FOR OFFICIAL USE

N5

National Qualifications 2026

Mark

X826/75/01 Environmental Science

WEDNESDAY, 22 APRIL

9:00 AM – 11:30 AM

X826750 1

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day Month Year

Scottish candidate number

Total marks — 100 marks

SECTION 1 — 66 marks

Attempt ALL questions.

SECTION 2 — 20 marks

Attempt ALL questions.

SECTION 3 — 14 marks

Questions 9 and 10 each contain a choice.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers and rough work is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting. Any rough work must be written in this booklet. You should score through your rough work when you have written your final copy.

Use **blue** or **black** ink.

You must leave your answer booklet on your desk; if you do not, you could lose all the marks for this paper.

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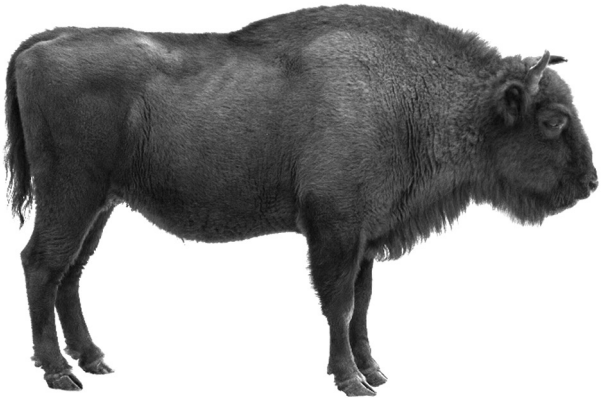
MARKS | DO NOT WRITE IN THIS MARGIN

SECTION 1 — 66 marks

Attempt ALL questions

1. The European bison is a large herbivore that can grow to around 2 metres in height.

Deforestation and over-hunting almost resulted in their extinction throughout Europe.



(a) State what is meant by the term *herbivore*. **1**

(b) Various approaches to conservation were used in the 20th century to increase the population of the European bison.

One method involved the breeding of European bison with local cattle. This produced male offspring that were infertile.

(i) Suggest what the production of infertile male offspring indicates about the European bison and the local cattle. **1**

MARKS | DO NOT WRITE IN THIS MARGIN

1. (b) (continued)

(ii) Suggest one other conservation practice that could have been used to increase the population of the European bison. **1**

(c) It is estimated that there are approximately 6200 European bison living in the wild and 2300 living in captivity.

Calculate the percentage of European bison that are living in the wild. **1**

Space for calculation

(d) In 2022, three European bison were released into a woodland in England. They grazed on grasses, shrubs, and saplings, and stripped the bark from tall trees for food.

Explain how this grazing behaviour may result in an increase in biodiversity. **2**

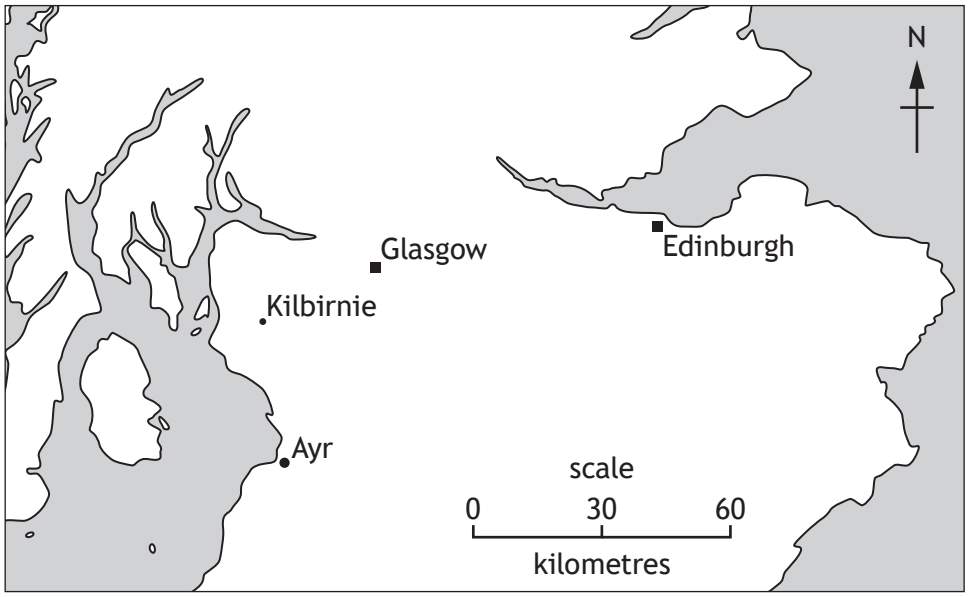
(e) It is predicted that the European bison will eventually be released into the wild in Scotland.

(i) Name the national organisation most likely to have responsibility for overseeing the reintroduction of European bison to Scotland. **1**

(ii) Suggest one role that this organisation may perform when overseeing the reintroduction of the European bison. **1**

MARKS | DO NOT WRITE IN THIS MARGIN

2. Kilbirnie is a small town in North Ayrshire, located approximately 32 kilometres southwest of Glasgow.



A steel mill, which produced iron and steel products, was built in Kilbirnie in the late 19th century, beside a loch. This resulted in a large increase in the population of Kilbirnie.

(a) Suggest one reason why building the steel mill resulted in a large increase in the population of Kilbirnie. **1**

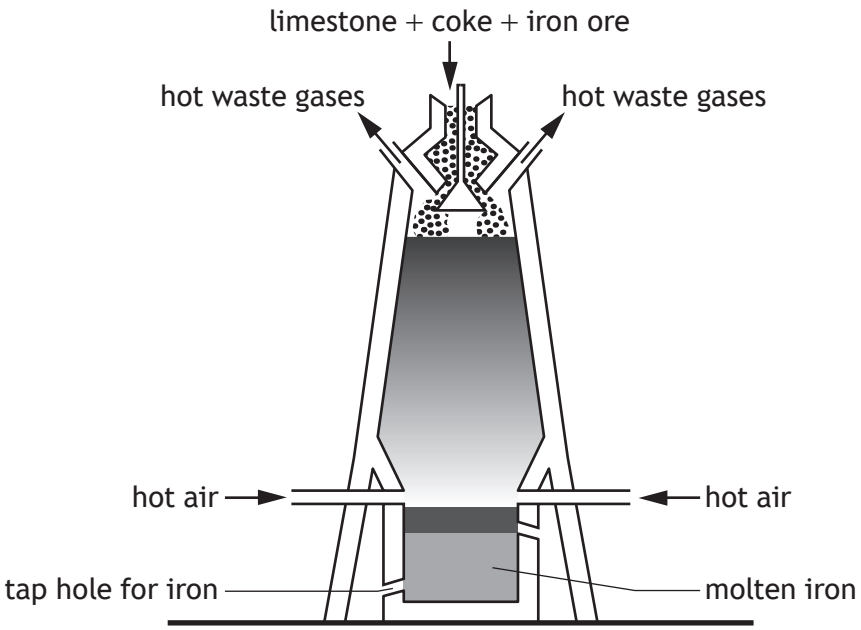
_____

_____

MARKS | DO NOT WRITE IN THIS MARGIN

2. (continued)

(b) The steel mill included several large industrial plants, such as the one shown in the diagram below.



(i) Name the industrial plant shown in the diagram. **1**

_____

(ii) Describe the formation of iron ore. **2**

_____

_____

_____

_____

_____

(iii) State the role of the following substances in the smelting process. **2**

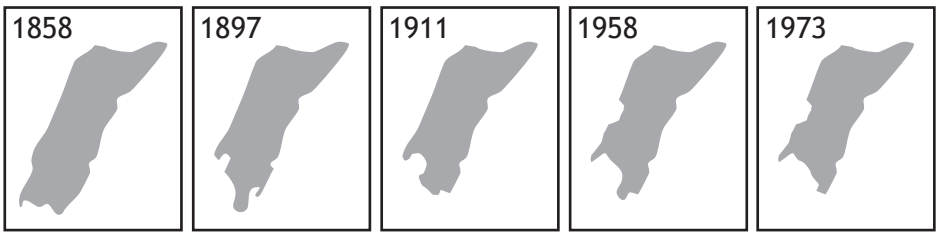
Substance	Role
Limestone	
Coke	

MARKS | DO NOT WRITE IN THIS MARGIN

2. (continued)

(c) Solid waste material from the smelting process was dumped into the loch throughout the operating life of the steel mill.

The diagram below shows the loch changing over time.



Key

☐ land

■ water

(i) Using information shown in the diagram, describe one change to the loch that has occurred between 1858 and 1973. **1**

_____

_____

(ii) Name the solid waste material produced during the smelting process. **1**

_____

(iii) Describe one other environmental impact that may result from the dumping of this solid waste material into the loch. **1**

_____

_____

MARKS | DO NOT WRITE IN THIS MARGIN

2. (continued)

(d) Lochshore Park stands on the site of the former steel mill. The park, which overlooks the loch, contains a café, play park, nature trails, community rooms for hire, and sports and educational facilities.

(i) Explain how one feature shown in the above image may be considered economically sustainable. **1**

Feature _____

Explanation _____

_____

_____

_____

(ii) The development at Lochshore park can provide jobs for members of the community.

Suggest one other positive social impact of this development. **1**

_____

_____

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

3. Local authorities in Scotland have a responsibility for waste management.

(a) Recycling rates have slowed in recent years.

(i) Define the term *recycling*. **1**

_____

_____

(ii) Suggest one reason why recycling rates have slowed in recent years. **1**

_____

_____

(iii) Recycling is one aspect of the '3Rs' strategy for managing waste.

Complete the table below to name the other two sustainable approaches to managing waste included in the '3Rs' strategy. **1**

R _____	R _____	Recycle

(iv) Suggest one approach that local authorities could take to encourage recycling. **1**

_____

_____

MARKS | DO NOT WRITE IN THIS MARGIN

3. (continued)

(b) Incineration is the controlled burning of waste to reduce it to ash.

The table shows the mass of household waste incinerated in Scotland, between 2017 and 2023.

Year	Mass of household waste incinerated (tonnes)
2017	94 636
2018	142 946
2019	330 368
2020	350 231
2021	355 440
2022	357 972
2023	548 277

(i) Describe the overall trend shown in the data. **1**

_____

_____

(ii) One reason for this overall trend is the generation of energy from the incineration of waste.

Suggest two other reasons for this overall trend. **2**

Reason 1 _____

_____

Reason 2 _____

_____

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

3. (b) (continued)

(iii) Generating energy from incinerating waste supports Scotland in achieving the United Nations Sustainable Development Goals (SDGs).

Explain how energy generated from incinerating waste can help Scotland meet one of the SDGs shown. **1**

SDG number _____

Explanation _____

_____

_____

(iv) The Scottish Government has restricted the building of new waste incinerators.

Suggest why this decision was made. **1**

_____

_____

[Turn over for next question

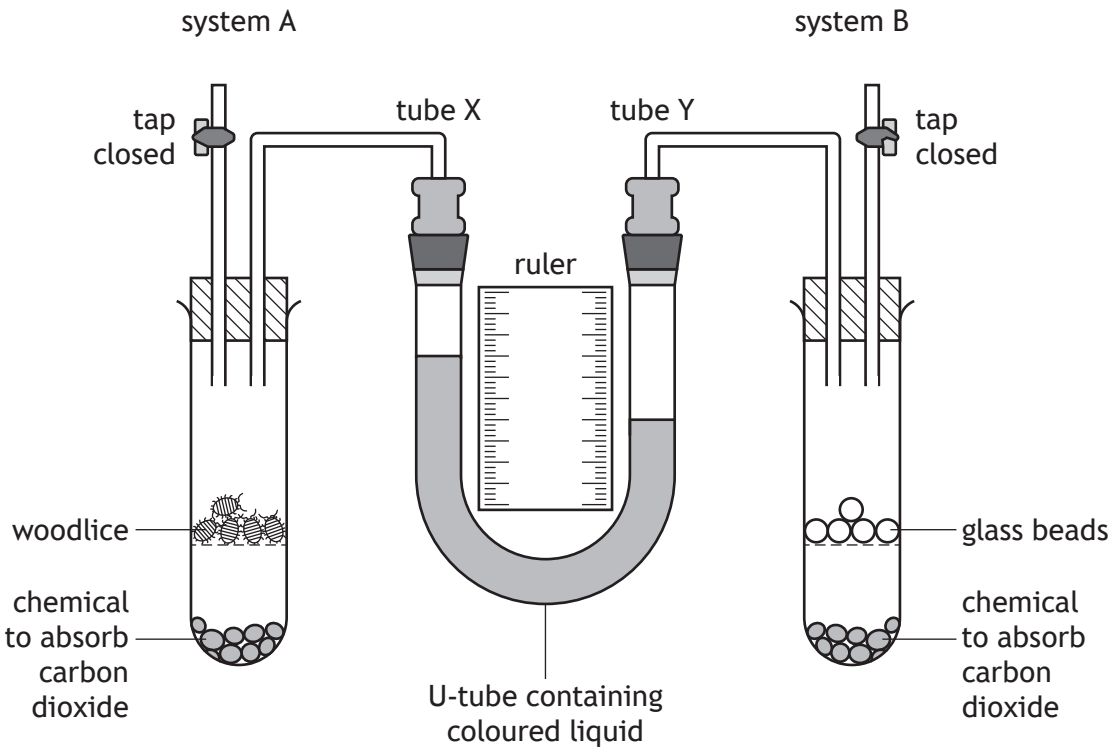
DO NOT WRITE ON THIS PAGE

MARKS | DO NOT WRITE IN THIS MARGIN

4. Respiration is a vital process that provides energy for all living things.

(a) Give the word equation for respiration. **1**

(b) A group of students measured the rate of respiration of woodlice using the apparatus shown.



MARKS | DO NOT WRITE IN THIS MARGIN

4. (b) (continued)

(i) As the woodlice respire, the liquid in tube X begins to rise.

Explain why the liquid rises up tube X. **2**

(ii) A chemical that absorbs carbon dioxide is present in both system A and system B.

Explain why it is necessary to absorb carbon dioxide from both systems. **1**

(iii) Explain the purpose of the glass beads in system B. **1**

[Turn over

4. (b) (continued)

(iv) The students used 5 woodlice in system A and 5 glass beads in system B. They measured the rise in the liquid in tube X over five minutes.

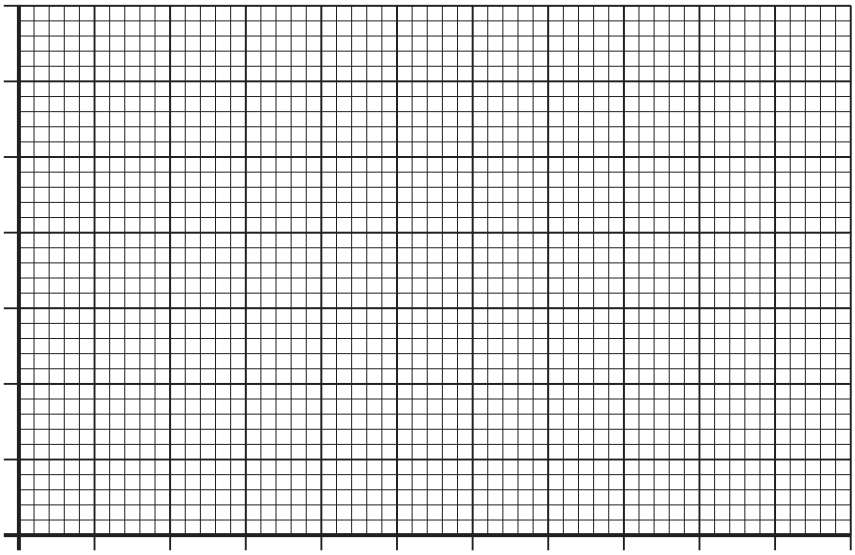
The experiment was repeated three times with all key variables kept constant.

The average rise in liquid, after each minute, was calculated.

Time (minutes)	Average rise in liquid in tube X (mm)
0	0.0
1	1.4
2	2.3
3	3.6
4	4.7
5	5.4

Using the information in the table, draw a **scatter** graph to show the average rise in liquid in tube X over five minutes. **3**

(An additional graph, if required, can be found on *page 34*.)



MARKS | DO NOT WRITE IN THIS MARGIN

4. (b) (continued)

(v) State why it is good practice to ensure that all key variables, such as temperature and number of glass beads, are kept constant during each repeat experiment. **1**

_____

_____

(vi) The students repeated the experiment with a greater number of woodlice in system A.

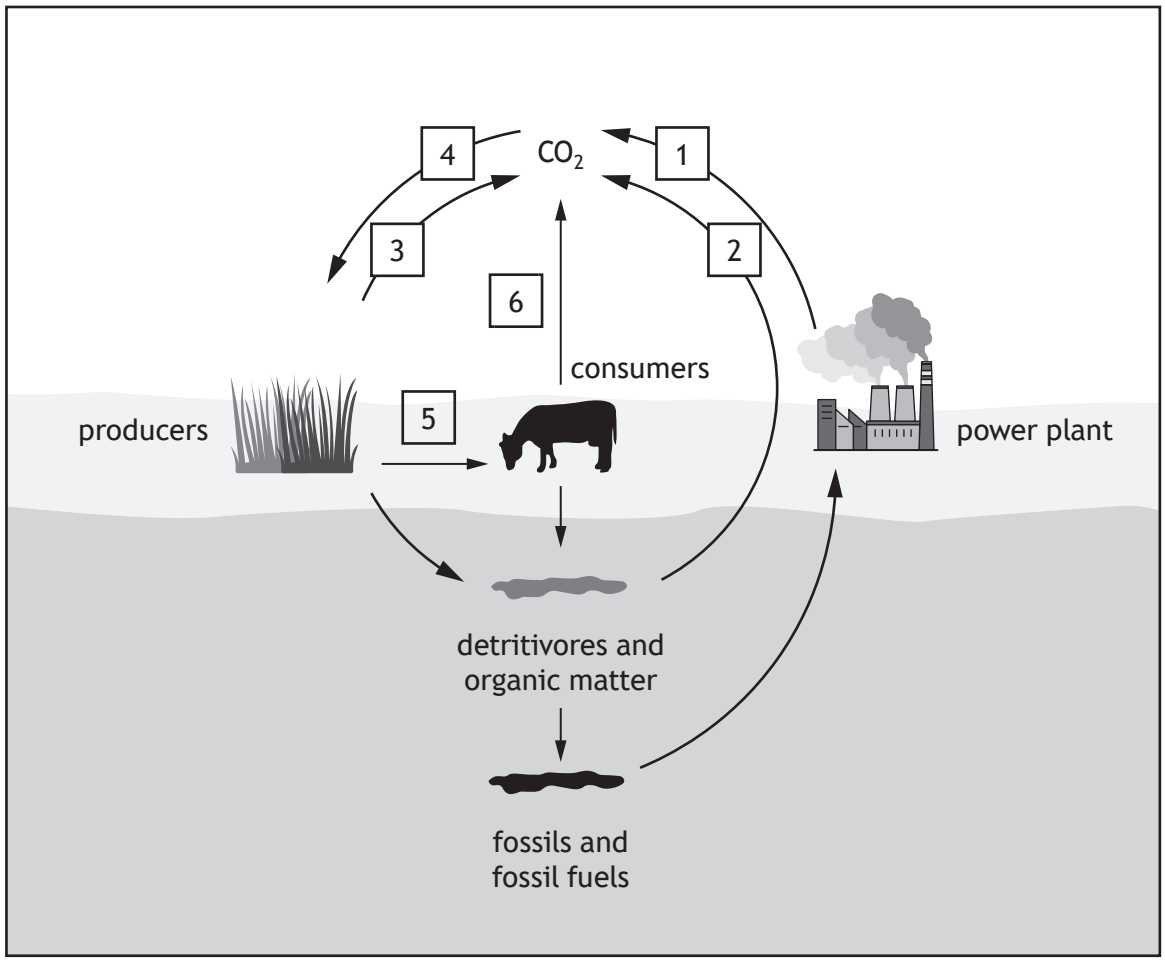
Predict the effect on the level of the liquid in tube X. **1**

_____

[Turn over

4. (continued)

(c) Respiration plays a vital role in the carbon cycle.



(i) Identify the arrows on the carbon-cycle diagram that represent respiration by ticking (✓) the appropriate boxes. **2**

1	2	3	4	5	6

(ii) Explain the importance of woodlice to the carbon cycle. **2**

_____

_____

_____

MARKS | DO NOT WRITE IN THIS MARGIN

5. The Viking Wind Farm, situated in the Shetland Islands, began generating electricity in 2024. The wind farm can generate enough energy to power nearly 500 000 homes.

(a) (i) State the energy change that takes place in the generator of a wind turbine. **1**

_____

(ii) State two factors that the developers would have considered when deciding where to site the wind farm. **2**

Factor 1 _____

_____

Factor 2 _____

_____

(b) Explain why the Viking Wind Farm may be considered a sustainable development. **2**

_____

_____

_____

_____

_____

(c) (i) The Viking Wind Farm was constructed on peat moorland.

State two abiotic conditions that encourage the formation of peat. **2**

Condition 1 _____

Condition 2 _____

(ii) Peat is cut and dried on the Shetland Islands as a form of biomass fuel.

Define the term *biomass*. **1**

_____

_____

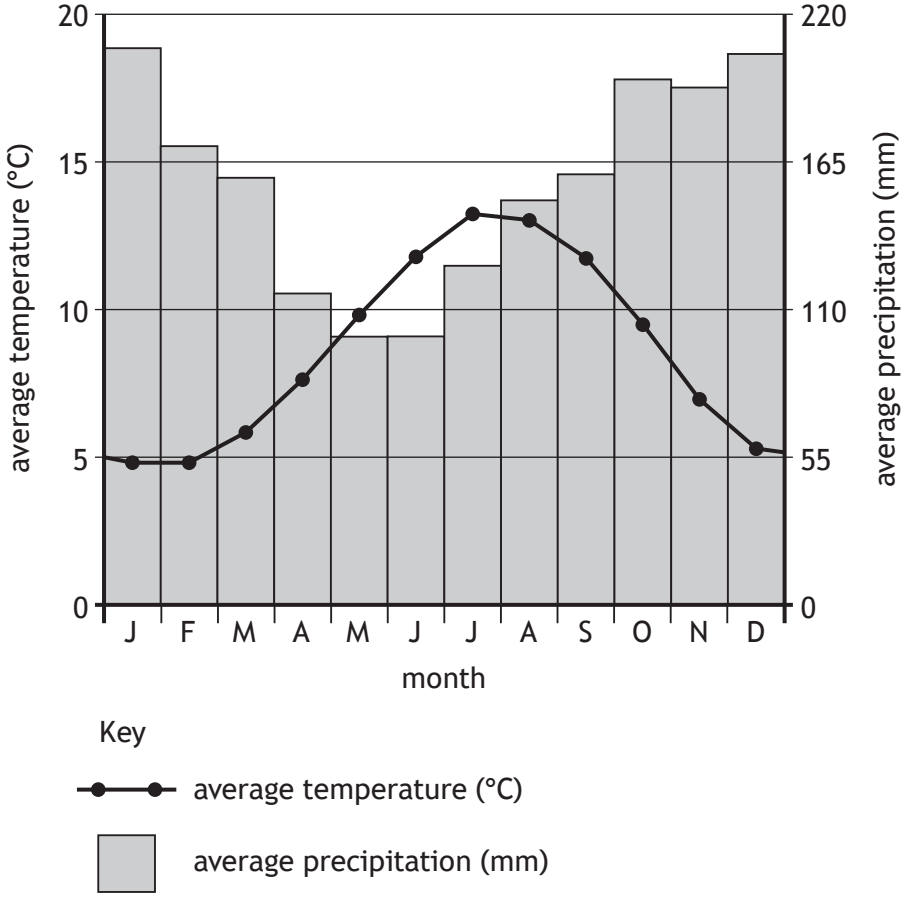
[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

6. The Isle of Skye is located off the west coast of mainland Scotland.

Industries on the Isle of Skye include tourism, agriculture, forestry, and fishing.

The climate graph shows the average temperature and average precipitation for the Isle of Skye.



(a) At certain times of the year, the island can experience issues with water availability.

Using information from the climate graph, identify which month is likely to experience the greatest water scarcity.

Justify your answer. **3**

Month _____

Justification _____

_____

_____

_____

_____

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MARKS | DO NOT WRITE IN THIS MARGIN

6. (continued)

(b) Demand for water varies throughout the year.

(i) Suggest one reason why water use on the Isle of Skye may vary throughout the year.

Justify your answer. **2**

_____

_____

_____

(ii) State two methods that a homeowner on the Isle of Skye may use to conserve water. **2**

Method 1 _____

_____

Method 2 _____

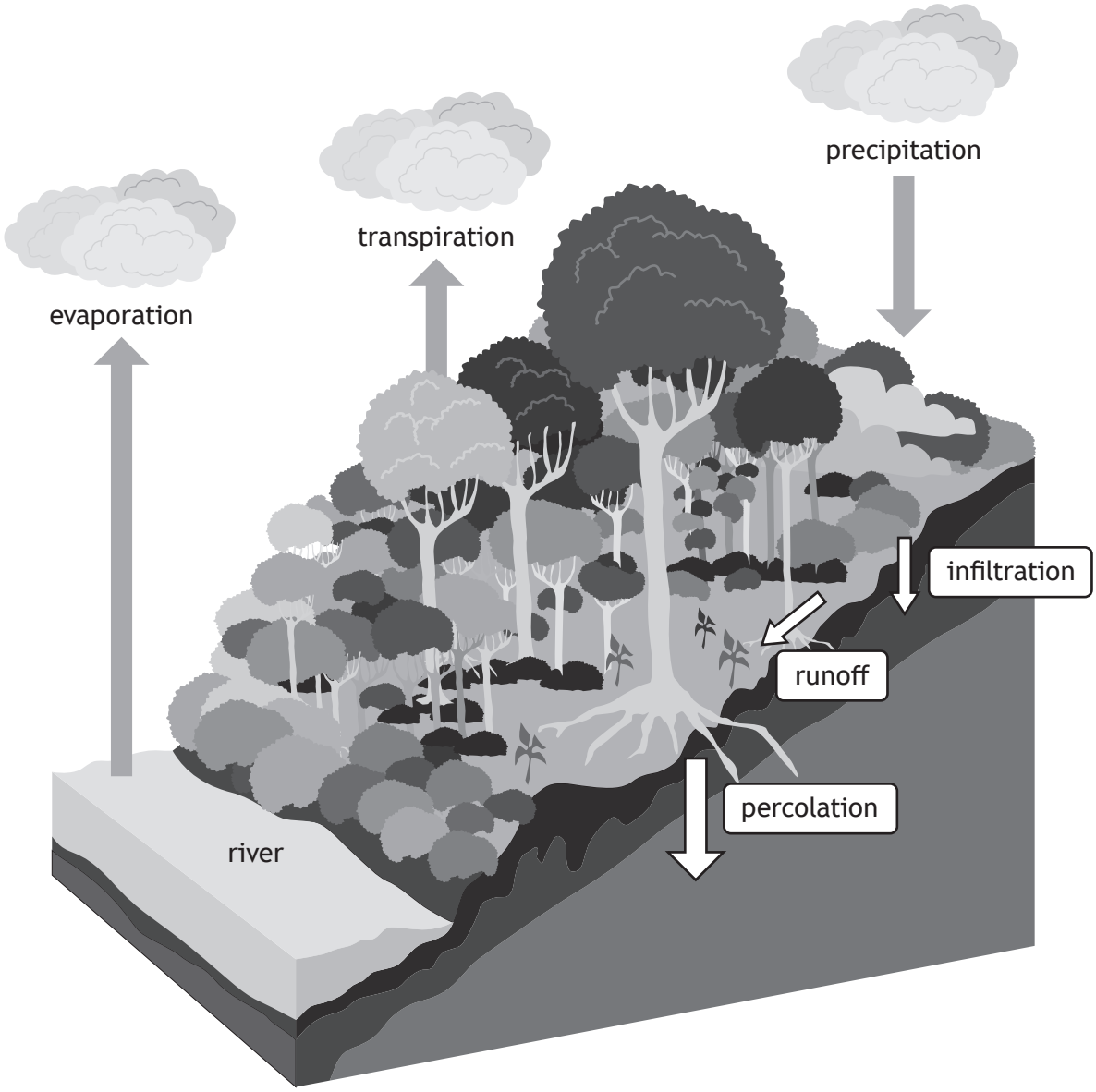
_____

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

7. Significant areas of the Amazon rainforest have been cleared over time. As a result, scientists have observed changes in rainfall patterns and river flow in the region.

The diagram shows parts of the water cycle in the Amazon rainforest.



(a) Name one process of the water cycle **not** shown in the diagram. **1**

_____

MARKS | DO NOT WRITE IN THIS MARGIN

7. (continued)

(b) (i) With reference to the water cycle, explain how deforestation may result in reduced levels of precipitation. **2**

(ii) With reference to the water cycle, explain how deforestation may result in flooding in the region. **2**

(iii) Deforestation changes the volume of water in underground water stores.

Name one type of underground water storage. **1**

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

7. (continued)

(c) Large-scale deforestation may also alter the composition of gases in the atmosphere.

(i) Name the most abundant gas in the atmosphere. **1**

_____

(ii) Predict the impact of large-scale deforestation on the levels of carbon dioxide and oxygen in the atmosphere.

Justify your answer. **2**

_____

_____

_____

_____

_____

MARKS | DO NOT WRITE IN THIS MARGIN

SECTION 2 — 20 marks

Attempt ALL questions

8. Increased consumer demand for minerals, particularly for the technologies sector, has resulted in a significant reduction of these resources on land. Governments and mining companies are now exploring new sources of minerals on the seabed.

One mining company has submitted an application to extract minerals from the seabed.

Their proposed technique involves a mining vehicle that manoeuvres around the seabed, breaking up the surface rock. The smaller pieces of rock are mixed with seawater to create a slurry. A hydraulic pump system transports the slurry from the mining vehicle to the production support vehicle, where the minerals are separated from the water and other sediments. The warm water, sediments, and other unwanted materials are then discharged back into the sea. The collected minerals are then transported to a facility on land for further processing.

Using the information shown in the supplementary source booklet and your knowledge of environmental science, answer the following questions.

(a) Before submitting the application, the company carried out a survey of the proposed location. The survey identified an abundance of minerals on the seabed.

(i) Suggest the importance of carrying out a survey before mining for minerals on the seabed. **1**

(ii) Describe the relationship between rocks and minerals. **2**

(iii) Explain why minerals are classed as a non-renewable resource. **1**

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

8. (continued)

(b) **Source 1** shows the proposed extraction technique.

(i) Name the layer of the Earth from which the rock will be extracted. **1**

_____

(ii) Once the rock has been converted into slurry, it will be transported to the production support vehicle by the hydraulic pump system.

The pump can generate a maximum pressure of 30 000 000 Pa.

The relationship between pressure, density, gravitational field strength, and depth of the seabed is shown in the formula

$$p = \rho g h$$

where: p is the pressure generated by the pump in pascals (Pa)

ρ is the density of the slurry = 1200 kg m^{-3}

g is the gravitational field strength = 9.8 N kg^{-1}

h is the depth of the seabed in metres.

Calculate the maximum depth, to the nearest metre, that the mining vehicle can operate to pump slurry to the production support vessel. **1**

Space for calculation

_____

(iii) Once the slurry has been processed in the production support vehicle, warm water, sediment, and unwanted materials will be discharged into the sea.

Describe a technique that could be used to measure the temperature of the water being discharged. **2**

_____

_____

_____

MARKS | DO NOT WRITE IN THIS MARGIN

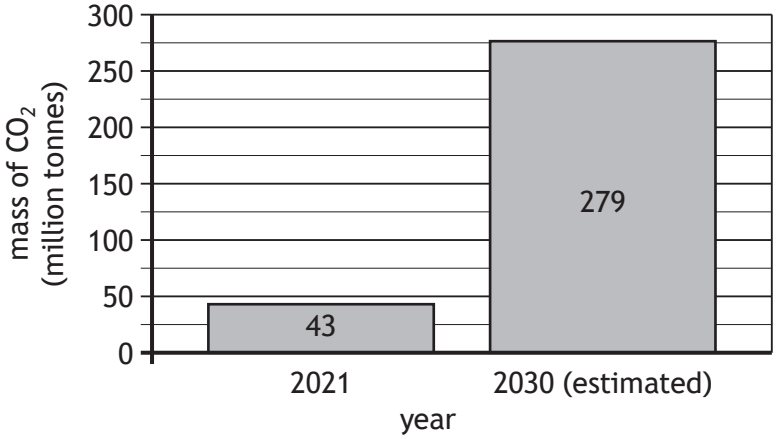
8. (continued)

(c) **Source 2** shows the minerals required for various low carbon technologies, including carbon capture and storage (CCS).

CCS is a means of trapping carbon dioxide and storing it underground, to reduce the impact on climate change.

(i) Explain why using CCS to trap carbon dioxide may reduce the impact of climate change. **2**

(ii) The graph shows the mass of carbon dioxide captured and stored in the United Kingdom in 2021 and an estimate for 2030.



Calculate the estimated percentage increase in the amount of carbon dioxide captured and stored between 2021 and 2030. **1**

Space for calculation

MARKS | DO NOT WRITE IN THIS MARGIN

8. (c) (continued)

(iii) To meet the 2030 estimate, more CCS facilities will need to be built.

The United Kingdom does not have deposits of all the minerals required for technologies used in CCS. It will have to import the remaining minerals from other countries.

Using **Sources 2**, **3**, and **4**, identify one country that can supply the remaining minerals for CCS technologies.

Justify your choice. **2**

Country _____

Justification _____

_____

_____

_____

(iv) Using **Source 2**, identify which of the renewable sources of energy requires the widest range of minerals. **1**

_____

(d) **Source 5** shows the estimated land and deep-sea mineral reserves.

(i) Suggest why the values provided are estimates and not actual values. **1**

_____

_____

_____

MARKS | DO NOT WRITE IN THIS MARGIN

8. (d) (continued)

(ii) The estimated global deep-sea reserves for some minerals, such as manganese, are much greater than the estimated global land reserves.

Calculate how many times greater the global deep-sea reserves of manganese are compared to the global land reserves. **1**

Space for calculation

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

8. (continued)

(e) Using the evidence from the sources and your knowledge of environmental science, decide whether the application to mine minerals from the seabed should be approved.

Justify your decision. **4**

☐ Approve application

☐ Do not approve application

MARKS | DO NOT WRITE IN THIS MARGIN

SECTION 3 — 14 marks

Questions 9 and 10 each contain a choice

Write your answers to questions 9 and 10 on the following pages.

You may use diagrams where appropriate.

9. A The demand for organic food has increased in recent years. This has led to an increase in organic farming practices throughout the United Kingdom.

Discuss organic farming under the following headings:

(a) advantages

(b) disadvantages. **7**

OR

B The global population of humans continues to rise, with projections suggesting that the world population will reach 8.5 billion by 2030.

Discuss the impact of an increasing global population on food supplies under the following headings:

(a) social

(b) economic

(c) environmental. **7**

10. A Living things are adapted to their habitats.

Discuss adaptations in organisms using examples in **one** named habitat. **7**

OR

B There are several quantitative techniques that can be used to sample organisms.

Discuss how different types of nets may be used to sample organisms. **7**

[Turn over

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SPACE FOR ANSWERS

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DO NOT WRITE IN THIS MARGIN

SPACE FOR ANSWERS

X826750131

DO NOT WRITE IN THIS MARGIN

SPACE FOR ANSWERS

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DO NOT WRITE IN THIS MARGIN

SPACE FOR ANSWERS

[END OF QUESTION PAPER]

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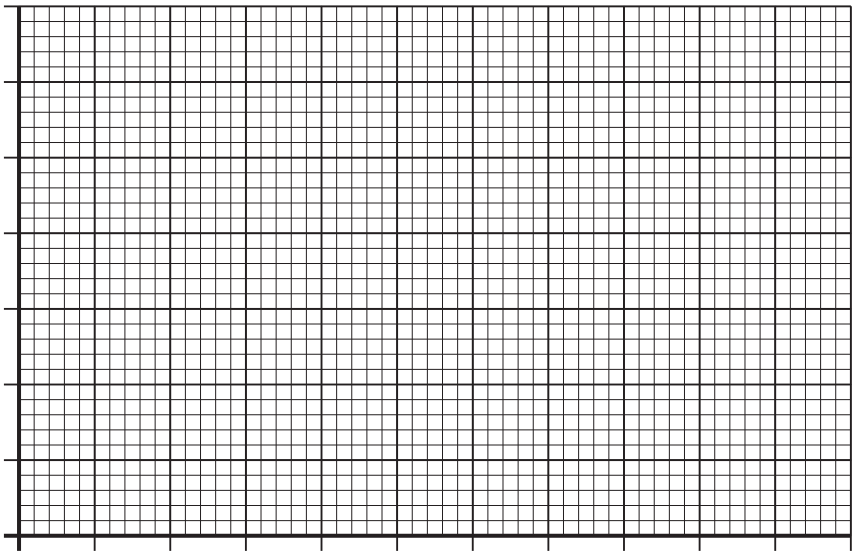
ADDITIONAL SPACE FOR ANSWERS AND ROUGH WORK

Additional graph for question 4 (b) (iv)



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ADDITIONAL SPACE FOR ANSWERS AND ROUGH WORK

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ADDITIONAL SPACE FOR ANSWERS AND ROUGH WORK

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