AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.7.2 ORGANISATION OF AN ECOSYSTEM (PACK 3)

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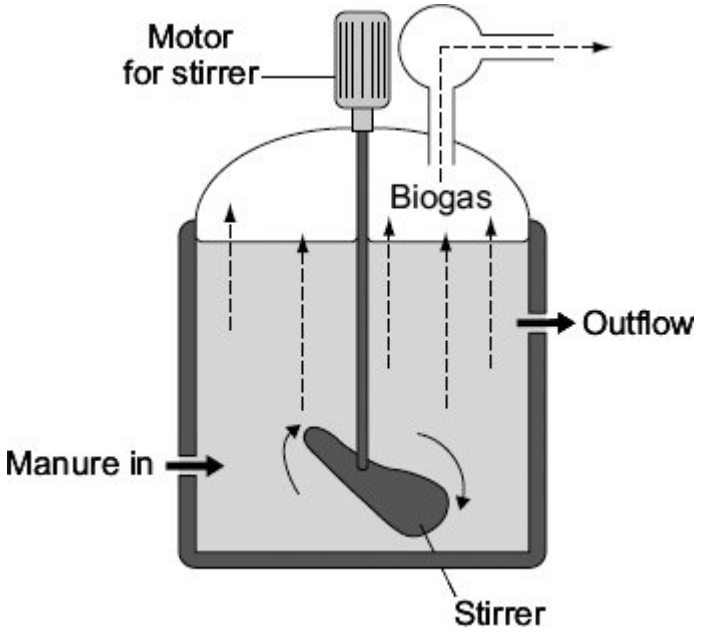
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Q1.

The diagram shows one type of biogas generator.



(a) With this type of biogas generator, the concentration of solids fed into the reactor must be kept very low.

Suggest **one** reason for this.

Tick (✓) **one** box.

A higher concentration contains too little oxygen. ☐

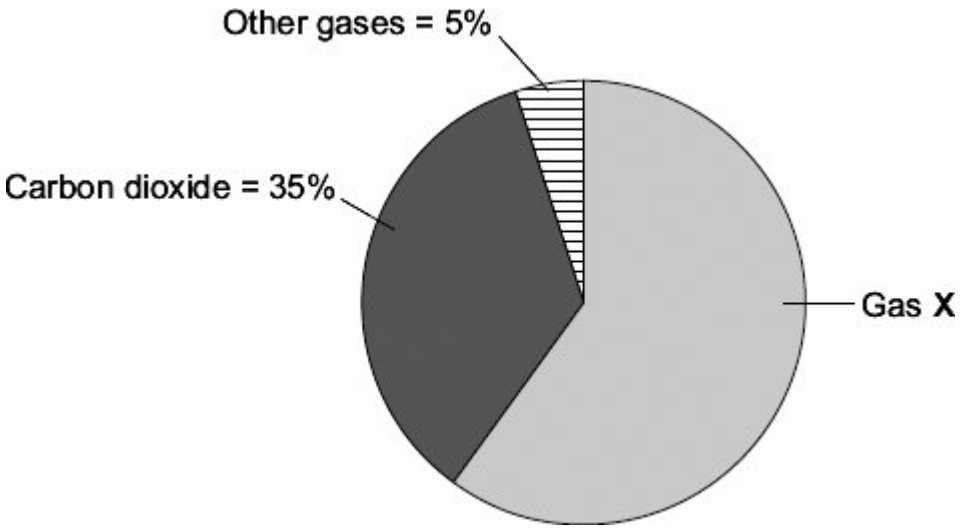
A higher concentration would be difficult to stir. ☐

A higher concentration contains too much carbon dioxide. ☐

(1)

(b) The pie chart shows the percentages of the different gases found in this biogas.

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Gas **X** is the main fuel gas found in this biogas.

(i) What is the name of gas **X**?

Draw a ring around **one** answer.

methane **nitrogen** **oxygen**

(1)

(ii) What is the percentage of gas **X** in the biogas?

Show clearly how you work out your answer.

_____

_____

_____

Percentage of gas **X** = _____

(2)

(c) If the biogas generator is not airtight, the biogas will contain a much higher percentage of carbon dioxide.

Draw a ring around the correct answer to complete each sentence.

(i) The air that leaks in will increase the rate of

aerobic respiration.
anaerobic respiration.
fermentation.

(1)

(ii) The process in part (c)(i) occurs because the air contains

ammonia.
nitrogen.

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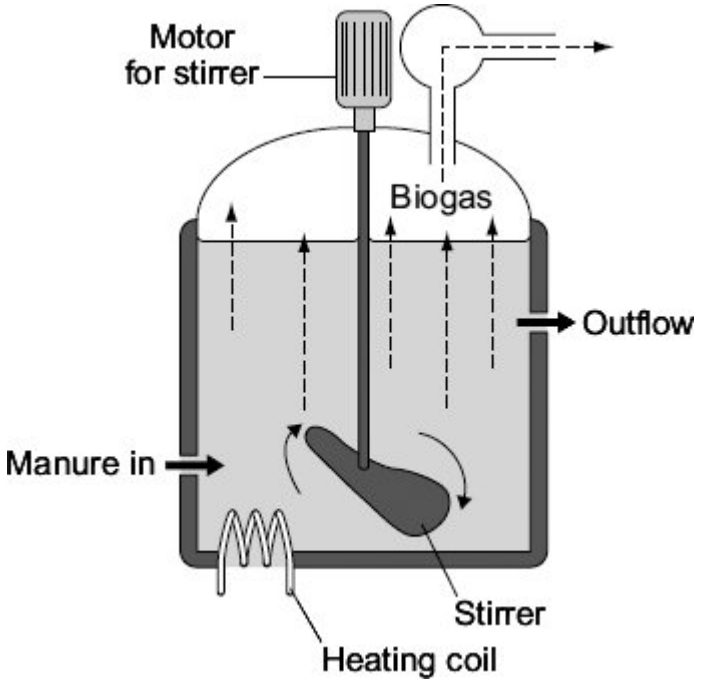
oxygen.

(1)

(Total 6 marks)

Q2.

The diagram shows one type of *anaerobic* digester. This is used to produce biogas.



(a) (i) What does *anaerobic* mean?

_____

_____

(1)

(ii) The concentration of solids fed into this digester must be kept very low.

Suggest **one** reason why.

_____

_____

(1)

(iii) This digester is more expensive to run than some other simpler designs of biogas generator.

Suggest **one** reason why.

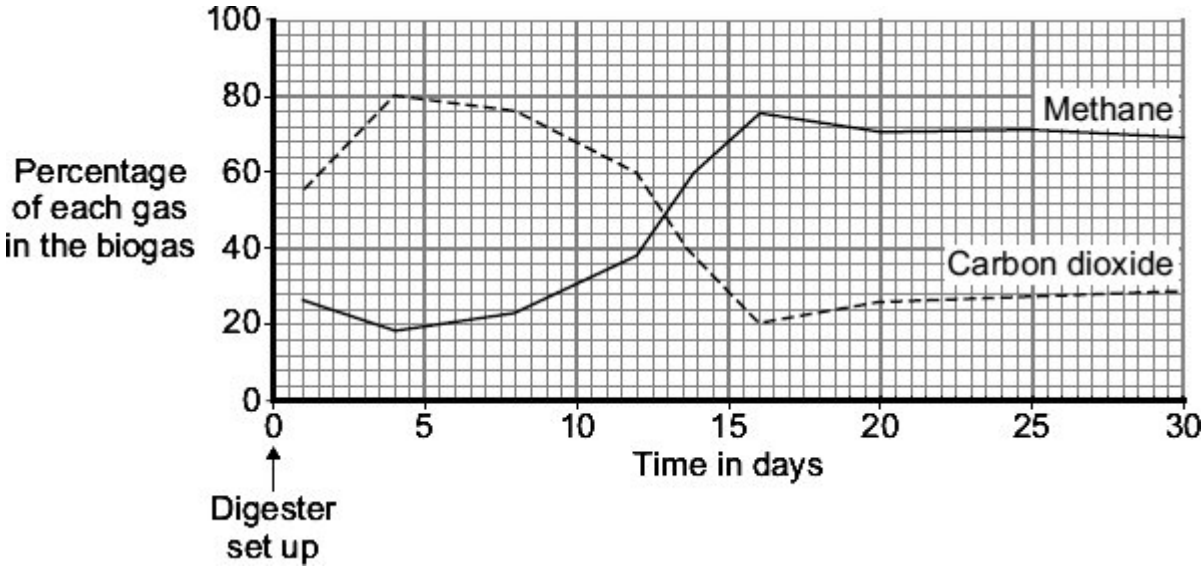
_____

_____

(1)

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(b) The graph shows how the composition of the biogas produced by the digester changed over the first 30 days after the digester was set up.



Use information from the graph to answer the following questions.

(i) Describe how the percentage of carbon dioxide changed over the 30 days.

_____

_____

_____

_____

_____

_____

(3)

(ii) On which day was the best quality biogas produced? _____

(1)

(c) Four days after the digester was first set up, the biogas contained a high percentage of carbon dioxide.

Suggest an explanation for this.

_____

_____

_____

_____

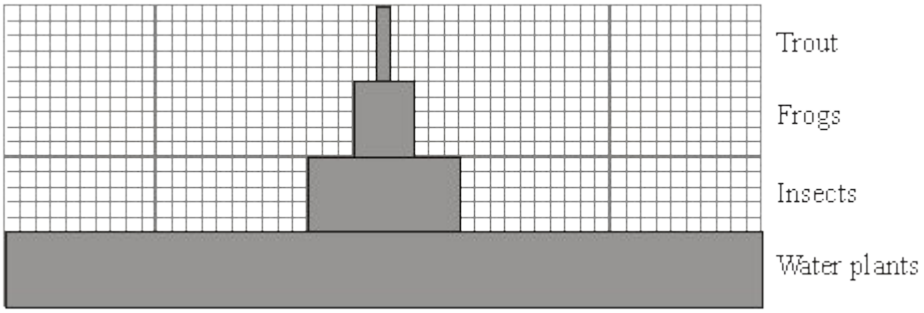
(2)

(Total 9 marks)

Q3.

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The diagram shows a pyramid of biomass drawn to scale.



(a) What is the source of energy for the water plants?

_____

(1)

(b) The ratio of the biomass of water plants to the biomass of insects is 5 : 1.

Calculate the ratio of the biomass of insects to the biomass of frogs.

Show clearly how you work out your answer.

_____

_____

ratio = _____ : 1

(2)

(c) Give **two** reasons why the biomass of the frog population is smaller than the biomass of the insect population.

1. _____

_____

2. _____

_____

(2)

(d) Some insects die.

Describe how the carbon in the dead insect bodies may be recycled.

_____

_____

_____

_____

_____

_____

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_____

_____

_____

_____

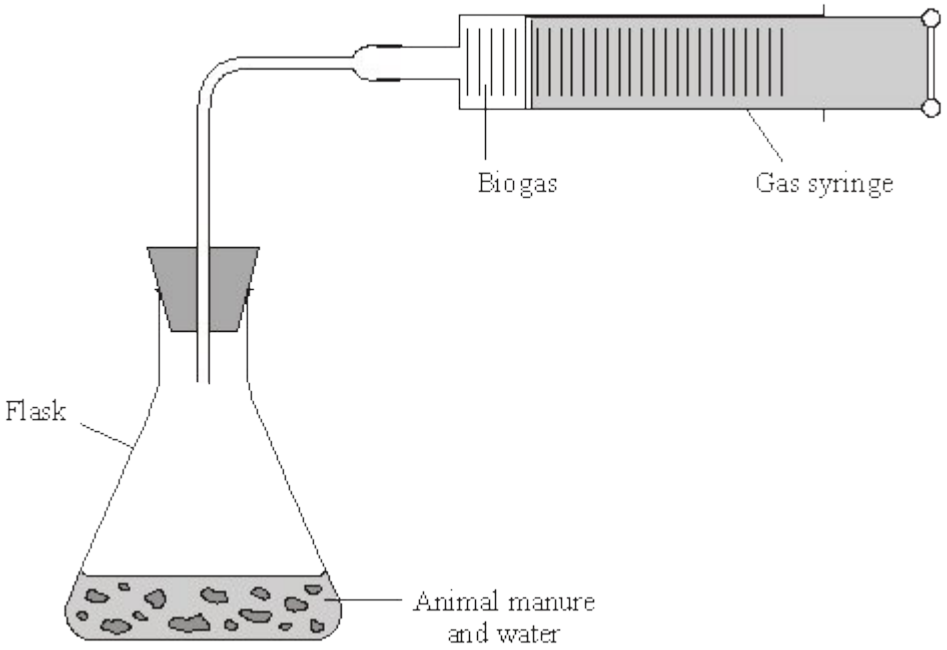
(4)

(Total 9 marks)

Q4.

Some students investigated the production of biogas from animal manure.

They used the apparatus shown in the diagram.



In their first investigation, the students collected the biogas in the gas syringe.

The table shows the percentage composition of the biogas.

Gas	Percentage composition
Methane	55
Carbon dioxide	40
Water vapour	5

(a) To make the biogas a more efficient fuel, the percentages of two of the gases in the table should be reduced.

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Which **two** gases should these be?

1. _____

2. _____

(1)

(b) The students then used the apparatus for a second investigation.

They bubbled oxygen through some fresh manure and water for one hour. They then set up the apparatus again and collected a second sample of biogas in the gas syringe.

Predict the effect of this procedure on the composition of the second sample of biogas.

Explain your answer.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

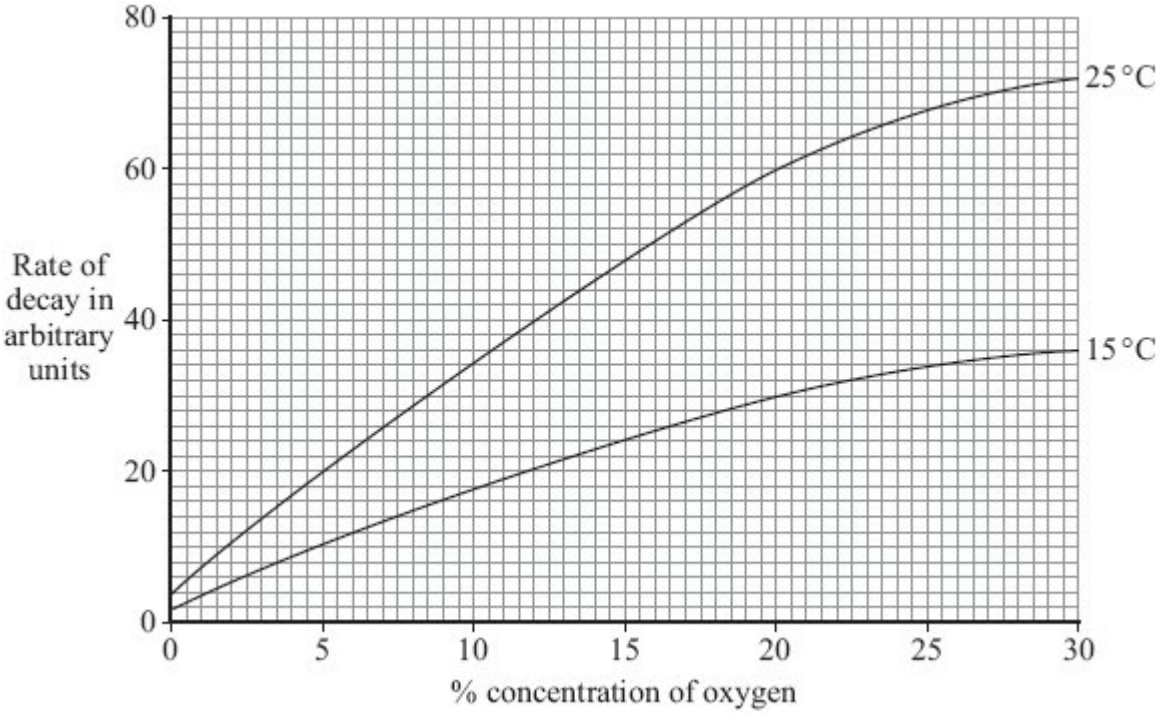
(Total 5 marks)

Q5.

Gardeners often put waste materials onto compost heaps.

The graph shows how the conditions in a compost heap affect how quickly waste materials in the heap decay.

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(a) (i) Describe the effect of increasing the temperature from 15 °C to 25 °C on the rate of decay at 20 % oxygen concentration.

_____

_____

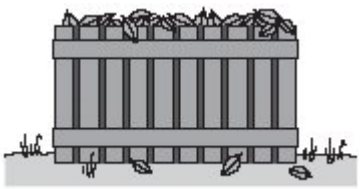
_____

_____

_____

(2)

(ii) Gardeners are advised to put waste materials into special compost bins. These bins have holes in their sides.



Holes in the sides of the compost bin help the waste materials to decay faster.

Explain why.

_____

_____

_____

_____

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_____

(2)

(b) A gardener noticed that some of his plants were growing poorly.

He put some decayed compost onto the soil, around the plants.
Six months later the plants were growing well.

Explain why.

_____

_____

(1)

(Total 5 marks)

Q6.

(a) Name the fuel gas present in biogas.

_____

(1)

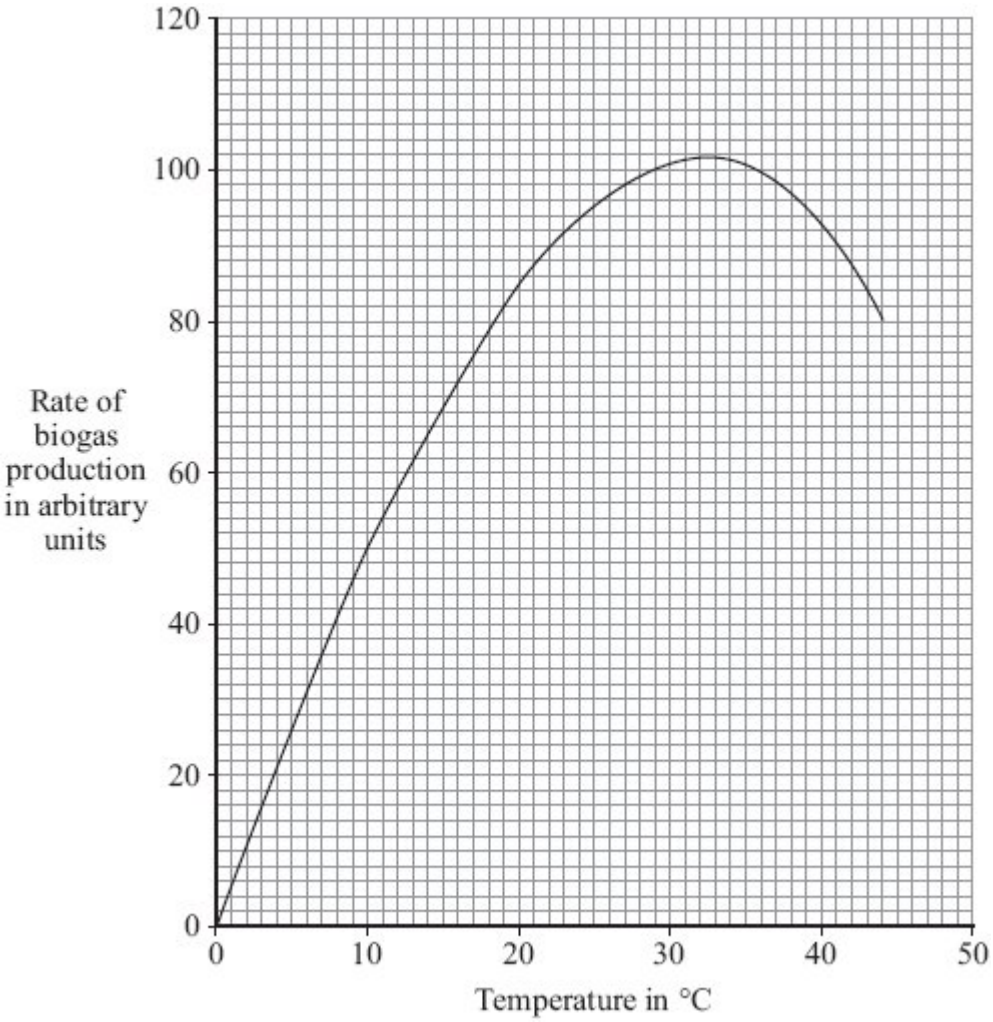
(b) Name the process that produces biogas.

_____

(1)

(c) The graph shows the effect of temperature on the rate of biogas production.

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(i) What is the best temperature for biogas production? _____ °C

(1)

(ii) In India, daytime temperatures can sometimes be higher than 40 °C.
It is useful to place the biogas generator underground.

Use information from the graph to suggest why.

_____

_____

_____

_____

(2)

(d) Temperatures at the UK sewage works vary between 0 °C and 25 °C.
The UK biogas generator has concrete walls, 60 cm thick.

How does the thickness of the walls affect the rate of biogas production?

Give a reason for your answer.

_____

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_____

_____

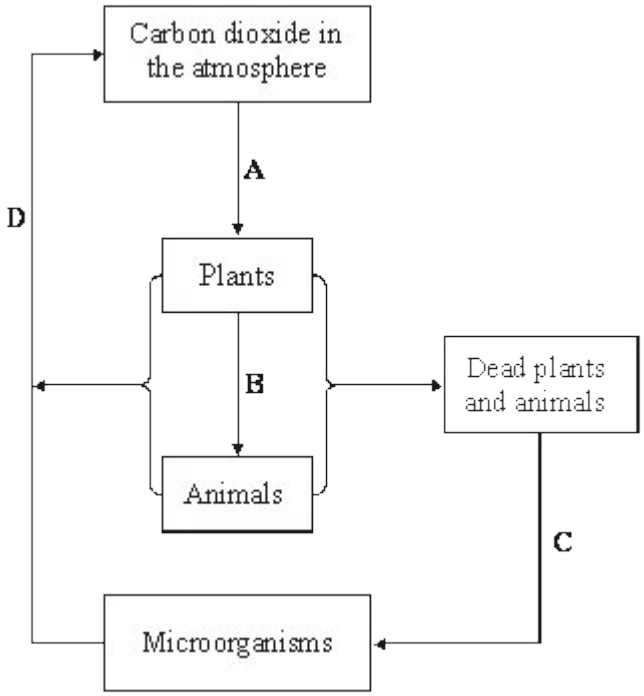
_____

(2)

(Total 7 marks)

Q7.

The diagram shows part of the carbon cycle.



(a) Which letter, **A**, **B**, **C** or **D**, represents:

(i) respiration _____

(1)

(ii) photosynthesis? _____

(1)

(b) Local authorities are encouraging people to recycle vegetable waste by converting it into compost.

Compost is made by mixing the vegetable waste with soil in a large container.

(i) Decay occurs more quickly if the container has holes in the sides.

Explain why.

_____

_____

_____

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_____

(2)

(ii) Spreading compost on the soil between plants leads to better growth of the plants.

Explain why.

_____

_____

(1)

(Total 5 marks)

Q8.

Read the passage below about biogas production in Sri Lanka, which is a country with a much warmer climate than the UK.

> Mr Ratnayake is a farmer. Using nothing more than cow dung, he has enough power to cook and provide heat and light for his home without using a single piece of wood. He collects the manure from his cows in their cattle shed. He then mixes the manure with water and leaves it to ferment in a large concrete pit. The gas produced is collected in a simple storage tank and is piped into his house for use.
>
> The dried manure left after this biogas is generated is richer than ordinary manure. It makes a good organic fertiliser for Mr Ratnayake's crops. He can then sell his crops at a higher price as they are organic produce.
>
> *http://www. i-sis.org.uk*

(a) (i) What is the fuel gas present in biogas?

_____

(1)

(ii) Name the process which produces biogas.

_____

(1)

(b) (i) Give **two** ways in which Mr Ratnayake benefits from making biogas as described in the passage.

1. _____

_____

2. _____

_____

(2)

(ii) This design of biogas generator works well in Sri Lanka. It would not work so well in the UK.

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Explain why.

_____

_____

_____

_____

(2)

(Total 6 marks)

Q9.

Gardeners often collect fallen leaves in autumn and place them on compost heaps.



(a) Over the next year the leaves decay.

Which living things cause leaves to decay?

_____

(1)

(b) The leaves decay more quickly in summer than in winter.

Give **one** reason why.

_____

_____

(1)

(c) The compost heap has holes in its sides to allow gases to enter.

Which gas is needed for decay?

Put a tick (✓) in the box next to your choice.

Carbon dioxide ☐

Nitrogen ☐

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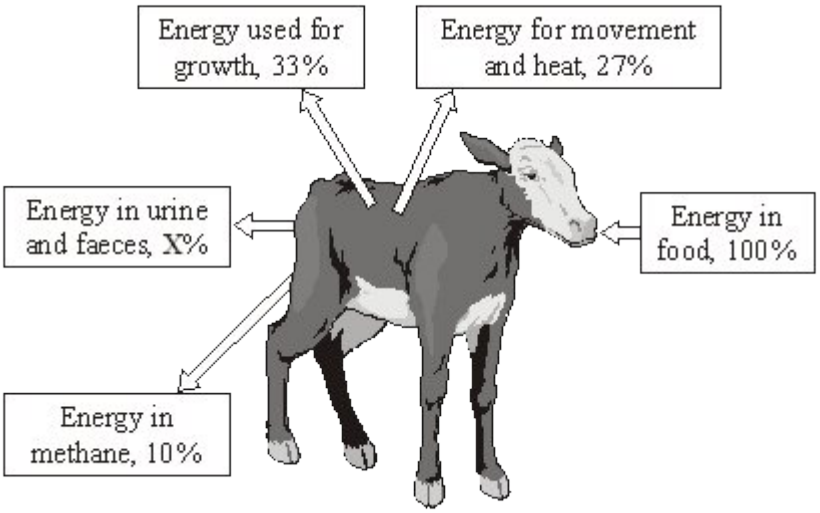
Oxygen ☐

(1)

(Total 3 marks)

Q10.

The diagram shows what happens to the energy in the food that a calf eats.



(a) Calculate the % energy lost as urine and faeces (**X**).
Show clearly how you work out your answer.

_____

_____

Energy lost as urine and faeces _____ %

(2)

(b) The energy in the food eaten by the calf in one day is 6 megajoules.

Calculate the amount of this energy that would be used for growth.
Show clearly how you work out your answer.

_____

_____

Energy used for growth _____ megajoules.

(2)

(c) Which process in the body transforms energy in food into heat?

_____

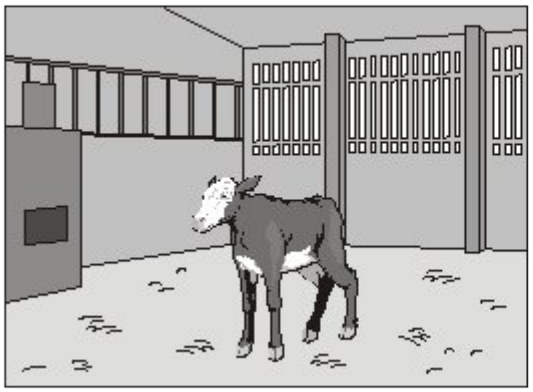
(1)

(d) The pictures show two methods of raising calves indoors.

Method 2 is now banned.

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Method 1



Method 2



(i) Calves raised indoors grow faster than calves raised outdoors.

Suggest **one** reason why.

_____

_____

(1)

(ii) **Method 2** was banned after public campaigns.

Suggest **one** reason why people campaigned against this method of rearing calves.

_____

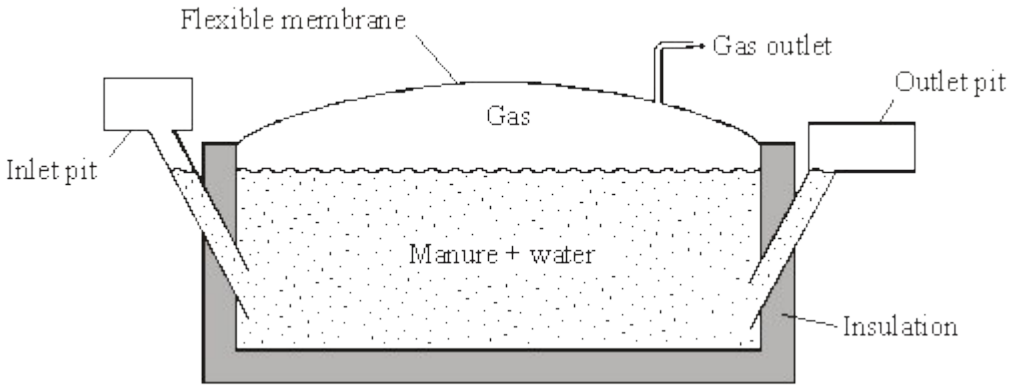
_____

(1)

(Total 7 marks)

Q11.

The diagram shows one design of biogas generator used on a large dairy farm in the USA.



(a) What is the main, useful gas in biogas?

Draw a ring around **one** answer.

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carbon dioxide **hydrogen** **methane**

(1)

(b) The insulation is installed so that biogas is produced at a faster rate.

Why is biogas produced at a faster rate?

_____

_____

(1)

(c) The table shows costs and income for this generator.

Item	**Yearly costs in dollars**	**Yearly income in dollars**
Electricity generated from biogas		22 800
Heating from burning biogas		4 200
Sale of fibre after biogas production		8 000
Operation and maintenance costs	10 000	

(i) Calculate the yearly profit from the biogas generator.

Show your working.

_____

_____

_____

(2)

(ii) It cost 200 000 dollars to build the generator. Use your answer to part (c)(i) to calculate how many years it would take to pay back this cost.

_____

_____

_____

(2)

(Total 6 marks)

Q12.

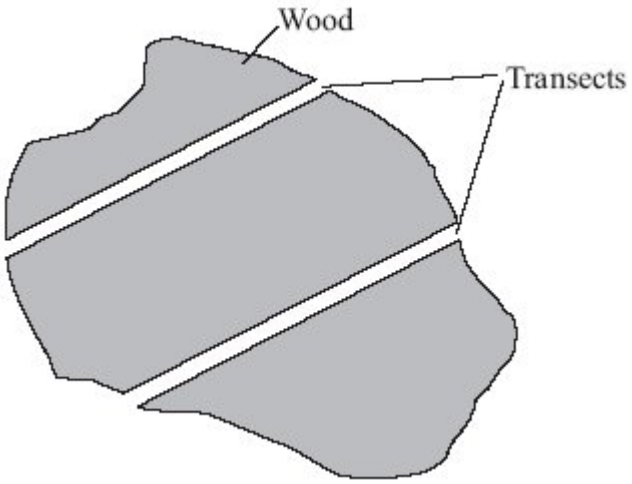
Red squirrels live in trees. They eat seeds from the cones of conifer trees. Squirrels store cones in ‘larders’ on the ground. These larders provide food through the winter. Each red squirrel makes and defends one larder.

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Scientists monitor squirrel numbers to find the best habitats for the squirrel's survival. In one investigation, scientists estimated the numbers of squirrels in different types of woodland. Each woodland contains a different species of conifer tree.

Here is their method.

- Ten woods of each type of woodland were surveyed.
- In each wood scientists measured out two transects (strips), each 600 m long and 10 m wide.
- A scientist walked slowly down the centre of each transect, recording the number of squirrel larders he could see.



(a) (i) How many transects all together did the scientists survey in each **type** of woodland?

Number of transects _____

(1)

(ii) What was the total area surveyed in **one** wood?

_____

Area _____ m^2

(1)

(b) Name **one** variable that was controlled in this investigation.

_____

(1)

(c) (i) The scientists recorded the number of larders instead of the number of squirrels they saw.

Explain how this could have increased the accuracy of the investigation.

_____

_____

(1)

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(ii) This method of counting the number of larders could have led to an inaccurate estimate of the number of squirrels.

Explain how.

_____

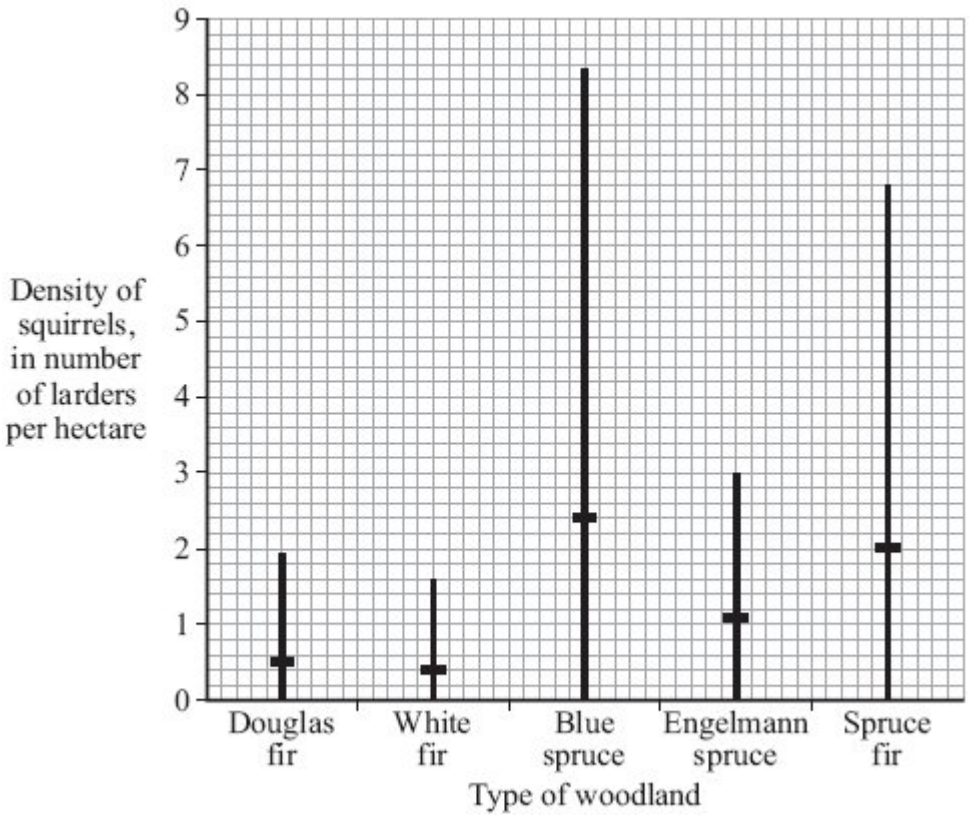
_____

_____

_____

(2)

(d) The results of the investigation are shown in the graph.



The horizontal mark on each bar represents the mean number of larders per hectare of woodland.

The range of the number of larders observed for Douglas fir woodland was 0 to 1.9 per hectare.

(i) What was the range of the number of larders per hectare in the Spruce fir woodland?

_____

(1)

(ii) The highest mean number of larders per hectare was found in Blue spruce woodland.

Suggest **one** explanation for this.

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_____

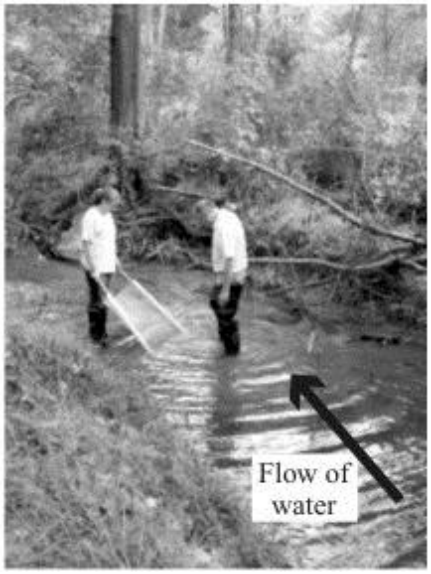
_____

(1)

(Total 8 marks)

Q13.

Invertebrate animals are used to monitor pollution in streams. The photograph shows scientists collecting a sample of invertebrates from a stream.



Reproduced with the permission of John Graham

This is the method that they use.

- A 1 m^2 area of the bed of the stream is marked out.
- A net 1m wide is held by one person on the downstream side of the marked-out area.
- The other person uses their boots to gently move stones in this area of the stream bed. They do this for three minutes. This dislodges invertebrates which are then caught in the net.
- The invertebrates are then identified and counted.

(a) Name **two** control variables (variables which must be kept the same) in this investigation.

1. _____

2. _____

(2)

(b) Suggest **two** reasons why the results from a sample might not be accurate.

1. _____

_____

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2. _____

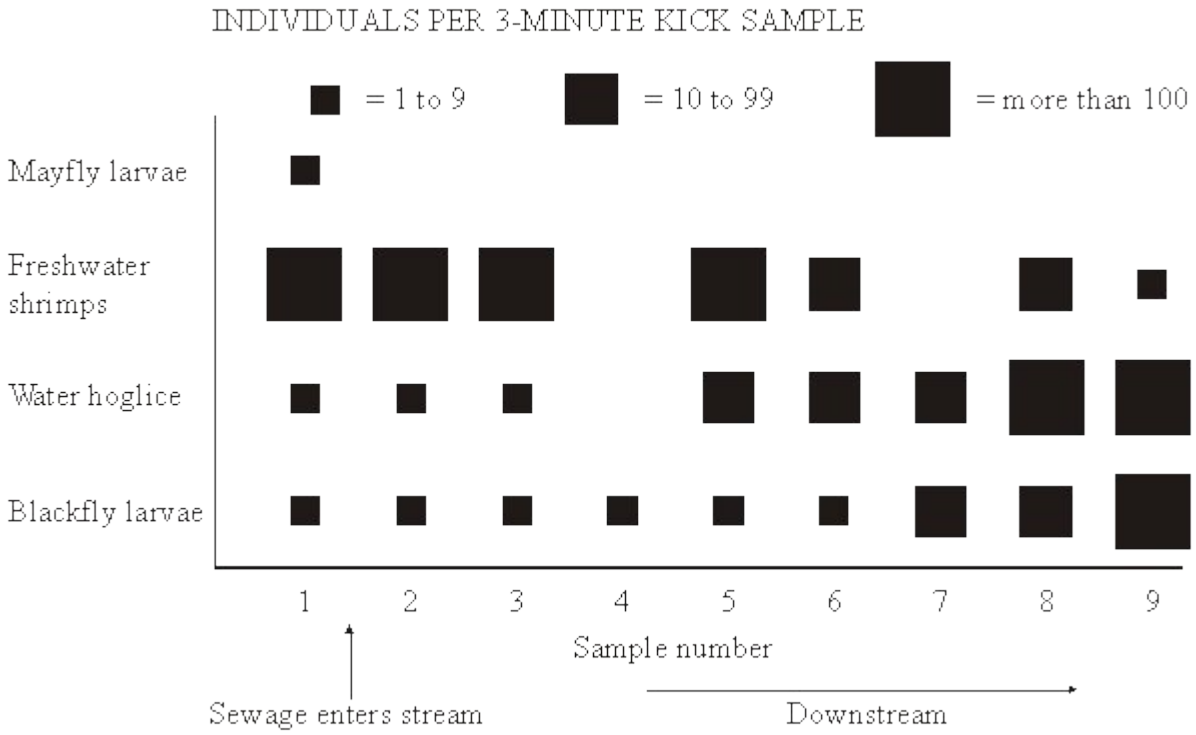
_____

(2)

The technique described above was used to investigate the effect of sewage on stream invertebrates.

- Sample 1 was taken upstream of the point where the sewage entered the stream.
- Samples 2–9 were taken at regular intervals downstream of the sewage inflow.

The graph shows the results.



(c) What was the range of the number of blackfly larvae that could be found in sample 7?

_____

(1)

(d) Describe, as fully as you can, how the number of water hoglice changed downstream from where sewage entered the stream.

_____

_____

_____

_____

(2)

(e) Which of the four invertebrates is the best indicator species for water which is **not** polluted by sewage?

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_____

Give the reason for your answer.

_____

_____

(2)

(Total 9 marks)

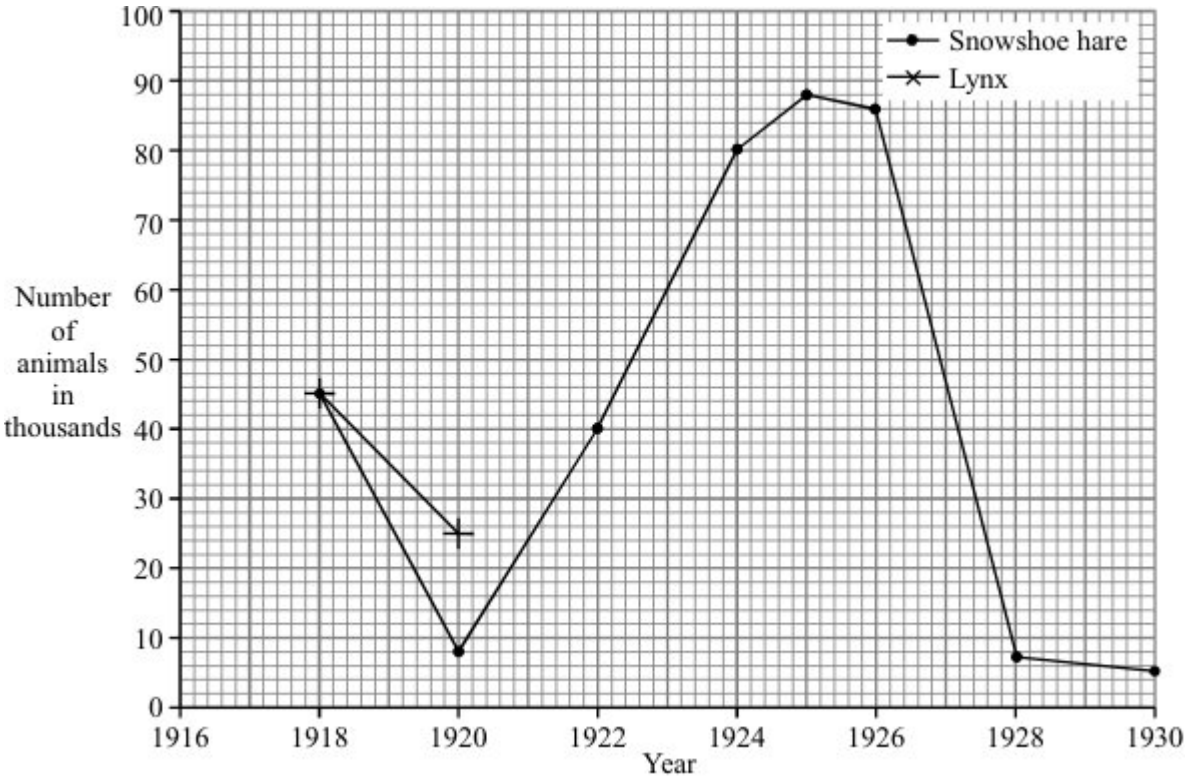
Q14.

The lynx is a wild cat which lives in Canada. The table shows the number of lynx trapped in a part of Canada in certain years.

Year	Number of lynx in thousands
1918	45
1920	25
1922	10
1924	20
1926	40
1928	50

The snowshoe hare is another wild animal found in Canada. The graph shows the number of snowshoe hares trapped in the same years. The lynx eats the snowshoe hare.

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(a) Draw a graph of the data in the table. The first two points have been plotted for you.

(2)

(b) From your graph, predict how many lynx were trapped in 1925.

_____ thousand

(1)

(c) Use the information to answer the following.

(i) What would you expect to happen to the number of lynx trapped in 1930?
Draw a ring around your answer.

rise **fall** **stay the same**

(1)

(ii) Give a reason for your answer to part (c)(i).

_____

_____

(1)

(d) The lynx is a predator. What is a predator?

_____

_____

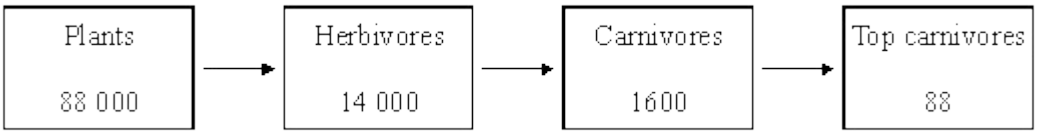
(1)

(Total 6 marks)

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Q15.

The diagram shows a food chain in a pond. The figures show the amounts of energy in each type of organism, in kilojoules per m^2 of pond per year.



(a) Calculate the percentage of the energy in the plants that is passed to the top carnivores. Show clearly how you work out your final answer.

_____

_____

_____

Answer _____ %

(2)

(b) In the space below, draw a pyramid of biomass for this food chain. Label your drawing with the names of the organisms.

(2)

(c) If humans ate organisms from this food chain, it would be more efficient to eat plants than to eat herbivores. Why is this?

_____

_____

_____

(1)

(Total 5 marks)

Q16.

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The table shows the sources of some of the energy used in India between 1960 and 1970.

	Source of energy in millions of tonnes			
	Non-renewable fuels		Renewable fuels	
Year	**Coal**	**Oil**	**Cow dung**	**Vegetable waste**
1960	47	7	101	31
1965	64	10	112	34
1970	71	15	123	38

(a) The change in the use of renewable fuels differs from that of non-renewable fuels. Calculate the percentage of renewable fuels used in 1960 and in 1970. Show clearly how you work out your final answer.

1960 _____

_____

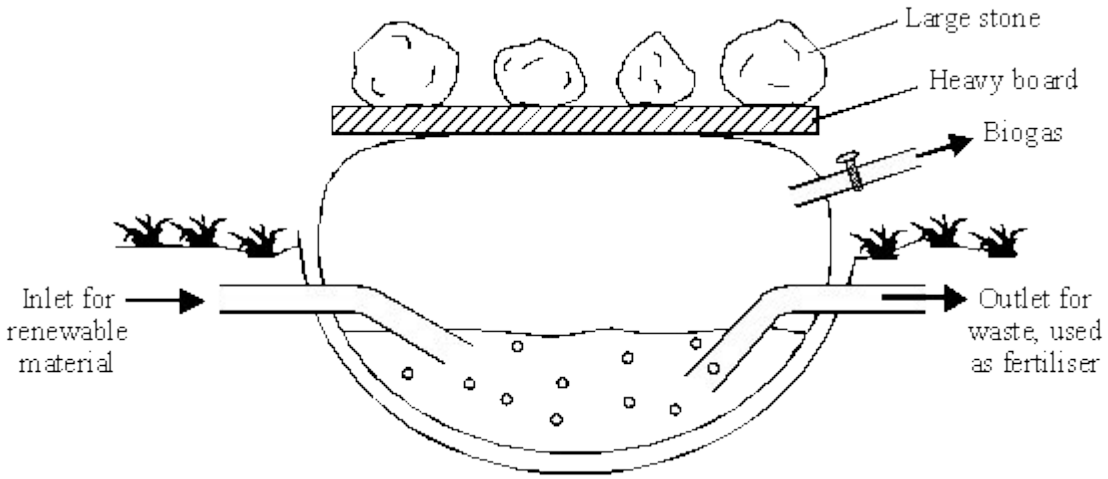
1970 _____

_____

(3)

(b) The Indian government suggested that villagers should make better use of renewable resources.

They introduced biogas generators. The diagram shows one type of biogas generator.



The table shows the economic costs and benefits of using this type of generator.

Feature	**Cost or profit in £s**
Cost of generator and fitting	250
Annual maintenance costs	40

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Annual profit from gas produced	30
Annual profit from fertiliser produced	40

Evaluate the advantages and disadvantages of using this type of generator.

_____

_____

_____

_____

_____

_____

_____

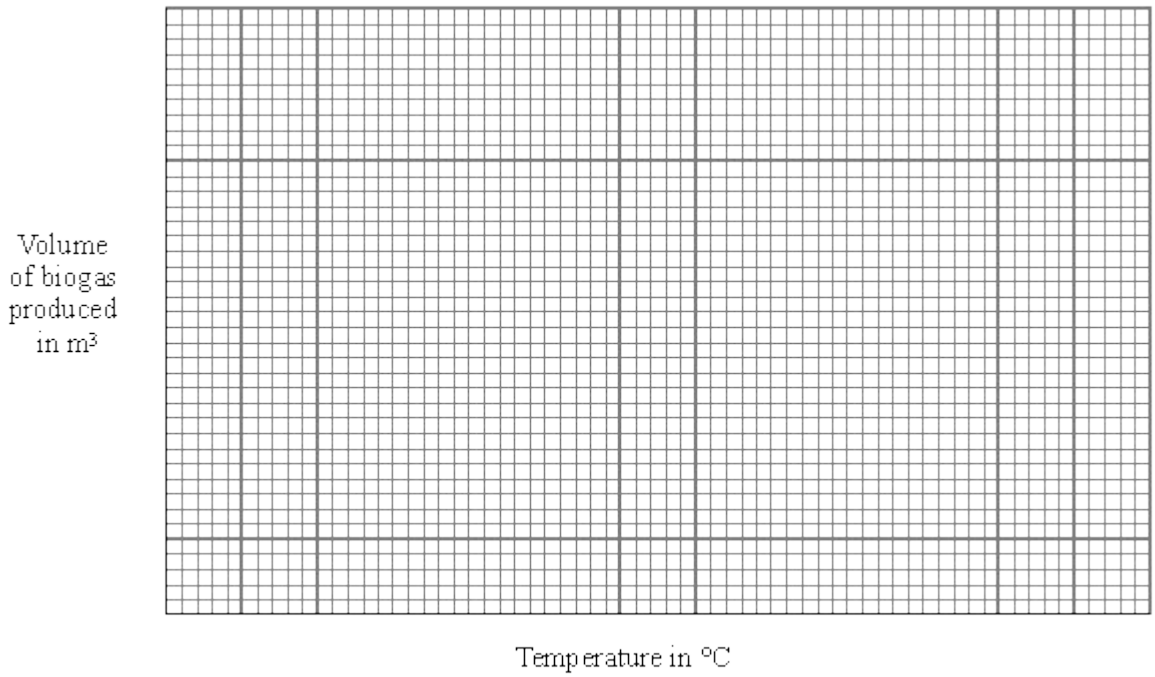
_____

(4)

(c) The table shows how temperature affects the rate of biogas production in the generator.

Temperature in °C	10	15	20	25	30	35	40
Volume of biogas produced each day in m^3	0.50	0.55	1.50	1.70	3.00	3.45	3.30

(i) Use the grid to draw a graph to show how temperature affects the rate of biogas production.



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(3)

(ii) Temperatures in India may reach over 35 °C. Explain the advantage of the generator being mainly underground.

_____

_____

_____

_____

(2)

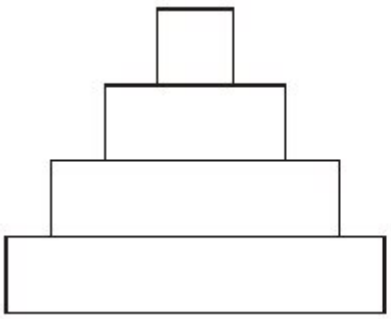
(Total 12 marks)

Q17.

This is a simple food chain.

Lettuce plant → Slug → Frog → Heron

The diagram shows a pyramid of biomass for this food chain.



_____

_____

_____

_____

(a) Write the names of the organisms in the food chain on the correct lines next to the pyramid of biomass.

(1)

(b) (i) The slug obtains its energy from the lettuce plant. What is the source of energy for the lettuce plant?

_____

(1)

(ii) What is the function of chlorophyll in a lettuce plant?

_____

(1)

(iii) The slugs ate some lettuce plants which contained 1620 kJ of energy. Only 10 per cent of this energy is used by the slugs for growth. Use the formula to calculate how much energy can be used by the slugs for growth. Show clearly how you work out your final answer.

$$\text{Amount of energy} = \frac{(\text{Percentage of energy used by slugs}) \times (\text{Amount of energy in lettuce})}{100}$$

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_____

_____

_____

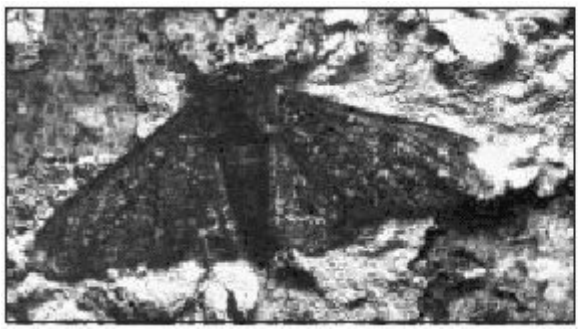
Amount of energy = _____ kJ

(2)

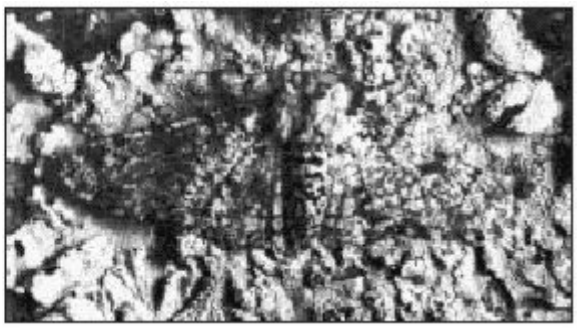
(Total 5 marks)

Q18.

The photographs show two varieties of moths, **X**and **Y**. The moths belong to the same species.
The moths are resting on a tree trunk in open countryside.



Moth **X**



Moth **Y**

(a) Which variety of moth, **X** or **Y**, is more likely to be killed by insect-eating birds? Give a reason for your answer.

Variety of moth: _____

Reason _____

_____

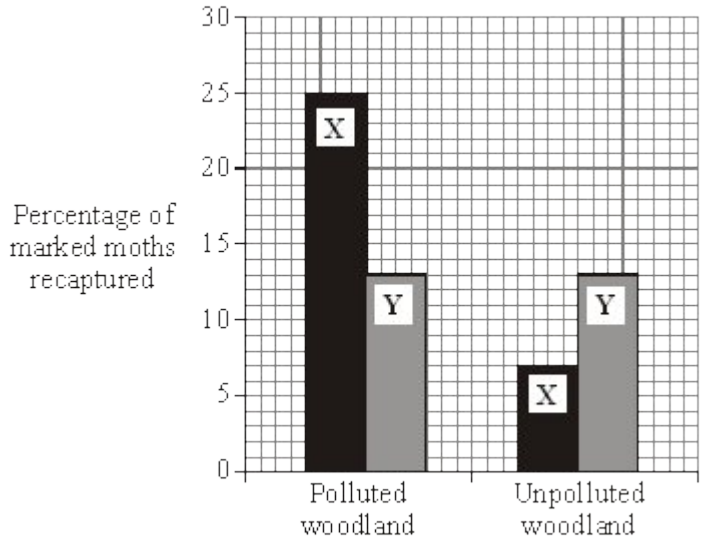
(1)

(b) In an experiment, large numbers of each variety of moth were caught in a trap.

- They were marked with a spot of paint on the underside of one wing and then released.
- A few days later, moths were again trapped and the number of marked moths was counted.
- The experiment was carried out in a woodland polluted by smoke and soot, and also in an unpolluted woodland.

The results are shown in the bar graph.

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(i) When the moths were being marked, suggest why the paint was put on the underside of the wing and not on the top.

_____

(1)

(ii) What percentage of moths of type **X** was recaptured in:

the polluted woodland; _____

the unpolluted woodland? _____

(2)

(iii) In each woodland, only a small number of marked moths of both varieties were recaptured. Suggest **one** reason for this.

_____

_____

(1)

(c) (i) The colour of the moths is controlled by a gene. The dark form was first produced by a mutation in the gene.

What chemical, found in a gene, is changed by a mutation? Draw a ring around your answer.

carbohydrate **DNA** **fat** **protein**

(1)

(ii) Some of the offspring from the original dark moth were also dark. What caused this?

_____

_____

(1)

(Total 7 marks)

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Q19.

Each autumn, many trees lose their leaves.

(a) Describe how carbon compounds in the leaves can be recycled so that they can be used again by the trees.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(b) Give **two** environmental conditions which speed up the processes that you have described in part (a).

1. _____

2. _____

(2)

(Total 6 marks)

Q20.

Figure 1 shows a food chain containing three organisms.

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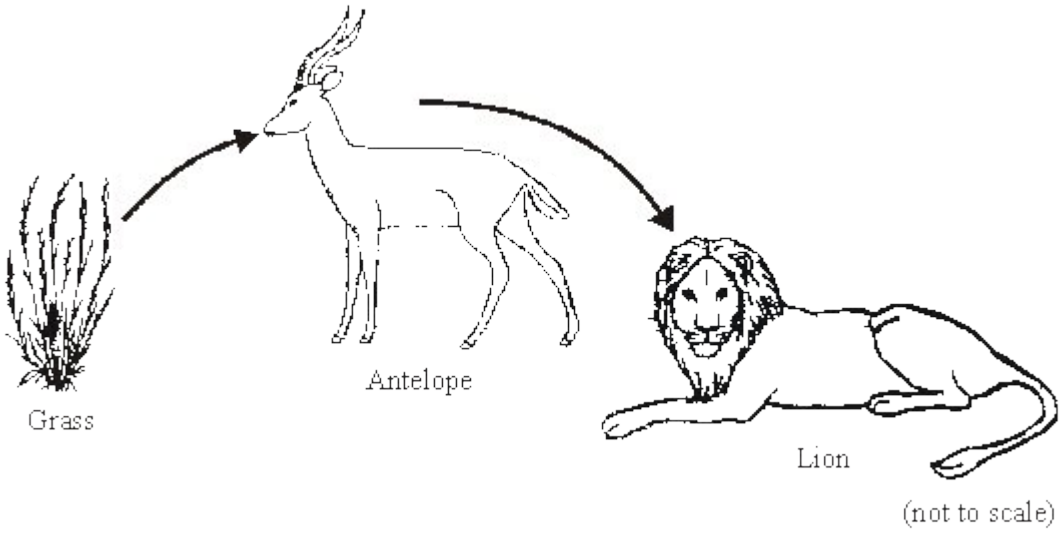


Figure 1

(a) (i) In this food chain, name:

the predator; _____

the prey. _____

(2)

(ii) What is the source of energy for the grass?

Draw a ring around **one** answer.

carbon dioxide **light** **nitrates** **water**

(1)

(iii) **Figure 2** shows a pyramid of biomass for the organisms in **Figure 1.**

Write the names of the organisms on the correct lines in **Figure 2.**

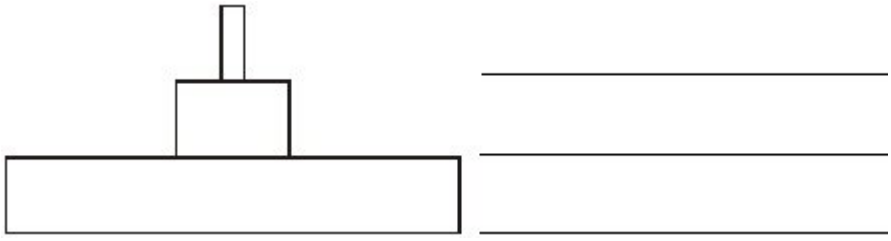


Figure 2

(1)

(b) Waste materials, like faeces from the animals, will decay,

(i) What sort of organisms cause decay?

_____

(1)

(ii) **Three** of the following conditions help decay to occur rapidly.

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Which conditions do this?

Draw a ring around each of the **three** answers.

aerobic **anaerobic** **cold** **dry** **moist** **warm**

(3)

(iii) The list below gives four substances. Two of these substances are produced by decay and can be used by the grass.

Which **two** substances are these?

Tick (✓) **two** boxes.

Carbon dioxide ☐

Mineral salts ☐

Oxygen ☐

Protein ☐

(2)

(Total 10 marks)

Q21.

The diagram shows the flow of energy through a forest. The figures are in kilojoules of energy per square metre per year.



(a) What percentage of the energy in the trees is passed on as food for the carnivores? Show clearly how you work out your final answer.

_____

_____

_____ per cent

(2)

(b) Give **three** reasons why so little of the energy in the trees is passed on to the carnivores.

1. _____

_____

2. _____

_____

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3. _____

_____

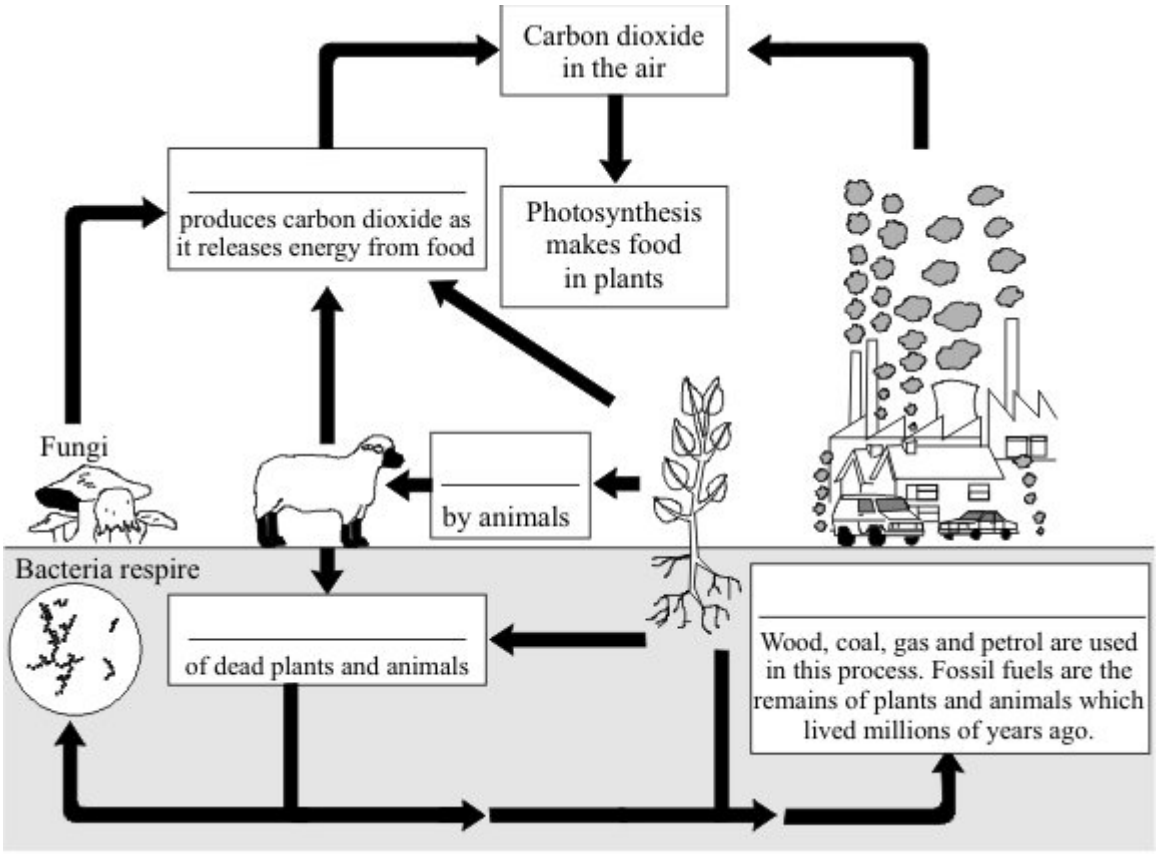
(3)

(Total 5 marks)

Q22.

(a) Use the words in the box to fill in the gaps in the diagram. You may use each word once or not at all.

carbon	burning	decay	eaten
nitrogen	oxygen	pollution	respiration



(4)

(b) (i) Why are fungi called decomposers?

_____

(1)

(ii) Give **one** other type of decomposer.

_____

(1)

(Total 6 marks)

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Q23.

(a) One food chain in the wood is:

Hazel tree nuts → squirrels → owls

(i) What does this food chain tell us?

_____

_____

(2)

(ii) Which **one** of the organisms in the food chain is a producer?

_____

(1)

(iii) This year the hazel bushes have produced very few nuts.

Explain, as fully as you can, how this might affect the populations of:

1. squirrels;

_____

_____

_____

_____

2. owls.

_____

_____

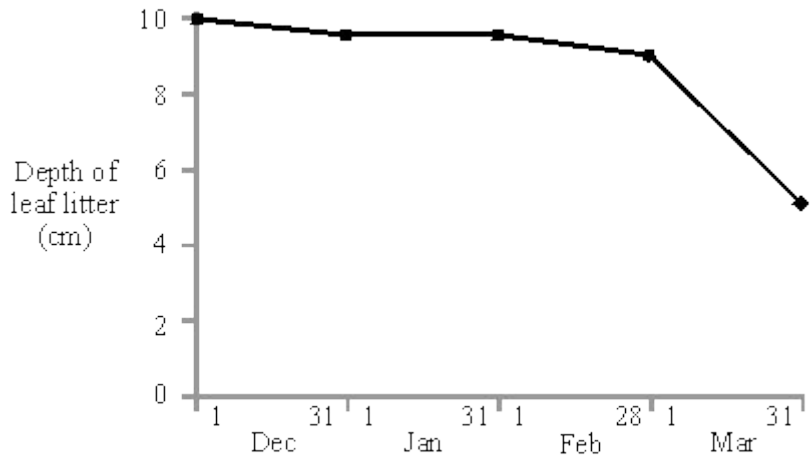
_____

_____

(4)

(b) An area of the floor of the wood 1 m² was fenced off so that animals could not reach it. The graph below shows the depth of leaf litter (dead leaves) inside the fence over the next few months.

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Explain, as fully as you can,

(i) why the depth of the leaf litter decreased;

_____

_____

_____

(1)

(ii) how this decrease happened.

_____

_____

_____

(1)

(iii) In which month does leaf litter disappear fastest? Explain why.

_____

_____

_____

_____

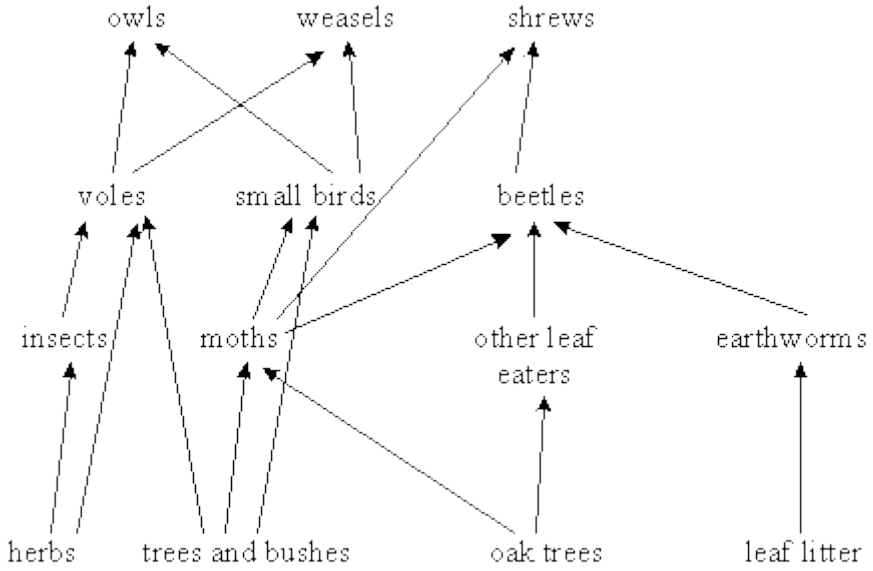
(2)

(Total 11 marks)

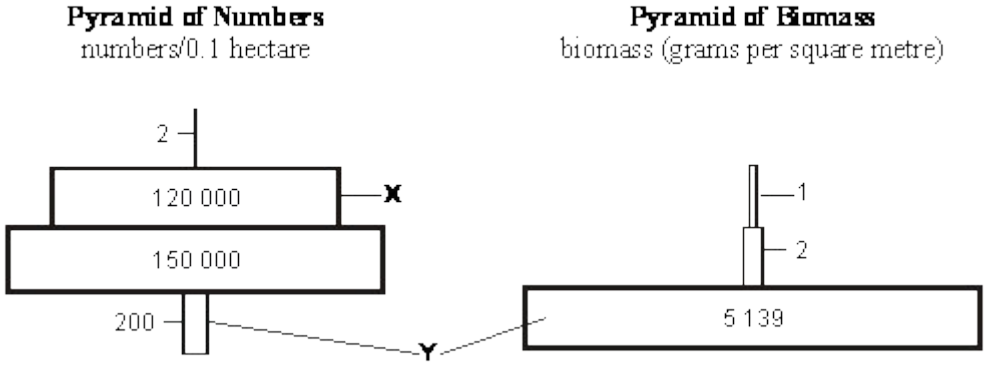
Q24.

The diagram below shows a food web for a wood.

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(a) The diagrams below show a pyramid of the numbers and a pyramid of the biomass for 0.1 hectare of this wood.



(i) Name **one** organism from the level labelled X.

_____

(1)

(ii) Explain, as fully as you can, why the level labelled Y is such a different width in the two pyramids.

_____

_____

_____

_____

(3)

(b) Explain, as fully as you can, what eventually happens to energy from the sun which is captured by the plants in the wood.

_____

_____

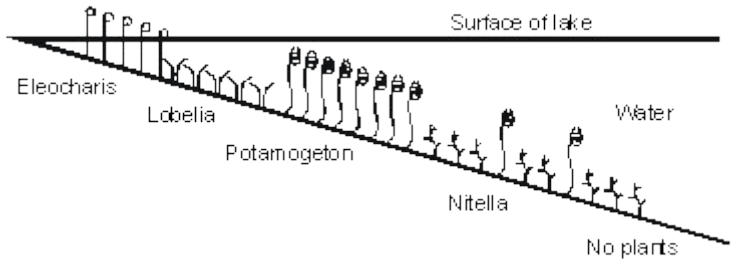
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(10)

(Total 14 marks)

Q25.

This is a diagram of a belt transect showing the major types of plants growing on the bottom of a lake.



(a) Suggest, and explain, **two** reasons why a much smaller population of Nitella plants is found amongst the Potamogeton plants than further down in the lake.

1. _____

2. _____

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_____

_____

(4)

(b) Describe how you would use the belt transect technique to measure the abundance and distribution of plants which live on the bottom of a shallow lake.

_____

_____

_____

_____

_____

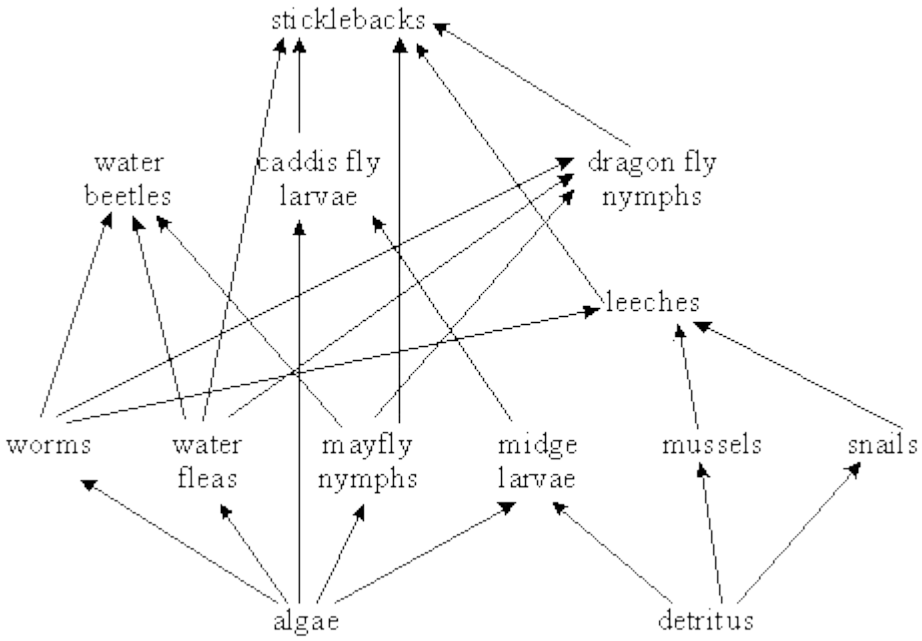
_____

(3)

(Total 7 marks)

Q26.

The diagram below shows a food web for some of the organisms which live in a pond.



You may need to use information from the food web to help you to answer the following questions.

(a) The algae photosynthesise. Complete the equation for photosynthesis.

carbon dioxide	+		+	light energy	→	sugar	+	

(2)

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(b) Only a small percentage of the Sun's energy captured by the algae is eventually incorporated into the body tissues of the stickleback. Explain, as fully as you can, what happens to the rest of the energy captured by the algae.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

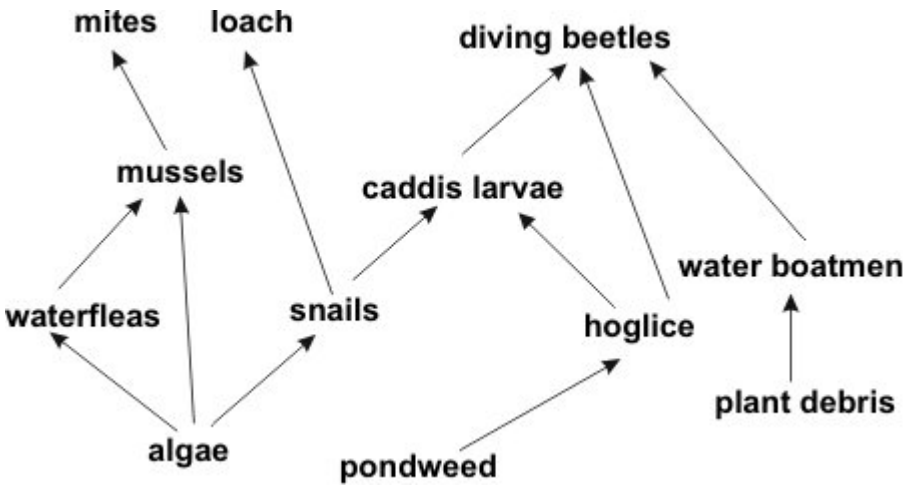
_____

(8)

(Total 10 marks)

Q27.

The diagram below shows a food web for some of the organisms which live in a pond.



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(a) (i) Name **one** secondary consumer in this food web.

_____

(1)

(ii) The algae are small green plants.

Give **three** conditions needed by green plants to produce sugars.

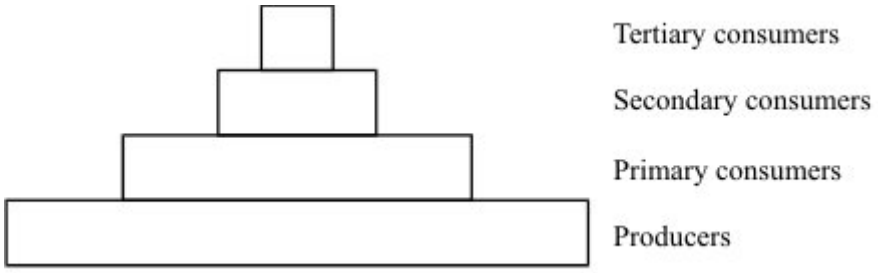
1. _____

2. _____

3. _____

(3)

(b) This is a pyramid of biomass for the organisms in the aquarium.



Some of the biomass of the producers is **not** transferred to the tertiary consumers.

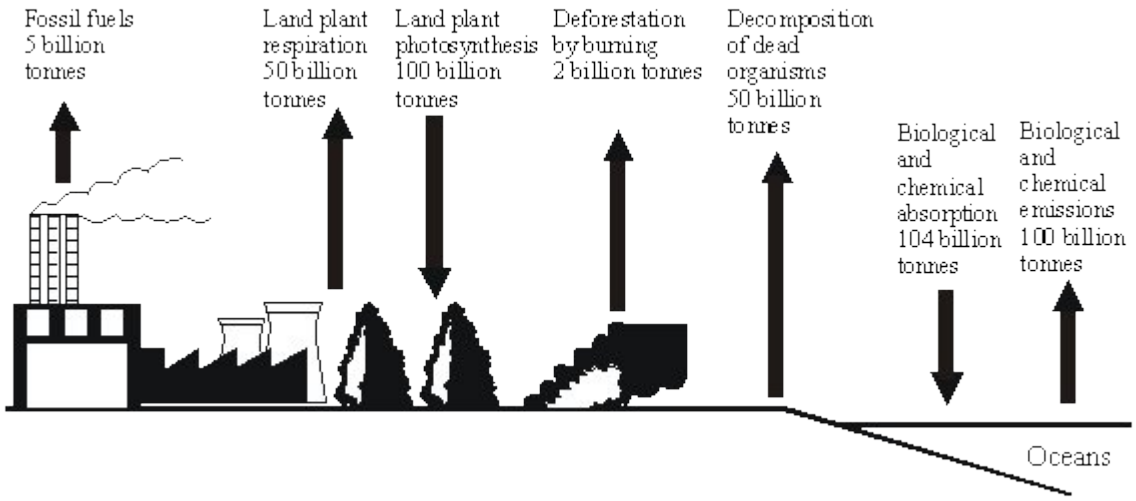
Explain, as fully as you can, what happens to this biomass.

(6)

(Total 10 marks)

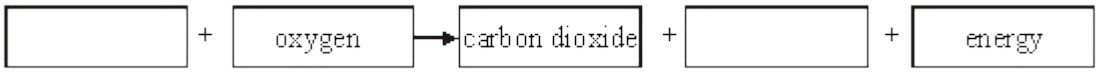
Q28.

The diagram below shows the mass of carbon involved each year in some of the processes in the carbon cycle.



(a) Complete the equation for plant respiration.

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(2)

(b) (i) Calculate the mass of carbon removed from the atmosphere each year. *(Show your working.)*

Answer _____ billion tonnes

(1)

(ii) Calculate the percentage of this total which is removed by the photosynthesis of land plants. (*Show your working*.)

Answer _____ %

(2)

(iii) Calculate the net gain of carbon by the atmosphere in one year. *(Show your working.)*

Answer _____ billion tonnes

(2)

(Total 7 marks)

Q29.

A gardener pulled up weeds and used them to start a compost heap. The compost heap soon became colonised by large numbers of earthworms and slugs. The gardener then noticed a hedgehog rooting through the compost heap, eating the earthworms and slugs. Every so often the hedgehog stopped to scratch itself. This was because it had large numbers of fleas which fed by sucking the hedgehog's blood.

(a) Use **only** information from the passage to answer the following.

Construct and label a pyramid of **biomass** for your food chain.

(2)

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(b) Gardeners put plant material onto compost heaps so that it will decay. They then put the decayed compost onto soil where they are growing their plants.

Give **three** conditions which are needed for plant material to decay rapidly.

1. _____

2. _____

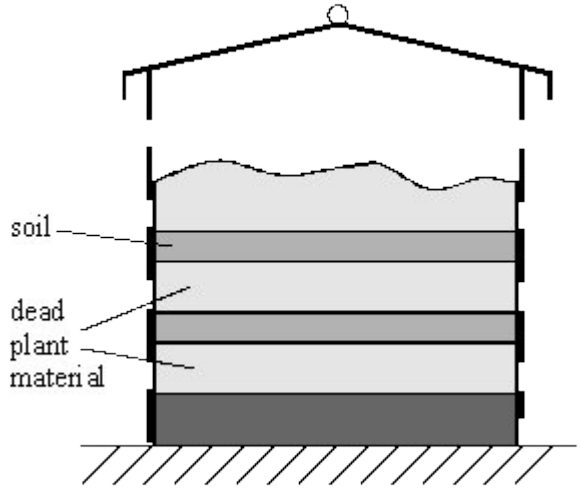
3. _____

(3)

(Total 5 marks)

Q30.

The drawing shows a section through a well-designed compost heap.



(a) Suggest why soil is put in with the dead plant material.

_____

_____

_____

(2)

(b) Explain why the compost heap is designed with holes in the sides.

_____

_____

_____

(2)

(Total 4 marks)

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Q31.

An oak wood contained the following:

200 oak trees

150 000 primary consumers

120 000 secondary consumers

(a) Draw and label a pyramid of biomass for **this** wood. (Your pyramid does **not** have to be drawn to scale.)

(2)

(b) A scientist estimated the total amount of energy flow through each level of the pyramid per year.

The results were:

Energy absorbed by oak trees	4 600 000 kJ per m^2 per year
Energy in sugar produced by trees	44 000 kJ per m^2 per year
Energy transferred to primary consumers	2 920 kJ per m^2 per year
Energy transferred to secondary consumers	700 kJ per m^2 per year

(i) Calculate the percentage of the energy absorbed by the trees that is transferred to sugar by photosynthesis. Show your working.

Answer _____ %

(2)

(ii) Suggest **two** reasons why a large proportion of the energy is not transferred to sugar.

1. _____

_____

2. _____

_____

(2)

(iii) Give **three** reasons why some of the energy in the primary consumers is not passed on to the secondary consumers.

1. _____

_____

2. _____

_____

3. _____

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_____

(3)

(Total 9 marks)

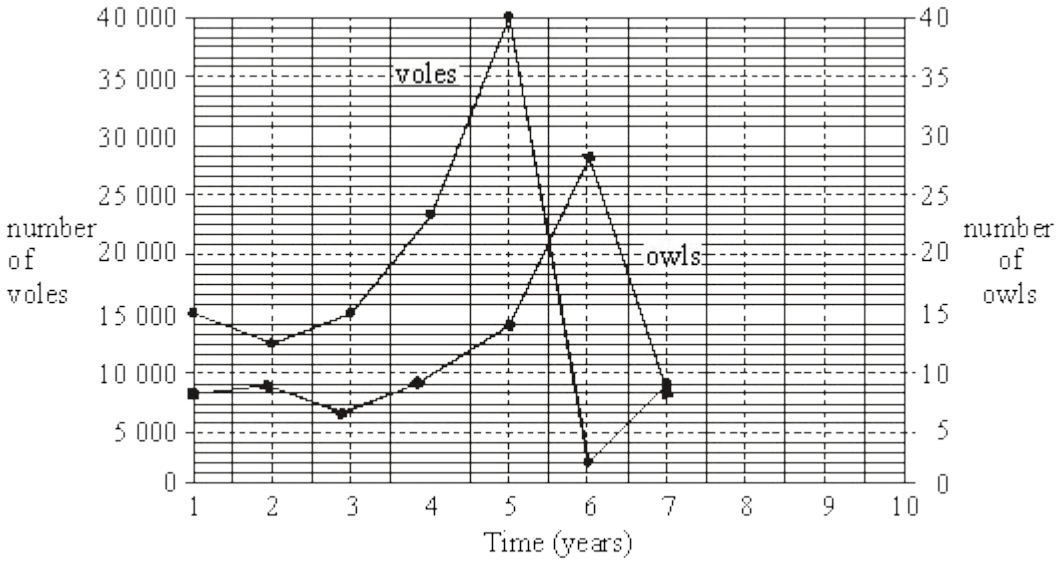
Q32.

The table shows the results of a ten-year study of the owls and voles in a forest.

YEAR	NUMBER OF VOLES (TO THE NEAREST THOUSAND)	NUMBER OF OWLS
1	15 000	8
2	12 000	9
3	15 000	7
4	23 000	9
5	40 000	14
6	2 000	28
7	9 000	8
8	19 000	9
9	10 000	14
10	8 000	16

The data for years 1 - 7 have been plotted on the grid below.

(a) Complete the graph by plotting the data for years 8 - 10.



(2)

(b) (i) What is the main factor which limits the size of the owl population?

_____

(1)

(ii) Suggest **two** reasons other than owl predation, for the large fall in the numbers of voles between years 5 and 6.

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1. _____

_____

2. _____

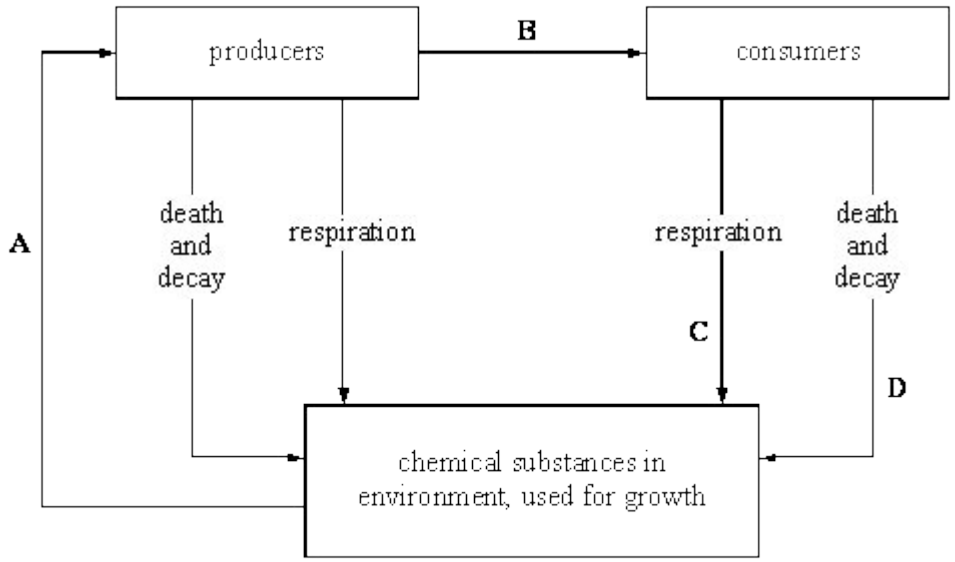
_____

(2)

(Total 5 marks)

Q33.

The diagram shows some of the stages by which materials are cycled in living organisms.



(a) In which of the stages, **A**, **B**, **C** or **D**:

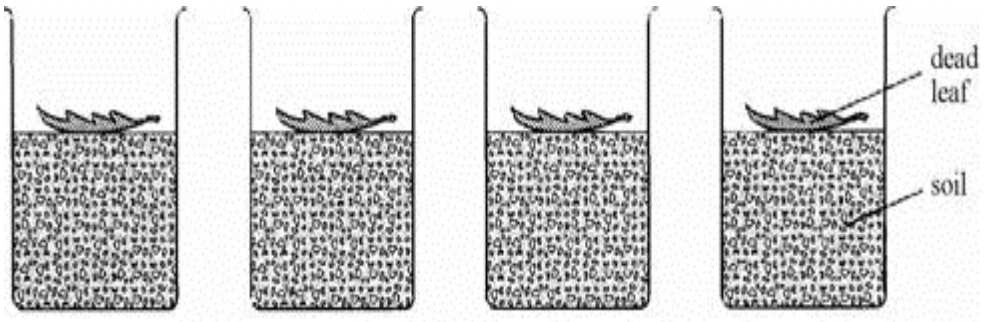
(i) are substances broken down by microbes; _____

(ii) is carbon dioxide made into sugar; _____

(iii) are plants eaten by animals? _____

(3)

(b) In an experiment, samples of soil were put into four beakers. A dead leaf was put onto the soil in each beaker. The soil was kept in the conditions shown.



W Warm and wet

X Cold and wet

Y Warm and dry

Z Warm and dry

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In which beaker, **W**, **X**, **Y** or **Z**, would the dead leaf decay quickest? _____

(1)

(Total 4 marks)

Q34.

Read the passage.



Glutton up a gum tree

Along the banks of the Cygnet River on Kangaroo Island, the branches of the dying gum trees stretch out like accusing fingers. They have no leaves. Birds search in vain for nectar-bearing flowers.

The scene, repeated mile upon mile, is an ecological nightmare. But, for once, the culprit is not human. Instead, it is one of the most appealing mammals on the planet – the koala. If the trees are to survive and provide a food source for the wildlife such as koalas that depend on them, more than 2000 koalas must die. If they are not removed the island's entire koala population will vanish.

Illegal killing has already started. Worried about soil erosion on the island, some farmers have gone for their guns. Why not catch 2000 koalas and take them to the mainland? "Almost impossible," says farmer Andrew Kelly. "Four rangers tried to catch some and in two days they got just six, and these fought, bit and scratched like fury."

Use the information from the passage and your own knowledge and understanding to give the arguments for and against killing koalas to reduce the koala population on Kangaroo Island.

_____

_____

_____

_____

_____

_____

_____

(Total 4 marks)

Q35.

Read the passage.

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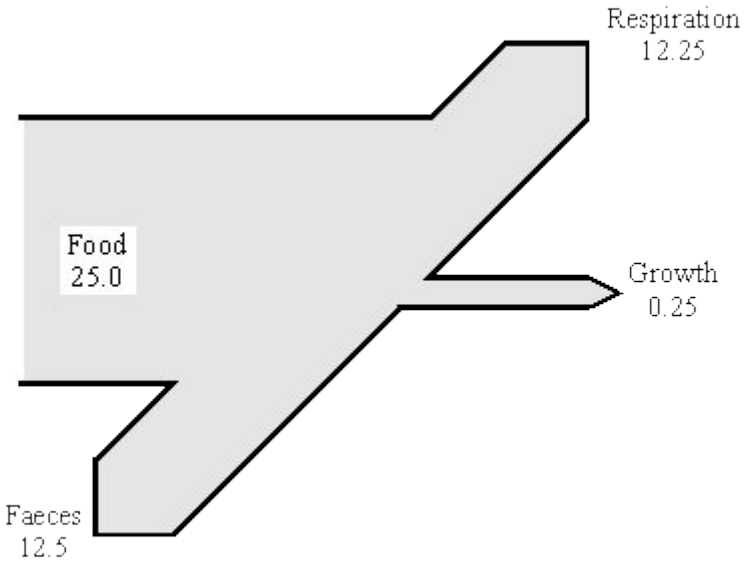
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The diagram shows the flow of energy through a koala.
The numbers show units of energy.



(i) Calculate the percentage of the food intake which is converted into new tissues for growth. Show your working.

_____ %

(2)

(ii) Give **three** different ways in which the koala uses the energy released in respiration.

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1. _____

_____

2. _____

_____

3. _____

_____

(3)

(Total 5 marks)

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