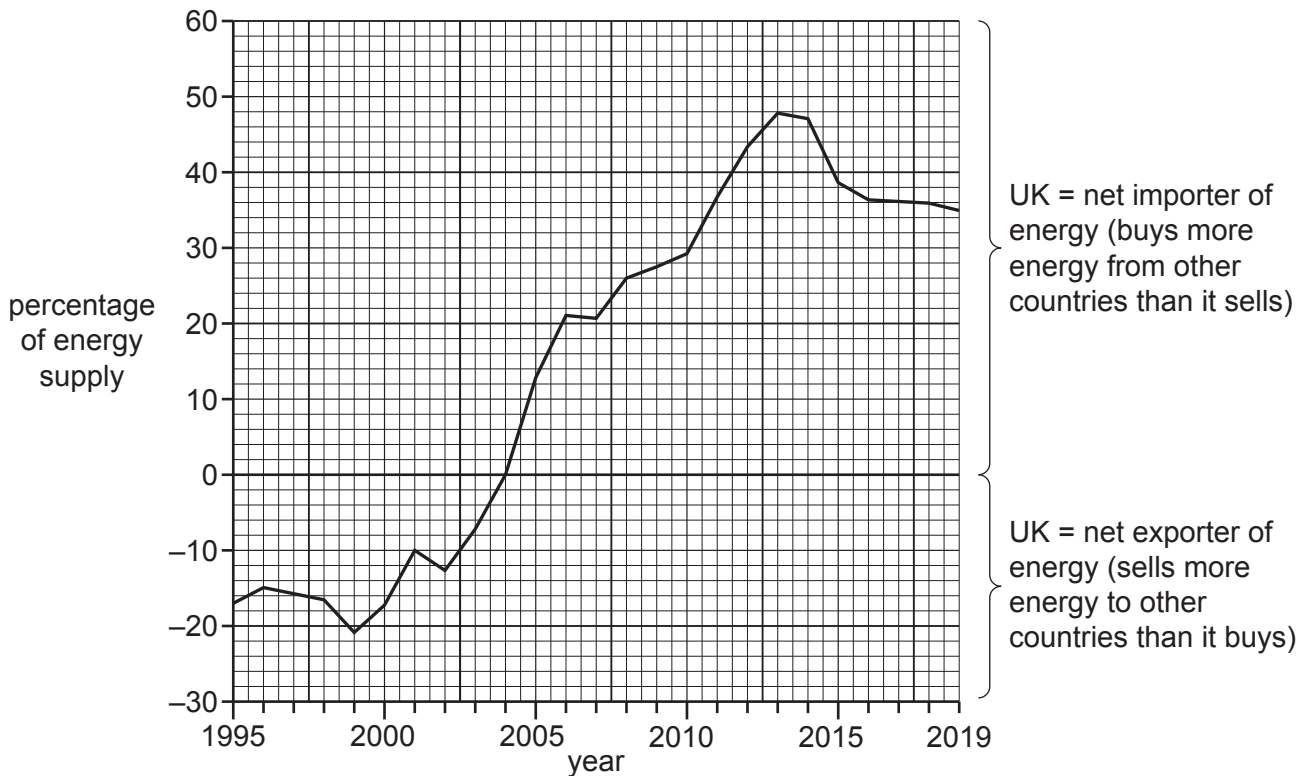
(f) Bioaccumulation of toxic substances can affect Bechstein bats.

Explain what is meant by bioaccumulation.

.....  
 .....  
 .....  
 ..... [2]

[Total: 16]

- 4 (a) The graph shows the net percentage of energy supply that was imported and exported from 1995 to 2019 for the UK.



- (i) State the year that the UK became a net importer of energy.

..... [1]

- (ii) Suggest **two** reasons why a country is a net importer of energy.

1 .....

.....

2 .....

.....

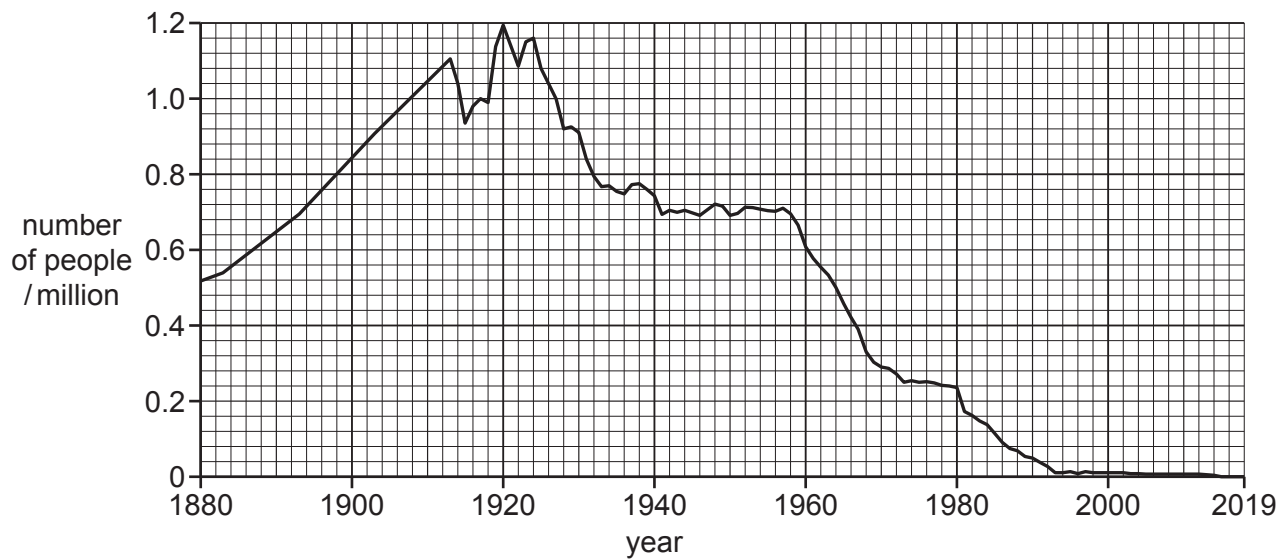
[2]

- (iii) Suggest **one** limitation for a country being a net importer of energy.

.....

..... [1]

- (b) The graph shows the total number of people employed in the coal industry in the UK from 1880 to 2019.



- (i) Describe the trends shown by the data in the graph.

.....

.....

.....

.....

.....

..... [3]

- (ii) Suggest reasons for the trends shown by the data.

.....

.....

.....

..... [2]

- (c) Shale rock is a sedimentary rock found in the UK.

The processes involved in the formation of sedimentary rock are shown.

**cementation      compaction      deposition      sedimentation      transport**

Put the processes in the correct order for the formation of sedimentary rock.

One has been completed for you.

→				
.....	<b>deposition</b>	.....	.....	.....

[3]

- (d) Fracking is a method used to extract gas or oil from shale rock in some countries.

Questionnaires are used to ask local people for their opinions on fracking.

- (i) State why a pilot questionnaire is carried out before the main questionnaire.

.....

..... [1]

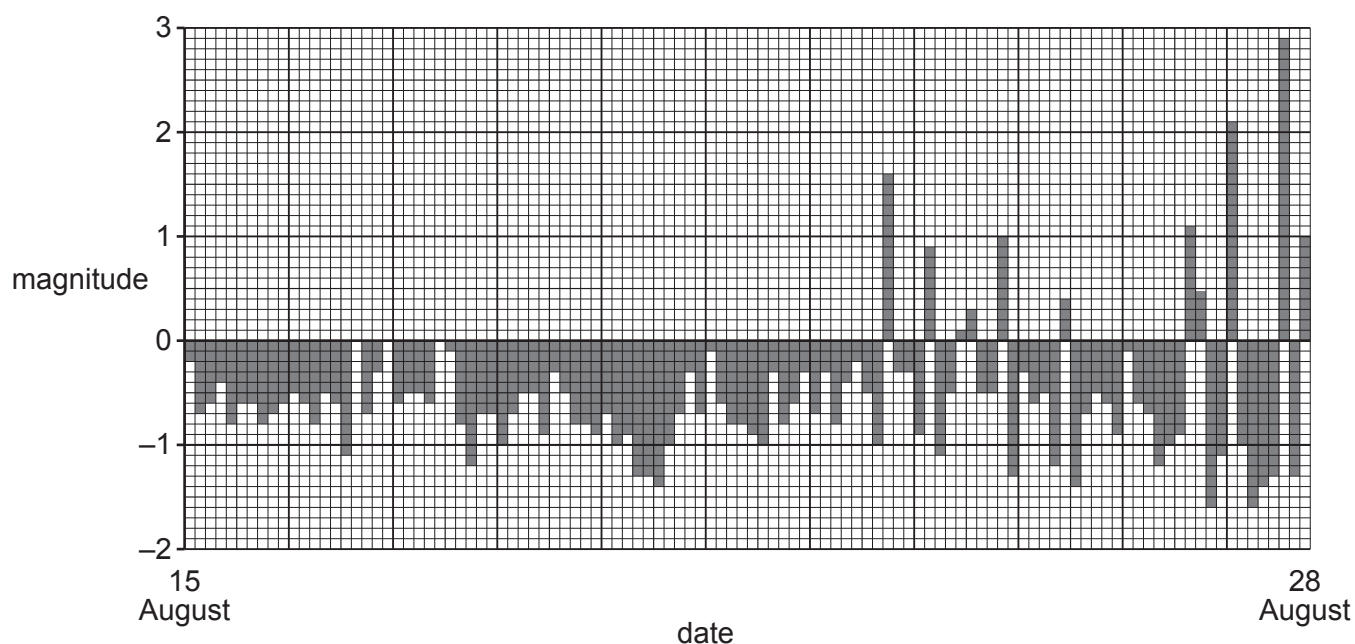
- (ii) Suggest why fracking might go ahead even if local people are against the idea.

.....

..... [1]

- (e) Fracking is thought to cause earthquakes. Earthquake activity at fracking locations is monitored.

The graph shows the magnitude of earthquake activity during a two-week period in August 2019 at one fracking location in the UK.



- (i) In 2019, the UK government required fracking to stop for 18 hours if earthquake activity above 0.5 magnitude was recorded.

State the number of earthquake events that required fracking to stop during the two-week period.

..... [1]

- (ii) Earthquake events above 2.0 can be felt on the Earth's surface.

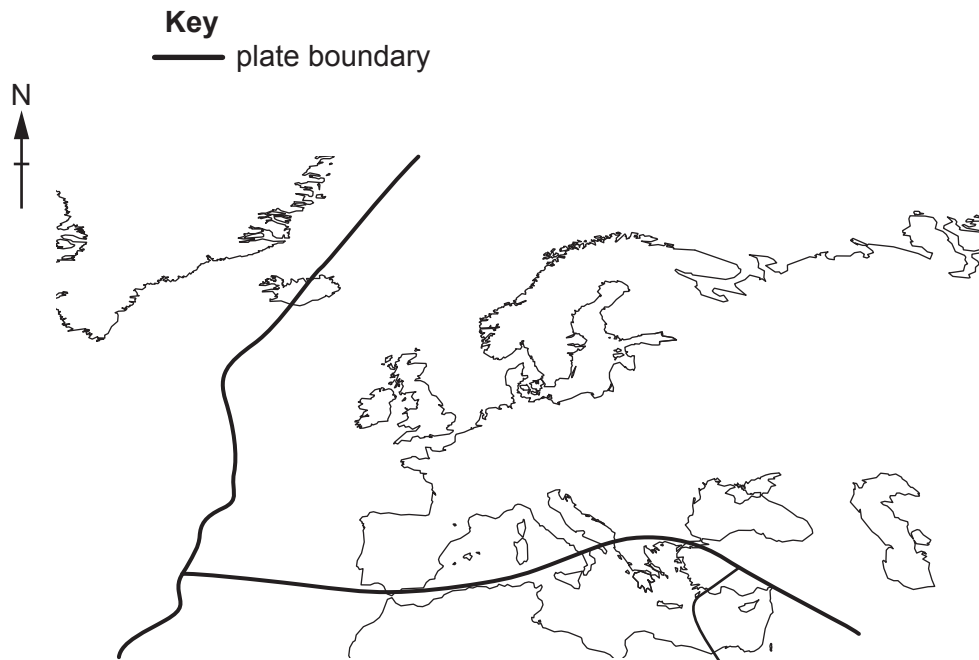
State the number of earthquake events that were felt on the Earth's surface during the two-week period.

..... [1]

- (iii) Suggest **one** reason why the UK government decided to stop fracking in November 2019.

.....  
 ..... [1]

- (f) The map shows the location of major plate boundaries around the UK.



- (i) Use the map to explain why earthquakes have only caused three deaths in the UK in the last 100 years.

.....  
 ..... [1]

- (ii) Disaster preparation helps to prevent deaths during a natural hazard.

State **three** ways to prepare for a natural hazard to help prevent deaths.

1 .....  
 2 .....  
 3 .....

[3]

(g) Some parts of the UK experience regular flooding.

(i) State **three** causes of flooding.

- 1 .....
- 2 .....
- 3 ..... [3]

(ii) Explain how flooding can benefit farmers.

- .....
- .....
- .....
- ..... [2]

[Total: 26]

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# **Cambridge IGCSE™**

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## **ENVIRONMENTAL MANAGEMENT**

**0680/21**

Paper 2 Management in Context

**October/November 2023**

**MARK SCHEME**

Maximum Mark: 80

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**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 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

**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)	71 (%);  172 963;	<b>2</b>
1(a)(ii)	sectors in clockwise rank order; largest first starting at 'noon'; correct plotting; key completed and matches sector shading;	<b>4</b>
1(b)(i)	<i>any three from:</i>  mechanisation; (synthetic) fertiliser; insecticide / pesticide / biological control; weed control / herbicide / fungi control / fungicide; planting multiple crops per year / intercropping; (increased use of) irrigation; reducing frequency of fallow years; large numbers of animals on limited land; crop rotation; controlled environments, greenhouses / hydroponics; irrigation; monoculture;	<b>3</b>

Question	Answer	Marks
1(b)(ii)	<p><i>max three benefits</i></p> <p>idea of increased efficiency;  increase yields;  increased profits;  less workforce needed;  cheaper food;  meets needs of current generation;</p> <p><i>max three negative impacts:</i></p> <p>deforestation;  habitat loss;  disruption of food chains;  loss of biodiversity;  genetic depletion;  large amounts of (animal) waste;  high use of, energy / resources / water;  not sustainable;  salinisation / increased salinity;  loss of soil, fertility / nutrients / minerals / organic content;  soil compaction / erosion / leaching / eutrophication;</p>	4
1(c)	random;	1
1(d)(i)	<p><i>any one from:</i></p> <p>to remove stones;  so they contain similar-sized particles of soil;</p>	1
1(d)(ii)	<p><i>any one from:</i></p> <p>so (ions in) water is not measured;  so each sample is comparable;</p>	1

Question	Answer	Marks
1(d)(iii)	<i>any one from:</i>  to get representative data for the whole field; to get a large enough sample to analyse;	<b>1</b>
1(e)(i)	<i>any three from:</i>  run-off / leaching; nutrient enrichment; algae blooms; eutrophication; changes pH of <b>water</b> ;	<b>3</b>
1(e)(ii)	low or no, crop yield / plant growth;	<b>1</b>
1(f)	<i>any three from:</i> air; water; organic / dead remains; microorganisms / named microorganism ; plant / animal;	<b>3</b>

Question	Answer	Marks
2(a)(i)	<i>any two from:</i>  north to south of country is linked; improves connection between cities; allows faster transport of, goods / people; increased tourism opportunities; improved economy; reduces, traffic / vehicles / cars / lorries / trucks / air travel;	<b>2</b>

Question	Answer	Marks
2(a)(ii)	<p><i>any two impacts of <b>building houses</b> with linked reasons:</i></p> <p>loss of biodiversity;            habitat destroyed / deforestation;            increased urbanisation;            more employment opportunities / economic growth;            noise pollution (from construction);            due to machinery;            as more hard surfaces;            increased run-off / flooding;            loss of farmland;</p>	4
2(b)	<p><i>any three from:</i></p> <p>carbon dioxide is a greenhouse gas;            contribute to global warming / climate change / (enhanced) greenhouse effect;            stated effect of climate change, e.g. sea level rise / flooding;            helps to meet carbon neutral target;</p>	3
2(c)	<p><i>any two from:</i></p> <p>(trees) <b>absorb</b> carbon dioxide;  <b>store</b> the carbon;            due to photosynthesis;  <math>6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2</math> /            carbon dioxide + water → glucose + oxygen;</p>	2
2(d)	<p><i>any one from:</i></p> <p>animals can escape (the building work);            to maintain animal migration routes;            to link breeding grounds;            to link populations;</p>	1
2(e)(i)	idea of competition (with native species);	1



Question	Answer	Marks
2(e)(ii)	to reduce the risk of spread (of the knotweed);	1

Question	Answer	Marks
3(a)	<i>any one from:</i>  reduction in food ; disruption of food chain; migration of prey; harder to catch prey;	1
3(b)(i)	bats are nocturnal / only active at night;	1
3(b)(ii)	<i>any one from:</i>  same bat could be counted more than once; public are not experts (so may count other species);	1
3(b)(iii)	<i>any four from:</i>  local knowledge of, where bats are / when bats active; many people can help; low cost; large amount of data can be collected; data can be collected quickly; raises awareness of the animal;	4
3(c)(i)	20;	1
3(c)(ii)	9;	1
3(c)(iii)	warmer temperatures;	1
3(d)(i)	(white ermine) moth;	1

Question	Answer	Marks
3(d)(ii)	numbers decrease <b>AND</b> they have less food to eat;	1
3(e)	<i>any two from:</i>  wind; insects; birds; self-pollination;	2
3(f)	(toxic substance) is absorbed; (absorbed) faster than it is lost (from an organism) / not excreted (fast enough) ;	2

Question	Answer	Marks
4(a)(i)	2004;	1
4(a)(ii)	<i>any two from:</i>  increasing demand / demand exceeds supply; increasing population; availability of, own natural reserves / named resource; accessibility of, natural reserves / named reserve; cost too high to extract own natural reserves / cheaper to buy it (than produce);	2
4(a)(iii)	<i>any one from:</i>  reliant on other countries; cannot set own energy policies; cost of imports; possible power shortages / disruption to supply;	1

Question	Answer	Marks
4(b)(i)	<p><i>any three trends from:</i></p> <p>increase to early 1900s / peak in 1920s;            fluctuates / decreases, 1910s to 1920s;            decreases 1920s to 1940s;            constant 1940s to 1960s;            sharp decrease from 1960s;            (almost) zero from 1993-5s;</p>	3
4(b)(ii)	<p><i>any two from:</i></p> <p><i>increase due:</i>            industrialisation;            urbanisation;            population increase;</p> <p><i>decrease due to:</i>            mechanisation;            not mining own reserves / reserves inaccessible / reserves are exhausted / no more reserves;            switch to, renewable energy / named other form of energy resource;            became net importer of energy;</p>	2
4(c)	<p>transport → (deposition) → sedimentation → compaction → cementation;            1 correct = 1 mark            2–3 correct = 2 marks            4 correct = 3 marks</p>	3
4(d)(i)	<p><i>any one from:</i></p> <p>test whether questions are, suitable / clear;            test whether sampling methods are suitable;            identify any problems with the questions;            check that answers can be easily analysed;</p>	1

Question	Answer	Marks
4(d)(ii)	<i>any one from:</i>  shortage of, gas / oil; high demand / current oil and gas supplies don't meet demand;	<b>1</b>
4(e)(i)	7;	<b>1</b>
4(e)(ii)	2;	<b>1</b>
4(e)(iii)	<i>any one from:</i>  too many earthquakes; probability / magnitude, of earthquakes cannot be predicted; public opposition / public feel fracking is not safe;	<b>1</b>
4(f)(i)	not located, on / near, a plate boundary;	<b>1</b>
4(f)(ii)	<i>any three from:</i>  evacuation plans; drills; emergency supplies; emergency rescue teams; early warning systems / monitoring; education of public; emergency shelters; medical teams; earthquake resistant buildings;	<b>3</b>

Question	Answer	Marks
4(g)(i)	<i>any three from:</i>  heavy rainfall; low-lying land; saturated / compacted, soil; deforestation / removal of vegetation; urbanisation; storm surges / tsunamis;	<b>3</b>
4(g)(ii)	deposition of silt / silting; improves fertility of soil;	<b>2</b>