FOR OFFICIAL USE

Total for Sections A and B

X055/301

NATIONAL QUALIFICATIONS 2008

FRIDAY, 6 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

Town

Forename(s)

Surname

Date of birth
Day Month Year

Scottish candidate number

Number of seat

1 (a) All questions should be attempted.

(b) It should be noted that in **Section B** questions 8 and 9 each contain a choice.

2 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.

3 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.

4 The numbers of questions must be clearly inserted with any answers written in the additional space.

5 Rough work, if any should be necessary, should be written in this book and then scored through when the fair copy has been written.

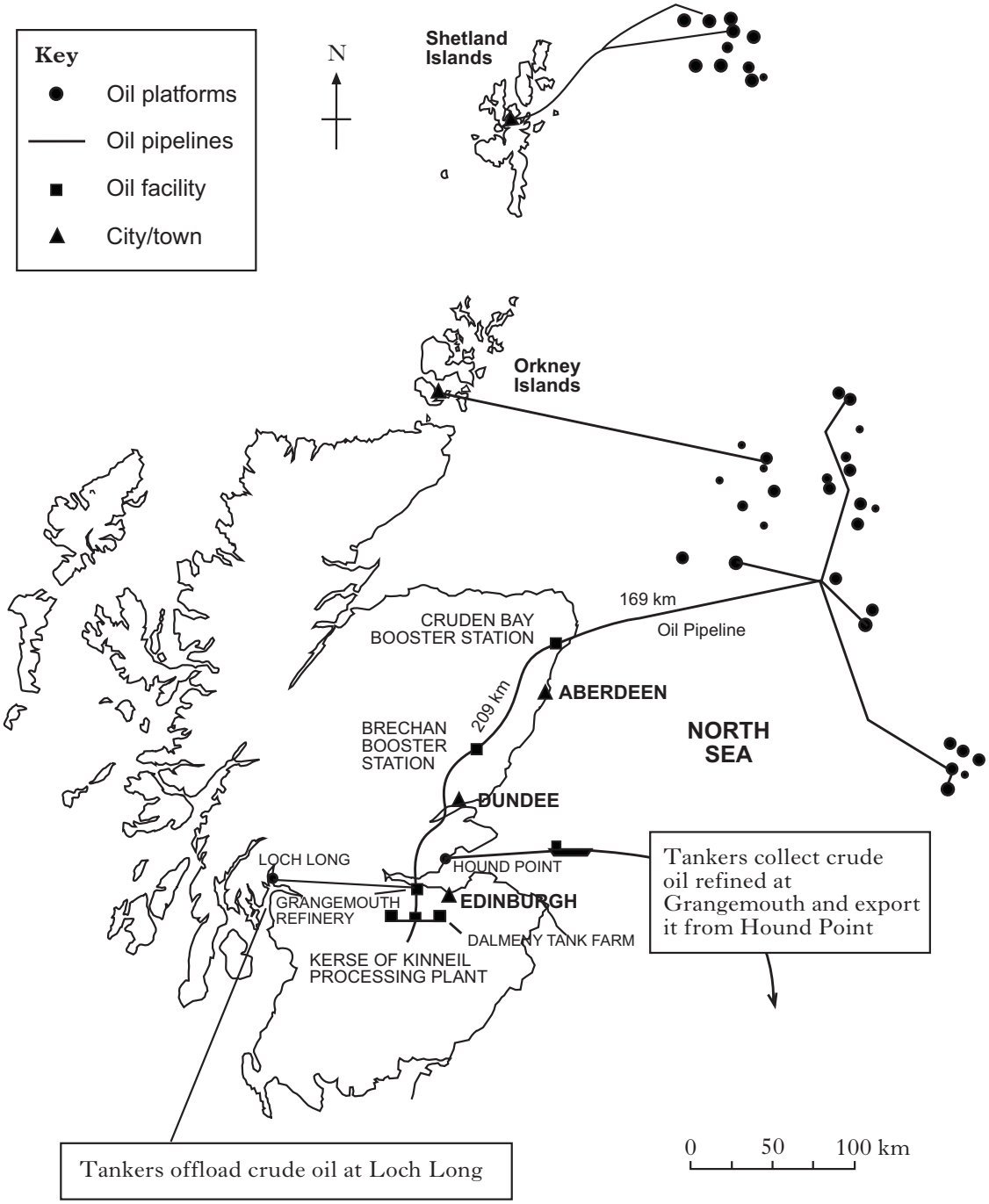
6 Before leaving the examination room you must give this book to the invigilator. If you do not, you may lose all the marks for this paper.

Marks

SECTION A

Answer ALL questions in this section.

1. (*a*) The diagram below illustrates the supply and distribution of crude oil in Scotland.



(i) Crude oil is a natural non-renewable resource.
Explain what this means.

_____

_____ **1**

DO NOT WRITE IN THIS MARGIN

Marks

1. (*a*) (continued)

(ii) Name **two** man-made products obtained from crude oil.

_____ and _____ **1**

(iii) Describe the supply route for oil from Loch Long to Grangemouth.

_____

_____ **1**

(iv) Suggest what happens to the crude oil delivered to the Orkney and Shetland Islands.

_____ **1**

(*b*) Oil companies should assess the transport, energy needs, waste disposal and pollution problems associated with their industry.

(i) What name is given to this type of assessment planning process?

_____ **1**

(ii) Identify **one** location along the supply routes where oil pollution problems may occur and give a reason for your answer.

Location _____

Reason _____

_____ **1**

(*c*) The supply of crude oil from the North Sea is declining, while the demand for oil and oil products is increasing.

Suggest **one** way in which you think oil companies should manage this situation.

_____ **1**

(*d*) An energy crisis over oil and oil products is predicted unless more sustainable practices are employed.

Give **one** example of how government planning policy is helping to support sustainable practices.

_____

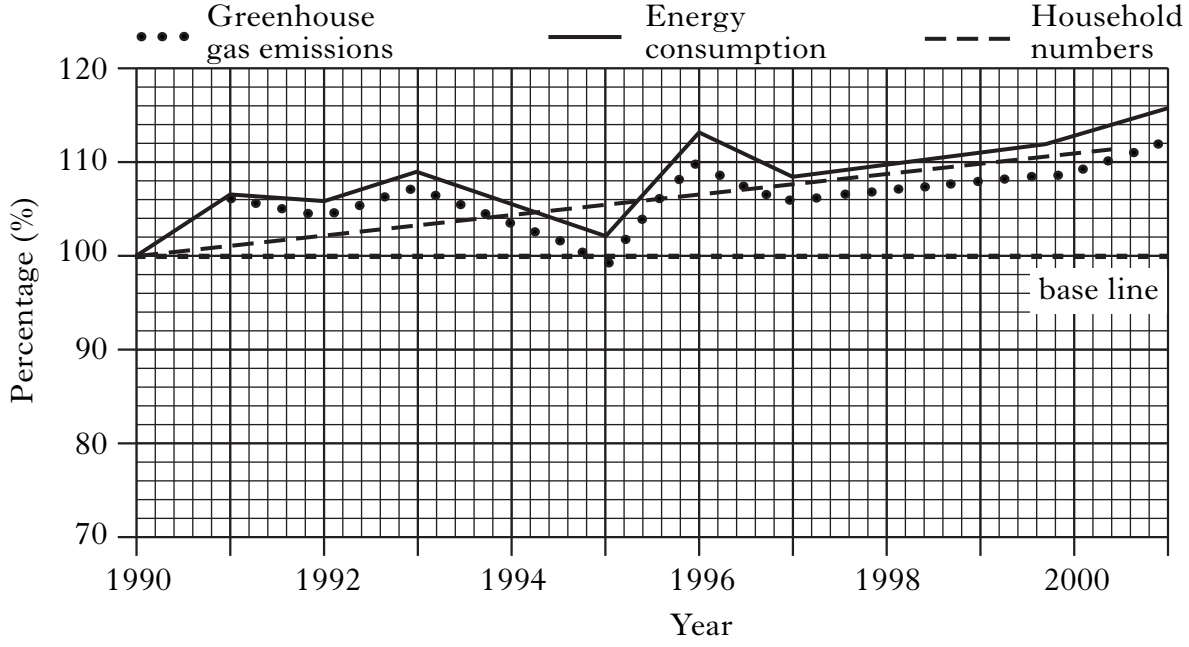
_____ **1**

Marks

1. (continued)

(*e*) Households account for about 25% of all energy consumption and around 20% of greenhouse gas emissions.

The graph below shows the changes in household numbers, energy consumption and greenhouse gas emissions from a base line of 100% in 1990.



(Adapted from DEFRA 2003)

(i) Describe the trends shown in the graph.

_____

_____

_____ **2**

(ii) Explain why the pattern of greenhouse gases follows that of energy consumption.

_____ **1**

(iii) Name **two** greenhouse gases.

_____ and _____ **1**

(iv) Suggest **two** ways in which personal initiatives could help reduce greenhouse gas emissions.

1 _____

2 _____ **1**

Marks

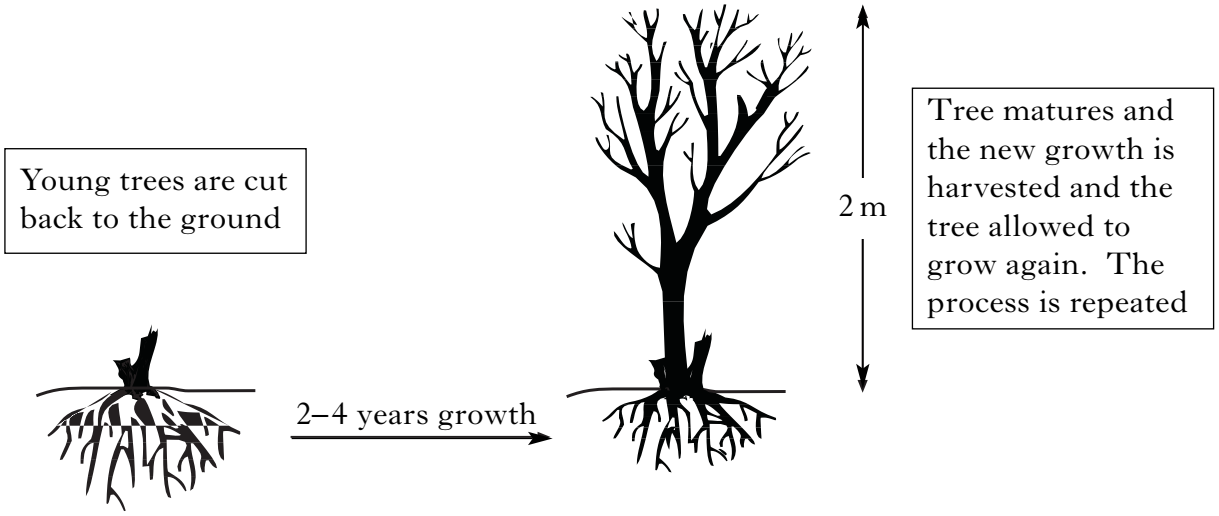
2. (*a*) Read the information below on biomass as a source of energy and answer the questions that follow.

Biomass as a source of energy

Biomass is a term used to describe material from both plants and animals. Biomass crops for energy production can be grown in a variety of ways. About 12% of the UK is forest or woodland. It has been estimated that this could produce a sustainable yield of 700 thousand tonnes of air dried wood per year for energy production.

Domestic and community projects already exist which use the thinnings and trimmings from existing woodland. For example, one type of woodchip boiler generates up to 350 kW, enough heat to supply two schools and a swimming pool. On a larger scale, biomass can be converted to electricity in a purpose build IGCC (Integrated Gasification Combined Cycle) power plant. Also wood can be burned with coal, a process called co-firing, in existing power stations.

The supply of wood for such power stations can be enhanced by growing energy crops on farmland not required for food production. Such a crop could be coppiced willow. One hectare of land used for coppicing can produce 10 tonnes of air dried wood per year. The diagram below shows the process of coppicing.



(i) Explain why biomass is considered a sustainable source of energy.

_____

_____ **2**

(ii) Name **three** sources of biomass.

1 _____

2 _____

3 _____ **1**

Marks

2. (*a*) (continued)

(iii) An area of one thousand hectares of coppiced woodland can fuel a 10 megawatt IGCC power station.

1 Calculate how many tonnes of air dried wood would be used.
Space for calculation

Answer _____ tonnes **1**

2 Estimate the energy that could be generated from an area of 250 thousand hectares used for coppicing.
Space for calculation

Answer _____ megawatts **1**

(iv) Name an organisation responsible for Scotland's forests and describe **one** of its roles which relate to sustainable development.

Organisation _____

Role _____

_____ **1**

(*b*) Biomass is a more important source of fuel in economically less developed countries (ELDCs) compared to economically more developed countries (EMDCs).

(i) State the main use of energy from biomass in an ELDC.

_____ **1**

(ii) Give **two** of the main uses of energy in an EMDC.

_____ and _____ **1**

Marks

2. (continued)

(*c*) Name **one** European country that uses biomass as a major energy source.

_____ **1**

(*d*) The table below shows the energy content (kJ/g) of different types of fuel.

Fuel	*Energy content* (kJ/g)
Wood	15
Paper	17
Dung	16
Straw	15
Domestic waste	9
Coal	28
Oil	42
Natural gas	55

(i) Calculate the ratio of energy content of wood, straw and natural gas as a simple whole number ratio.

Space for calculation

Wood _____ : Straw _____ : Natural gas _____ **1**

(ii) Compare the energy content of fossil fuels with non-fossil fuels.

_____

_____ **1**

(iii) Name the Scottish initiative which sets targets for a reduction in fossil fuel use and an increase in renewable sources of energy.

_____ **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks

2. (continued)

(*e*) Give **two** advantages and **two** disadvantages of using solar energy.

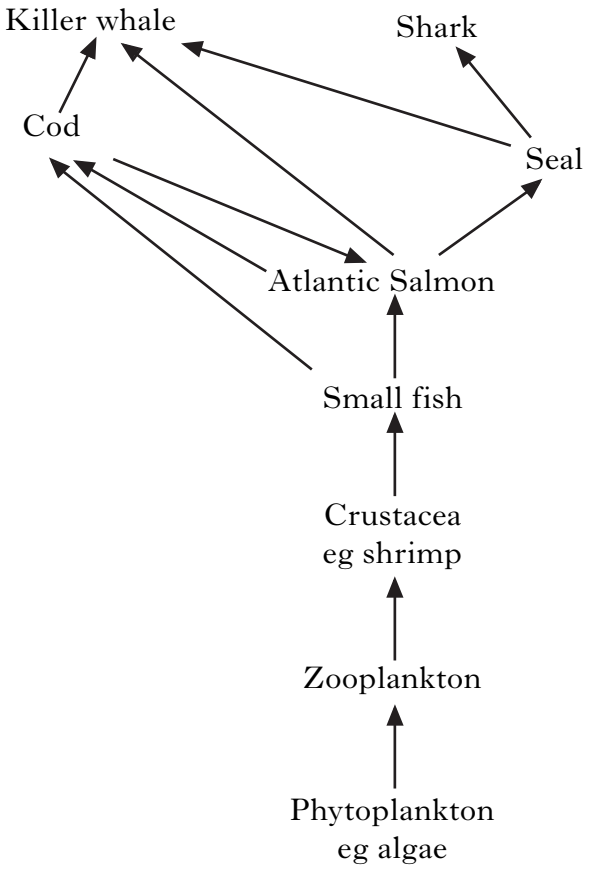
Advantage 1 _____

Advantage 2 _____

Disadvantage 1 _____

Disadvantage 2 _____ **2**

3. (*a*) The diagram below shows part of a marine food web in the North Atlantic Ocean.



(i) Name the autotroph in the food web.

_____ **1**

(ii) Give **one** example of intra-specific competition for the Atlantic Salmon.

_____ **1**

(iii) The seal population is increasing due to restricted culling.
More small fish are being caught by factory ships.
Explain the effect that these changes will have on the Atlantic Salmon population.

1 Seal population increase _____

_____ **1**

2 Decrease in small fish numbers _____

_____ **1**

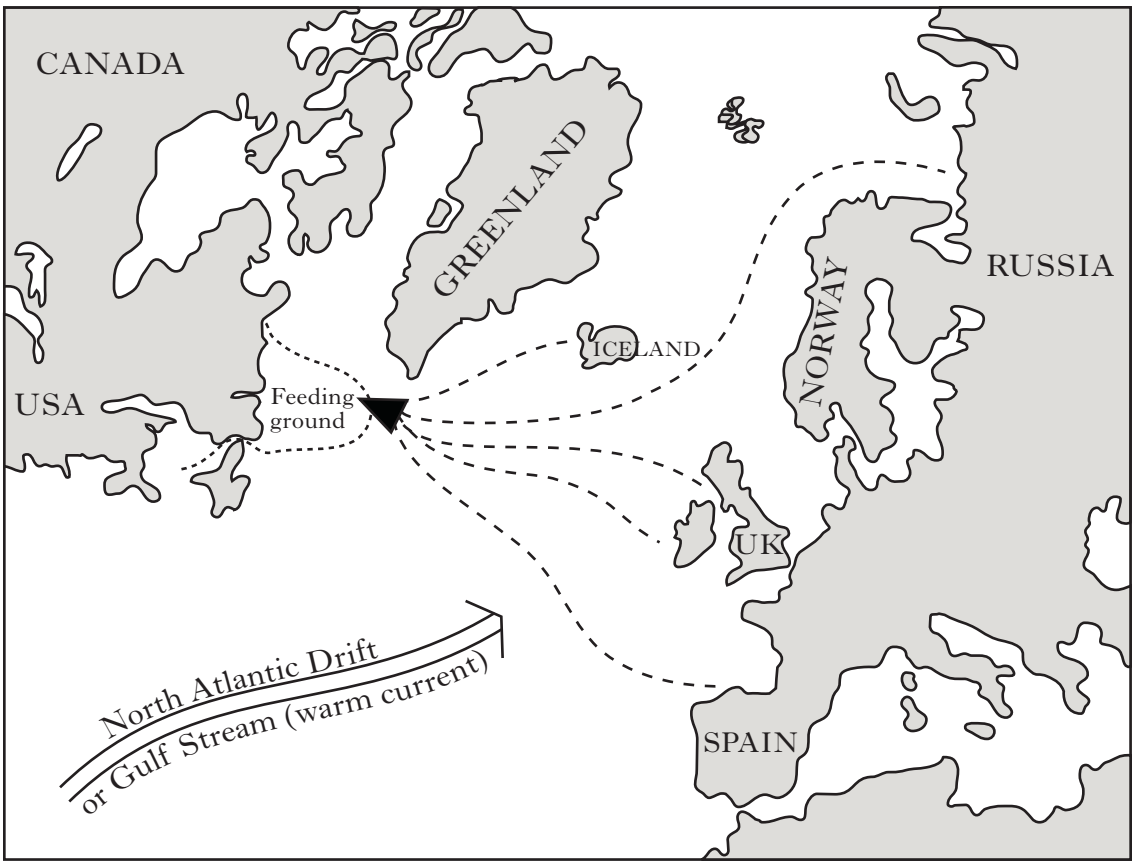
(iv) Use **one** species from the food web to describe the meaning of the term "carrying capacity".

_____ **1**

Marks

3. (continued)

(*b*) The diagram below shows the feeding grounds of the Atlantic Salmon and the countries to which they return to spawn (lay their eggs). They return to the river in which they were laid as eggs.



Key – – – – → Path of Salmon to feeding ground

It is predicted that the salmon's feeding grounds will be altered as a result of changing sea temperatures linked to global warming. This may lead eventually to the extinction of the Atlantic Salmon.

(i) Do you consider global warming to be a **natural** disaster? Circle **one** option and give a reason for your answer.

Natural disaster Yes No

Reason _____

_____

_____ **1**

(ii) Are natural disasters caused by density dependent or density independent factors?

_____ **1**

Marks

3. (*b*) (continued)

(iii) Explain **one** effect that a change in sea temperatures could have on the Atlantic Salmon population.

_____

_____ **1**

(iv) Name **one** abiotic factor, other than temperature, which could affect the number of Atlantic Salmon.

_____ **1**

(v) Name **one** method by which the Atlantic Salmon could be sampled.

_____ **1**

(vi) Explain why it is important that the Atlantic Salmon population is monitored.

_____

_____ **1**

(*c*) Farmed salmon for the food industry are reared in cages in sea lochs around the coast of Scotland. The sea louse is a parasite of salmon. Fish farmers use chemicals as a routine management practice to kill this parasite.

(i) Explain why fish farmers kill this parasite.

_____

_____ **1**

(ii) Predict which type of salmon—wild or farmed, will be more infected by the sea louse. Circle your prediction and give a reason for your answer.

Prediction Wild Farmed

Reason _____

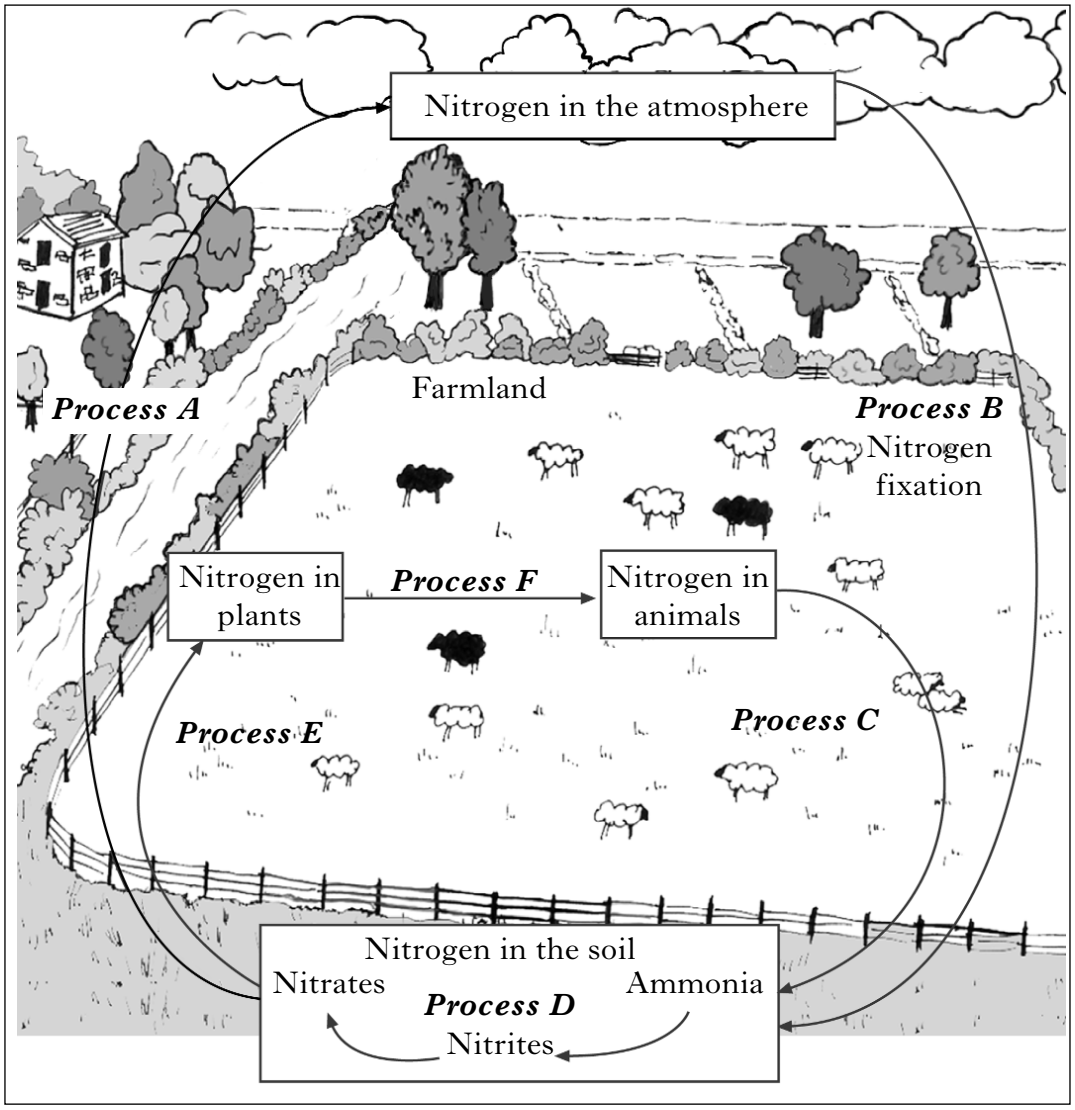
_____ **1**

(*d*) Name the International Agreement which sets TACs (Total Allowable Catch) to help conserve fish.

_____ **1**

Marks

4. (*a*) The diagram below shows the cycling of the nutrient, nitrogen, in a farmland ecosystem.



(i) Complete the table below with letters selected from the diagram and the names of the process outlined in the description.

Letter	*Name of process*	*Description of process*
		Nitrogen being passed along the food chain
D		The conversion of ammonium compounds to nitrites and nitrates
	Denitrification	Nitrogen being released from nitrates by bacterial action

2

Marks

4. (*a*) (continued)

(ii) How can farmers use the process of nitrogen fixation to improve the nitrogen content of the soil?

_____ **1**

(iii) Give **one** other natural way in which the nutrient content of a soil can be improved.

_____ **1**

(*b*) Rivers flowing through intensively farmed areas are susceptible to eutrophication.

(i) Give a reason for this.

_____

_____ **1**

(ii) Describe what happens during eutrophication in a river.

_____

_____

_____

_____

_____ **3**

(*c*) Land owners are being persuaded to act as environmental stewards and to help maintain or enhance biodiversity.

(i) Give **two** ways in which landowners can enhance biodiversity.

1 _____

2 _____ **1**

(ii) Name **one** national initiative which promotes biodiversity on farmland ecosystems.

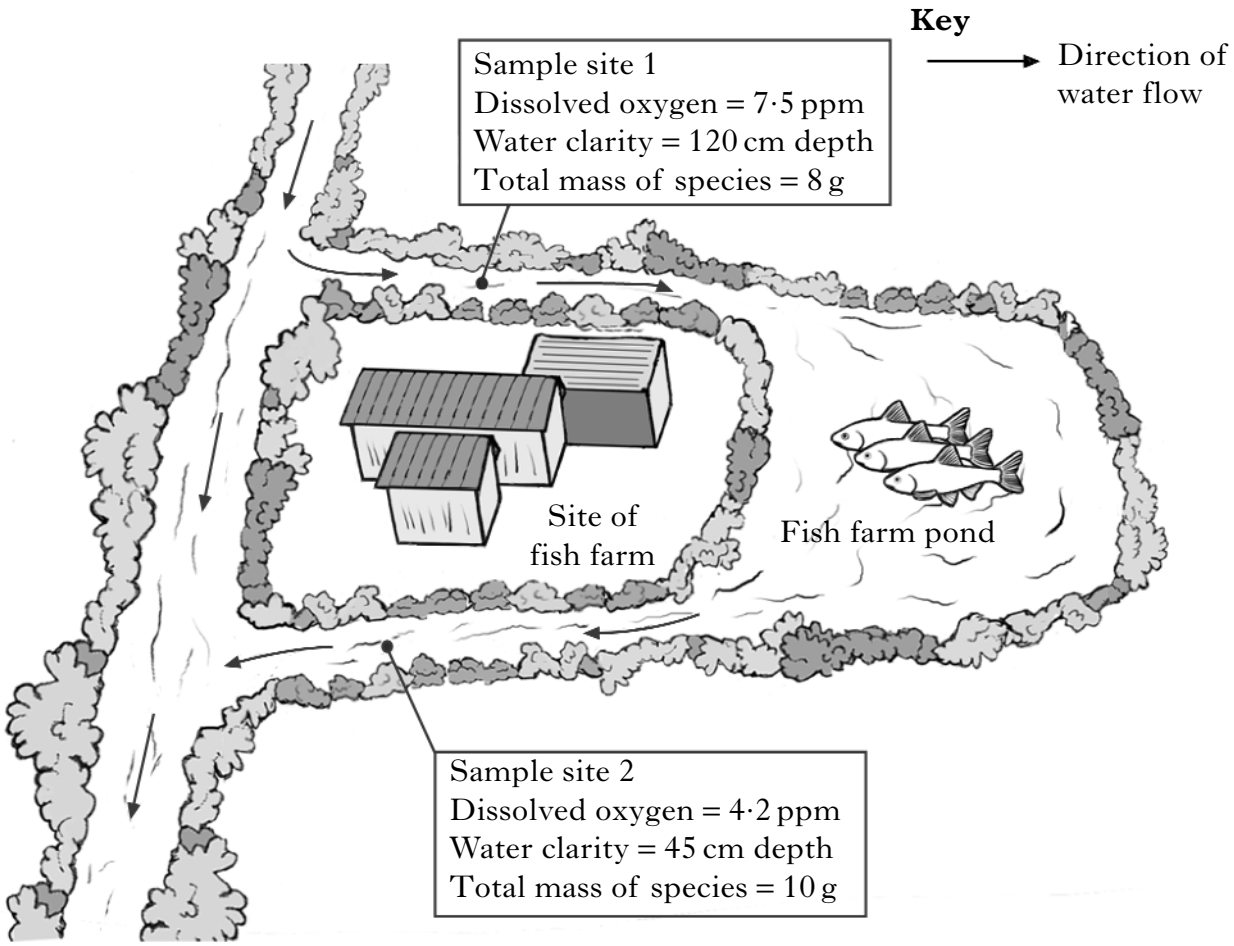
_____ **1**

[Turn over

5. (*a*) An investigation was carried out on the invertebrate species in a river ecosystem above and below a fish farm as shown in the diagram and table below.

Water clarity was measured by lowering a white disc into the water, and recording the depth in centimetres at which the disc was no longer visible.

Dissolved oxygen was measured with an oxygen meter in parts per million (ppm).



Invertebrate species	*Number of organisms collected*	
	Sample site 1	*Sample site 2*
Caddis fly nymphs	15	4
Mayfly nymphs	46	0
Freshwater shrimp	2	25
Chironomid larvae	14	58
Water louse	3	21

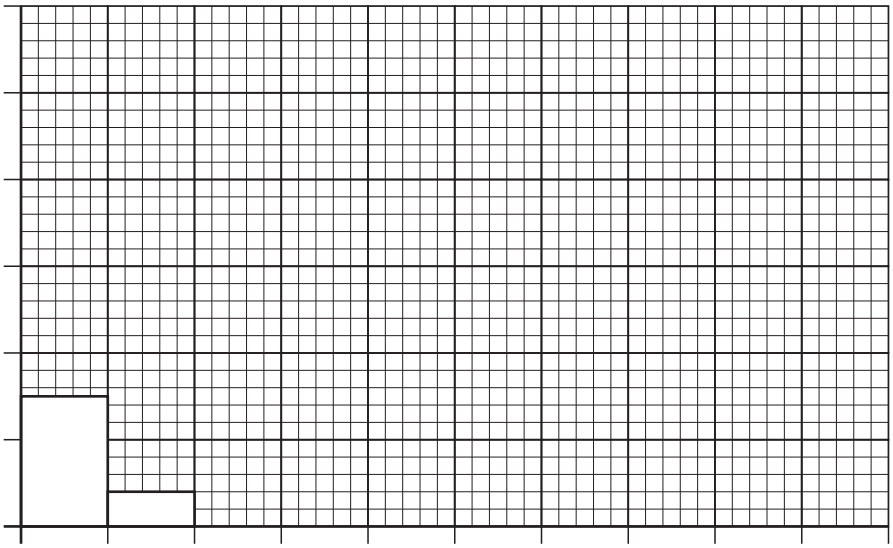
Marks

5. (*a*) (continued)

(i) Complete the bar chart to show the number of organisms of each species above and below the site of the fish farm by:

- adding the label and scale to the *y* axis **1**
- completing the *x* axis and the key **1**
- inserting the data. **1**

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



Key

CFN	Caddis fly nymphs
	Mayfly nymphs
	Freshwater shrimp
	Chironomid larvae
	Water louse

[Turn over

Marks

5. (*a*) (continued)

(ii) Describe how the data could be made more reliable.

_____

_____ **1**

(iii) Which species is best adapted to clear water conditions?
Give a reason for your answer.

Species _____

Reason _____ **1**

(iv) **Underline** the conclusion which best describes the impact of the fish farm on the species collected from this river ecosystem.

1 There has been an increase in biomass and an increase in biodiversity.

2 There has been an increase in biomass and a decrease in biodiversity.

3 There has been a decrease in biomass and a decrease in biodiversity.

4 There has been a decrease in biomass and an increase in biodiversity. **1**

(*b*) What name is given to an organism that by its presence or absence in an ecosystem indicates the level of an abiotic factor?

_____ **1**

(*c*) Some fish farms have a Visitors Centre where food pellets can be purchased to feed the fish.

(i) Give **one** reason why food pellet sales must be carefully monitored to protect water quality.

_____

_____ **1**

(ii) Explain why it is good practice for fish farm managers to aerate the water in such circumstances.

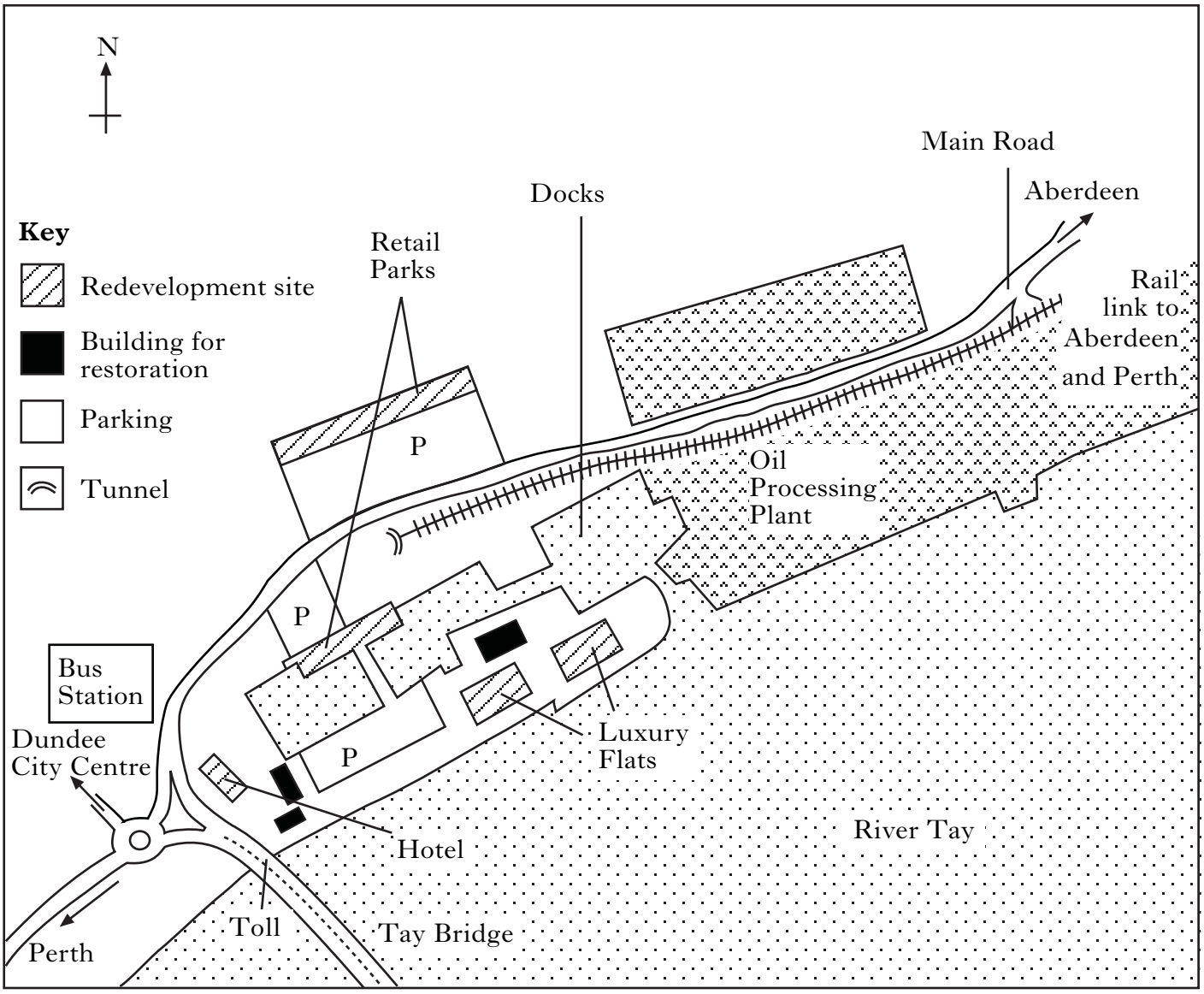
_____

_____

_____ **1**

[Turn over for Question 6 on *Page eighteen*

6. (*a*) The sketch map below shows land uses and new developments in an urban area of Dundee. Historically, the area was the site of the whaling and jute industries.



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Marks

6. (*a*) (continued)

(i) Suggest **one** human influence to account for the decline of the whaling industry.

_____ **1**

(ii) Give **three** present day land uses in this area.

1 _____

2 _____

3 _____ **1**

(iii) Account for the location of the oil processing plant.

_____

_____ **1**

(iv) Suggest **two** advantages of developing the retail parks on brownfield sites, near the centre of the city, compared to an out of town development.

1 _____

_____ **1**

2 _____

_____ **1**

[Turn over

Marks

6. (continued)

(*b*) The table below shows the annual traffic crossing the Tay Road Bridge (000s) in a southbound direction from 1997 to 2005.

Vehicle type	*Annual southbound crossings (000s)*								
	1997	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*
Cars and vans	3485	3537	3558	3649	3729	3784	3882	4001	4132
Buses	48	52	52	49	44	45	44	45	49
Others	237	239	279	262	264	271	281	296	293
Total southbound crossings	3770	3828	3889	3960	4037	4100	4207	4342	4474

(i) Calculate the percentage increase in the total crossings between 1997 and 2005.

Space for calculation

Answer _____ % **1**

(ii) Discuss the trends shown in the table in relation to strategic energy management plans.

_____

_____

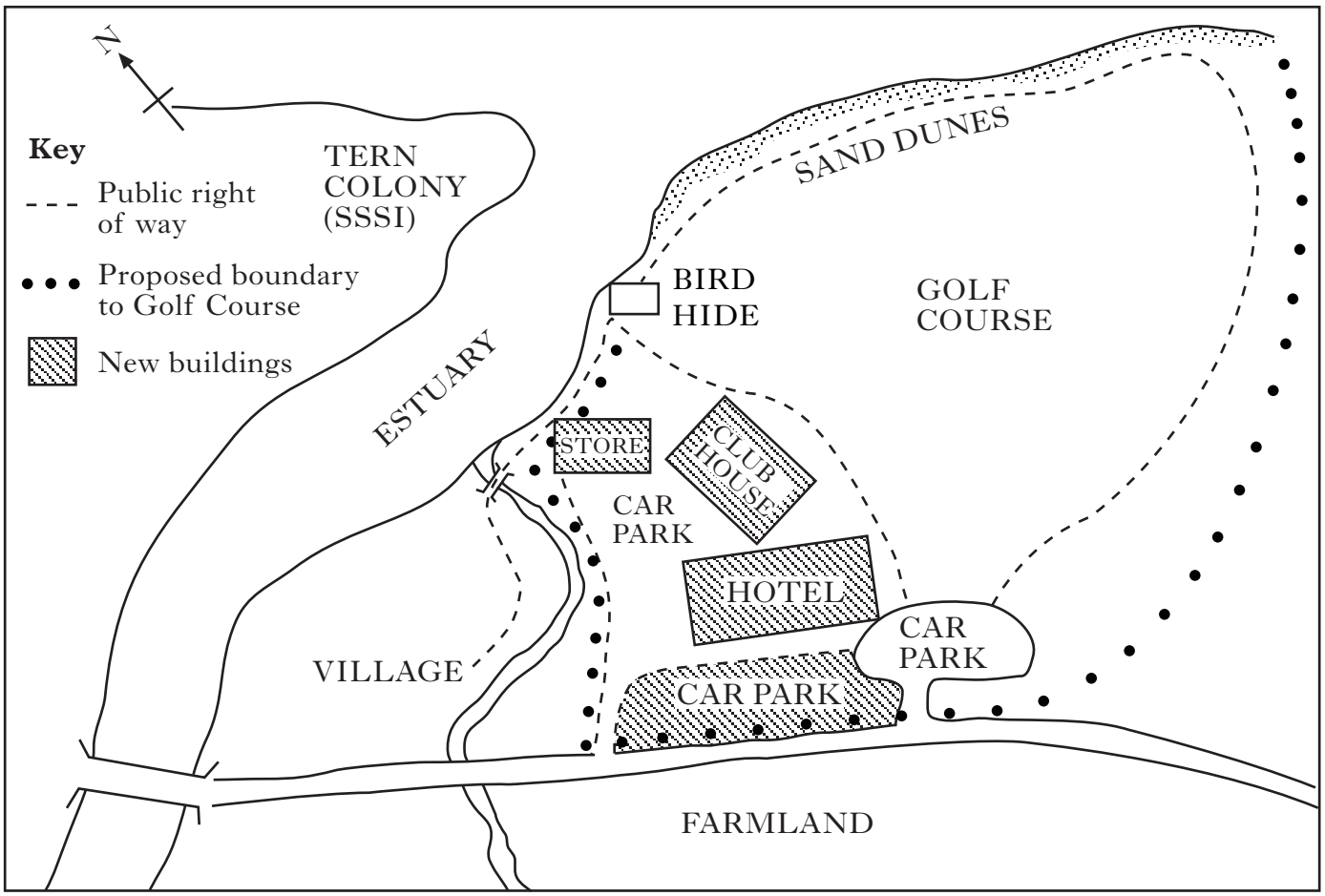
_____

_____

_____

_____ **3**

7. (*a*) The diagram below shows the site of a proposed golf course development on an isolated sand dune ecosystem.



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Marks

(i) Describe **two** negative impacts the proposed development could have on the sand dune ecosystem.

1 _____

2 _____ **2**

(ii) Describe **one** conflict arising from this proposed development and suggest a possible resolution.

Conflict _____

_____ **1**

Resolution _____

_____ **1**

[Turn over

Marks

7. (*a*) (continued)

(iii) Give **two** advantages, other than economical, that the proposed development would bring to the local community.

Advantage 1 _____

Advantage 2 _____ **1**

(iv) Give **one** aesthetic impact which would be unwelcome to the local community.

_____ **1**

(*b*) The golf course developers must carry out an Environmental Impact Assessment.
Explain what this means.

_____

_____

_____ **1**

(*c*) The whole area shown on the diagram is designated an NSA.

(i) What is an NSA?

_____ **1**

(ii) Suggest **one** way in which the Golf Course management could avoid the leaching of nutrients into the estuary if the development goes ahead.

_____

_____ **1**

(iii) Name the statutory organisation responsible for monitoring Scotland's estuaries and watercourses.

_____ **1**

(*d*) A sand dune ecosystem shows progressive changes in vegetation type from primary colonisers to climax community.
What is the name of this process?

_____ **1**

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.

Marks

8. Answer **EITHER** A **OR** B.

A. Discuss the impacts on the environment of the following:

(*a*) crofting; **5**

(*b*) ecotourism; **5**

(*c*) waste disposal. **5**

(15)

OR

B. Discuss how the following can support sustainability:

(*a*) organic farming methods; **5**

(*b*) industrial practices; **5**

(*c*) Local Agenda 21. **5**

(15)

9. Answer **EITHER** A **OR** B.

A. Describe the techniques used and the findings for an investigation carried out on a named land or water use. **(15)**

OR

B. Describe the effects of leisure and recreational activities in a named national park and how negative impacts can be lessened by park management strategies. **(15)**

[*END OF QUESTION PAPER*]

[Turn over

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Marks

SPACE FOR ANSWERS

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Marks

SPACE FOR ANSWERS

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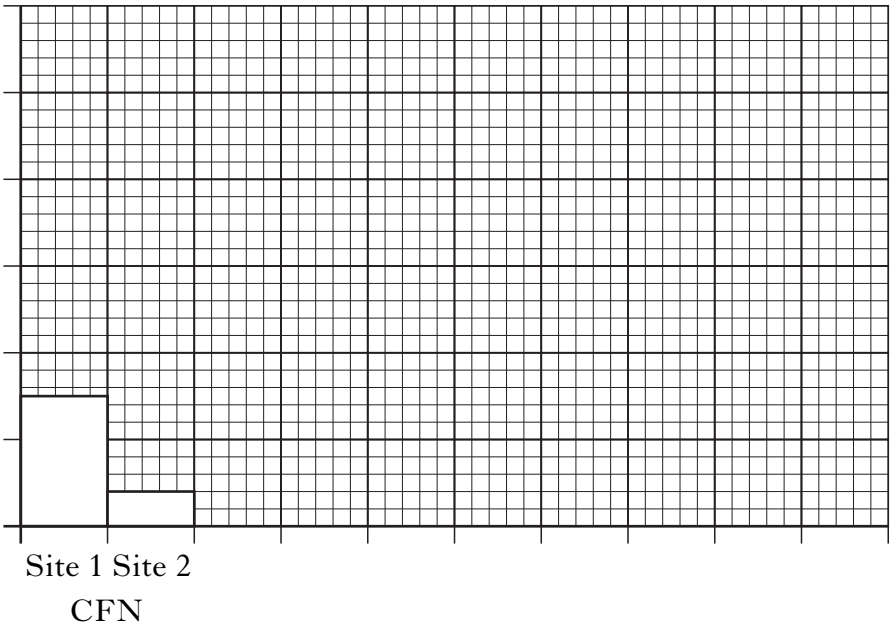
SPACE FOR ANSWERS

ADDITIONAL BAR CHART FOR QUESTION 5(*a*)(i)



Key

CFN	Caddis fly nymphs
	Mayfly nymphs
	Freshwater shrimp
	Chironomid larvae
	Water louse