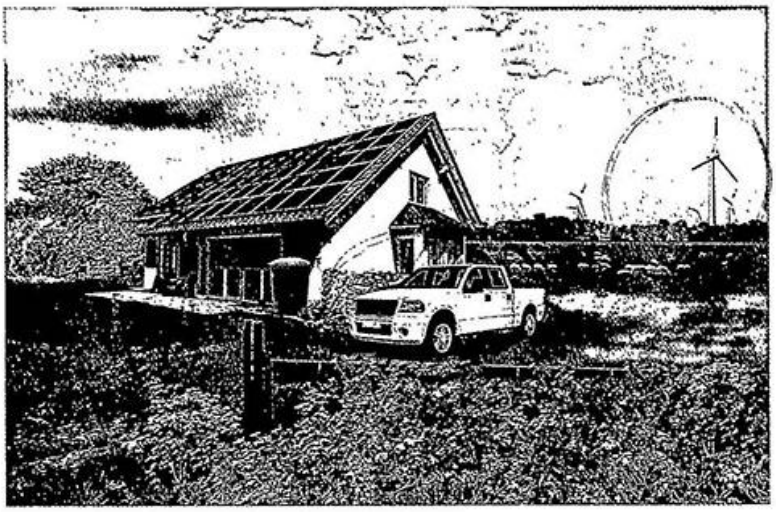
Candidate 1 evidence

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

car

House.

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

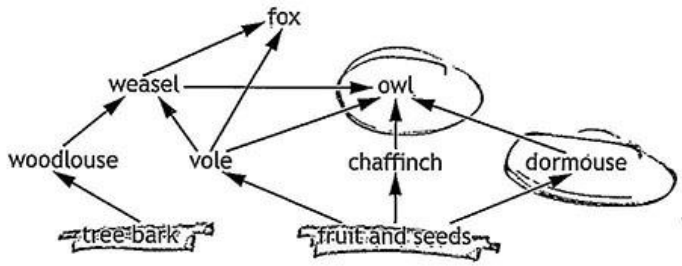
Solar energy

Wind energy

(b) Describe one benefit of renewable energy. 1

It is an infinite source of energy ~~and~~ and does not produce harmful fumes that can cause destruction to the atmosphere.

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

fruits and seeds.

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

To show the direction of energy flow. ~~from one organism to~~

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

The chaffinch and the dormouse are in competition with eachother over the fruits and seeds

(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 stay the same as there is less competition for the fruits and seeds so as a result the number of voles and chaffinches would increase and would make up for the difference in the decrease of the dormouse.

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

By using traps to catch dormouses these traps could be placed within a certain area and the number of dormouse caught could be used to estimate the size of the overall population.

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.

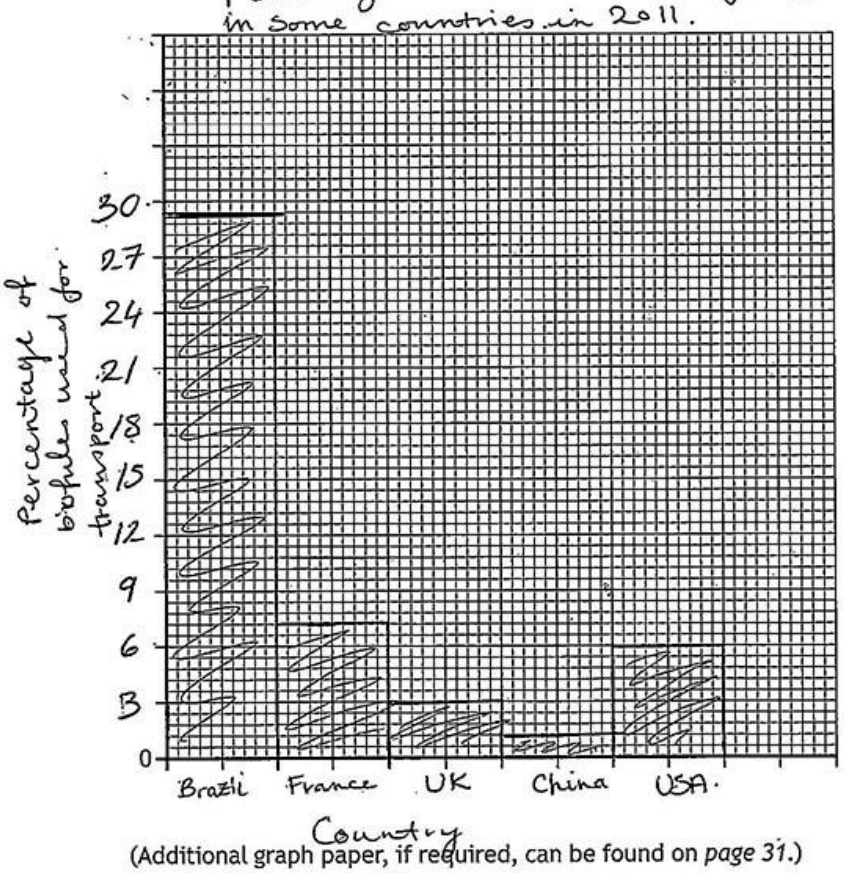
	Country	Percentage of biofuels used for transport
1	Brazil	29
2	France	7
3	UK	3
4	China	1
5.	USA	6

(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

Brazil = 29% transport.

1% = 2340000.

20% = 46800000
9% = 2106000 —— } 48,906000

~~23·4~~

2340,000,000

48, 906, 000. 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**

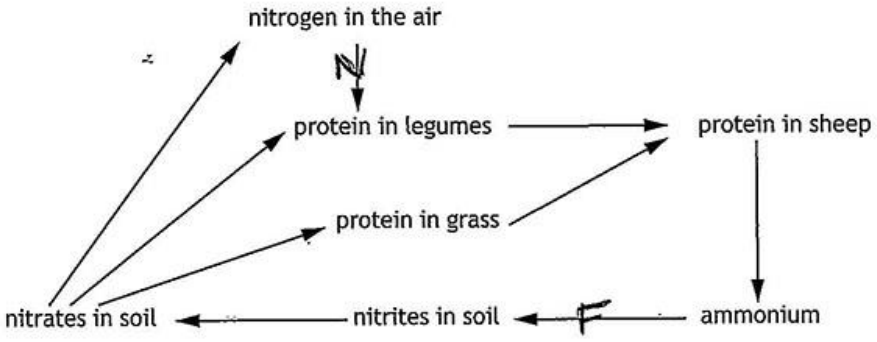
1 They are expensive to make and still emit fumes into the atmosphere through the creation process.

2 ~~They still emit chemicals that harm the atmosphere when they are being used as fuels for vehicles.~~

They take a long time to make as renewable energys such as sugar cane in Brazil have to be distilled for fermentation for years before they can be used.

[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. ~~Oxidisation~~ 1

Denitrifying 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

This could be achieved using a fertiliser ~~or a~~ this is put in with the soil around the plants to help it 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

8 kg = 100%.

~~6 kg = 80%.~~

6.4 = 80%.

1.6 = 20%.

1.6 kg

4. (continued)

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

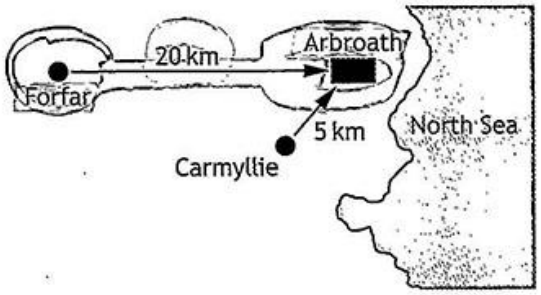
Explain why this practice may not be sustainable. 2

As it is unknown how much water is in the rock and it may be being destroyed for no reason. There is not enough Water ~~to~~ within the rock to irrigate the crops, many rocks would have to be extracted. The soil may also be ruined due to the extraction of rocks.

[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

Week = 5 days. There and back = 10 journeys

20 km = 1 journey

20 × 10 = 200

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

30 km = 1 journey there

1/2 journey back

~~10 × 5 = 100~~ ~~30 = altitude~~

50

~~100~~ 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

1 L = 10 km

~~100 ÷~~ 50 ÷ 10 = 5

~~10~~ 5 l

5. (continued)

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

As not as much fuel is needed, thus saving the teacher money.

(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

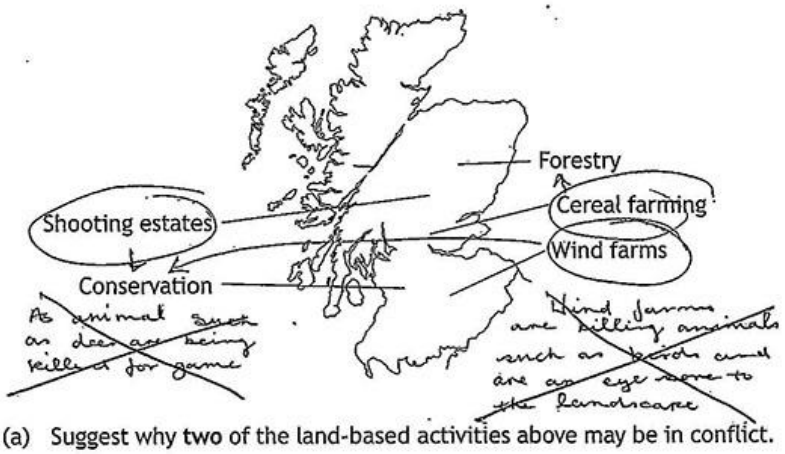
- Public Transport
- ~~for sharing~~ cycling

(d) Hybrid cars are becoming more popular.
Evaluate the sustainability of this trend. 2

This is a sustainable trend, as ~~there~~ rising cost of petrol means that it is cheaper to rely on ~~energy~~ electricity as well. Cities are also introducing fees for cars that enter if the car is switched to electricity this fee can be avoided as no fumes are being produced by the car.

[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 Wind farms.

Conflict Wind farms are killing animals such as birds and are a source of animals. noise pollution for ~~those~~ living near by.

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

hill Walking.

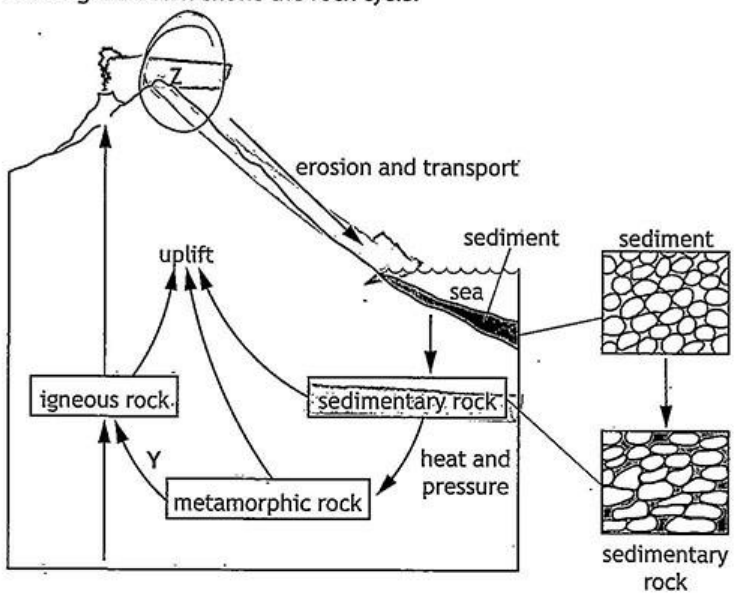
(c) Other than cereals name one economically important agricultural crop produced in Scotland. 1

Wheat

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

The role of organisations such as the Scottish Environmental Protection Agency (SEPA) is to protect ~~and~~ the scottish landscape and ensure it is not ruined by things such as litter ~~of~~ or flytipping and to ensure that animals living Scotland are not harmed by man made or their habitats are not destroyed by man made structures.

7. The diagram below shows the rock cycle.



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

Explain the term *weathering*. 2

* the rock is broken down into smaller rocks that break off of the large rock to form over.

~~Hithe~~ Weathering is the process of * rocks ~~is broken down to produce more smaller rocks~~. This can be done through physical, chemical or freeze-thaw weathering.

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

The sediment is crushed under the layers and layers of dead organisms. This pressure pushes all these dead organisms together until they harden to form a sedimentary rock.

7. (a) (continued)

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

The metamorphic rock is heated to become magma and then it cools becomes igneous.

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

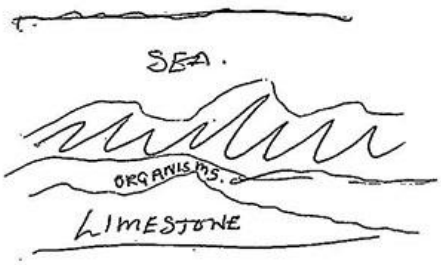
You may use diagrams in your answer if you wish.

Limestone was formed millions of years ago. ~~Some~~ Dead organisms fell to (see fig 1). the bottom of the Mediterranean Sea and were crushed under layers of sand (see fig 2) and mud until they hardened. The limestone was then pushed to the top of the ~~ocean~~ ocean through the ~~layers of~~ limestone continuously ~~forming~~. (see fig 3.) layers of dead organisms being crushed under layers of mud.

fig 1:

fig 2:

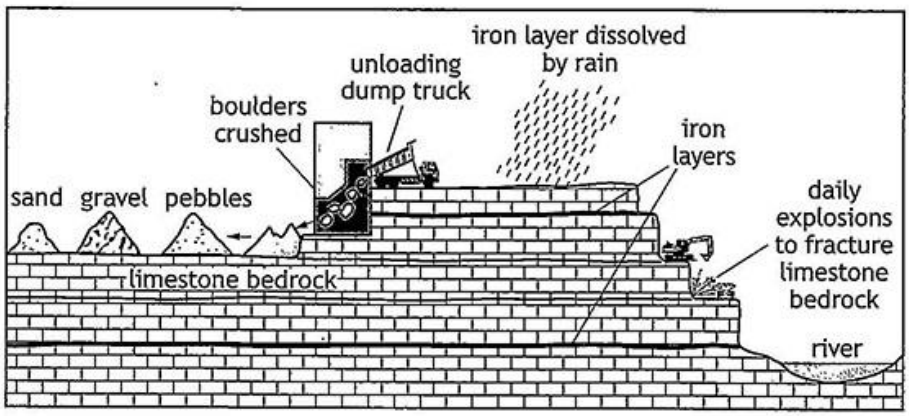
fig 3:



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

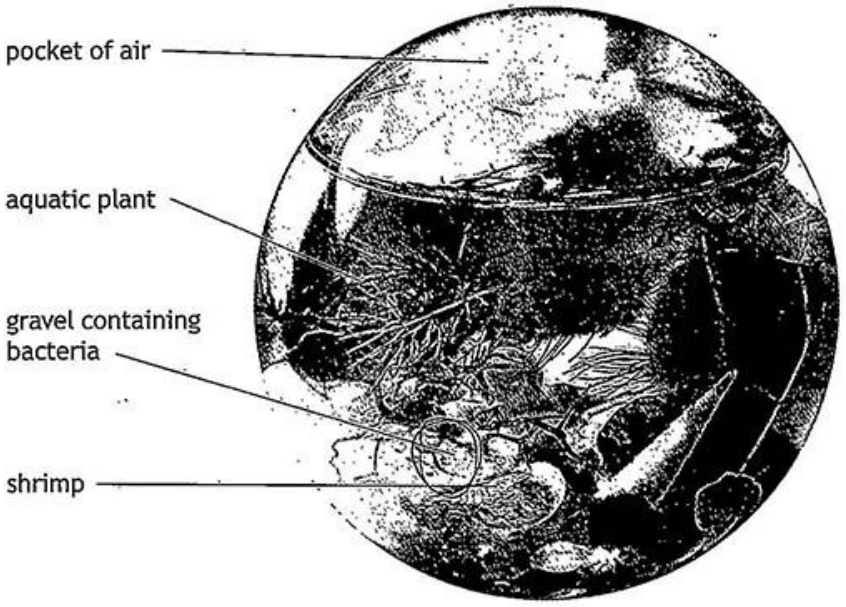
The quarry could destroy habitats and also create noise pollution through the use of explosions and large machinery. The ~~dust from the~~ ~~exct~~ quarry also alters the landscape through the digging of the soil for rocks.

(ii) State one other use of limestone. 1

It can be used to balance the pH on fields of for crops.

[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

Ecosystem is all the living and non-living organisms ~~live~~ together within one area.

(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 + carbon dioxide → oxygen + water

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

As the plants ~~pr~~ recieve light from outside the Sphere and the carbon dioxide is expelled through ~~the~~ by the shrimp. ~~The plant produces~~ ~~oxygen bubbles then~~ Glucose is ~~produced by the~~ ~~bacteria allowing~~ them to help in the ~~respiration process~~ ~~as they are eaten by the shrimp,~~ ~~plant~~ during respiration Carbon dioxide is used up by the plant during respiration allowing the oxygen to keep being produced as not to kill the shrimp.

[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.

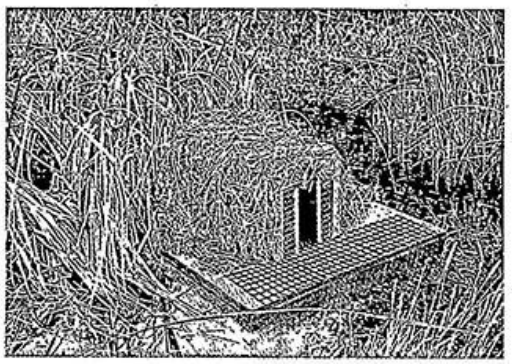
The spread of mink and their continued presence across the Hebrides acts as a threat to many bird populations.

(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

non-native 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 disguise the raft and therefore there will be more chance the mink will want to enter the raft and it will not ruin the area the raft has been placed in. *

(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

The raft could be tested in different locations within the area.

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

Animals that are not mink may enter and as a result their foot print will be recorded.

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 have no natural predators and can kill the native species within the island. This causes an imbalance within the foodchain and biodiversity

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

By introducing a predator that would 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.

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

A wind dial.

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

Ans it keeps the lambs away from the forest and the proposed biomass plant. *

* the area is also sheltered by the woodland area.

(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 location at location B would increase as the area is no longer sheltered by the trees.

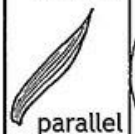
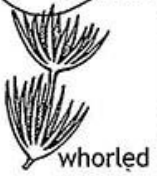
[Turn over

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	
	 needle			 whorled

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

The ash leaf has spear shaped leaves with netlike veins. The edges of the leaves are toothed with the leaves being opposite to one another 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	Ash
	Simple leaf	Go to 3
3.	Leaf toothed	Go to 4
	lobed	Oak
4.	Hand-shaped	Sycamore
	Leaf spear-shaped	Silver birch

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

As some of the trees will not have leaves on them due to shedding them in the winter.

[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 Pitfall trap.

Description of use The trap is dug into the ground and covered with leaves. The invertebrets fall into the trap and cannot get out. These invertebrets are counted and an estimate is made.

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

As Woodland X is a larger forested area than Woodland Y.

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

* area nearby this saving on fuel costs for transport.

As the ground is flat with no houses. Woodland X has plenty of trees that can be used that is in an *

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

Space for calculation

~~36+~~ 3500 +
3000 +
2700 +
2600 +
1800 ÷ 5
= 2720

2720. 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

& it easier to install a Windfarm.

Wind turbines - The area is ~~for~~ in a valley thus directs alot of Wind flow in the valley and this could be used to generate electricity. Furthermore the ground is flat thus making it

(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 permission for the plant should be granted as it will bring jobs to the local town and increase the local economy.

The plant should not be built as it will cause noise pollution to the local area. The

The plant should not be built as the plant will destroy habitats in its construction

The plant should not be built as it will be an eye sore and people may no longer wish to visit the local community.

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.

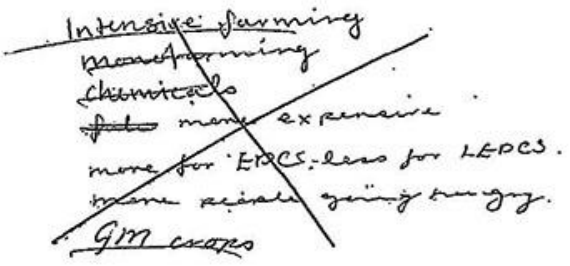
(b) Describe the production of energy by hydroelectric power. 7

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.

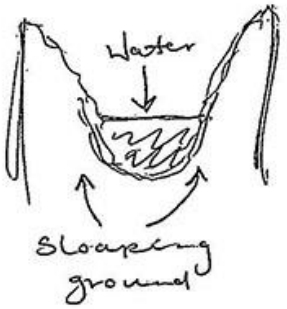
Discuss these issues and possible solutions. 7



[Turn over

SPACE FOR ANSWERS

11. (a) ~~Factors~~ A hydro electric power Scheme must be in a mountainous area that receives ~~heavy~~ rainfall as a dam must be built to trap and store the water ~~in the~~ before the power station is built. The mountainous area reduces the cost of having to build a full dam as the flooded ground will naturally dam the water at the sides.



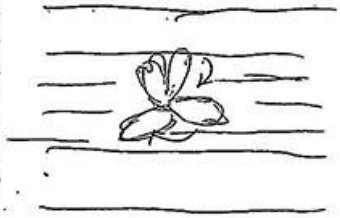
The area for building must also be away from towns and cities as there is alot of noise pollution during the building process of the hydro electric power station. However the building site must not be too remote as money needs to be spent on transporting both the workers to build the dam and the materials used to build it.

The ~~dam~~ Hydro electric power station must also ~~be~~ be in an area where it can successfully connect to the ~~nearest~~ national grid as this is where the energy produced by the hydro electric power station is stored after it has been generated.

SPACE FOR ANSWERS

(B) Energy is produced when Water is filtered from the resivour to ~~the~~ the bottom of the hydro electric powerstation. The area at the bottom usually connects to a river or alternative Water Source.

The Water is filtered through turbines, that causes ~~the turbine used~~ turn when the Water is filtered through it. This generates electricity.



The electricity generated by the turbines is then sent to the national grid via the cables connected to pylons. The national grid direct the electricity to be used for either domestic or industrial purposes.

12. (a) There is an increased amount of pressure on food production due to the growing population.

farmers are turning to methods such as intensive farming ~~v~~ methods to meet the needs of the growing population's need for food. This includes battery farming chickens and clearing rodgerows for more crops.

MARKS

SPACE FOR ANSWERS

Farmers are also turning to methods such as mono farming. This is when one crop is continuously grown to create an abundance of it. This ruins the soil the due to the lack of variation in nutrients it receives.

Farmers are also using more herbicides and pesticides on their crops to kill bacteria and weeds to produce a bigger yield. The effects of chemicals on humans is non-existant in small quantities however due to the increasing number of farmers using chemicals it is unknown what the effects of increased digestion of these chemicals can do.

There has been an increased use of GM crops. These are crops that have been genetically modified to withstand disease, this produces a bigger overall yeild for the crop.

Food will become more expensive due to the growth in population. If there is not an ~~There is an~~ increase in food production there will be a rise in cost of food. This will see an increased amount of people having to go hungry or starve.
There will also be an imbalance of food around the World. Between LEDCs will have less food while EDCs will have more food due to the increase in intensive farming methods.

[END OF QUESTION PAPER]