

FOR OFFICIAL USE

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X055/301

Total for
Sections A and B

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NATIONAL
QUALIFICATIONS
2009

WEDNESDAY, 10 JUNE
1.00 PM – 3.30 PM

MANAGING
ENVIRONMENTAL
RESOURCES
HIGHER

Fill in these boxes and read what is printed below.

Full name of centre

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Town

--

Forename(s)

--

Surname

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Date of birth

Day Month Year

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Scottish candidate number

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Number of seat

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- (a) All questions should be attempted.

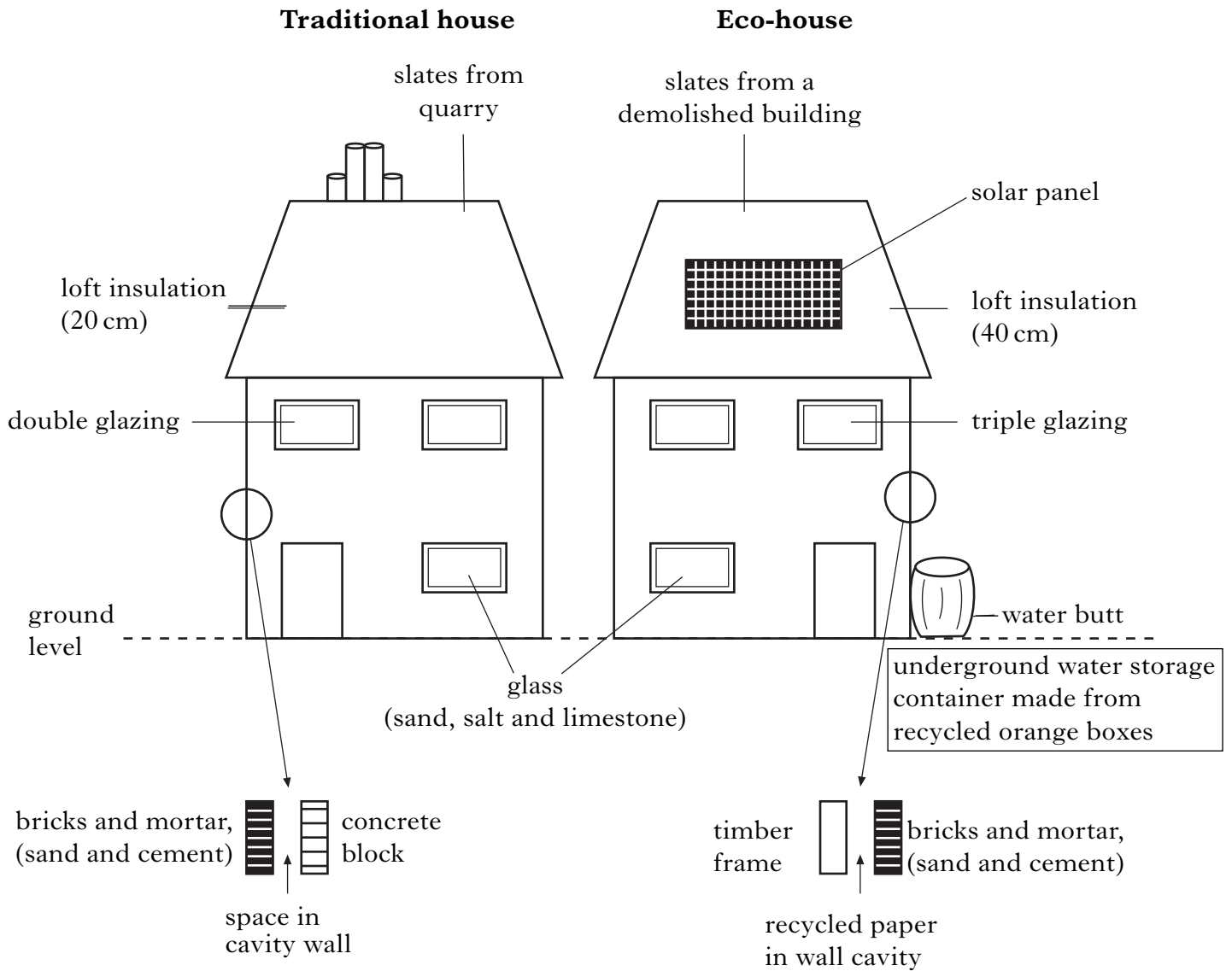
(b) It should be noted that in **Section B** questions 8 and 9 each contain a choice.
- The questions may be answered in any order but all answers are to be written in the spaces provided in this answer book, and must be written clearly and legibly in ink.
- Additional space for answers will be found at the end of the book. If further space is required, supplementary sheets may be obtained from the invigilator and should be inserted inside the **front** cover of this book.
- The numbers of questions must be clearly inserted with any answers written in the additional space.
- Rough work, if any should be necessary, should be written in this book and then scored through when the fair copy has been written.
- Before leaving the examination room you must give this book to the invigilator. If you do not, you may lose all the marks for this paper.



SECTION A

Answer ALL questions in this section.

1. (a) The diagram below shows some of the materials used to build two different types of house.



*Marks***1. (a) (continued)**

- (i) Name
- two**
- natural resources that are used in house building.

_____ and _____

1

- (ii) Compare the environmental impact of supplying the roofing material for each house.

1

- (iii) The cost of heating an eco-house can be significantly reduced.
-
- Suggest
- three**
- features shown in the diagram opposite which might contribute to this reduction in cost.

1 _____

2 _____

3 _____

1

- (iv) Give
- one**
- disadvantage of using solar energy to heat water.

1

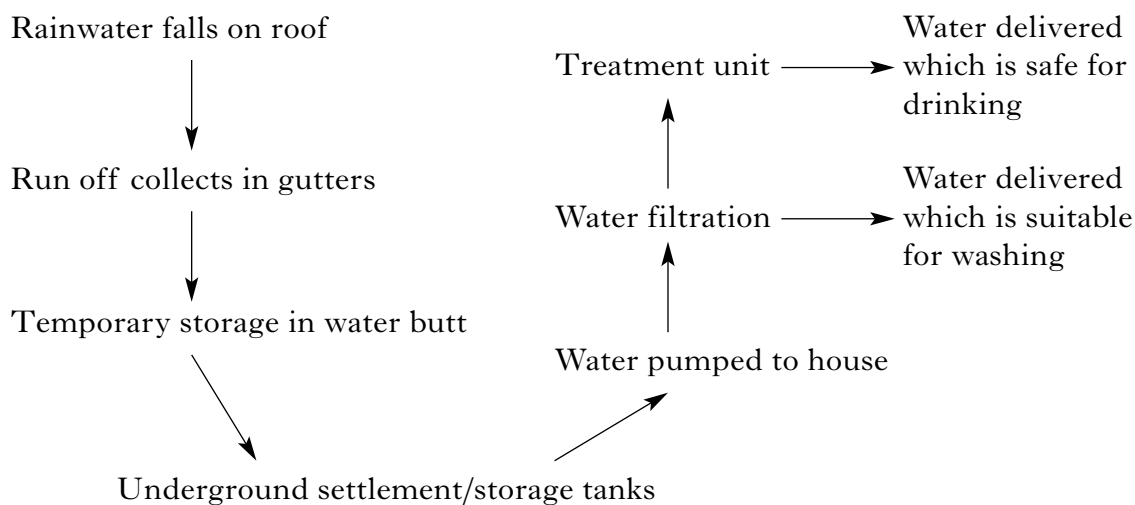
- (v) Explain
- one**
- advantage of using solar energy to heat water.

1**[Turn over]**

Marks

1. (continued)

- (b) The flow diagram shows how rainwater can be captured and utilised at the eco-house.



- (i) Explain why this would be a suitable method for supplementing a Scottish home with water.

1

- (ii) Each tank stores 2000 litres of water and supplies a family of four for seven days. Calculate how much water is used on average per day by each person.

Space for calculation

Answer _____ litres

1

- (iii) Suggest **two** ways to reduce water use in a house.

1 _____

2 _____

1

- (c) Name the organisation responsible for testing water pollution in rivers and lochs in Scotland.

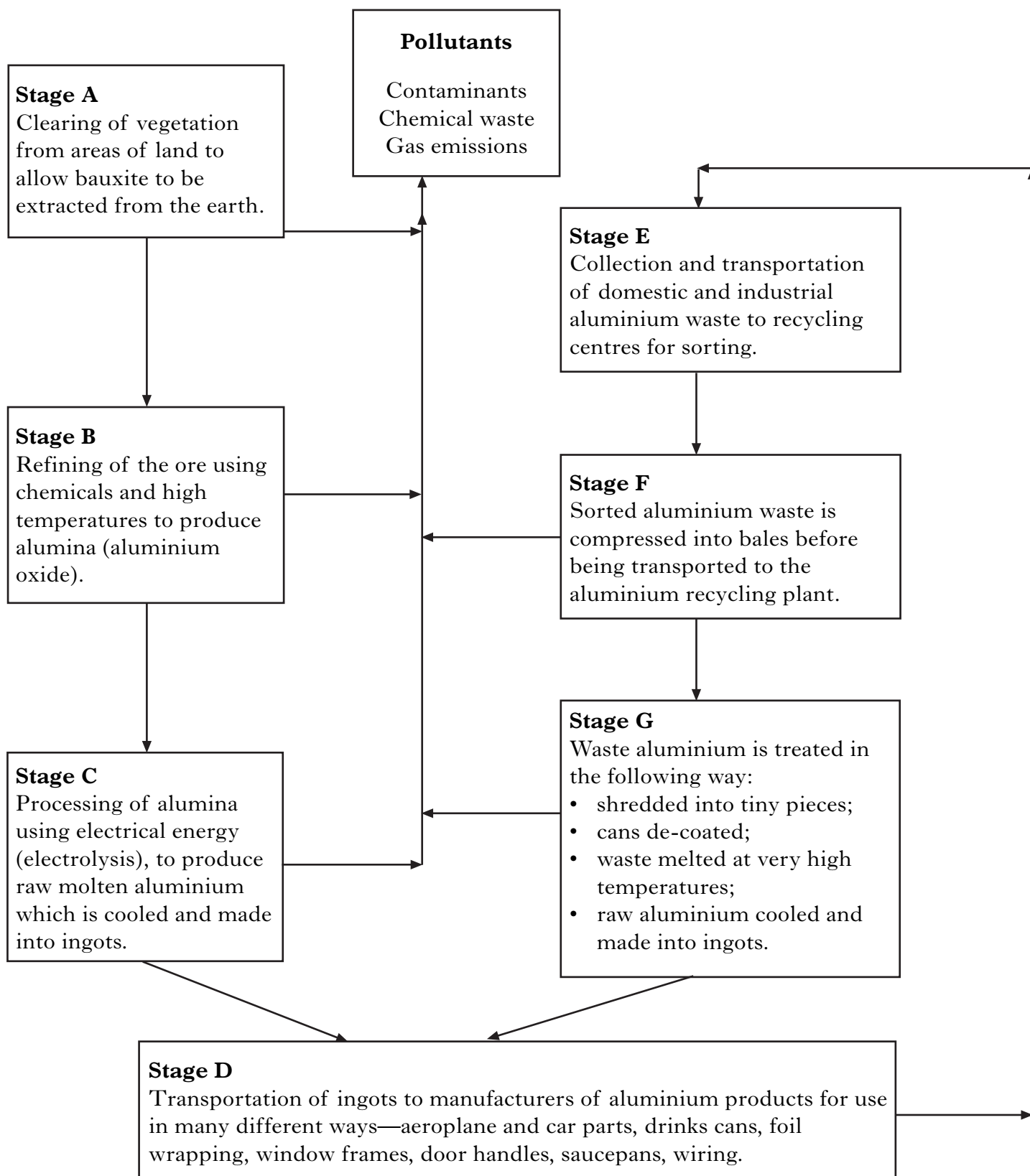
1

[Turn over for Question 2 on *Page six*

2. (a) Aluminium is the most abundant metal on Earth and is used in a variety of ways.

It is extracted from the earth as an aluminium ore called bauxite, mainly in Australia, the West Indies and West Africa.

The flow chart below shows the main processes involved in the production of aluminium.



Marks

2. (a) (continued)

- (i) Is aluminium a renewable or a non-renewable resource?

Circle your choice and give a reason for your answer.

Renewable

Non-renewable

Reason _____

1

- (ii) Give
- one**
- disadvantage to the environment of extracting bauxite from the earth.

1

- (iii) Using information from the flow chart, describe
- two**
- energy intensive stages in the processing of aluminium.

1 _____

2 _____

1

- (iv) Describe how the processing of aluminium invokes the “polluter pays” principle.

2

- (b) It takes 14 000 kilo-watt hours of energy to produce 1 tonne of aluminium from bauxite. By contrast, recycling aluminium from scrap metal reduces energy demand by 95%.

Calculate the energy required to produce one tonne of aluminium from recycled aluminium.

Space for calculation

Answer _____ kilo-watt hours

1

Marks

2. (continued)

- (c) Give **two** factors which an aluminium recycling facility must take into account when carrying out a life cycle assessment.

1 _____

2 _____

1

- (d) Other than hydro-electric power (HEP), name **one** other major source of energy and suggest **one** advantage and **one** disadvantage of its use.

Source of energy _____

Advantage _____

Disadvantage _____

2

- (e) A survey was carried out on recycling items of waste by households. The table shows the percentage of households involved in recycling for the years 2003–2006.

<i>Year</i>	<i>Percentage of households involved in recycling (%)</i>			
	<i>Metal cans</i>	<i>Glass bottles</i>	<i>Newspaper and cardboard</i>	<i>Plastic</i>
2003	14	35	45	13
2004	20	39	53	19
2005	37	50	69	36
2006	48	57	76	47

Marks

2. (e) (continued)

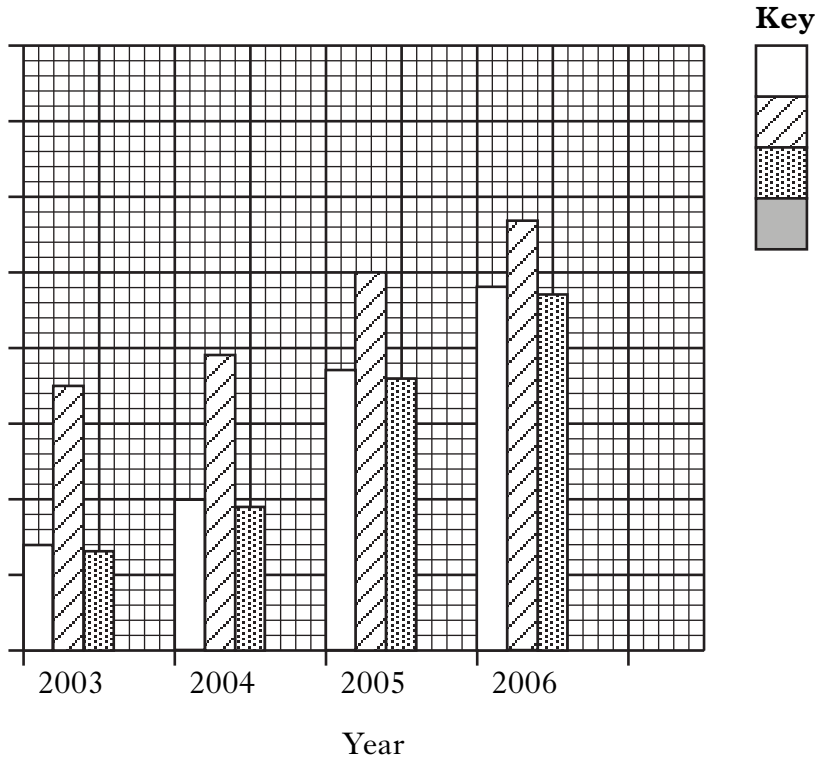
Use the information in the table opposite to complete the bar graph below by:

- adding the scale and label on the y-axis;
- adding the missing data;
- completing the key.

1
1
1

(Additional graph paper, if required, can be found on *Page thirty-two*.)

Graph showing the recycling of items of domestic waste by households from 2003–2006.

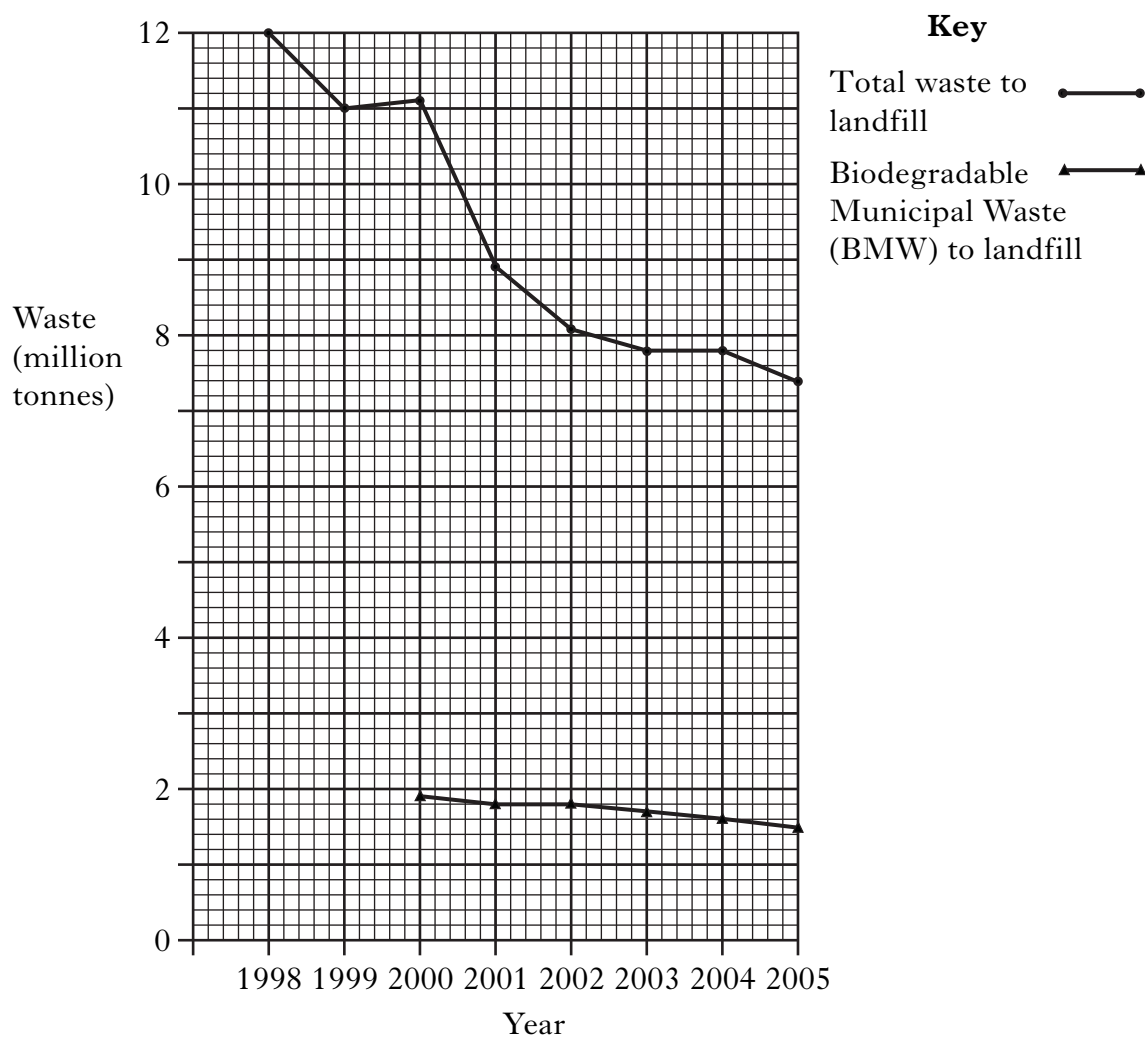


[Turn over

Marks

2. (continued)

- (f) The graph below shows two trends in waste going to landfill between 1998–2005.



- (i) Calculate the mass of Biodegradable Municipal Waste as a percentage of the total waste going to landfill in 2004.

Space for calculation

Answer _____ % **1**

- (ii) Explain how these trends indicate the effectiveness of the Scottish Government's policy on waste management.

_____ **1**

*Marks***2. (f) (continued)**

- (iii) Suggest **one** reason for the decrease in Biodegradable Municipal Waste (BMW) going to landfill.

1

- (iv) Describe **one** example of the sustainable use of resources in waste management in a country other than the UK.

Country

Description

1**[Turn over]**

Marks

3. (a) Current Scottish forestry practices are based on sustainable management and include the following strategies:

- reduction of upland afforestation with non-native species;
- expansion, restoration and improvement of native woodland;
- removal of dense conifer stands along streams to reduce shading.

(i) What is meant by “sustainable management” of forestry?

1

(ii) Explain why the planting of non-native conifers was originally the basis of the forestry industry.

1

(iii) Predict the effect of the current practices on biodiversity and explain your answer.

Prediction _____

Explanation _____

1

(b) The table below gives information about three different woodland habitats targeted for restoration and expansion in Scotland. Planting may be subsidised by grant schemes.

<i>Woodland habitat</i>	<i>Restoration target area (ha)</i>	<i>% restoration target achieved</i>	<i>Expansion target area (ha)</i>	<i>% expansion target achieved</i>
Native pinewoods	11 200	100	25 000	90
Upland oak woods	3000	11	3000	50
Upland mixed ash woods	800	0	2000	0

*Marks***3. (b) (continued)**

- (i) Calculate the total target area of native pinewood for which restoration and expansion has been achieved.

Space for calculation

Answer _____ ha

1

- (ii) Expansion is achieved by new planting mainly on marginal and upland farming land.

Suggest why more woodland has been expanded than restored.

1

- (c) Acid rain can cause serious damage to trees.

- (i) Describe how acid rain is produced.

1

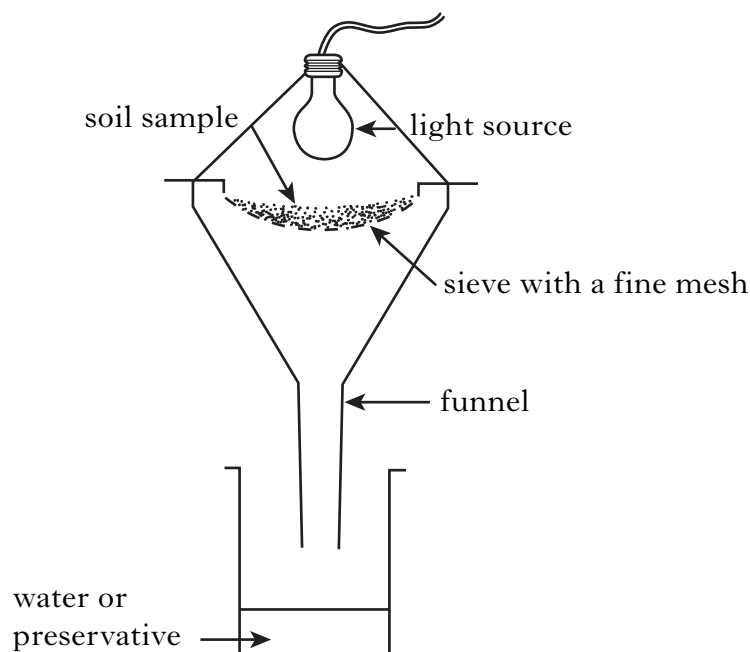
- (ii) Suggest **one** way in which you personally could help in the reduction of acid rain.

1

[Turn over

Marks

4. (a) An investigation was carried out to compare two adjacent soil ecosystems. Six core soil samples of equal mass were taken at each location. The number of earthworms found in each sample was counted and the worms removed. Samples of each soil were then placed in the equipment shown below.



- (i) Name the equipment shown above.

_____ 1

- (ii) Give **two** variables which must be kept constant in order to give valid results when comparing the soil samples using this equipment.

_____ and _____ 1

Marks

4. (continued)

- (b) The table below shows the average number of organisms, organic matter (%) and soil moisture (%) of the soil samples from each ecosystem.

<i>Ecosystem</i>	<i>Average number of organisms</i>			<i>Average soil moisture (%)</i>	<i>Average organic matter (%)</i>
	<i>Earthworms</i>	<i>Mites</i>	<i>Springtails</i>		
Woodland soil	12	765	29	22	8.5
Farmland soil	3	102	13	18	1.1

- (i) Compare the frequency and distribution of the organisms shown in the table and suggest a reason for the difference.

Reason _____

2

- (ii) Suggest how the reliability of the data could have been improved.

1

- (iii) Name **two** abiotic factors measured in the investigation.

_____ and _____

1

- (iv) Earthworms, mites and springtails are all detritivores.
Describe the niche of a detritivore.

1

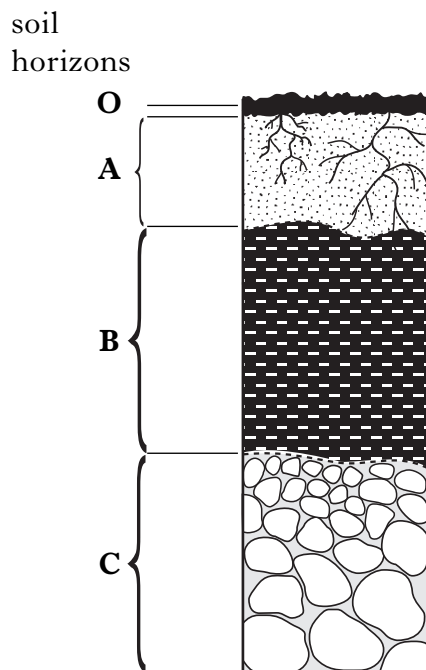
- (v) Describe a sampling technique for fast-moving soil organisms such as beetles and centipedes.

1

Marks

4. (continued)

(c) The diagram below shows a soil profile.



- (i) Describe **one** way in which the geology of an area can contribute to the soil profile.

1

- (ii) The layers in a soil profile are called horizons. Identify **two** horizons from the diagram where organisms are most likely to be numerous and give a reason for your answer.

Horizon _____ and _____

Reason _____

1

- (iii) Give **one** way in which climate can affect the formation and development of a soil.

1

5. The table below shows the preferred habitat requirements for some moorland birds.

<i>Species</i>	<i>Feeding preferences</i>	<i>Preferred height of heather for shelter or nesting (cm)</i>	<i>Preferred size of heather patches on the moor</i>
Red Grouse	Heather, 10–30 cm in height	Above 25	small
Black Grouse	Heather, 20–30 cm in height	Above 30	small
Golden Plover	Heather, less than 10 cm in height	Less than 10	large
Twite	Grass seeds and insects in grassland between heather patches	Above 15	large
Merlin	Small birds, eg Twite	Less than 30	small
Hen Harrier	Large birds, eg Grouse, Golden Plover	Above 60	small

- (a) Using information from the table, answer the following questions.

- (i) Which **two** species have the most similar habitat requirements?

_____ 1

- (ii) Give **one** example of:

1 an autotroph; _____

2 an omnivore. _____ 1

- (iii) Construct a food chain using **three** species.

_____ 1

- (iv) Give **one** example of inter-specific competition, other than for food availability.

Species _____ and _____

Reason for competition _____ 1

- (v) Explain why the preferred size of heather patch is “small” for the Hen Harrier.

_____ 1

*Marks***5. (continued)**

- (b) Much of the heather moorland in Scotland is an example of a semi-natural ecosystem. Some moorlands are managed primarily to maximise the population of a game bird—the Red Grouse—for recreational shooting. The management regime involves regular burning or muirburn, on a rotational basis, in order to produce small patches of heather suitable for the grouse to feed and nest. Muirburn also benefits other species within this ecosystem.

- (i) Explain what is meant by the term semi-natural ecosystem.

1

- (ii) Explain why monitoring of the Red Grouse population is carried out.

1

- (iii) Describe what would happen to a heather moorland if muirburn was to be discontinued.

1

- (c) Ecosystems are managed for a variety of other purposes.

For a named ecosystem, describe and explain **one** management practice which benefits biodiversity and **one** management practice that has a negative impact.

Named ecosystem _____

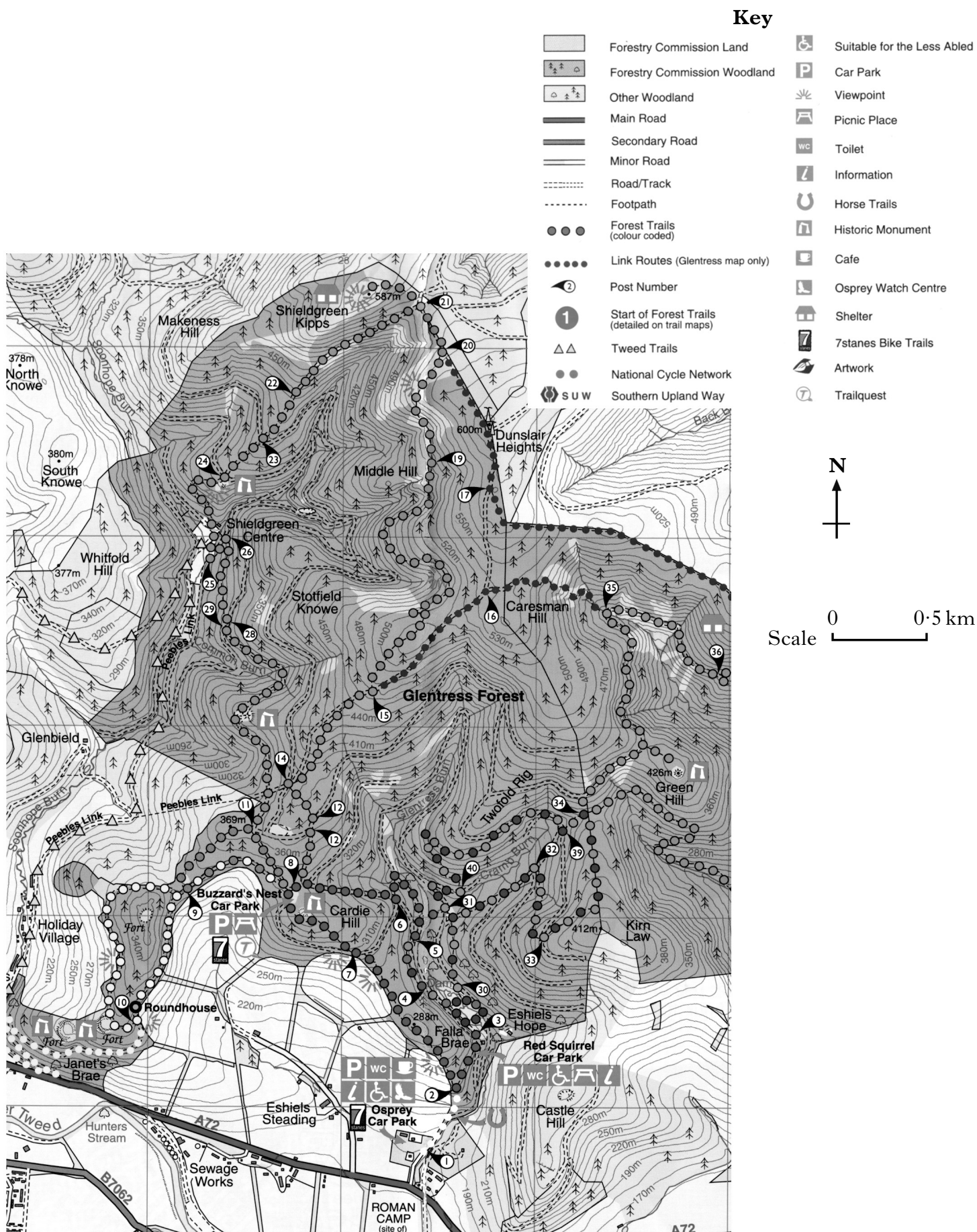
Beneficial practice _____

Negative impact practice _____

2

[Turn over for Question 6 on *Page twenty*

6. (a) Glentress Forest, in the Southern Uplands, is a working forest with integrated access for recreation. The map below shows the main features of the forest.



*Marks***6. (a) (continued)**

- (i) Give **one** social advantage and **one** economic benefit of Glentress Forest to the local community.

Social advantage _____

Economic benefit _____

1

- (ii) Suggest **one** conflict that could arise between visitors to the forest resulting from their different recreational pursuits and suggest a possible solution.

Conflict between _____ and _____

Reason _____

Solution _____

2

- (iii) Give **two** other recreational pursuits available at Glentress.

_____ and _____

1

- (iv) Access to certain areas of the forest can, at times, be restricted. Suggest **one** possible reason for this.

1

- (v) Name the organisation with public responsibility for Scottish forests.

1**[Turn over]**

6. (continued)

- (b) The table below provides information about some of the pieces of legislation which have helped protect the Scottish countryside and our natural heritage.

<i>Legislation</i>	<i>Information</i>
National Parks and Access to the Countryside Act 1949	Introduction of SSSIs and NNRs. Gave power to local authorities to create local nature reserves.
The Countryside (Scotland) Act 1967	Strengthened features of the 1949 Act. Imposed upon public bodies a duty of conservation towards natural heritage.
	Provided protection in law for many animal and plant species throughout the UK. Strengthened the status of SSSIs.
The Natural Heritage (Scotland) Act 1991	Established SNH as a statutory body for protecting, enhancing and facilitating our natural heritage.
The Town and Country Planning Act 1990 and The Town and Country Planning (Scotland) Act 1997	Provided guidelines on issues of planning and new developments, giving procedures on planning permission and providing some protection to the countryside, eg TPOs.
Land Reform (Scotland) Act 2003	Clarified the rights of access to land and the obligations of land managers. Introduced the Scottish Access code.
Nature Conservation (Scotland) Act 2004	Designed for the conservation and enhancement of Scotland's natural features, including wildlife. Gave improved guidelines on SSSIs and the rights and obligations of land managers and public authorities.

- (i) Name the piece of legislation missing from the table above.

Marks

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1

- (ii) Name the Act which provides guidelines on planning controls.

1

- (iii) What do the following abbreviations stand for?

SSSI _____

NNR _____

1

*Marks***6. (b) (continued)**

- (iv) Describe **one** advantage to the public and **one** disadvantage to landowners of the right of Access given under the Land Reform (Scotland) Act 2003.

Advantage _____

Disadvantage _____

2

- (c) Name **one** National Park in Scotland and give **two** benefits to the environment derived from its establishment.

National Park _____

1 _____

2 _____

2

- (d) The marine environment is one of the least protected areas of Scotland.

- (i) Suggest **two** reasons why the marine environment may be in need of protection.

1 _____

2 _____

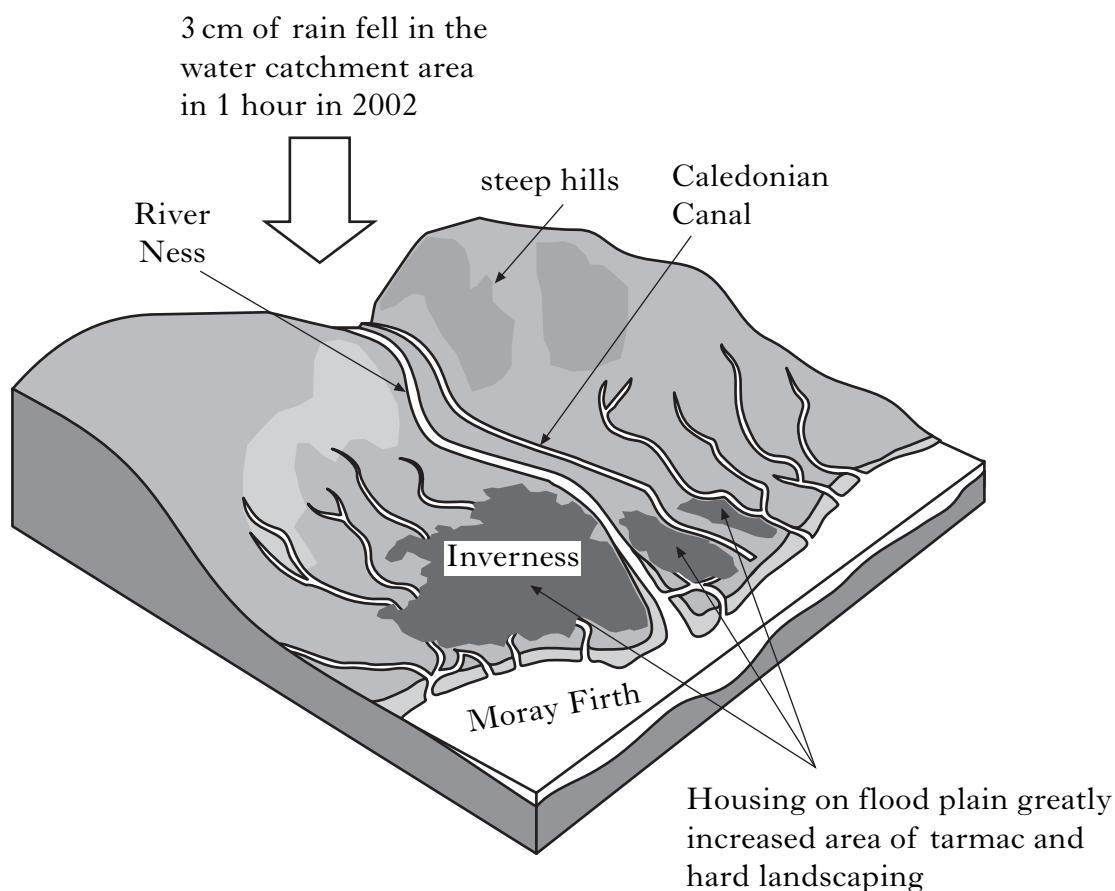
1

- (ii) Give **one** way, other than legislation, in which better protection can be provided to the marine environment.

1**[Turn over]**

Marks

7. (a) The diagram shows part of the Inverness water catchment area.



- (i) Using information from the diagram, explain why flooding was a serious problem in 2002 when three centimetres of rain fell in one hour over the catchment area.

2

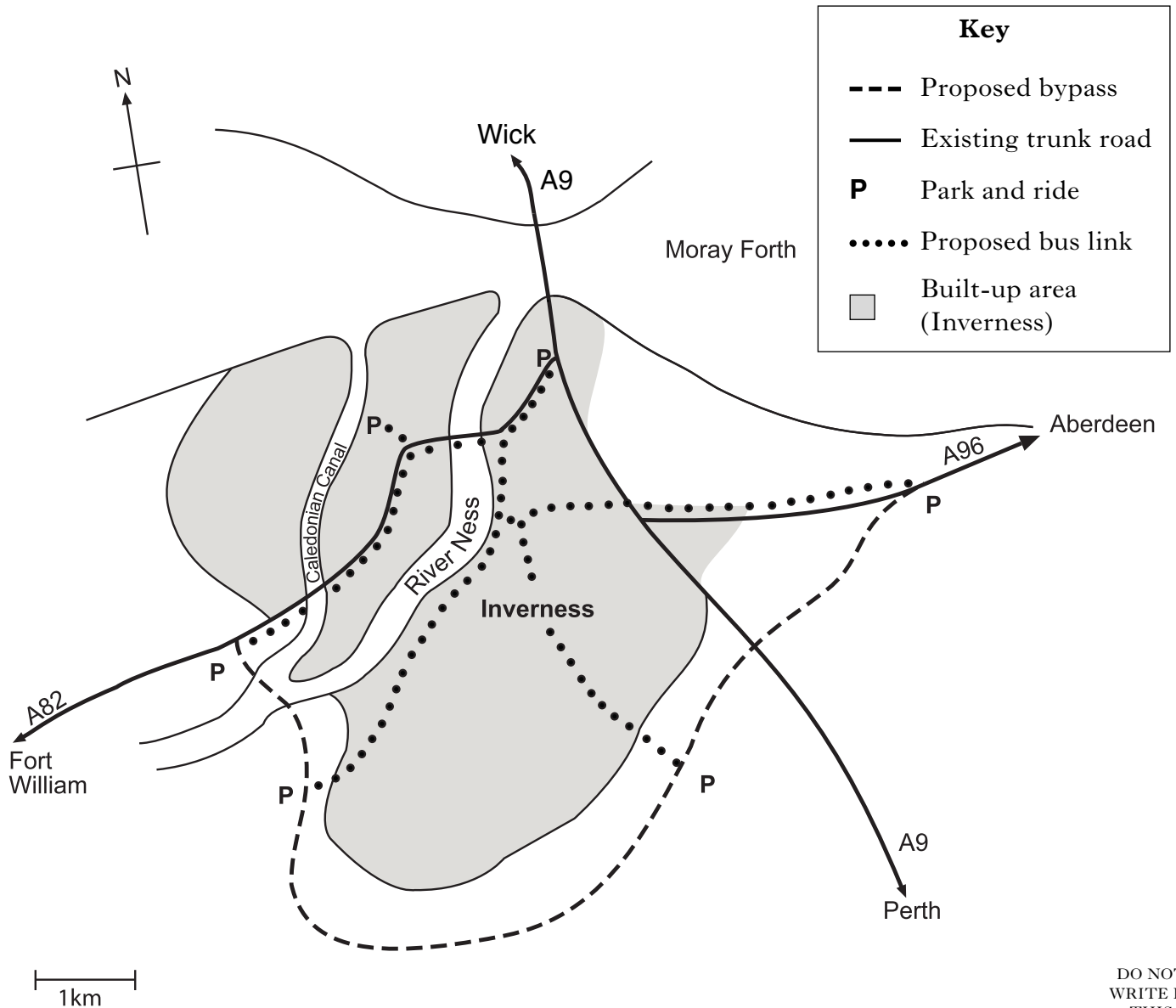
- (ii) Explain why extreme weather conditions, such as heavy rainfall, are occurring more frequently.

1

7. (continued)

- (b) Traffic congestion in Inverness can be a severe problem at certain times.

The sketch map shows the route of a proposed bypass for Inverness traffic.



- (i) From the diagram, give **two** developments which would reduce traffic congestion in the city centre.

1 _____

2 _____

1

- (ii) Suggest **two** other ways by which the local authority could reduce car use in the city centre.

_____ and _____

1

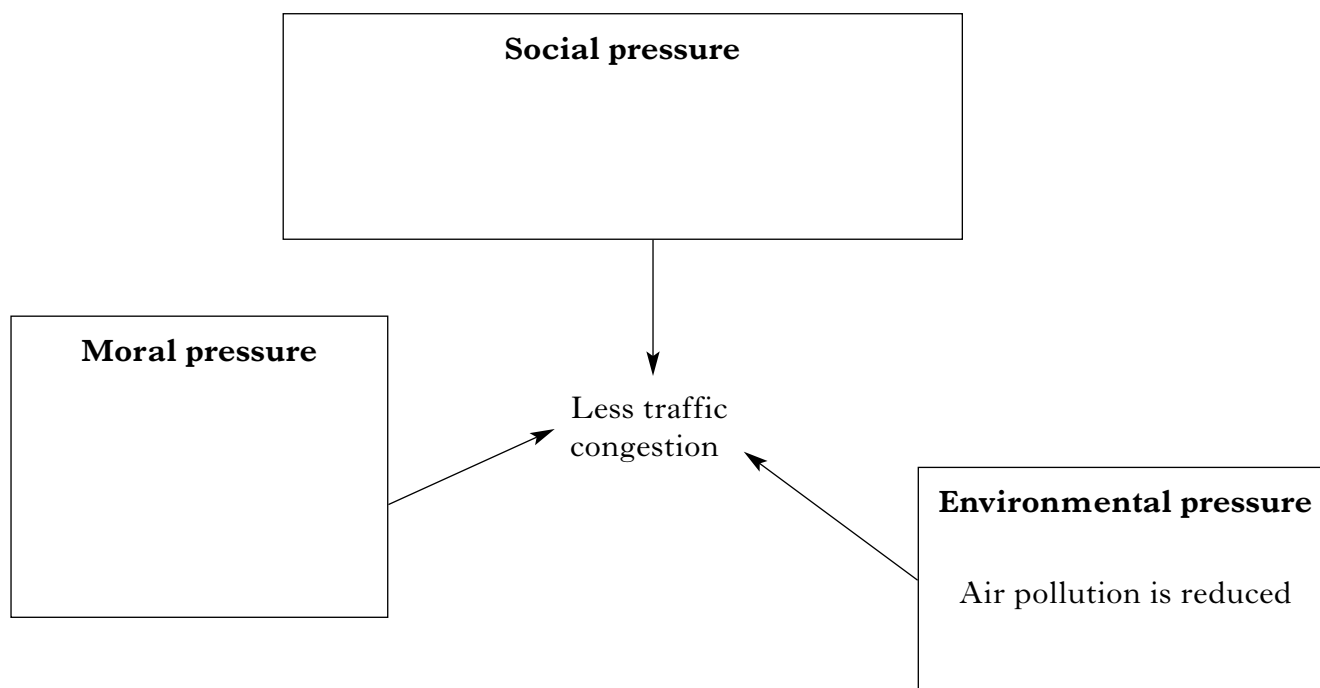
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7. (continued)

- (c) Complete the diagram by giving **one** social and **one** moral pressure to reduce congestion in city centres.



2

- (d) New transport links such as a bypass require a change of land use.

- (i) Give **one** other example of a change of land use in rural areas of Scotland.

1

- (ii) Suggest **one** advantage and **one** disadvantage of this change of land use to the environment.

Advantage

Disadvantage

2

Marks

7. (continued)

- (e) When a change of land use is proposed, an Environmental Impact Assessment (EIA) must be carried out. Describe what is meant by this and give an example.

Description _____

Example _____

2

[Turn over for Section B on *Page twenty-eight*

SECTION B

BOTH questions in this section should be attempted.

Note that each question contains a choice.

Questions 8 and 9 should be attempted on the blank pages which follow.

Supplementary sheets, if required, may be obtained from the invigilator.

Labelled diagrams may be used where appropriate.

- | | | <i>Marks</i> |
|----|--|--------------|
| 8. | Answer EITHER A OR B. | |
| | A. Discuss feeding relationships under the following headings: | |
| | (a) food pyramids; | 5 |
| | (b) symbiotic associations; | 5 |
| | (c) the impact of human activities. | 5 |
| | | (15) |
| | OR | |
| | B. Discuss population dynamics under the following headings: | |
| | (a) predator/prey relationships; | 5 |
| | (b) density dependent factors; | 5 |
| | (c) the impact of human activities. | 5 |
| | | (15) |
| 9. | Answer EITHER A OR B. | |
| | A. Describe the management of aquaculture, its conflicts and the positive and negative impacts on the environment and the local community. | (15) |
| | OR | |
| | B. Describe power generation in Scotland, its conflicts and positive and negative impacts on the environment and the local community. | (15) |

[END OF QUESTION PAPER]

Marks

SPACE FOR ANSWERS

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Marks

SPACE FOR ANSWERS

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Marks

SPACE FOR ANSWERS

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Marks

SPACE FOR ANSWERS

ADDITIONAL BAR GRAPH FOR QUESTION 2(e)

