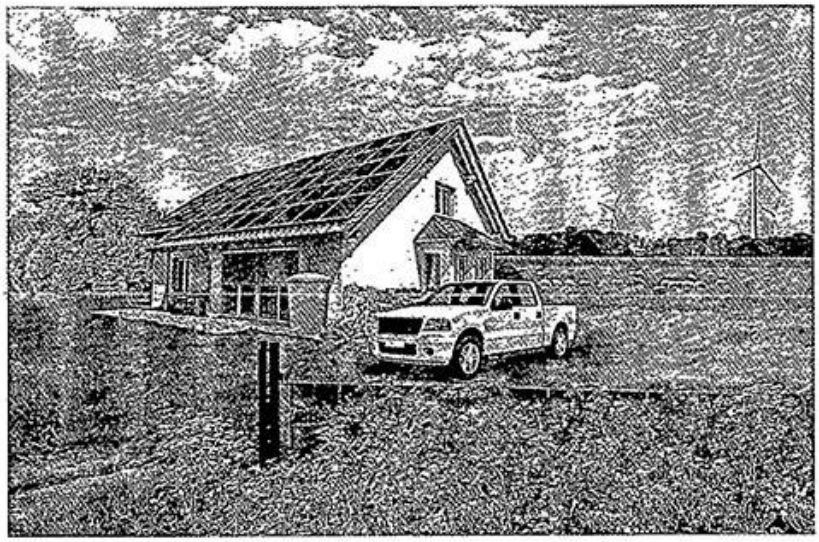
Candidate 3 evidence

SECTION 1 — 66 marks MARKS

Attempt ALL questions

1. The photograph below shows a country landscape.



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

~~energy~~ petrol

~~trees~~ wood

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

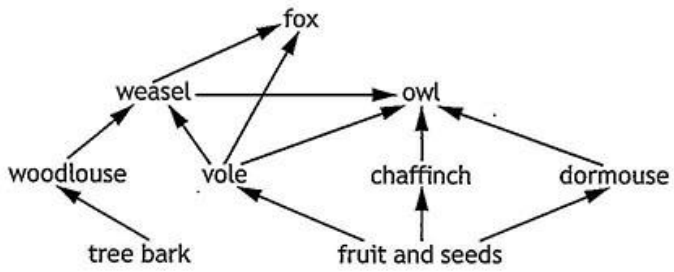
wind power

solar power,

(b) Describe one benefit of renewable energy. 1

they do not contribute to the greenhouse effect

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

Fruit and seeds, the producer

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

they show the flow of energy through the food web

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

weasel and owl

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

Give a reason for your answer. 1

the number of owls would decrease as there would be less food for it to eat

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

Using a quadrat

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.

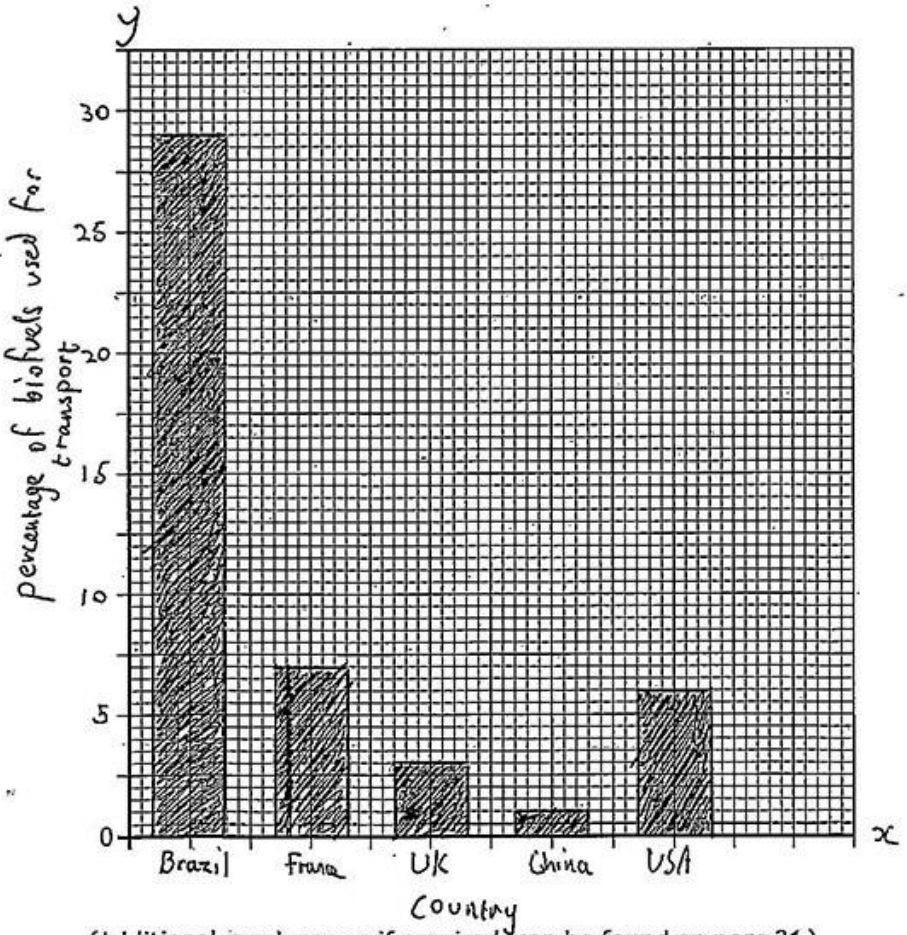
Country	*Percentage of biofuels used for transport*
Brazil	29
France	7
UK	3
China	1
USA	6

(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

23·4 ÷ 10 6.786 billion

= 2·34 ÷ 10

= 0.234 x 29

6786000000 1

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

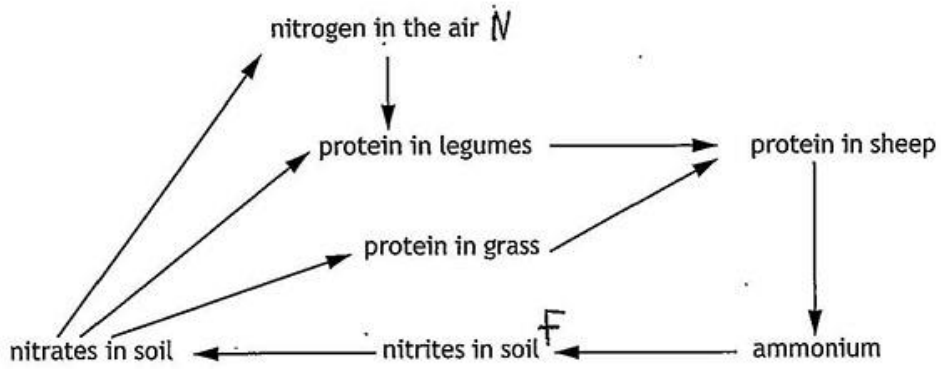
Suggest two reasons why the use of biofuels may not be environmentally friendly. 2

1 as deforestation can occur to gain biofuels which destroys the habitat of animals

2 when burning biofuels they release carbon dioxide into the atmosphere therefore contributing to the greenhouse effect.

[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

bacteria

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

Explain how this could be achieved. 2

they can put fertiliser into the soil, before planting. The helps the plants grow

(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

20% of 2 $2 \div 10 = 0.2 \times 2$

0.4 kg

4. . (continued)

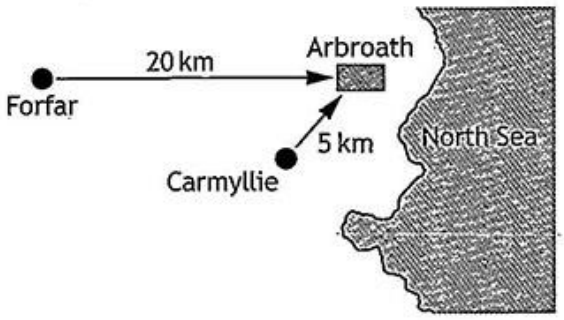
(e) Farmers throughout the world often extract water contained within porous rock to irrigate crops.

Explain why this practice may not be sustainable. 2

this practice is not sustainable as it takes a lot of energy to extract water contained within porous rock.

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

40 x 5
=

200 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

0 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

4 x 5

20 l

5. (continued)

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

As it saves her money on fuel, because they use less fuel.

(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

If they walked as it is only 5km away or took the bus

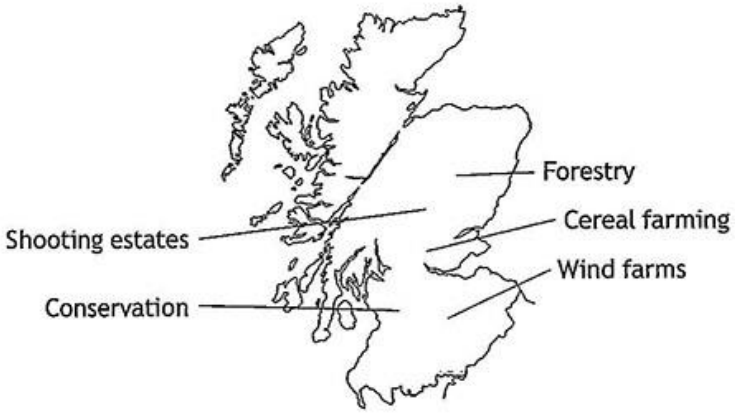
(d) Hybrid cars are becoming more popular.

Evaluate the sustainability of this trend. 2

hybrid cars will eventually be replaced by fully electric cars that need no petrol or diesel as these cars would have the minimum Carbon dioxide emissions unlike hybrid cars.

[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 Conservation

Land-based activity 2 Shooting estates

Conflict Conservations dont want shooting estates firing weapons as it would scare and possibly harm the wildlife.

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

Quad biking

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

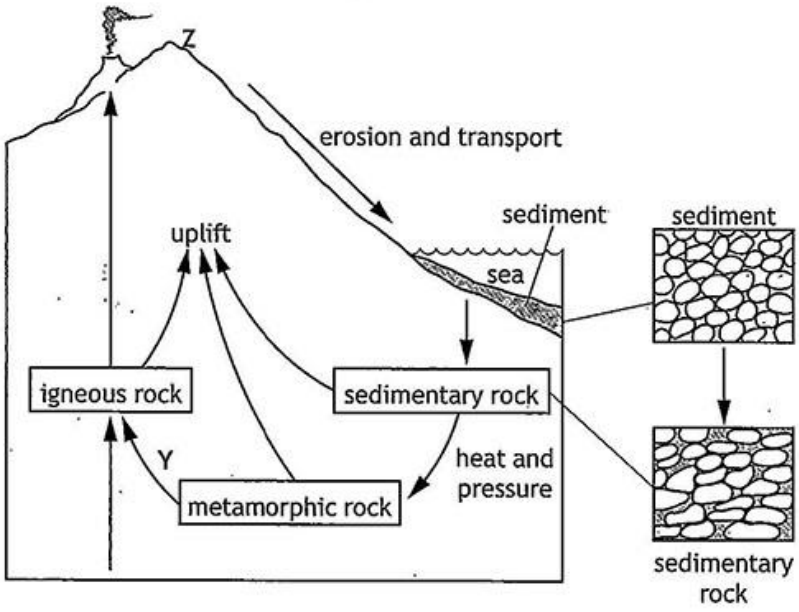
Straw berrys

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

they try to protect forrests from being cut down, Try to lower FO^2 emissions, Protect animals, and many other things to protect the environment.

SSPCA.

7. The diagram below shows the rock cycle.



(a) (i) The rock at location Z is being weathered.
Explain the term *weathering*. 2

weathering is the breaking down or erosion of rocks over geological time by water.

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

Sediment turns into sedimentary rock when it gets compacted

7. (a) (continued)

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

When molten metamorphic rock cools down it turns into igneous

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

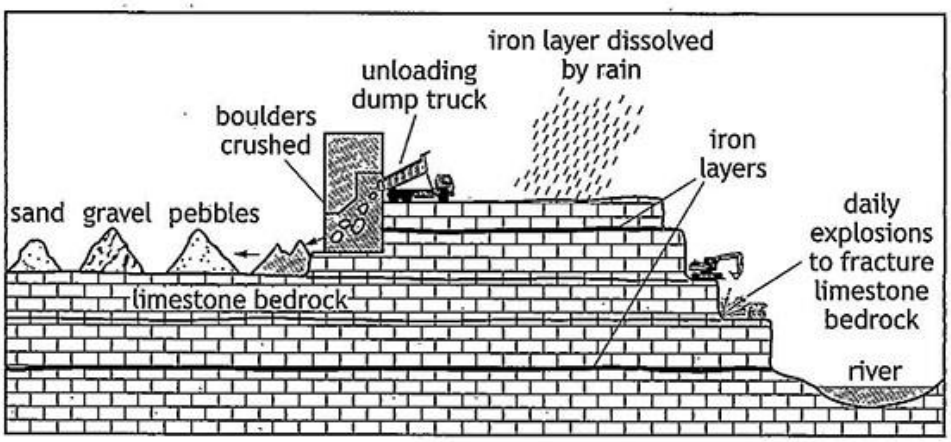
You may use diagrams in your answer if you wish.

limestone is formed through heavy compaction

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

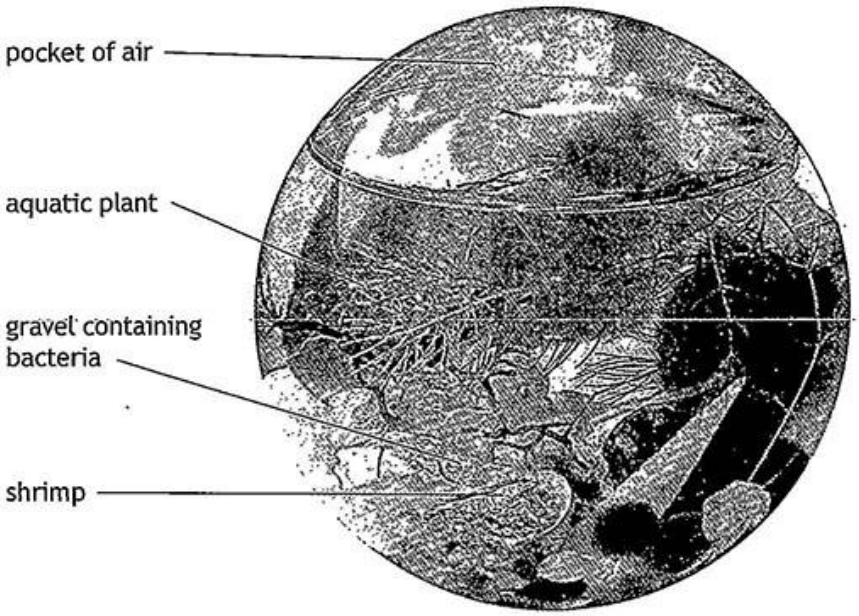
the quarry would create a lot of noise there angering people in the small town and scaring off the wildlife. Also small creatures could be living within the quarry.

(ii) State one other use of limestone. 1

limestone can be used for construction

[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

an ecosystem is all the things in an environment, such as, habitat, community

(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

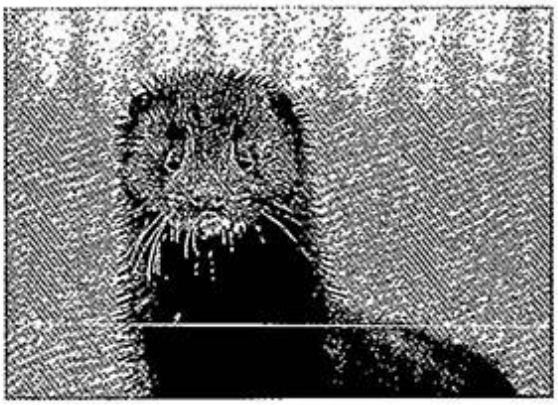
glucose + carbondioxide $\xrightarrow{\text{light energy}}$ oxygen + water

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

as sunlight goes into the sphere it hits the aquatic plant. photosynthesis occurs. creating oxygen.

[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.



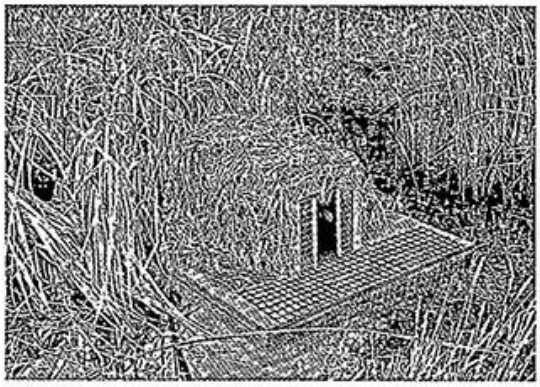
The spread of mink and their continued presence across the Hebrides acts as a threat to many bird populations.

(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

invasive species

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

to make it blend in with its surrounding environment.

(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

if the set up multiple diffenent rafts in diffenent parts of the area

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

another animal could step on the raft and be mistaken for a mink

[Turn over

MARKS

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

as the american mink is a non native species and it is eating the native species of the area.

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

a predator could be realeased to hunt the mink

SECTION 2 — 20 marks

Attempt ALL questions

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

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

wind mill

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

as the average wind speed is far slower there in location A. making it safer.

(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

the wind speed would be far faster as there wouldn't be any trees to block the wind.

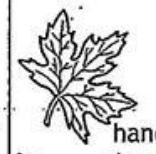
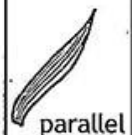
[Turn over

10. (continued)

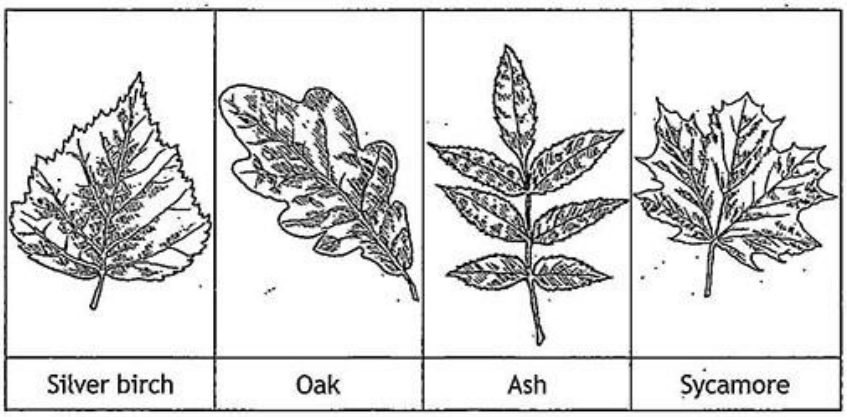
(b) Plants can be identified by examining the features of their leaves.

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

MARKS

10. (b) (continued)

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

an ash leaf has netlike veins, has a spear shaped shape, has a compound number, has toothed edges, and has an opposite arrangement on the stem.

(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.	compound leaf	Ash
	Simple leaf	Go to 3
3.	Leaf toothed	Go to 4
	Leaf smooth	Oak
4.	Leaf hand-shaped	Sycamore
	Leaf spear-shaped	~~Ash~~ Silver birch

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

~~Ash~~ because leaves change during the winter months.

[Turn over

MARKS

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 pitfall trap

Description of use you dig a small hole in the ground put a cup in it cover the cup and hole with twigs and leafs wait for invertebrates to fall in.

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

there are far more trees in woodland X than there is in woodland Y.

MARKS

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

There are a lot of trees with high Calorific vale in woodland X.

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

Space for calculation

3500 + 3000 + 2700 + 2600 + 1800.
= 13600 ÷ 5
=

2720 kWh tonne^{-1}

MARKS

10. (d) (continued)

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

Justify your answer. 2

wind power because there are lots of high winds in the area such as at location A.

(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

The biomass plant should not be built. One reason for my answer is that newly born lambs would die due to the cold wind created by there not being a wood land to shelter them. Also another reason is that they should use wind power instead as it won't have nearly as much of an affect on the environment that cuting down the woodland would have. also it would harm local bussinesses as a local bed and breakfast said that the falling trees and smoke produced by the large biomass plant would mean that they would lose customers

SECTION 3 — 14 marks MARKS

Questions 11 and 12 each contain a choice

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

11.

A. The natural green house effect is whe gasses are in the atmosphere naturally these gases stop some heat from bouncing off the earth's surface and back into space [redacted] therefore contributing to climate change, [redacted] and global warming. But the natural greenhouse effect doesn't affect climate [redacted] change and the planet at a dangerous level;

The enhanced greenhouse effect is when human actions such as burning fossil fuels contributes to the green house affect adding more carbon dioxide to the earth's atmosphere trapping heat in the earth as the gas absorbs the heat. this affects the planet at a dangerous level. This is the reason people are trying for example to switch from petrol cars to electric cars.

12. A.

An impact of the increasing population on earth's food supplies is that we need far more food than ever before meaning we have to produce more food than ever before to keep up with the rising demand. This means that more fertiliser will need to be used on crops damaging the environment as rain can move the fertiliser to a nearby pond or lake causing an algal bloom posibly killing the wildlife in that pond or lake as the algal bloom would result in the plants in the pond or lake being blocked from the sun meaning they cant perform photosynthesis therefore the fish wont have any oxygen and will die. A positive impact is that many new jobs will open up as a result of this

Meanily people who didn't have a job befor can have one now to help keep up with the worlds growing demand for food. As the population increases so will the amount of people inpoverty as there won't be enough food to feed them.