

FOR OFFICIAL USE



National
Qualifications
2022

Mark

X826/75/01

Environmental Science

TUESDAY, 31 MAY
9:00 AM – 11:30 AM



* X 8 2 6 7 5 0 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

SECTION 1 — 66 marks

Attempt ALL questions.

SECTION 2 — 20 marks

Attempt ALL questions.

SECTION 3 — 14 marks

Questions 10 and 11 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.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.



* X 8 2 6 7 5 0 1 0 1 *

SECTION 1 — 66 marks

Attempt ALL questions

1. In Scotland, the beaver population became extinct approximately 400 years ago due to human activity. They were reintroduced in 2009 as part of the Scottish Beaver Trial.



- (a) (i) Suggest a human activity that may have led to the extinction of the beaver population in Scotland. 1

- (ii) Name the national organisation with responsibility for advising the Scottish Government about the beaver trial. 1

- (b) Reintroducing native species, such as the beaver, increases biodiversity. However, the introduction of invasive non-native species (INNS) can lead to a reduction in biodiversity.

- (i) Give an example of an invasive non-native species found in Scotland. 1



1. (b) (continued)


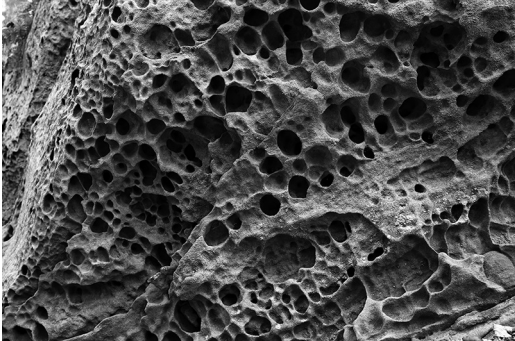

- (ii) Explain how the introduction of an invasive non-native species can lead to a reduction in biodiversity.

2

[Turn over



2. The three photographs show landscapes with different examples of weathering.
- (a) Identify the correct type of weathering by circling one choice for each landscape.

Landscape	Type of Weathering
	<p>biological</p> <p>chemical</p> <p>physical</p>
	<p>biological</p> <p>chemical</p> <p>physical</p>
	<p>biological</p> <p>chemical</p> <p>physical</p>

2. (continued)

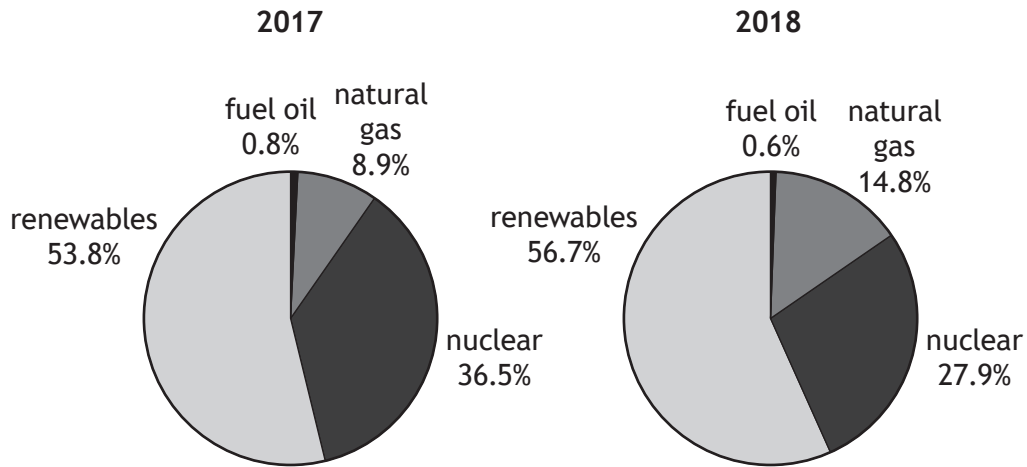
(b) Describe the difference between weathering and erosion.

2

[Turn over



3. The pie charts show the percentage of electricity generation in Scotland from different sources in 2017 and 2018.



(a) Fossil fuels are said to be non-renewable.

(i) Define the term *non-renewable*.

1

(ii) Calculate the difference in the percentage of electricity generated using fossil fuels from 2017 to 2018.

1

Space for calculation



3. (continued)

(b) Hydro-electric power schemes contribute to Scotland's renewable energy production.

(i) State the energy change involved in a hydro-electric power scheme.

1

(ii) Describe two environmental impacts of hydro-electric power schemes.

2

1 _____

2 _____

(iii) Other than hydroelectricity, name two types of renewable energy.

2

1 _____

2 _____

(c) Fuel oil is used to produce energy.

Fuel oil is a product obtained from crude oil.

(i) Describe how crude oil is formed.

2

[Turn over



3. (c) (continued)

(ii) Name the process used to obtain products such as fuel oil from crude oil. 1

(iii) Describe the role of temperature in the separation of products, such as fuel oil, from crude oil. 2



4. The table shows information about the properties of six types of commonly used plastics.

Plastic	Properties				
	Flexible	Floats in water	Transparent	Fire resistant	Resistant to chemicals
PET	✓		✓		✓
HDPE		✓			✓
PVC			✓	✓	✓
LDPE	✓	✓	✓		✓
PP	✓	✓	✓		
PS	✓				

(a) Use information in the table to answer the following questions.

(i) Select the best type of plastic for making laboratory safety glasses. 1

(ii) Explain your selection. 2

(iii) Explain why LDPE plastics may be easier to remove from the oceans compared to PS plastics. 1

[Turn over



4. (continued)

MARKS DO NOT WRITE IN THIS MARGIN

(b) The table below shows information about types of plastic waste arriving at recycling centres.

Type of plastic waste	Properties			
	Main use	Melting point (°C)	Commonly recycled?	Value of recycled plastic (£ per tonne)
PET	transparent bottles	250	yes	100
HDPE	non-transparent bottles	200	yes	400
PVC	plumbing products	140	no	
LDPE	plastic bags	110	yes	210
PP	plastic tubs	170	no	

(i) Using the information from the table, draw a bar graph on the opposite page to show the melting point for the type of plastic waste.
(Additional graph paper, if required, can be found on page 37.)

3

(ii) A large recycling centre sorts two tonnes of LDPE type plastic each day. The recycling centre operates for 300 days a year. Calculate how much money is raised in one year by selling this material.
Space for calculation

1



4. (b) (continued)

A large grid of graph paper, consisting of 20 columns and 20 rows of small squares. The grid is intended for students to show their work for question 4(b).

4. (continued)

- (c) Other than taking waste to a recycling centre, suggest one method by which a local council could encourage householders to recycle their waste.

1



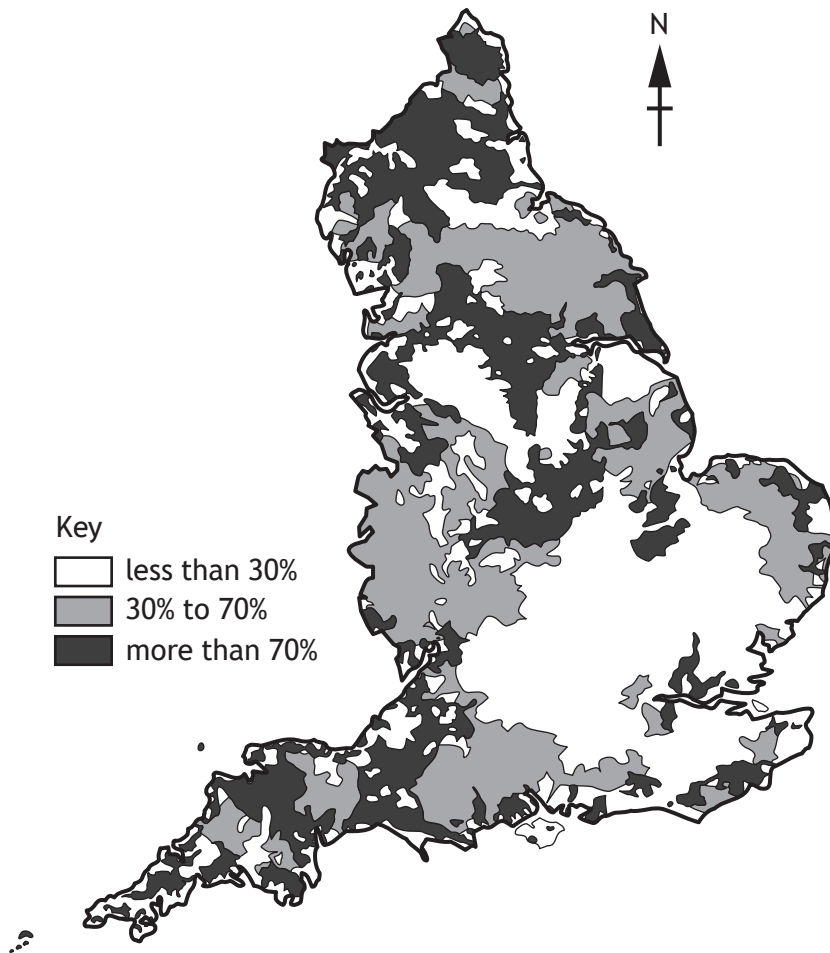
5. Water abstraction refers to the process of taking or extracting water from a natural source for various uses. Natural sources include rivers, lakes, and groundwater aquifers.

MARKS DO NOT WRITE IN THIS MARGIN

During a year, water may not be available for abstraction at all times.

The map shows the percentage of time water may be available for abstraction in England.

Percentage of time water may be available for abstraction



- (a) Define the term *groundwater*.

1

- (b) (i) Suggest two reasons why some areas in England have less time when water is available for abstraction.

2



5. (b) (continued)

- (ii) Agriculture uses a large volume of abstracted water.
State two uses for abstracted water in agriculture.

2

- (iii) In one year, 26 000 million litres of freshwater were abstracted in England. 55% of this was used for public water supply, the remainder was for other uses.

Calculate the volume abstracted for other uses.

1

Space for calculation

_____ million litres

- (c) Drought, a damaging period of water shortage, is a key factor in determining water availability.

- (i) Suggest why the impact of drought is likely to be more severe in the summer after a dry winter.

1

- (ii) Suggest a possible impact on humans of summer drought in England.

1

- (iii) State one method of water conservation in the home.

1



5. (continued)

(d) SEPA is the national organisation with responsibility for monitoring water quality in Scotland.

Water quality can be determined using indicator species.

(i) Define the term *indicator species*.

1

(ii) Rat-tailed maggots are indicator species that thrive in rivers where the water has low oxygen concentration.

Suggest a waste product that may enter a river that results in low oxygen concentration in the water.

1

(iii) State another role of SEPA.

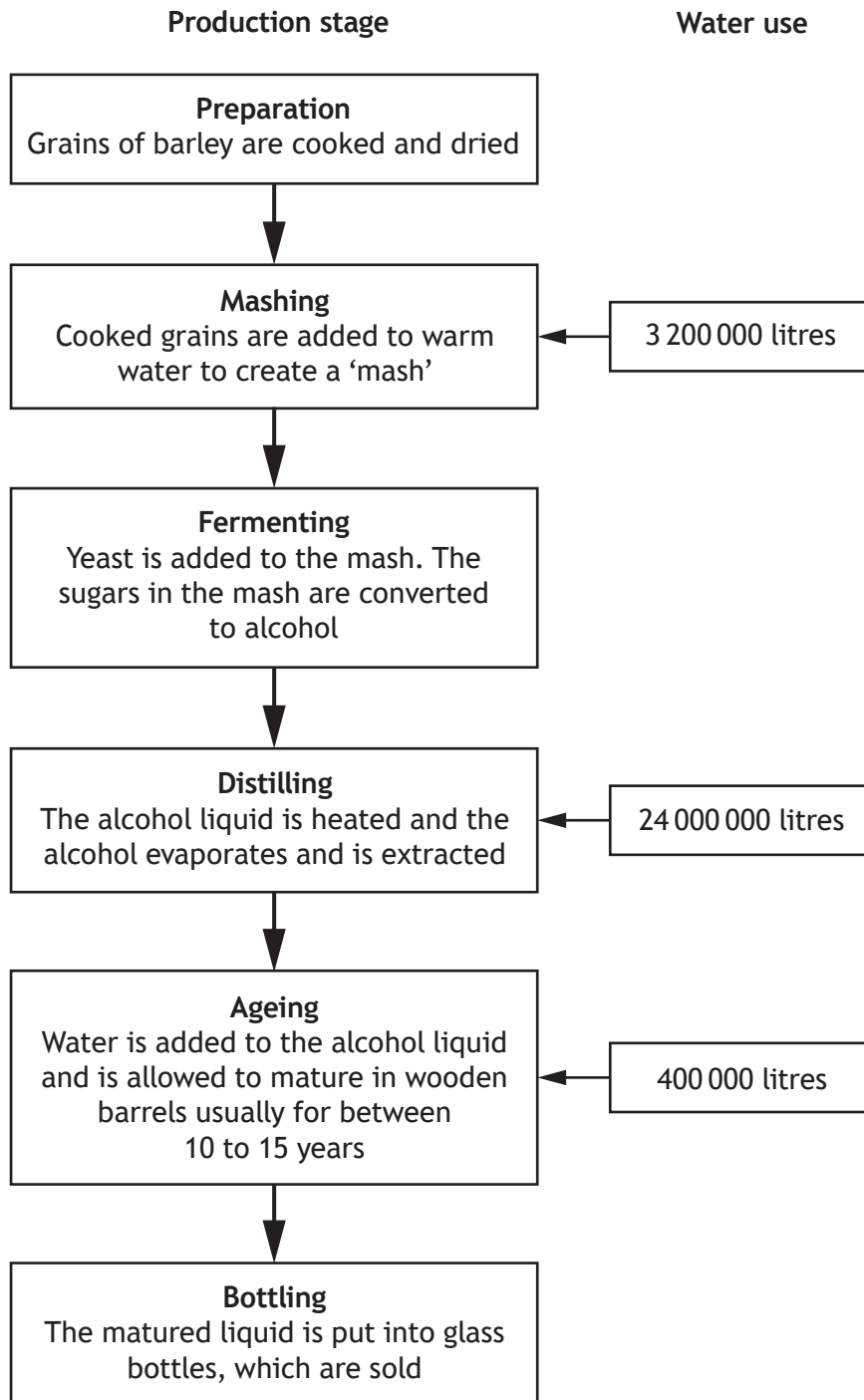
1

[Turn over



6. Whisky production is an important industry in Scotland.

The diagram shows the different stages involved in the production of whisky in a distillery.



* X 8 2 6 7 5 0 1 1 6 *

6. (continued)

(a) The agricultural crop barley is one of the main resources used in producing whisky.

(i) Circle the **two** terms that refer to barley.

1

physical resource	biological resource	renewable resource	non-renewable resource
-------------------	---------------------	--------------------	------------------------

(ii) Using information from the diagram, identify two other resources used in making whisky.

1

1 _____

2 _____

(b) Calculate the simplest whole number ratio of the volume of water used in the mashing, distilling, and ageing processes.

1

Space for calculation

_____ : _____ : _____
 mashing distilling ageing

(c) Distilleries use large volumes of water for cooling purposes, which is then released back into streams and rivers.

(i) Name one aquatic abiotic factor that could be impacted by this release of water **and** describe a technique that could be used to measure it.

3

Aquatic abiotic factor _____

Technique _____



6. (c) (continued)

(ii) Suggest one method the distillery could use to reduce its water usage in the manufacturing process.

1

(d) Some whisky companies in Scotland are investing in biomass. The waste grain product, known as *draff*, is combined with woodchips and burned to release energy to power the distillery.

Suggest one advantage and one disadvantage of using biomass.

2

Advantage _____

Disadvantage _____



* X 8 2 6 7 5 0 1 1 8 *

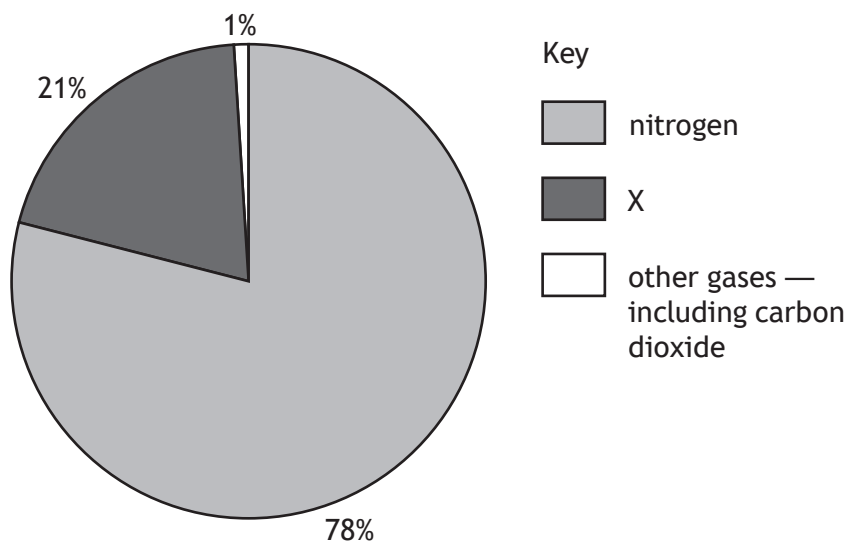
[Turn over for next question

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* X 8 2 6 7 5 0 1 1 9 *

7. The pie chart shows the approximate composition of gases in the atmosphere.



(a) Identify gas X.

1

(b) Carbon dioxide is a greenhouse gas.

(i) Explain the role of greenhouse gases in the **natural** greenhouse effect.

2

(ii) Describe the importance of the **natural** greenhouse effect for life on Earth.

1



7. (continued)

(c) Carbon dioxide can be removed from the atmosphere by producers in the biosphere, as part of the carbon cycle.

(i) Name this process.

1

(ii) Name two processes that add carbon dioxide to the atmosphere.

2

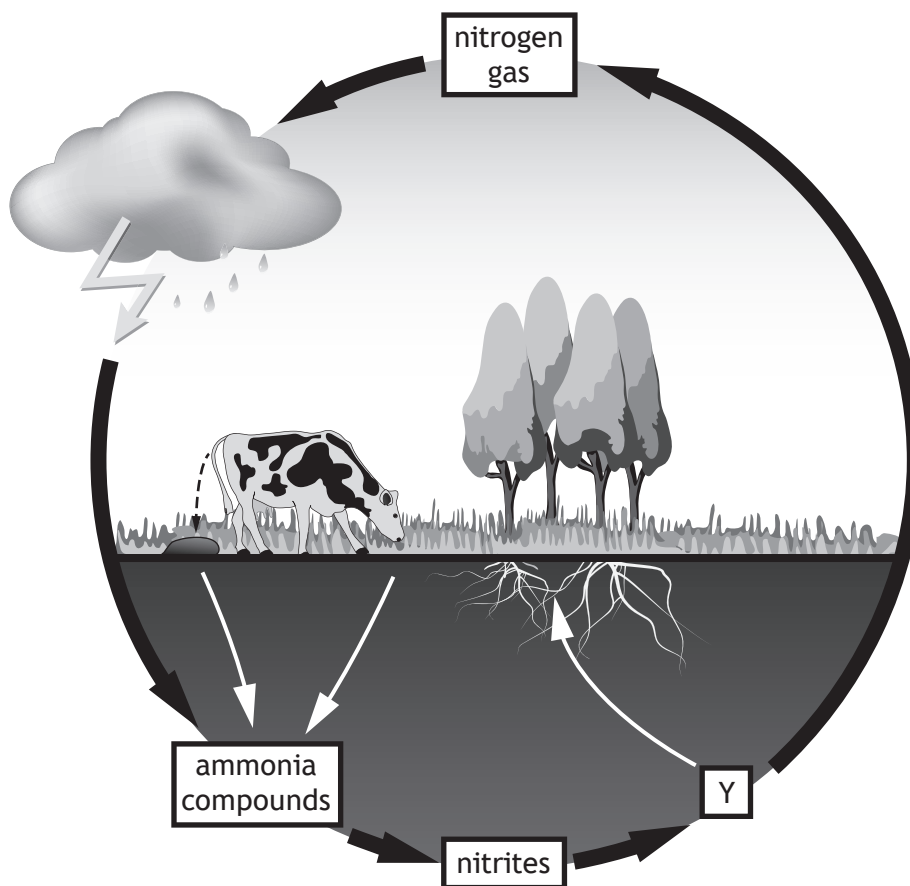
1 _____

2 _____

[Turn over



8. The diagram shows part of the nitrogen cycle. The nitrogen cycle is essential for plant growth.



- (a) Substance Y is absorbed by plant roots.

Name substance Y.

1

- (b) Clover plants have bacteria in their root nodules, which convert nitrogen gas into a form that plants can use.

- (i) Name this process.

1

- (ii) State the term used to describe plants, such as clover, that have root nodules.

1



8. (continued)

(c) Nitrogen-based fertilisers can be applied to crops.

Describe one advantage and one disadvantage of using fertilisers.

2

Advantage _____

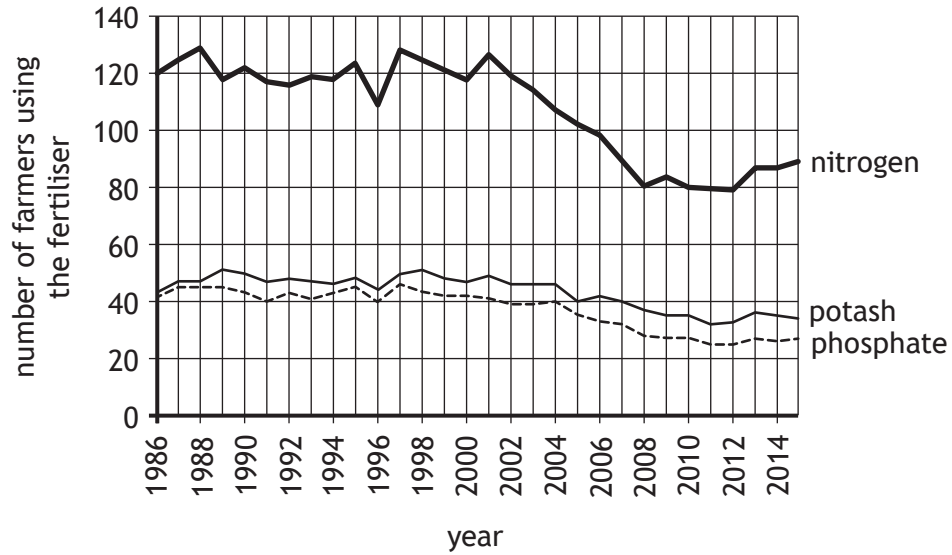
Disadvantage _____

[Turn over



8. (continued)

(d) The graph shows the number of farmers in a sample area using specific nutrient fertilisers over a 29-year period.



(i) Describe the overall trend in the number of farmers using fertilisers over the 29-year period.

1

(ii) Calculate the percentage change in the number of farmers using nitrogen fertiliser between 1986 and 2008.

2

Space for calculation

_____ %



SECTION 2 — 20 marks

Attempt ALL questions

9. The development of a maritime container terminal has been proposed on an estuary on the east coast of the United Kingdom.

An estuary is where a large river flows into the sea. It is affected by the movement of the tides.

At low tide, large areas of mudflat are exposed. The mudflats have SSSI status to protect wading birds from being disturbed by people and dogs. These areas are easily damaged if the estuary is dredged, as the water flow will become more rapid and erode them away.

The land around the estuary is low lying with the highest point being only ten metres above current sea level.

The motorway was built recently. It was constructed to avoid being flooded by future rises in sea level.

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

[Turn over



9. (continued)

(a) Source 1 is a sketch map showing three current industrial sites at the western end of the estuary.

(i) Air pollution levels were found to be significantly higher to the east of the oil refinery.

Suggest a reason for this.

1

(ii) The coal-fired power station is due to close in 2023.

Predict what might happen to the number of hospital admissions for breathing disorders in this area when the coal-fired power station closes.

Give a reason for your answer.

1

(b) The UK Government is encouraging the use of electric vehicles and will ban the sale of new petrol and diesel cars by 2030.

(i) Predict the impact this policy may have on the rate of sea level rise due to climate change.

Explain your answer.

2

(ii) Using Source 1, suggest the impact of rising sea levels on the abandoned quarry.

1



9. (b) (continued)

(iii) Sea walls could be built to protect areas from rising sea levels. However, current funding for this is only available to build a maximum of four kilometres of sea walls. Important industrial sites would be given priority. Using Source 1, explain whether the town could be protected by sea walls.

2

(c) The mudflats are habitat to an abundance of birds of international importance and are designated as an SSSI.

(i) State the meaning of the term *habitat*.

1

(ii) Other than birdlife, state one reason why an area may be designated as an SSSI.

1

(d) One of the species of wading birds found in the mudflats is shown in Source 4. Suggest why changing plumage colour may help this bird to be better adapted to its environment.

1

[Turn over



9. (continued)

(e) The paired statement key can be used for identifying some birds found on the mudflats during summer months.

- | | |
|--------------------------------------|-------------------|
| 1. Feet webbed | go to 2 |
| Feet not webbed | go to 3 |
| 2. Orange/red band around the breast | Shelduck |
| No orange/red band around the breast | Eider duck |
| 3. Beak short | go to 4 |
| Beak not short | go to 5 |
| 4. Orange/red breast | Knot |
| No orange/red breast | Ringed plover |
| 5. Orange/red breast | Bar tailed godwit |
| No orange/red breast | Curlew |

Using the paired statement key:

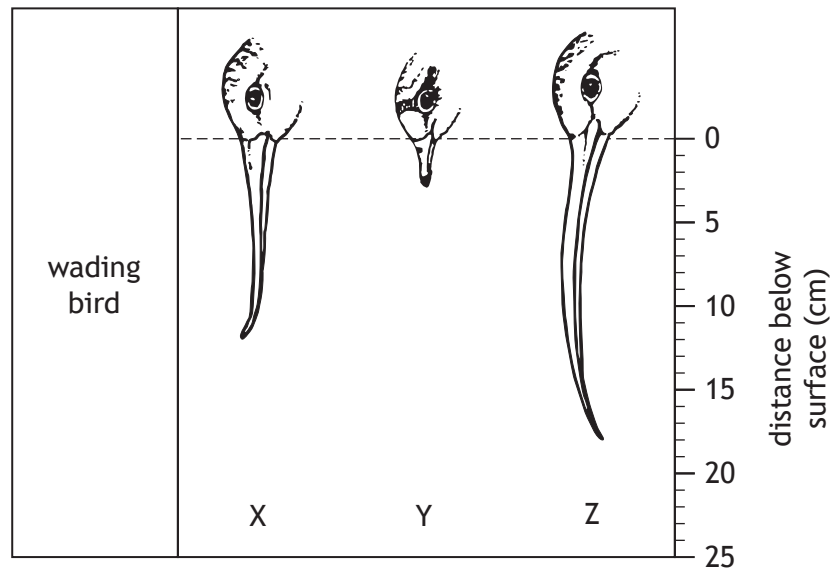
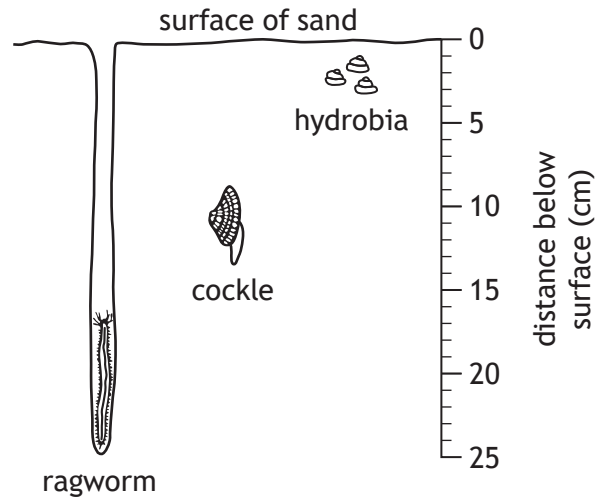
(i) identify the bird pictured in Source 4 1

(ii) describe the difference between the curlew and the ringed plover. 1



9. (e) (continued)

(iii) The birds feed on burrowing animals which live at different depths on the estuary. The diagrams show three of the burrowing animals, the depths at which they live, and the depth to which birds can reach with their beaks.



(A) Using both diagrams, select the animal that each of the bird species is likely to be feeding on.

1

X _____

Y _____

Z _____



9. (e) (iii) (continued)

(B) Select the bird, X, Y, or Z, that would be able to feed on all of the animals shown.

1

(C) Suggest why it is an advantage for the birds to have different diets.

1

(D) Cockles are very sensitive to pollution and cannot live in polluted sand.

Predict one effect on the wildlife of the estuary if the cockles were to die out.

1



SECTION 3 — 14 marks

Questions 10 and 11 each contain a choice

Write your answers to questions 10 and 11 on the following pages.

You may use diagrams where appropriate.

- | | | | |
|------------|----------|---|----------|
| 10. | A | <p>A group of students plan to do a survey of the variety of invertebrates living in the leaf litter in a woodland.</p> <p>Describe what equipment they should use and how they should use it to ensure their results are reliable.</p> | 7 |
| OR | | | |
| | B | <p>A group of students plan to do a survey of the variety of plants growing at ground level in a woodland.</p> <p>Describe what equipment they should use and how they should use it to ensure their results are reliable.</p> | 7 |
| 11. | | | |
| A | | <p>A family is thinking about going on holiday. They want their holiday to be more sustainable and have a low impact on the environment.</p> <p>Discuss ways in which the family could have a holiday with a low impact on the environment.</p> | 7 |
| OR | | | |
| B | | <p>A family wants to try and reduce the impact of their diet on the environment.</p> <p>Discuss choices the family could make to reduce the impact of their diet on the environment.</p> | 7 |



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SPACE FOR ANSWERS



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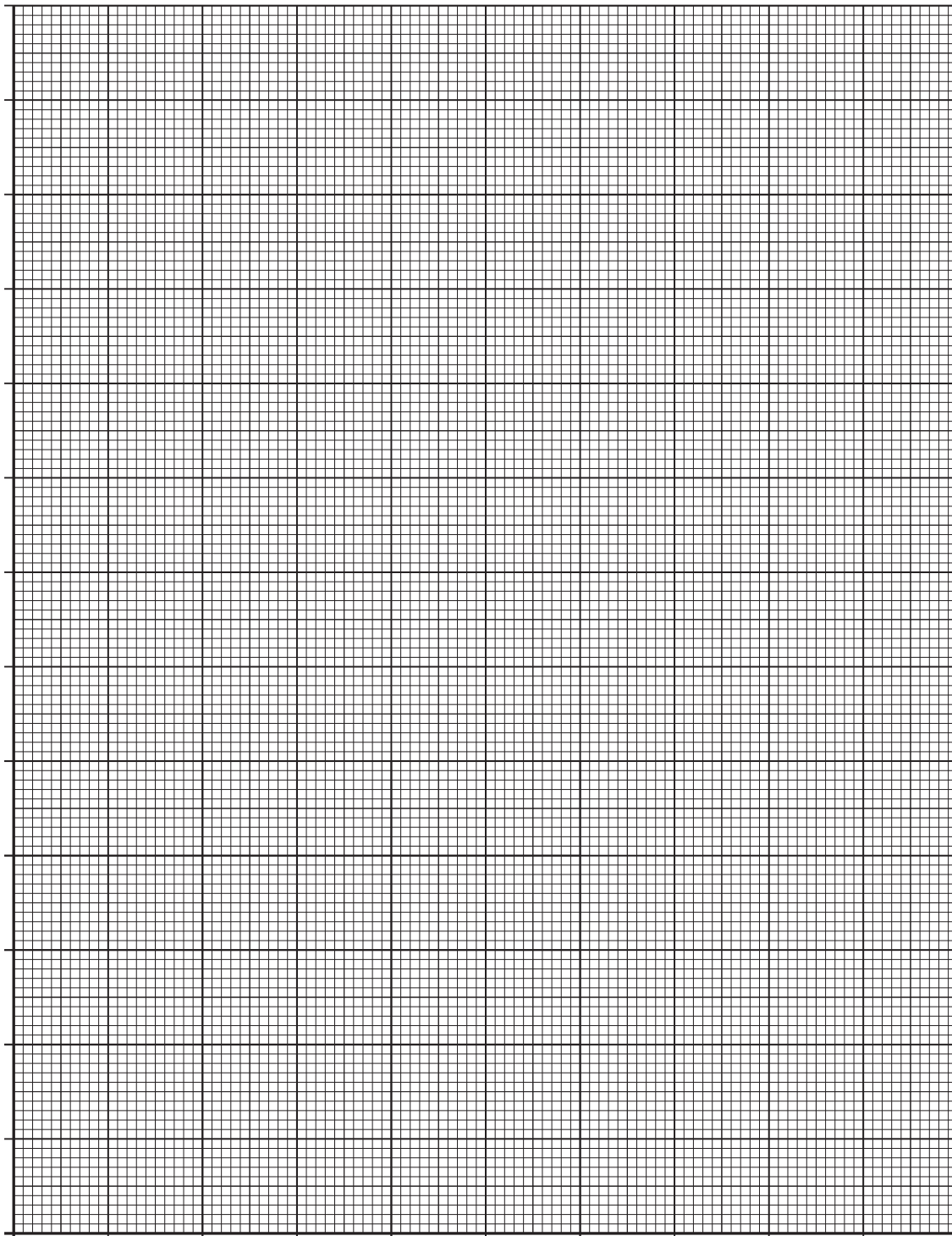
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[END OF QUESTION PAPER]



ADDITIONAL SPACE FOR ANSWERS AND ROUGH WORK

Additional graph paper for question 4 (b) (i)



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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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Question 8 Designua/shutterstock.com



* X 8 2 6 7 5 0 1 4 0 *