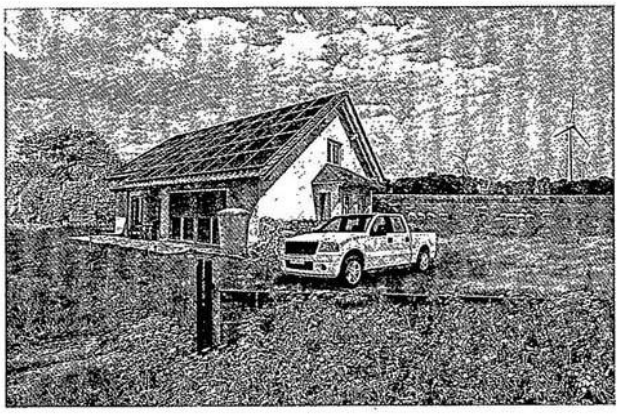
Candidate 2 evidence

SECTION 1 — 66 marks
Attempt ALL questions

1. The photograph below shows a country landscape.



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

Wind

light

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

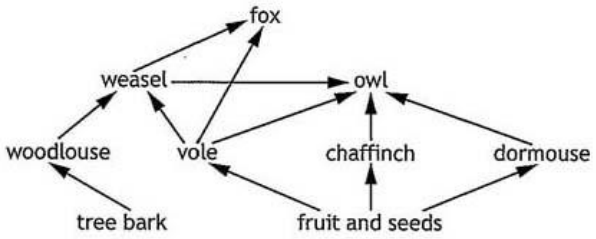
Solar power

Wind energy (windmills)

(b) Describe one benefit of renewable energy. 1

Renewable energy is cheaper

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

The Sun

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

To show the direction of energy flow.

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

chaffinch and dormouse

(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 will decrease as there is less food available and they are in competition with the weasel for vole

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

Quadrats can be used to estimate the size of the dormouse population in an ecosystem as if you throw randomly and repeat it gives you an average as you count how many squares they appear in.

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.

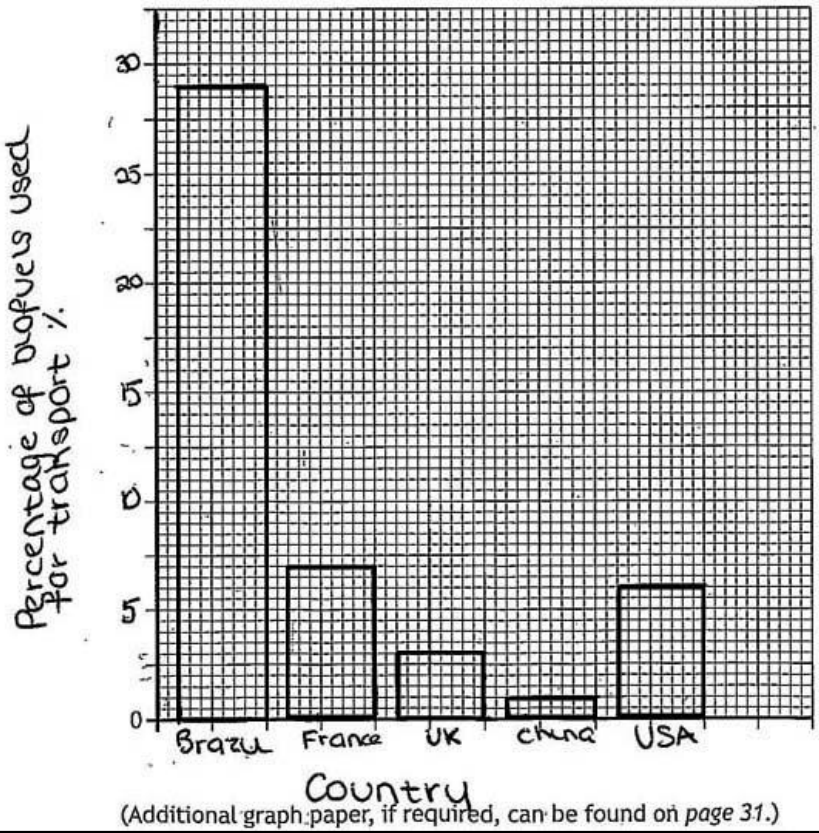
Country	*Percentage of biofuels used for transport*
Brazil	29
France	7
UK	3
China	1
USA	6

(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.

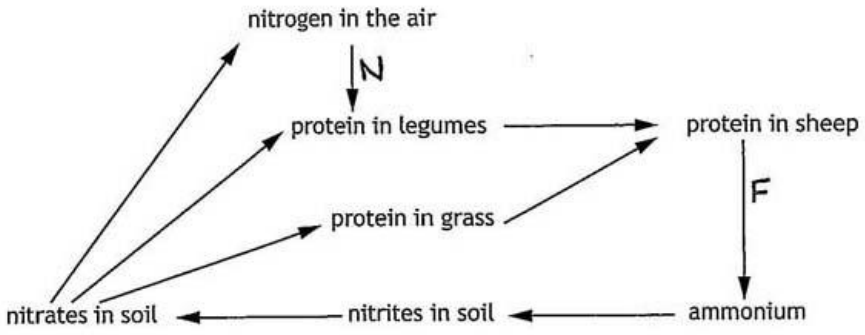
Suggest two reasons why the use of biofuels may **not** be environmentally friendly. 2

1 Releases gases into the atmosphere and environment by travelling

2 Extraction pollutes the environment

[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

Consumer

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

Explain how this could be achieved. 2

Farmers can achieve the increase of grass crop yield by using fertilisers which contain nitrates.

(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

0·4 kg

4. (continued)

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

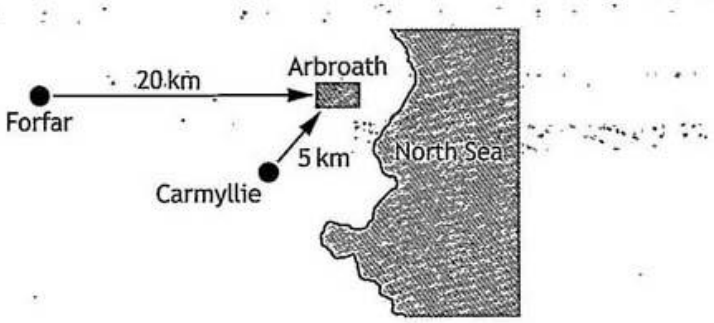
Explain why this practice may not be sustainable. 2

This isn't sustainable as there may not be many rocks available

[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

10 x 20 km
= 200 km

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 x 5 = 150
200 − 150 = 50

50 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

50 ÷ 10 = 5l

5 l

5. (continued)

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

A hybrid car is better for the environment as it doesn't release harmful gases.

(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

- The teacher could walk
- The teacher could get a bus

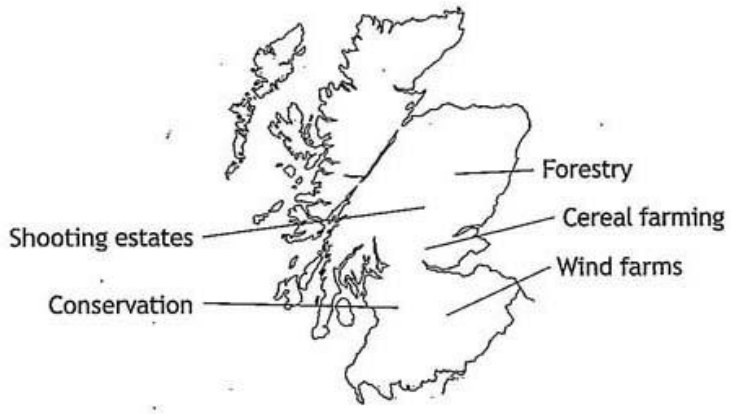
(d) Hybrid cars are becoming more popular.

Evaluate the sustainability of this trend. 2

Hybrid cars are sustainable as they reduce greenhouse effect because they don't release gases. They are more sustainable than petrol and diesel cars that let off harmful gases into the environment

[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 Forestry

Conflict Conservation is methods to protect animals from being hunted and becoming extinct, forestry is where people hunt

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

Cereal farming

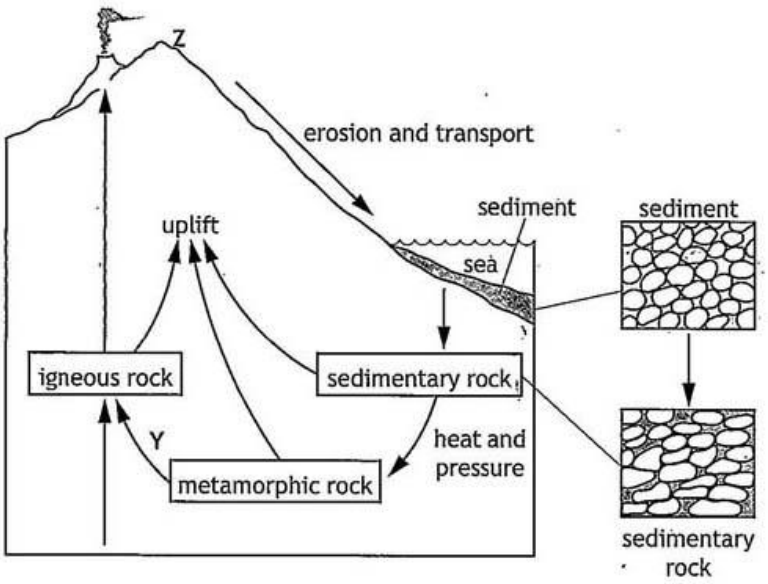
(c) Other than cereals name one economically important agricultural crop produced in Scotland. 1

Potato

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

SEPA's role is to protect species from going extinct and manage water in the environment

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 term for cooling the rock and changing its state.

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

Sediment changes into sedimentary rock as it is in the sea for a good amount of time and pressure separates the rock.

7. (a) (continued)

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

cooling

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

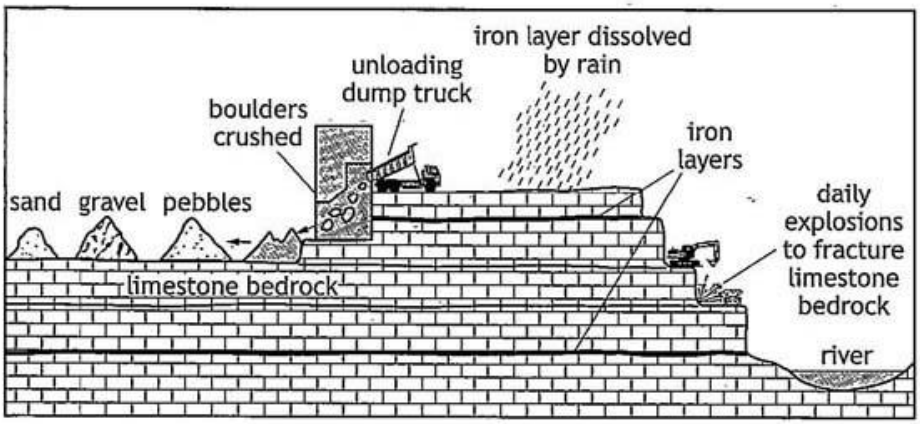
You may use diagrams in your answer if you wish.

limestone is formed at the bottom of the sea.

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

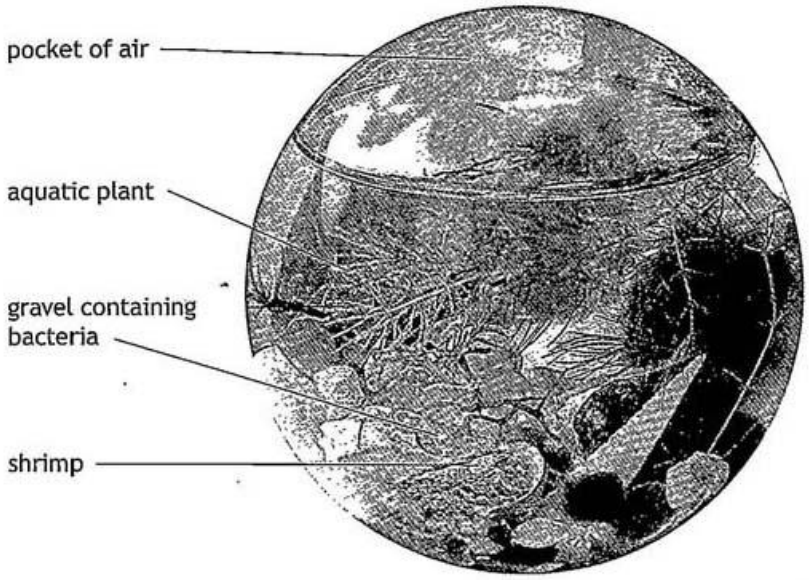
The lorry transporting the limestone is releasing gases which isn't good for the environment. The quarry is loud and may distrupt organisms in the environment.

(ii) State one other use of limestone. 1

glass

[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 the place and conditions where organism live.

(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

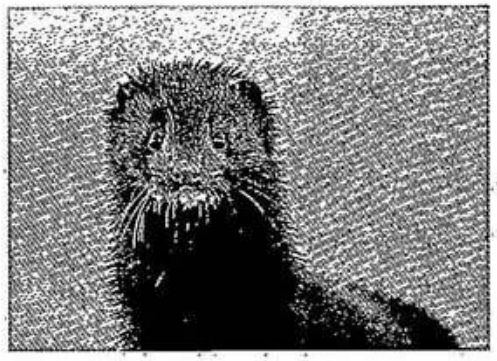
glucose + oxygen ⟶ carbon dioxide + water

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

The aquatic plant is able to carry out photosynthesis as it is able to recieve energy from the sun and is already getting enough water.

[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.



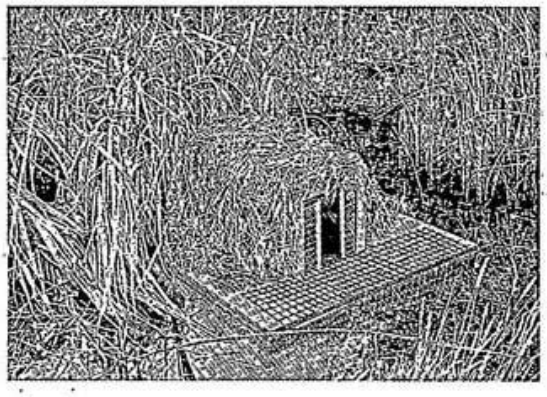
The spread of mink and their continued presence across the Hebrides acts as a threat to many bird populations.

(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

[redacted] invasive 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 camoflage the mink and attract them to the raft

(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

Repeat to work out an average

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

Different organism may approach the raft and give unreliable information about the mink

[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

This is necessary because the American Mink has the ability to spread fear and damage to the environment and this could have an effect on other organisms.

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

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

Wind mill

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

It is away from the biomass plant and close to woodland.

(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

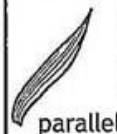
Windspeed will increase.

10. (continued)

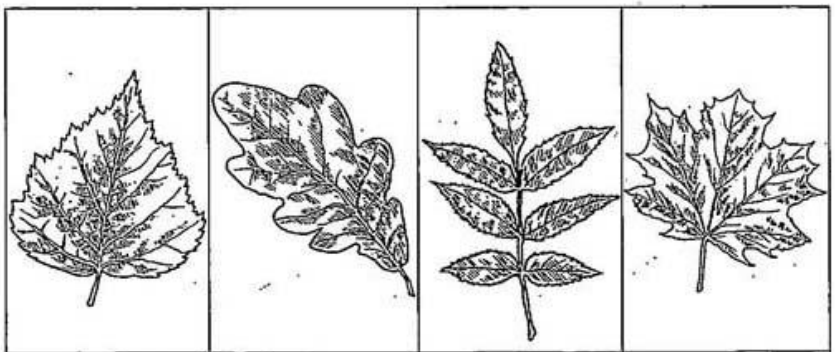
(b) Plants can be identified by examining the features of their leaves.

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

The ash leaf is a spear-shaped, compound leaf with toothed edges with an alternate arrangement on the stem. The ash leaf has netlike veins.

(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 lobed	Oak
4.	leaf hand-shaped	Sycamore
	Leaf spear-shaped	silver birch

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

leaves are dry and rotten so cannot tell

[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 Dig a hole in an area of the woodland and place small cup with air holes into the ground. Camoflage with grass and leaves leave overnight or for set time and then check to see how many caught-

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

Woodland Y has sheep that eats the grass and could be eating species

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

The heat energy is away from organisms and there is more room

(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

13600 ÷ 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

Hydroelectric power stations.

(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

Permission for the biomass plant shouldn't be granted as animals die and habitats are destroyed. Protection for the animals. The biomass plant produces smoke that pollutes the air.

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

MARKS

SPACE FOR ANSWERS

12 B) The increasing population is causing waste management issues such as landfill sites which cause pollution, eyesore and bad smells. Energy such as heat, light and electricity is being wasted too.

To help reduce waste management issues, you could recycle plastic which helps the environment and saves organisms. Other items can be recycled such as cardboard.

To save heat energy you could turn down the heating and wear an extra item of clothing.

Water is wasted and to save water people can have showers instead of baths.