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N5

National Qualifications 2018

Mark

# X826/75/01 Environmental Science

THURSDAY, 31 MAY
9:00 AM – 11:30 AM

*X8267501*

**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 11 and 12 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. 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.

SQA ©

*X8267501 01*

**SECTION 1 — 66 marks**

**Attempt ALL questions**

MARKS | DO NOT WRITE IN THIS MARGIN

**1.** The photograph below shows a country landscape.

(a) (i) Name two physical resources shown in the photograph. **2**

_____

_____

(ii) Name two types of renewable energy shown in the photograph. **2**

_____

_____

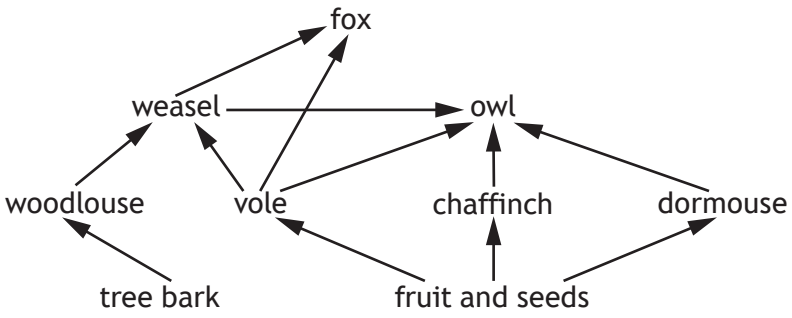
(b) Describe one benefit of renewable energy. **1**

_____

_____

_____

**2.** The food web below shows some of the organisms found in a woodland ecosystem.




(a) Name the source of energy in this food web. **1**

(b) State the purpose of the arrows in the food web. **1**

(c) Name two organisms from the food web which are in competition with each other. **1**

(d) (i) Predict what would happen to the number of owls if the dormouse population decreases.

Give a reason for your answer. **1**

(ii) Describe a named method that could be used to estimate the size of the dormouse population. **2**

**3.** Biofuels can be used as a renewable energy source. The table below shows the percentage of biofuels used for transport in some countries in 2011.

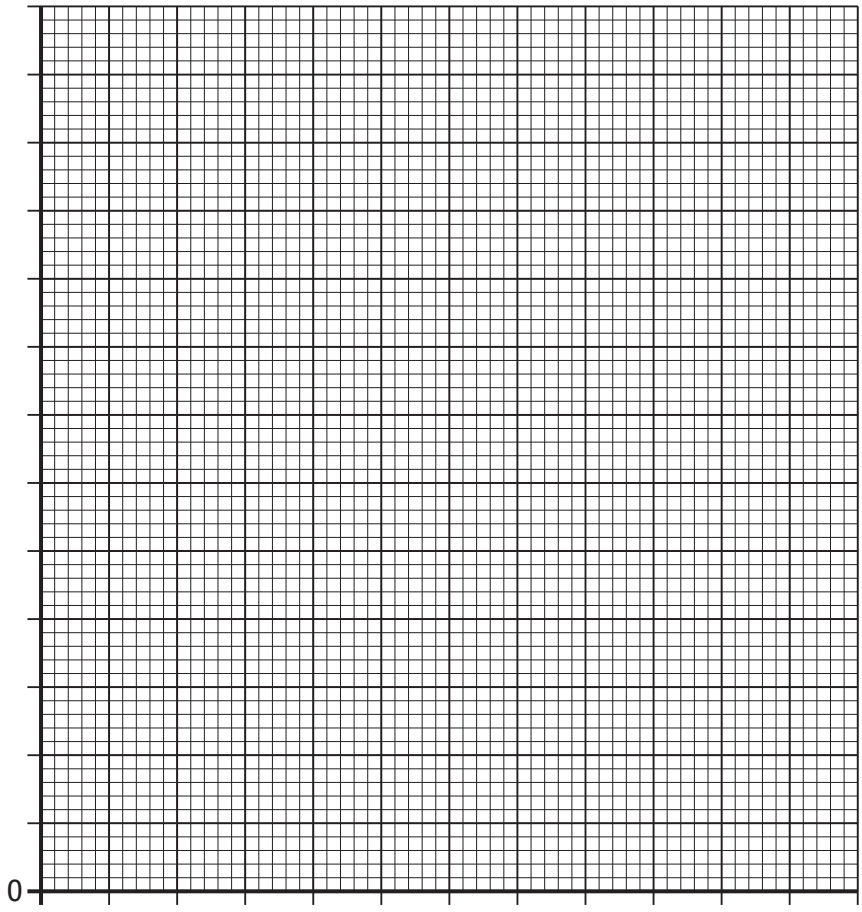
| *Country* | *Percentage of biofuels used for transport* |
|---|---|
| Brazil | 29 |
| France | 7 |
| UK | 3 |
| China | 1 |
| USA | 6 |

(a) Using the information in the table, complete the bar graph below by:

1 adding the scale and label to the horizontal (x) axis

2 completing the scale and adding the label to the vertical (y) axis

3 completing the bar graph to show the percentage of biofuels used for transport. **3**




(Additional graph paper, if required, can be found on *page 31*.)

**3. (continued)**

(b) In 2011 Brazil produced 23·4 billion litres of biofuel.

Calculate how many litres of biofuel were used for transport in Brazil. **1**

*Space for calculation*

_____ l

(c) Biofuels are often seen as being more environmentally friendly than fossil fuels.

Suggest two reasons why the use of biofuels may **not** be environmentally friendly. **2**

1 _____

_____

_____

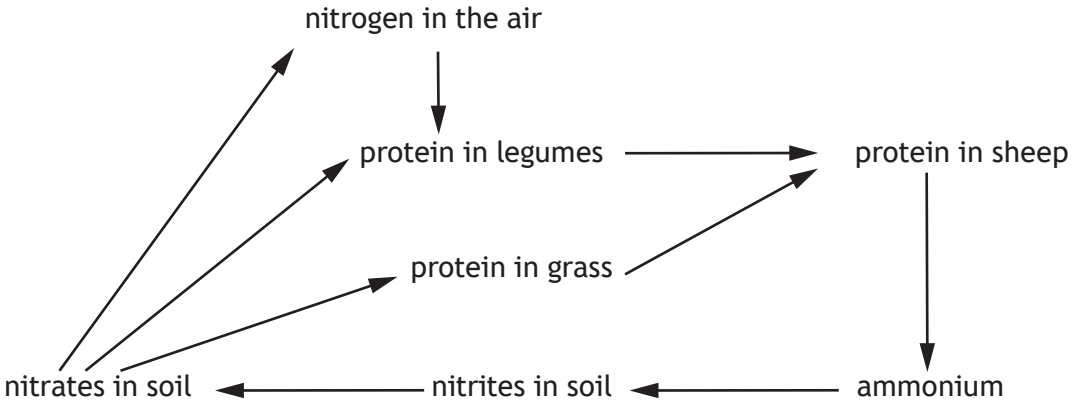
2 _____

_____

_____

**[Turn over**

**4.** The diagram below shows part of the nitrogen cycle on a sheep farm.




(a) (i) Place an **'F'** on the diagram to show the stage in which fungi are most important. **1**

(ii) Place an **'N'** on the diagram to show the stage in which nitrogen fixation takes place. **1**

(b) State the type of organism that is responsible for converting nitrates in the soil into nitrogen gas in the air. **1**

_____

(c) Farmers try to increase the yield of the grass crop. This requires a supply of nitrates.

Explain how this could be achieved. **2**

_____

_____

_____

_____

(d) On this farm, a sheep eats 8 kg of grass per day. The grass contains 6 kg of water and 20% of the remaining dry mass is protein.

Calculate the mass of protein the sheep eats per day. **2**

*Space for calculation*

_____ kg

**4. (continued)**

(e) Farmers throughout the world often extract water contained within porous rock to irrigate crops.

Explain why this practice may not be sustainable. **2**

_____

_____

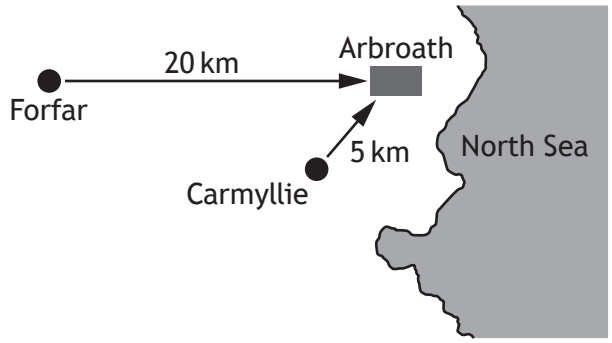
_____

_____

**[Turn over**

**5.** A teacher has a hybrid car with a rechargeable battery and a petrol engine. It runs on electricity provided by the battery for a distance of 30 kilometres. Once the battery runs out of charge, it switches to the petrol engine.

(a) The teacher lives in Forfar and makes five return journeys to school in Arbroath each week.




(i) Using information from the map, calculate how many kilometres per week the teacher travels to school and back. **1**

*Space for calculation*

_____ km

(ii) Each night, the teacher fully charges the car battery using their home power supply.

Calculate the distance travelled per week when the battery has run out of charge. **1**

*Space for calculation*

_____ km

(iii) When running on petrol, the car consumes 1 litre of petrol every 10 kilometres.

Calculate the weekly petrol consumption. **1**

*Space for calculation*

_____ l

**5. (continued)**

(b) Suggest a reason why the teacher decided to buy a hybrid car. **1**

(c) Another teacher lives in Carmyllie and drives a diesel car to school.

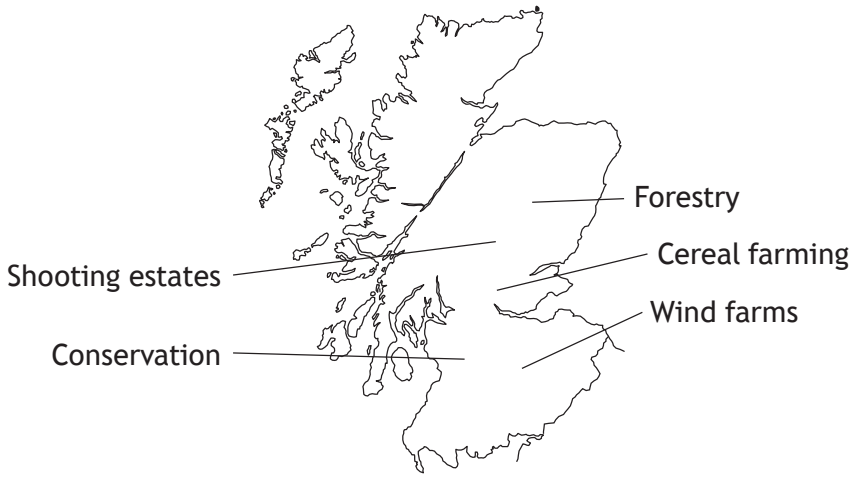
Suggest two methods that could make their journey to school more sustainable. **2**

(d) Hybrid cars are becoming more popular.

Evaluate the sustainability of this trend. **2**

**[Turn over**

**6.** The diagram below shows some of the land-based activities in Scotland.




(a) Suggest why **two** of the land-based activities above may be in conflict. **2**

Land-based activity 1 _____

Land-based activity 2 _____

Conflict _____

_____

_____

(b) Name one other land-based activity. **1**

_____

(c) Other than cereals name one economically important agricultural crop produced in Scotland. **1**

_____

(d) Describe the role of a named national organisation responsible for protection of the environment. **2**

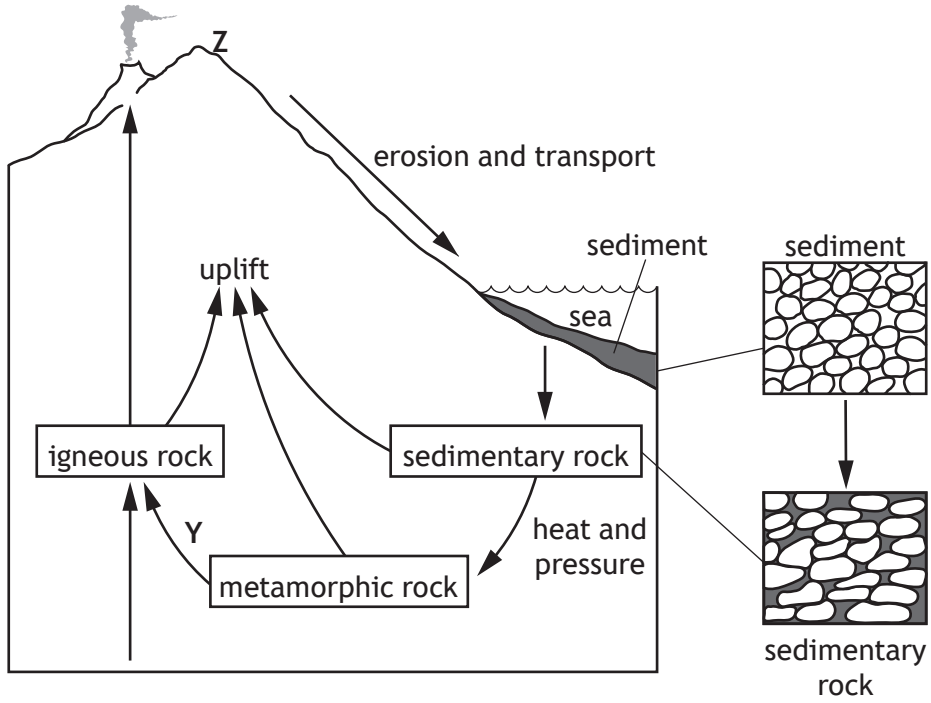
_____

_____

_____

_____

**7.** The diagram below shows the rock cycle.




(a) (i) The rock at location **Z** is being weathered.

Explain the term *weathering*. **2**

(ii) Describe how sediment changes into sedimentary rock. **3**

**7. (a) (continued)**

(iii) State what process occurs at location **Y** to change metamorphic rocks into igneous rocks. **1**

_____

(b) Describe the conditions under which limestone is formed. **2**

You may use diagrams in your answer if you wish.

_____

_____

_____

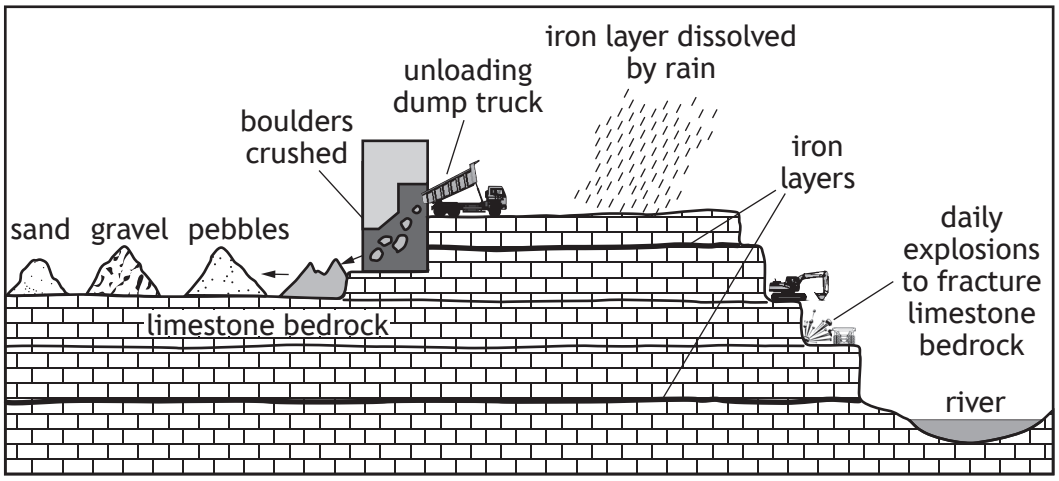
_____

_____

**7. (continued)**

(c) The diagram below shows a limestone quarry located near a small town.

All the limestone from the quarry is transported by lorry to a cement factory at the other end of the town.

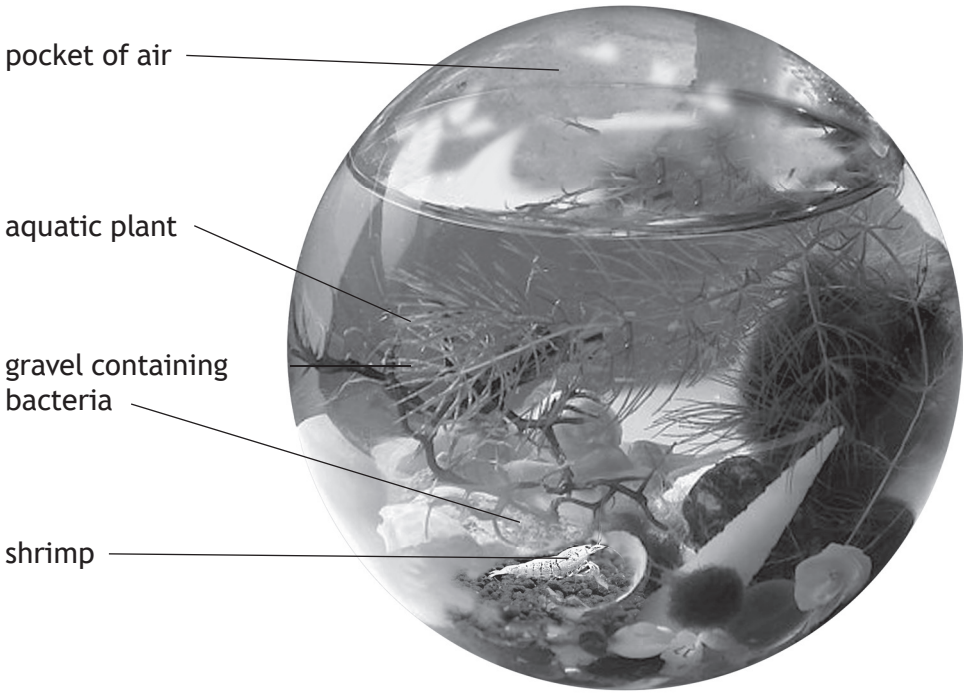



(i) Evaluate the environmental impact of the quarry. **2**

(ii) State one other use of limestone. **1**

**[Turn over**

**8.** The product below is a sealed marine ecosystem that can be kept at home. The sphere is airtight. The plants and animals can remain alive for many years provided the sphere is kept in the correct conditions.




(a) Define the term *ecosystem*. **1**

(b) Respiration and photosynthesis are two of the processes carried out by organisms in the ecosystem.

(i) Complete the table below by inserting a tick (✓) in the boxes to show which organism(s) carry out respiration and photosynthesis, and at what time. **3**

| | *Photosynthesis* | | *Respiration* | |
|---|---|---|---|---|
| *Organism* | *Daylight hours* | *Darkness hours* | *Daylight hours* | *Darkness hours* |
| Aquatic plant | | | | |
| Shrimp | | | | |
| Bacteria | | | | |

**8. (b) (continued)**

(ii) Complete the word equation for respiration. **1**

glucose + _____ ⟶ _____ + water

(iii) Explain how the aquatic plant in the ecosystem is able to carry out photosynthesis. **3**

_____

_____

_____

_____

_____

_____

**[Turn over**

**9.** The American mink was introduced to the UK for the production of fur. Some of the mink escaped and are now found living wild in many areas of the country including the Hebrides. The American mink is a carnivore that is commonly found around waterways.

The spread of mink and their continued presence across the Hebrides acts as a threat to many bird populations.

(a) State the term used to describe a species which has been introduced to the UK and has the ability to spread and cause damage to the environment. **1**

_____

**9. (continued)**

(b) The diagram below shows a mink raft. It consists of a floating raft with a tunnel containing a floor of clay and sand. If a mink enters the tunnel its footprints will be recorded.

(i) Suggest why the raft has been covered with vegetation. **1**

(ii) The raft is used to survey if there are mink present in an area.
State one way the results of a survey could be made more reliable. **1**

(iii) Suggest a source of error that may be encountered when using the mink raft. **1**

**[Turn over**

**9. (continued)**

(c) Populations of American mink on some Hebridean islands have been found to be so high that conservationists have suggested that they should be eliminated completely.

(i) Explain why this is necessary. **2**

(ii) Suggest one way in which this could be achieved. **1**

**SECTION 2 — 20 marks**

**Attempt ALL questions**

DO NOT WRITE IN THIS MARGIN

Glen Clova in Angus is a remote rural area. An outdoor education centre intends to build a biomass plant using locally available wood as a fuel.

An environmental consultant has recently been surveying the area.

**Using the information shown in the Supplementary Source booklet, answer the following questions.**

**[Turn over**

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**DO NOT WRITE ON THIS PAGE**

**10.** Instruments were installed to measure the wind speed and wind direction at Locations A and B shown in **Source 2**.

The table below is a summary of the results for a complete year.

| Location | *Abiotic factor* | |
|---|---|---|
| | *Average annual wind speed* (km per hour) | *Prevailing wind direction* |
| A | 20 | South east |
| B | 2 | South east |

(a) (i) A wind vane is used to indicate wind direction.

Name a piece of equipment used to measure wind speed. **1**

(ii) Explain why sheep farmers in this glen prefer to place newly born lambs in fields near to Location B. **1**

(iii) Suggest what would happen to the wind speed at Location B if the Norway spruce woodland was cut down to provide fuel for the biomass plant. **1**

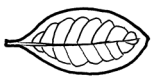
**[Turn over**

**10. (continued)**

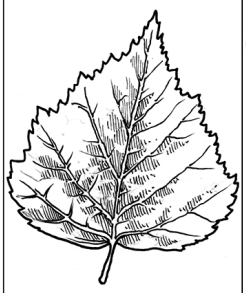
(b) Plants can be identified by examining the features of their leaves.

The table below shows some leaf features and the terms used to describe them.

**Leaf features table**

| Veins | Shapes | Number | Edges | Arrangement on the stem |
|---|---|---|---|---|
|  netlike |  hand-shaped |  simple |  smooth |  alternate |
|  parallel |  spear-shaped |  compound |  toothed |  opposite |
| | round  |  compound |  lobed |  whorled |
| |  needle | | | |

The diagrams below show the leaves from some of the trees identified in Woodland X shown in **Source 3**.

| | | | |
|---|---|---|---|
|  |  |  |  |
| Silver birch | Oak | Ash | Sycamore |

**10. (b) (continued)**

(i) Using the information in the leaf features table describe fully the ash leaf. **2**

_____

_____

_____

_____

(ii) The trees can be identified using a paired statement key. Complete the key below using information from the leaf features table and the leaf diagrams. **2**

| | | |
|---|---|---|
| 1. | Leaves needle-shaped | Norway spruce |
| | Leaves not needle-shaped | Go to 2 |
| 2. | _____ | Ash |
| | Simple leaf | Go to 3 |
| 3. | Leaf toothed | Go to 4 |
| | _____ | Oak |
| 4. | _____ | Sycamore |
| | Leaf spear-shaped | _____ |

(iii) Suggest why this paired statement key would be less useful during winter months. **1**

_____

_____

**[Turn over**

**10. (continued)**

(c) The following environmental data was obtained to compare Woodland X and Woodland Y, shown in **Source 3**.

| Woodland | *Number of species* | |
|---|---|---|
| | *Ground invertebrates* | *Ground plants* |
| X | 52 | 12 |
| Y | 26 | 7 |

(i) Name a method used to investigate ground invertebrates.
Describe how it is used. **2**

Method _____

Description of use _____

_____

_____

_____

_____

(ii) Using all the sources available, suggest why there is a higher biodiversity at Woodland X than Woodland Y. **1**

_____

_____

**10. (continued)**

(d) When wood is burned energy is given off in the form of heat. This is known as the calorific value. Different tree species have different calorific values.

The environmental consultant investigated the calorific value of the wood from the trees found in Woodlands X and Y. The table below shows the results.

| *Species* | *Calorific value* (kWh tonne$^{-1}$) |
|---|---|
| Ash | 3500 |
| Sycamore | 3000 |
| Silver birch | 2700 |
| Oak | 2600 |
| Norway spruce | 1800 |

(i) The adventure company would like to build their biomass plant at Location Z and harvest the trees at Woodland X.

Using the information given in the table, suggest a reason for their decision. **1**

_____

_____

(ii) Calculate, using the information in the table above, the average calorific value of the trees found in Woodland X. **2**

*Space for calculation*

_____ kWh tonne$^{-1}$

**10. (d) (continued)**

(iii) Using the sources provided, suggest one other renewable method of producing power in Glen Clova.

Justify your answer. **2**

(e) The outdoor adventure company have applied to the Local Authority for permission to build the biomass plant.

Some local people are not happy with the proposal.

Using the evidence from the sources and your knowledge of environmental science, decide whether or not permission for the biomass plant should be granted.

Justify your answer. **4**

## SECTION 3 — 14 marks

**Questions 11 and 12 each contain a choice**

MARKS | DO NOT WRITE IN THIS MARGIN

Write your answers to questions 11 and 12 on the following pages.

You may use diagrams where appropriate.

**11.** **A** The Earth is surrounded by a mixture of gases, known as the atmosphere.

(a) Describe the natural greenhouse effect.

(b) Describe what is meant by the enhanced greenhouse effect and the impacts that may result from it. **7**

**OR**

**B** New hydroelectric power schemes are currently being built in Scotland.

(a) Describe the requirements for siting a hydroelectric power scheme.

(b) Describe the production of energy by hydroelectric power. **7**

**12.** **A** Discuss the impacts of an increasing global population on Earth's food supplies. **7**

**OR**

**B** The increasing global population is causing waste management issues.

Discuss these issues and possible solutions. **7**

**[Turn over**

MARKS | DO NOT WRITE IN THIS MARGIN

**SPACE FOR ANSWERS**

MARKS | DO NOT WRITE IN THIS MARGIN

## SPACE FOR ANSWERS

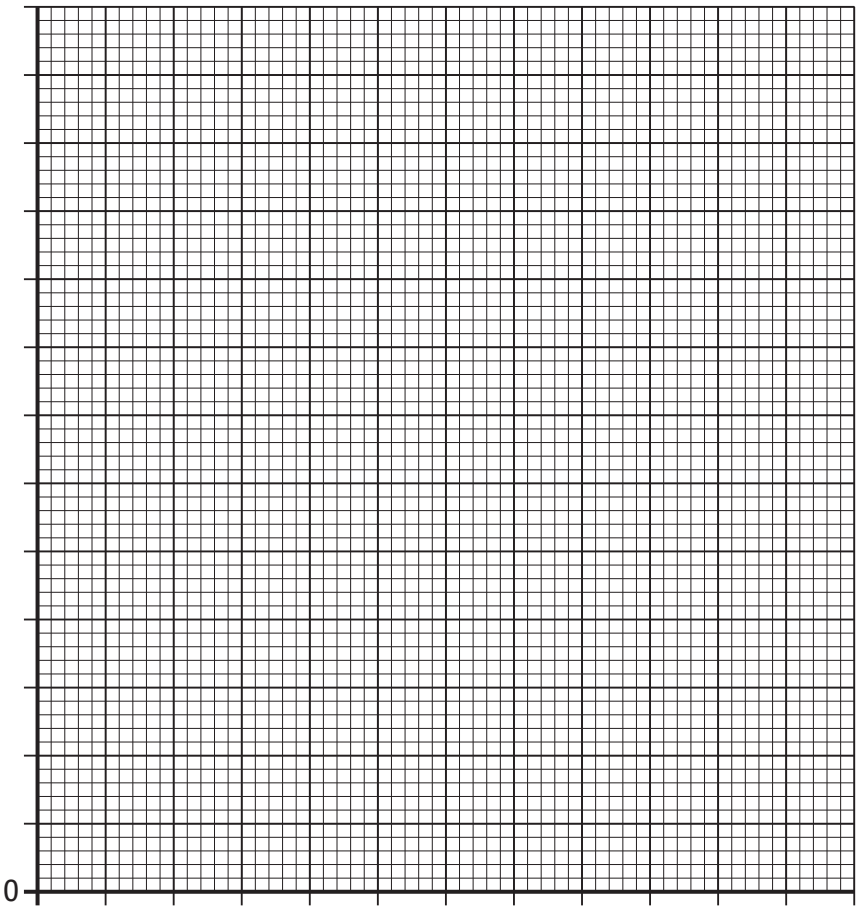
MARKS | DO NOT WRITE IN THIS MARGIN

**SPACE FOR ANSWERS**

**[END OF QUESTION PAPER]**

## ADDITIONAL SPACE FOR ANSWERS AND ROUGH WORK

**Additional graph paper for question 3 (a)**



MARKS | DO NOT WRITE IN THIS MARGIN

**ADDITIONAL SPACE FOR ANSWERS AND ROUGH WORK**

MARKS | DO NOT WRITE IN THIS MARGIN

## ADDITIONAL SPACE FOR ANSWERS AND ROUGH WORK

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ACKNOWLEDGEMENTS

Question 1 – OxfordSquare/Shutterstock.com
Anteromite/Shutterstock.com
VarnaK/Shutterstock.com
Sylv1rob1/Shutterstock.com
fokke baarssen/Shutterstock.com
Nerthuz/Shutterstock.com

Question 9 (a) – Gallinago_media/Shutterstock.com

Question 9 (b) – Yevgeniy Yesmukharov/Shutterstock.com

National Qualifications 2018

# X826/75/11

# Environmental Science
# Supplementary Source Booklet

THURSDAY, 31 MAY
9:00 AM – 11:30 AM

**This booklet contains sources for use with question 10 in Section 2.**

**Supplementary sources of information**

**Source 1** is a map extract showing Glen Clova in Angus.

Sources 2 and 3 display information relating to the area shown in the Source 1 map extract:

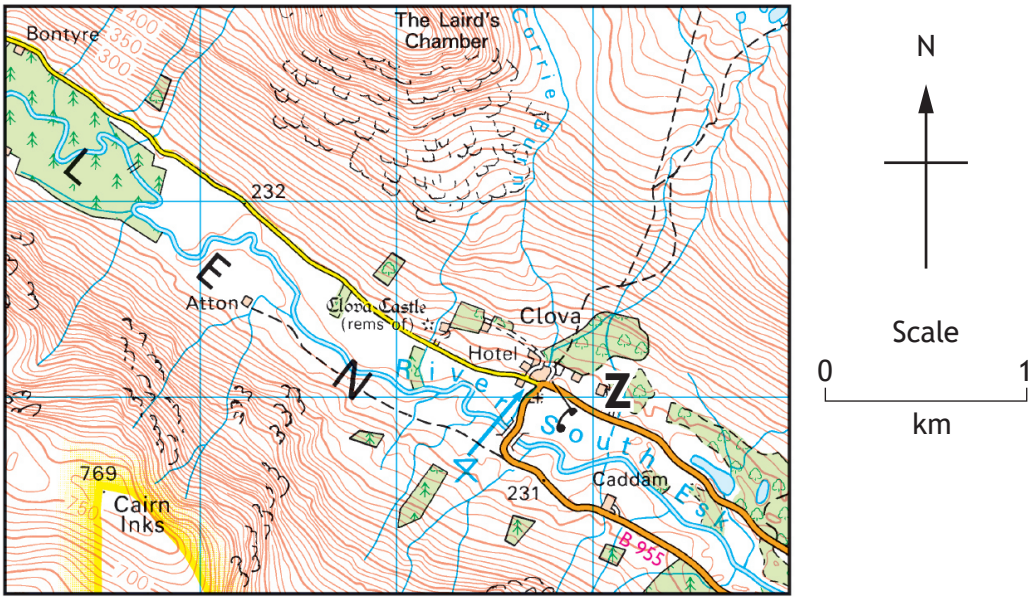
- **Source 2** is a sketch map displaying woodland areas surveyed and watercourses present in the area.
- **Source 3** is a photograph taken on the slopes above the proposed biomass plant.

**Source 4** contains some opinions of local people that were interviewed by the environmental consultant.



*X8267511*

**Source 1: Map extract showing Glen Clova in Angus**




Key

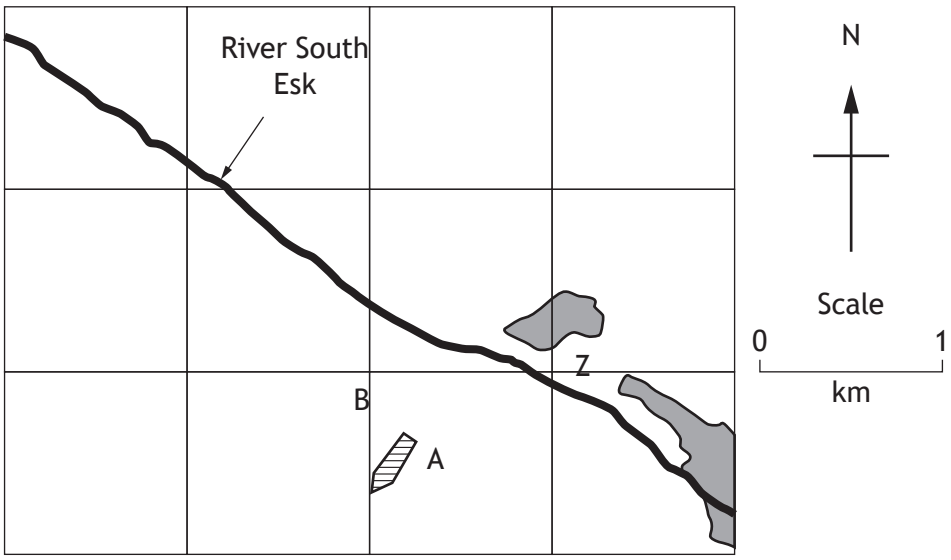
Path/Other road, drive or track

Coniferous wood

Non-coniferous wood

Z Location of proposed biomass plant

**Source 2: Sketch map of Glen Clova**




Key

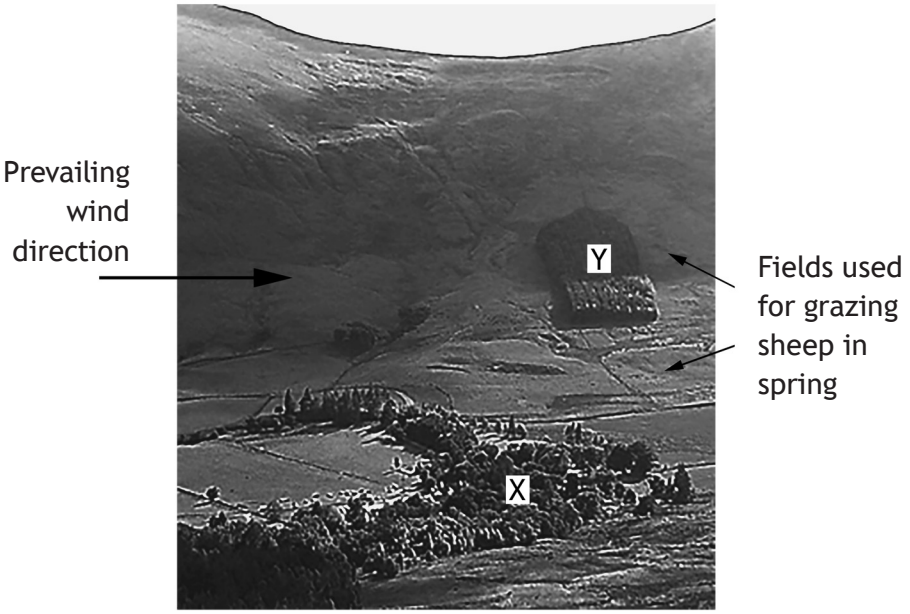
Woodland area containing mainly birch, oak, sycamore and ash trees

Woodland area containing mainly Norway spruce

Z Location of proposed biomass plant

A B Locations where consultant placed wind measuring instruments

**Source 3: Photograph taken on the slopes above Location Z, looking south-west**




**Source 4: Opinions of some local people**

'My newly born lambs can die in spring because of the cold wind that comes up the glen from the south east. For many years, the woodland shelters and protects them.'

*Local sheep farmer*

'The scars on the landscape caused by tree felling and the smoke produced from this large biomass plant will mean that I will lose customers that come here to enjoy this remote area.'

*Local bed and breakfast owner*

**[END OF SUPPLEMENTARY SOURCE BOOKLET]**

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