AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.3.3

Land use

Past-paper questions

Tier	**Higher**
Question groups	**64**
Available paper years	**2007–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.7.3.3 Land use

Question 01

March 2007 | BLY1A | Original Q8 | Legacy

QUESTION EIGHT

The drug thalidomide was developed as a sleeping pill. During its development its effectiveness was tested on volunteers.

Two groups of 10 people, **X** and **Y**, were given tablets. The tablets for Group **X** contained thalidomide but the tablets for Group **Y** did not. Neither group knew which type of tablet they were taking.

The time taken for each person to fall asleep before and after taking the tablets was recorded.

The investigation was repeated three times. The mean (average) results for each person are shown in the table.

Group	**Mean time taken to fall asleep in minutes**										
X with thalidomide	**Person**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
	Before taking the tablets	47	39	52	37	40	32	30	28	46	48
	After taking the tablets	27	32	19	17	24	36	14	22	29	31
Y without thalidomide	**Person**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
	Before taking the tablets	36	48	52	36	44	34	34	26	44	46
	After taking the tablets	36	49	48	33	45	35	28	24	40	41

8A The mean time taken for Group **Y** to fall asleep was less after taking the tablets than before taking the tablets.

The most likely reason for this was that . . .

1 thalidomide is an effective treatment for inability to get to sleep.

2 the patients believed that the tablets contained thalidomide.

3 the sample size was too small.

4 the scientists watching Group **X** were not as observant as those watching Group **Y**.

Question 01 · continued

8B Which of the following factors would be the most difficult to control during the investigation?

1 the body mass of each person

2 the number of males and females in each group

3 the concentration of thalidomide in the tablets

4 the belief of each person that the drug would work

8C One way in which the information shows that the investigators attempted to achieve reliable results is that . . .

1 Group **X** took a placebo so that comparisons could be made.

2 the investigation was repeated three times.

3 the mean time taken to fall asleep before taking the tablets was the same for each group.

4 the volunteers chosen all had difficulty getting to sleep.

8D Thalidomide was banned after it was found to cause severe limb abnormalities in babies born to women who took the drug during pregnancy.

Recently, thalidomide has been reintroduced.

Which of the following diseases is it now used to treat?

1 leprosy

2 meningitis

3 rabies

4 rubella

4.7.3.3 Land use

Question 02

June 2007 | BLY1B | Original Q7 | Legacy

QUESTION SEVEN

This question is about global warming.

7A How does an increase in greenhouse gases in the atmosphere lead to an increase in global warming?

1 More of the radiation from the Sun passes into the atmosphere.

2 The atmosphere radiates more energy back to Earth.

3 The Earth radiates more energy back into the atmosphere.

4 The sea absorbs more energy from the Sun.

7B Forests are often cut down to clear land for growing crops.

Keeping forests rather than cutting them down for growing crops helps to reduce global warming because . . .

1 carbon dioxide can be ‘locked-up’ in wood for many years.

2 growing crop plants increases the number of microorganisms in the soil.

3 forests release large amounts of carbon dioxide.

4 some crop plants remove sulfur dioxide from the atmosphere.

Question 02 · continued

7C Scientists use computer models to predict increases in global temperature.

The table shows the predictions for global temperature increases from 2000 to 2100 produced by different models.

	Predicted temperature increase 2000 to 2100 in °C		
Model	**Total**	**Land**	**Ocean**
P	4.7	7.0	3.8
Q	4.0	5.0	3.6
R	3.9	4.8	3.4
S	3.7	5.5	3.0
T	3.3	4.2	3.0
U	3.0	4.6	2.4
V	2.3	3.1	2.0
W	2.2	2.8	2.0

Which two predictions are in closest agreement?

1 **R** and **S**

2 **S** and **T**

3 **T** and **U**

4 **V** and **W**

7D The predictions made by using the different models vary because . . .

1 the instruments that scientists use are not sensitive enough.

2 scientists do not have sufficient data on how different factors affect global temperatures.

3 some of the scientists do not have appropriate computer programming skills.

4 it is impossible to do experiments connected with global warming.

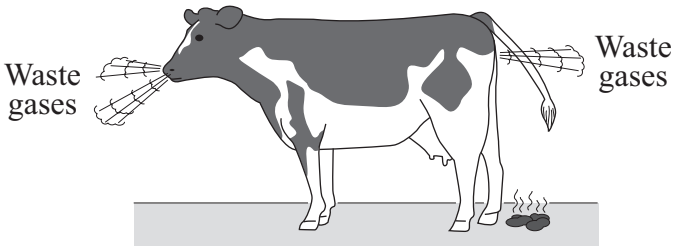
4.7.3.3 Land use

Question 03

March 2008 | BLY1BP | Original Q5 | Legacy

QUESTION FIVE

Rearing cattle affects the environment.



5A In addition to methane, which other greenhouse gas do cattle release into the atmosphere?

1 carbon dioxide

2 carbon monoxide

3 nitrogen dioxide

4 sulfur dioxide

5B Cattle rearing can lead to sewage and farm chemicals entering streams and lakes.

The level of pollution of these water systems can be estimated most reliably by examining the . . .

1 colour of the water.

2 range of lichens living near the water.

3 range of invertebrates living in the water.

4 temperature of the water at regular intervals.

5C Greenhouse gases keep the Earth warm because . . .

1 they are good insulators.

2 they trap energy as it enters the Earth's atmosphere from the Sun.

3 they allow more radiation to pass through.

4 they re-radiate energy back to the Earth.

4.7.3.3 Land use

Question 03 · continued

March 2008 | BLY1BP | Original Q5 | Legacy

5D Forests help to reduce the greenhouse effect mainly by . . .

1 'locking-up' carbon dioxide as wood.

2 giving out oxygen.

3 taking in methane.

4 absorbing radiation from the Sun.

Turn over for the next question

4.7.3.3 Land use

Question 04

June 2008 | BLY1BP | Original Q1 | Legacy

QUESTION ONE

This question is about adult cell cloning.

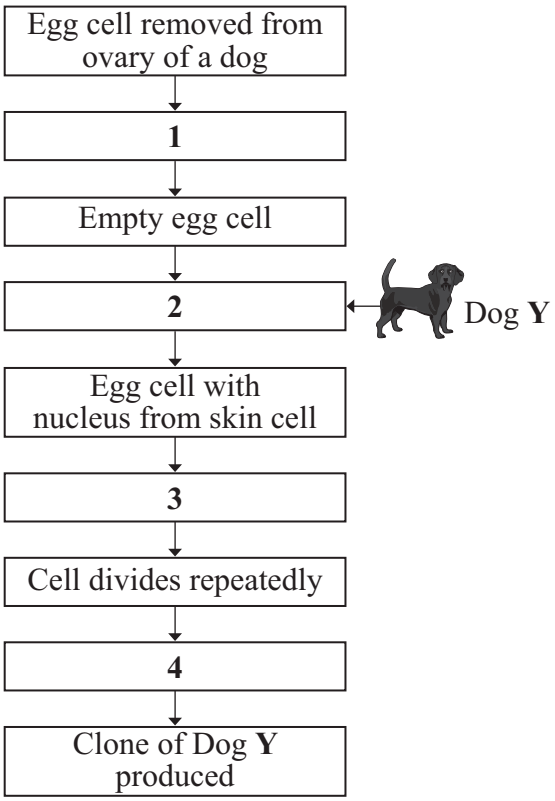
Match stages, **A**, **B**, **C** and **D**, with the labels **1–4** on the diagram to explain how clones of dogs can be produced.

A nucleus transferred from skin cell of Dog **Y**

B electric shock applied

C ball of cells inserted into womb of female

D nucleus removed from egg cell



4.7.3.3 Land use

Question 05

November 2008 | BLY1BP | Original Q5 | Legacy

QUESTION FIVE

The table gives information about the number of species of organisms in the world today.

	Total number of known species
plants	400 000
animals	1 400 000
species which live in tropical rainforests	720 000

5A The rate of extinction of species in tropical rainforests is currently 0.5% per year. This rate is predicted to increase to 5% per year.

How many species will become extinct next year if the predicted rate takes place?

1 3600

2 20 000

3 36 000

4 70 000

5B What is the main cause of the extinction of rainforest species?

1 pollution

2 loss of habitat

3 overcrowding

4 increase in sustainable development

5C Deforestation also damages the environment because . . .

1 less oxygen is released into the atmosphere.

2 less carbon dioxide is released into the atmosphere.

3 less carbon is ‘locked-up’ in timber.

4 more methane is released into the atmosphere.

4.7.3.3 Land use

5D One reason often given for clearing forests is that it provides an income for the local population.

Which of the following is **not** an economic reason for deforestation?

1 The forest could be developed for tourism.

2 Some plants in the forest may be sources of useful drugs.

3 The local people can conserve the forest for future generations.

4 Some trees in the forest may be valuable.

Turn over for the next question

4.7.3.3 Land use

Question 06

March 2009 | BLY1BP | Original Q6 | Legacy

QUESTION SIX

Biofuels can be produced from crops such as sugar cane. After harvesting, the sugar is converted into alcohol by microorganisms. Alcohol can be used in vehicles either on its own or mixed with petrol. This reduces the need to use crude oil as an energy source.

6A Some people have linked global shortages of food to the increase in biofuel production.

This could be because . . .

1 rainforests provide large amounts of food.

2 land previously used for food crops is being used to grow sugar cane for conversion to alcohol.

3 factories making biofuel are often built on farmland.

4 drilling for crude oil damages large areas of farmland.

6B Supporters of the use of biofuel claim that it is more 'environmentally friendly' than using petrol.

This could be because . . .

1 sugar cane plants take in carbon dioxide from the atmosphere.

2 trees 'lock up' large amounts of carbon, for many years, in wood.

3 fields of sugar cane increase the number of different species of animals in an area.

4 burning alcohol releases about the same amount of carbon dioxide as the plants took in when they were growing.

6C Large areas of rainforest might be cut down to provide land to grow sugar cane.

This may be harmful because . . .

1 biodiversity is reduced.

2 less oxygen will be released into the atmosphere.

3 extra methane is released which causes global warming.

4 more carbon dioxide will be released into the atmosphere.

4.7.3.3 Land use

Question 06 · continued

March 2009 | BLY1BP | Original Q6 | Legacy

6D The land made available by cutting down trees can only be used to grow sugar cane for about three years. After this, the land can be used to raise cattle.

Increased cattle farming leads to increasing atmospheric temperatures on Earth.

This is mainly because cattle release . . .

1 methane which allows more of the Sun's heat to reach Earth.

2 carbon dioxide which absorbs heat and retains it.

3 methane which absorbs heat and radiates it back to Earth.

4 carbon dioxide which allows more of the Sun's heat to reach Earth.

Turn over for the next question

4.7.3.3 Land use

Question 07

June 2009 | BLY1BP | Original Q9 | Legacy

QUESTION NINE

Organic foods have become popular in recent years. They are grown without the use of pesticides and artificial fertilisers. But a government report in 2007 showed that the production of some organic foods is more damaging to the environment than their non-organic equivalents. However, supporters of organic farming claim that it is better than non-organic farming in conserving biodiversity and is better for the soil.

9A Biodiversity is . . .

1 the ability of plants and animals to adapt to a wide variety of different environments.

2 the ability of two plants or animals to live alongside each other for their mutual benefit.

3 the existence of a wide variety of plants and animals.

4 the existence of two different environmental adaptations of the same species of plant.

The table compares some of the effects of non-organic and organic food production on the environment.

Environmental effect and units	Amount in kg of production on farm					
	Sheep meat		Chicken		Milk	
	Non-organic	Organic	Non-organic	Organic	Non-organic	Organic
Energy used in MJ	23	18	12	16	2.5	1.6
Global warming potential in grams of CO_2 equivalent	17 400	10 100	4750	6680	1060	1230
Freshwater pollution by fertiliser potential in grams of phosphate equivalent	200	584	49	86	6.3	10.3
Acidification potential in grams of sulfur dioxide equivalent	380	1510	173	264	16.2	26.4
Land use in hectares	0.0014	0.003	0.64	1.4	0.001	0.002

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9B The information in the table indicates that . . .

1 all organic food production uses more energy than non-organic farming methods.

2 changing completely to organic methods will at least double the amount of land used for food production.

3 organic food production improves the environment.

4 organic farming reduces the amount of pollution resulting from sulfur dioxide.

4.7.3.3 Land use

Question 07 · continued

9C A change from non-organic farming methods to the organic production of chicken and milk may . . .

1 contribute to an increase in acid rain.

2 help to reduce pollution of freshwater.

3 help to reduce global warming.

4 reduce the amount of energy consumed in the production of the food.

9D Which of the foods in the table is responsible for the greatest increase in environmental pollution when it is produced organically rather than non-organically?

1 sheep meat

2 chicken

3 milk

4 it is impossible to tell from this data

END OF TEST

4.7.3.3 Land use

Question 08

June 2009 | BLY2H | Original Q4 | Legacy

4 A manufacturer is trying to improve the quality of the biological detergent he produces.

Scientists at his company carried out the following experiments on enzymes:

- Samples of lipase were collected from five different types of bacterium, **A**, **B**, **C**, **D** and **E**.
- The samples were diluted to give the same concentration of lipase.
- Agar jelly containing a lipid was prepared in a dish. This forms a cloudy mixture which becomes clear when the lipid is digested.
- Five small holes were cut into the agar.
- Two drops of lipase solution from bacterium **A** was added to hole **A**.
- This process was repeated for each sample of lipase.

Diagram 1 shows the appearance of the dish.

Diagram 1

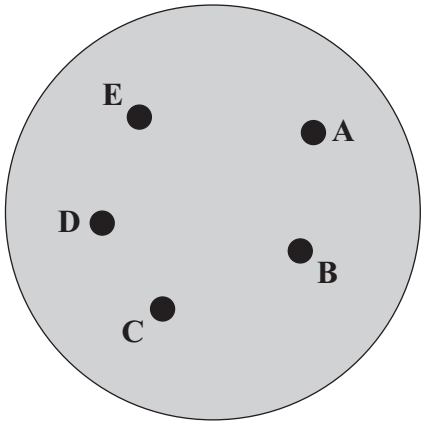
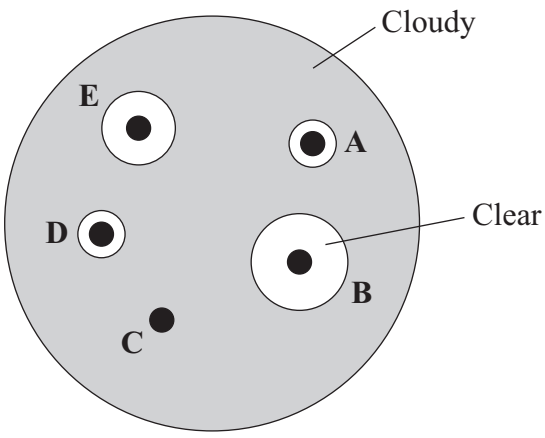


Diagram 2 shows the appearance of the dish 24 hours later.

Diagram 2



4.7.3.3 Land use

Question 08 · continued

for mark

4 (a) (i) Which type of bacterium, **A**, **B**, **C**, **D** or **E**, produced the most effective lipase in this investigation?

Write your answer, **A**, **B**, **C, D** or **E**, in the box. ☐

(1 mark)

4 (a) (ii) Explain your answer.

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(1 mark)

4 (b) The manufacturer plans to add the most effective lipase to the washing powders he produces.

Suggest **two** other factors he should investigate before deciding which lipase is the most effective.

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2.....

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(2 marks)

4 (c) Many biological detergents cannot be used at high temperatures.

Explain why.

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(1 mark)

5

4.7.3.3 Land use

Question 09

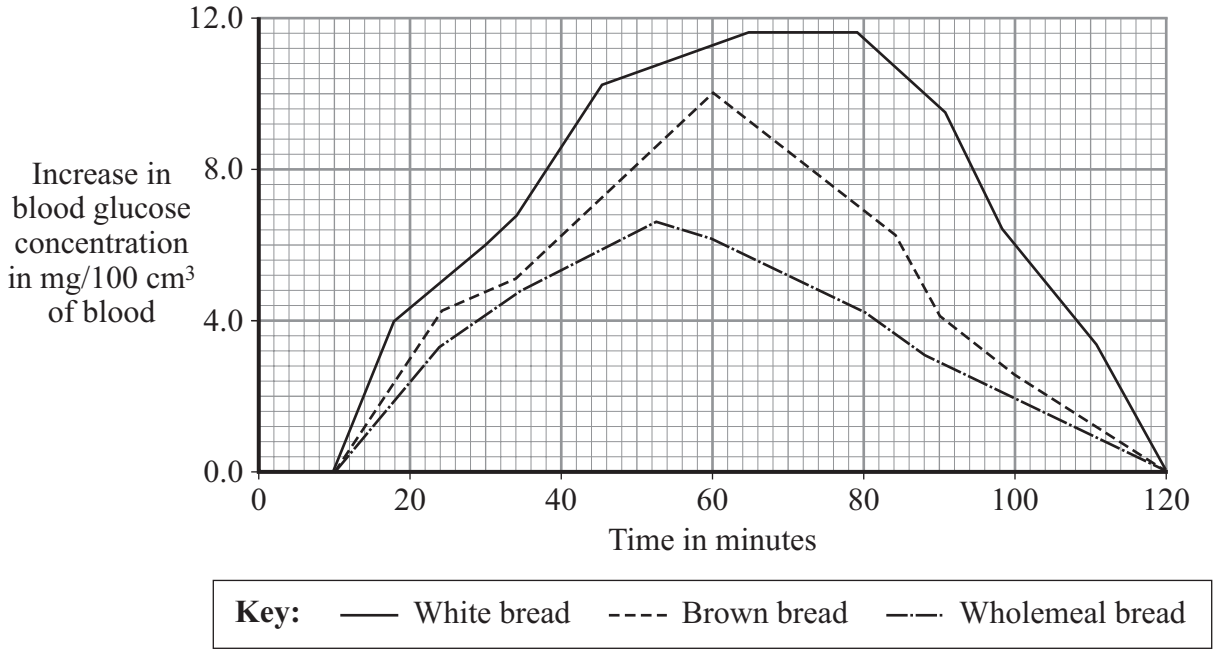
June 2009 | BLY2H | Original Q5 | Legacy

5 Insulin controls blood glucose concentration.

5 (a) The rate at which blood glucose concentration changes is affected by the food eaten.

In an experiment a person who does not have diabetes ate two slices of white bread. The change in her blood glucose concentration was recorded over the next 120 minutes.
The experiment was repeated; first with two slices of brown bread and then with two slices of wholemeal bread.

The graph shows the results of the three experiments.



5 (a) (i) Which type of bread would be most suitable for a person with diabetes?

Type of bread.....

Give **two** reasons for your answer.

1 .....

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2 .....

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(2 marks)

4.7.3.3 Land use

Question 09 · continued

for mark

5 (a) (ii) Explain, as fully as you can, the reasons for the changes in blood glucose concentration when the person ate the brown bread.

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(4 marks)

5 (b) *Pancreatic-cell transplantation* is a new treatment for diabetes. Insulin-making cells are taken from up to three dead donors. The cells are kept alive before being injected into the diabetic in a small operation. The cells soon begin to make insulin.

In one recent study 58% of recipients of pancreatic-cell transplants no longer needed insulin injections.

Give the advantages and disadvantages of the new treatment for diabetes compared with using insulin injections.

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(3 marks)

9

4.7.3.3 Land use

Question 10

November 2009 | BLY1BP | Original Q5 | Legacy

QUESTION FIVE

This question is about the effect that burning fuels has on the environment.

5A Which of the following are greenhouse gases?

1 sulfur dioxide and carbon dioxide

2 methane and oxygen

3 carbon dioxide and methane

4 methane and sulfur dioxide

A company can extract a fuel from single-celled plants, called algae, which grow on ponds. Fuels such as biodiesel are already produced from palm oil plants. Palm trees are grown where other trees have been cut down. A scientist estimates that the algae could produce 120 000 litres of fuel compared with 6000 litres from palm oil plants in the same area of deforested land. Unlike fuel from palm oil, burning fuel from algae does not produce sulfur dioxide.

5B The company claims that the fuel from algae will **not** contribute to global warming.

This is because . . .

1 algae take in as much carbon dioxide when growing as the fuel releases when burned.

2 burning the fuel releases carbon dioxide.

3 the plant takes in more sulfur when it is growing than is released, as sulfur dioxide, when the fuel burns.

4 the plants remove methane from the atmosphere when growing.

5C What area of land would be needed to make a pond that would produce the same amount of fuel as a 10 000 m^2 field of palm oil plants?

1 20 m^2

2 50 m^2

3 200 m^2

4 500 m^2

4.7.3.3 Land use

Question 10 · continued

5D Using the information given, why might it be an advantage to use algae rather than palm oil to produce fuels?

1 Burning the fuel from algae results in less acid rain.

2 Producing fuel from algae does **not** require deforestation.

3 Algae grow more quickly than palm oil plants.

4 The fuel produced from algae burns more efficiently than that from palm oil plants.

Turn over for the next question

4.7.3.3 Land use

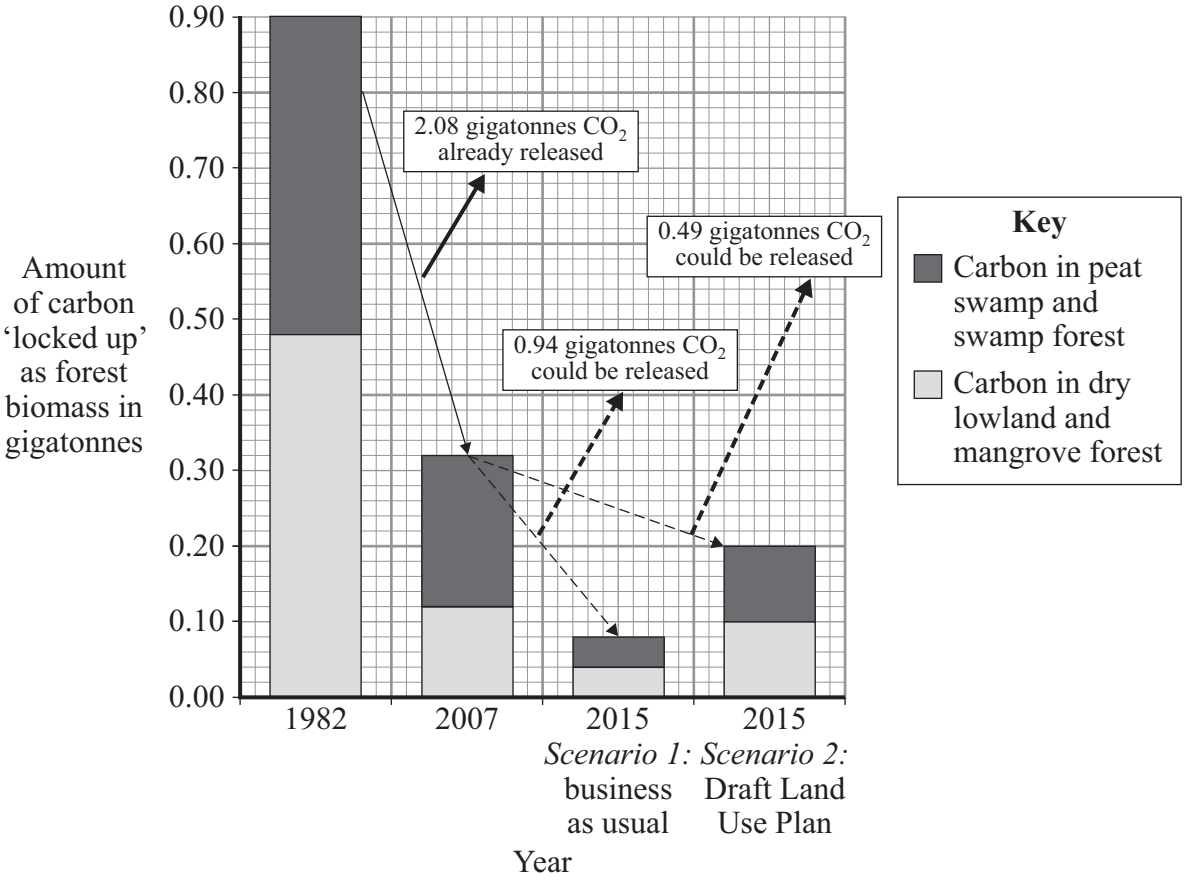
Question 11

November 2009 | BLY1BP | Original Q7 | Legacy

QUESTION SEVEN

Deforestation affects the environment.

The graph shows some possible effects of deforestation in part of Indonesia.



7A By how much did the total amount of carbon 'locked up' in peat swamp and swamp forest decline between 1982 and 2007?

1 0.16 gigatonnes

2 0.22 gigatonnes

3 0.36 gigatonnes

4 0.58 gigatonnes

4.7.3.3 Land use

Question 11 · continued

7B What mass of carbon dioxide will be released between 1982 and 2015 if *Scenario 2* is adopted?

1 0.49 gigatonnes

2 1.43 gigatonnes

3 2.57 gigatonnes

4 3.02 gigatonnes

7C The graph refers to a *Draft Land Use Plan* for 2015.

How could this plan reduce the amount of carbon dioxide in the atmosphere by 2015?

1 by building more roads

2 by building more houses

3 by replanting forests

4 by giving protected status to more animal species

7D The *Draft Land Use Plan* is an example of . . .

1 biodiversity.

2 increasing the human population.

3 recycling.

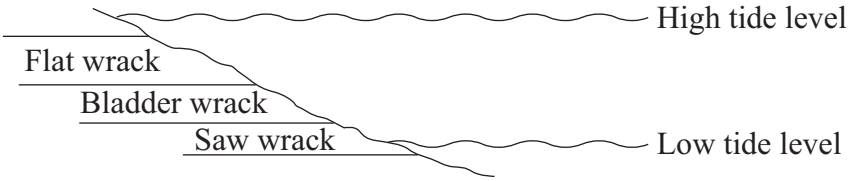
4 sustainable development.

4.7.3.3 Land use

Question 12

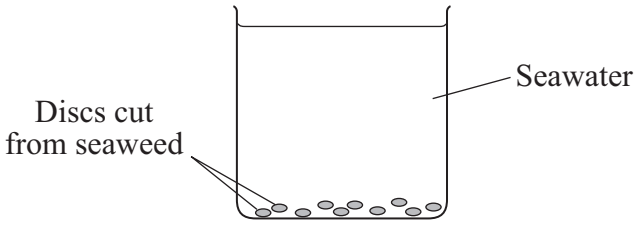
January 2010 | BLY2H | Original Q4 | Legacy

4 The diagram shows where three seaweeds live on a seashore.
As the tide moves in and out, these seaweeds are covered with seawater for different lengths of time.



Some students investigated the rate of photosynthesis in these seaweeds.

- They cut ten small discs from one seaweed.
- They dropped the discs into seawater in a beaker.
- They recorded the time taken for the fifth disc to float to the surface.
- They repeated this experiment with the other two seaweeds.



4 (a) (i) Suggest why the discs floated to the surface.

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(1 mark)

4 (a) (ii) Suggest the advantage of recording the time taken for the fifth disc to reach the surface, rather than for the tenth disc.

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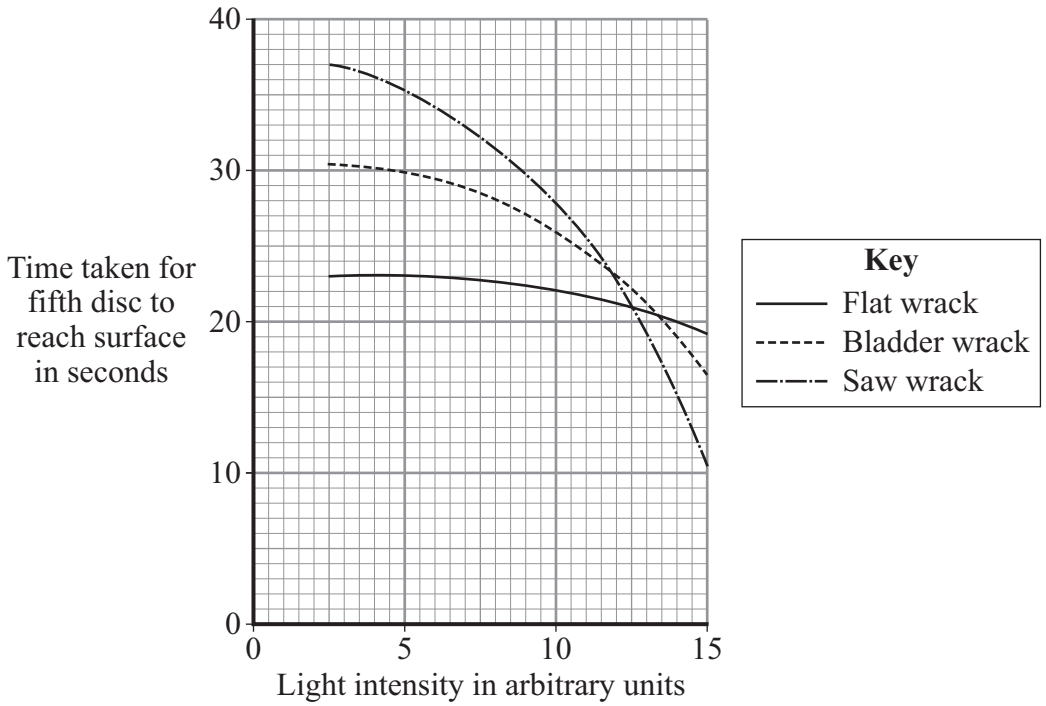
(1 mark)

4.7.3.3 Land use

Question 12 · continued

for mark

4 (b) The students carried out their experiments at different light intensities.
The graph shows the results they collected.



4 (b) (i) Compare the rate of photosynthesis for flat wrack with the rate for saw wrack at different light intensities.

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(2 marks)

4 (b) (ii) Seawater absorbs light.

The growth rate of saw wrack is less than the growth rate of bladder wrack.

Suggest why.

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(2 marks)

6

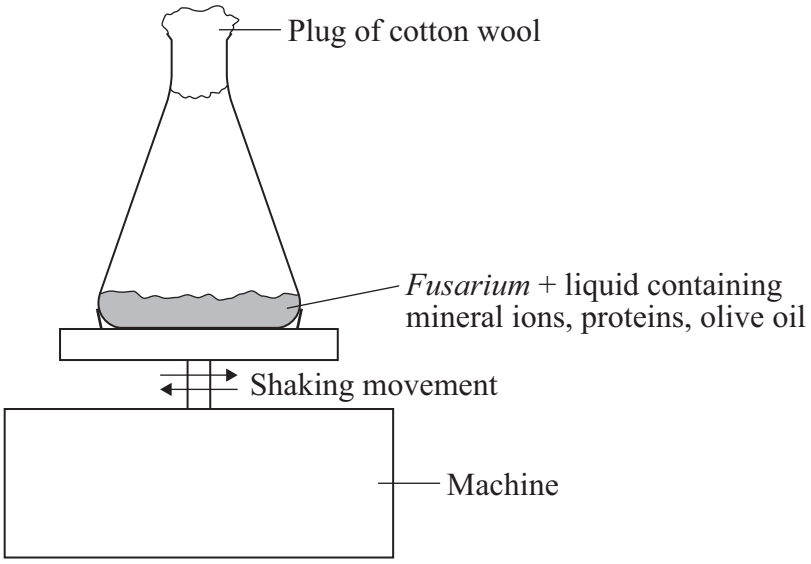
4.7.3.3 Land use

Question 13

January 2010 | BLY3H | Original Q7 | Legacy

7 Lipase is an enzyme used in biological detergents. It catalyses the digestion of fats and oils.

Scientists investigated the production of lipase by the fungus, *Fusarium*.
The scientists made up different liquids containing mineral ions, proteins and olive oil.
They mixed 90 cm^3 of one of these liquids with a *Fusarium* culture in a flask.
The flask was then shaken on a machine throughout the investigation, as shown in the diagram.



The scientists carried out two investigations.

- In each investigation, 10 cm^3 of a high concentration of *Fusarium* was used.
- In **Investigation 1**, they varied the concentration of protein.
- In **Investigation 2**, they varied the concentration of olive oil.
- In each investigation, they measured the amount of lipase produced in each flask over 72 hours.
- They repeated each investigation three times.

7 (a) (i) The shaking movement mixed the liquid and the *Fusarium*.

Suggest **one** further reason why the flasks were shaken throughout the investigations.

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(1 mark)

4.7.3.3 Land use

Question 13 · continued

for mark

7 (a) (ii) The high concentration of *Fusarium* in each flask increased the rate of lipase production.

Suggest **one** other reason why a high concentration of *Fusarium* was used.

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(1 mark)

Question 7 continues on the next page

4.7.3.3 Land use

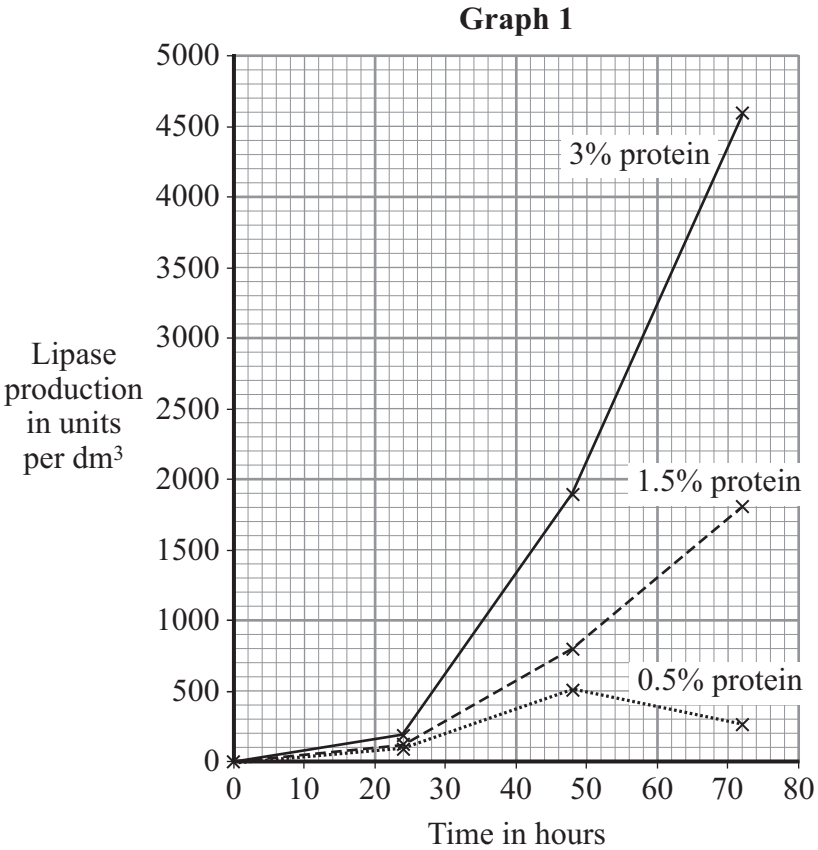
Question 13 · continued

for mark

7 (b) Graphs **1** and **2** show the results of the two investigations.

Graph 1 shows lipase production at three different concentrations of protein.

Graph 2 shows lipase production at three different concentrations of olive oil.

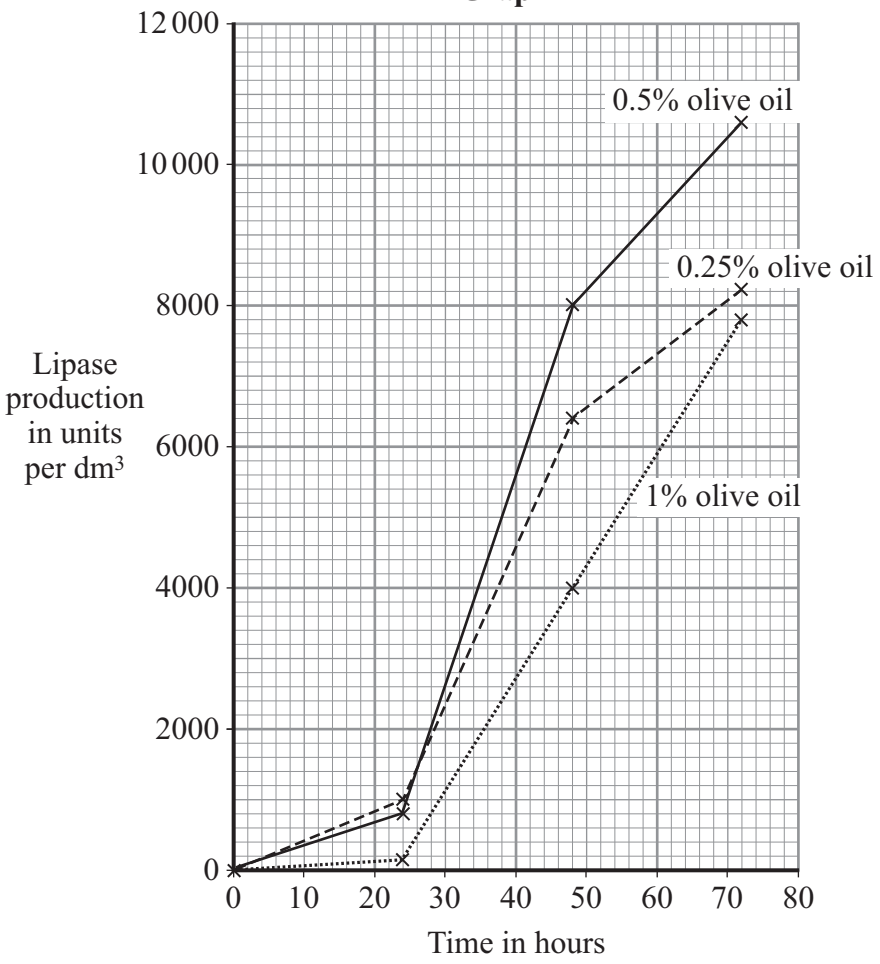


4.7.3.3 Land use

Question 13 · continued

for mark

Graph 2



7 (b) (i) From **Graph 2**, calculate the maximum rate of lipase production per hour.

Show clearly how you work out your answer.

.....

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.....

Answer =.....units of lipase per dm^3 per hour
(2 marks)

Question 7 continues on the next page

Question 13 · continued

for mark

7 (b) (ii) Each point plotted on **Graphs 1** and **2** is the mean of three values.

The scientists published only the mean results in their scientific paper. They did not include the actual measured values.

Why would it have been better to have included the actual measured values?

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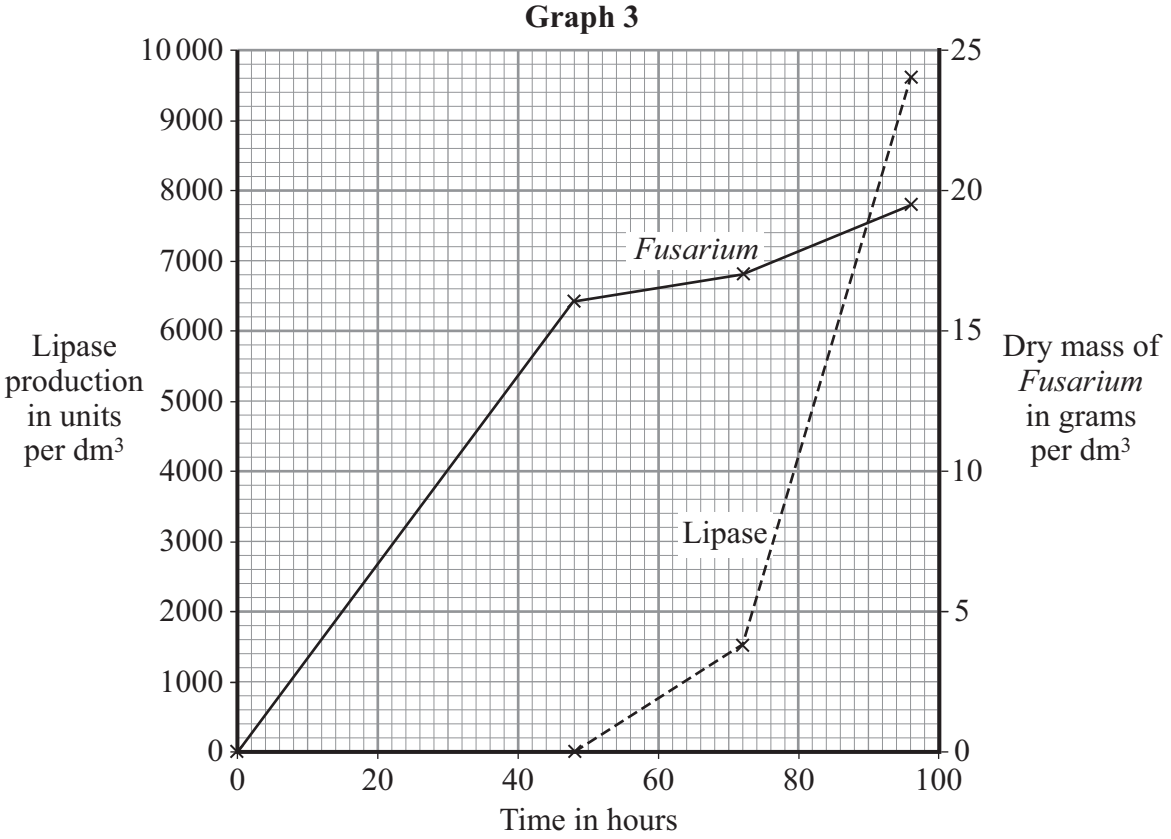
.....

(2 marks)

7 (c) The scientists then carried out **Investigation 3**.
They used the results of **Investigations 1** and **2** to provide optimum concentrations of protein and olive oil. They measured the dry mass of the *Fusarium* and the amount of lipase produced over 96 hours.

The results of **Investigation 3** are shown in **Graph 3**.

Graph 3



4.7.3.3 Land use

Question 13 · continued

for mark

7 (c) (i) Use information from **Graph 3** to describe the relationship between the growth of *Fusarium* and the production of lipase.

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(2 marks)

7 (c) (ii) Suggest an explanation for this relationship.

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(2 marks)

10

4.7.3.3 Land use

Question 14

March 2010 | BLY1AP | Original Q9 | Legacy

QUESTION NINE

Some diseases are caused by viruses. Each type of virus only infects and causes the disease in one species of organism. One of the reasons for this is that a protein on the virus surface only matches with the cells of one particular species of organism.

9A Why does the flu virus make us feel ill?

1 The virus itself produces a toxin.

2 The virus damages the cells in which it reproduces.

3 The large number of viruses increases our temperature.

4 Viruses reproduce rapidly as soon as they are breathed in.

9B Bird flu is caused by a virus.

What might happen to the existing form of bird flu virus that would allow it to infect humans and cause flu in Britain?

1 an increase in the number of birds with the bird flu virus

2 a new strain of bird flu entering Britain

3 a change in the antibody which the bird flu virus carries

4 a change in the protein on the virus surface

Question 14 · continued

Humans produce antibodies against viruses.

A scientist investigated the effect of a virus infection on the antibody concentration in a person's blood.

The person was infected by day 3.

Time in days	1	4	7	10	13	16	19	22	25
Antibody concentration in mg per 100 cm^3 of blood	5.1	6.0	10.4	35.9	55.9	50.2	48.8	32.7	10.0

9C Which conclusion can be drawn from the data?

1 This virus did not reproduce until the 10th day.

2 Antibody production by the body continues to rise until the patient recovers.

3 The patient had recovered by the 25th day.

4 Antibody production by the body rises to a peak after an infection and then declines.

9D Another scientist repeated the investigation but could not measure the antibody concentration directly. Instead, he made measurements using a blood cell counter. He counted the white blood cells using a microscope with an automatic cell counter. A colleague said that he would not trust this data as much as measuring the antibody concentration with a machine.

Which of the reasons below best accounts for his colleague's attitude?

1 There is no relationship between the number of white cells and the concentration of antibodies.

2 Counting white cells is a less sensitive method than measuring antibody concentration with a machine.

3 The antibody measuring machine is more expensive to buy and run.

4 Reading the cell counter is less accurate than reading the scale on the antibody machine.

END OF TEST

4.7.3.3 Land use

Question 15

March 2010 | BLY1BP | Original Q8 | Legacy

QUESTION EIGHT

The Lua tribe of the Philippines rely on 'slash and burn' agriculture. They cut down and burn an area of forest big enough to grow their crops. After about two years they move on to use another area of the forest. The Lua tribe has survived in the same region for many years. Their agriculture has to be managed very carefully.

8A The population of the tribe increased, so they burned a bigger area of the forest in which they lived.

What would be the most likely effect on the species that normally live in the region?

1 The animals would live at a higher population density in the remaining forest.

2 The animals would move away from the farmed area but die in the remaining forest because there would be too much competition.

3 There would be more types of native species because new areas of forest had been cleared.

4 There would be no effect on the native species.

The agricultural methods used by the Lua tribe had little effect on the carbon dioxide concentration in the air.

8B The most likely reason for this is that . . .

1 their population was not growing fast enough.

2 when the Lua tribe burns the forest, oxygen is taken in and carbon dioxide is released.

3 the Lua tribe did not plant rice on the cleared land.

4 the amount of carbon dioxide released by burning was the same as the amount of carbon dioxide reabsorbed by the crops.

4.7.3.3 Land use

Question 15 · continued

8C A forestry company was given the right to harvest the mature trees in the area, but also burned other areas.

Why was the company accused of increasing the chance of climate change?

1 Cutting down trees causes an increase in the temperature of the atmosphere.

2 Burning trees releases the 'locked up' carbon as carbon dioxide into the atmosphere, which then traps heat.

3 Using the trees for timber releases carbon dioxide into the atmosphere more quickly than photosynthesis can absorb it.

4 Fewer trees in the area allows more space for microorganisms to respire and release carbon dioxide.

8D Deforestation by the forestry company led to a reduction in biodiversity.

Why should society be concerned about this decrease?

1 A greater biodiversity reduces the chance of climate change.

2 The forest food chains would be shorter.

3 Some of the organisms that were lost may have been of future use.

4 There may be an increased use of herbicides in the area.

4.7.3.3 Land use

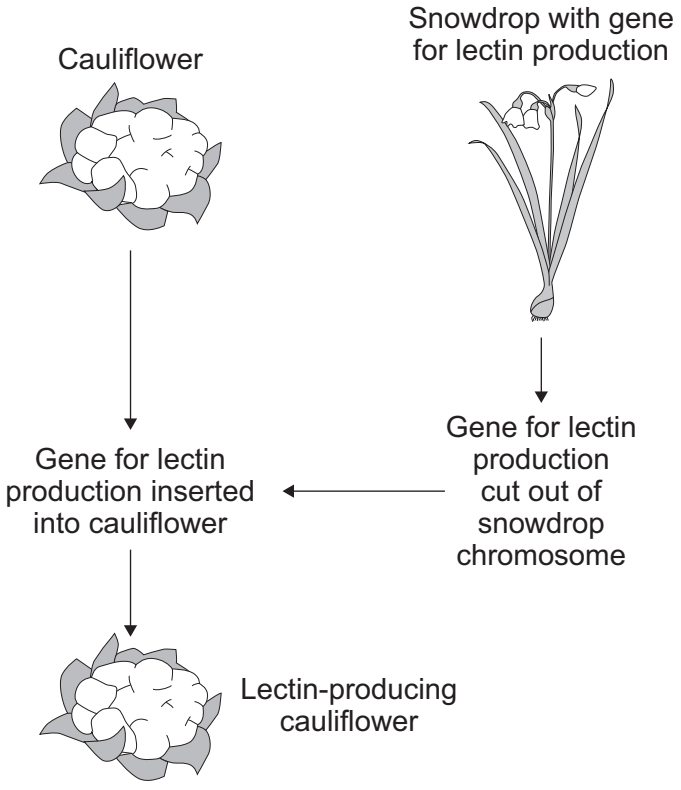
Question 16

June 2010 | BLY1BP | Original Q4 | Legacy

QUESTION FOUR

Up to 40 % of cauliflower crops may be eaten by insects.
Snowdrops can survive attacks by insects because they produce a substance called lectin.
Lectin interferes with the insect's digestive system.

The diagram shows one method of introducing the gene for lectin production into cauliflowers.



4A The gene for lectin production is cut from the snowdrop chromosome using . . .

1 lectin.

2 a herbicide.

3 an enzyme.

4 an electric shock.

4B The technique used to transfer the gene from the snowdrop to the cauliflower is called . . .

1 biodiversity.

2 embryo transplant.

3 cloning.

4 genetic engineering.

4.7.3.3 Land use

Question 16 · continued

4C What is the main benefit to the environment of farmers growing lectin-producing cauliflowers?

1 More snowdrops will survive.

2 Less pesticide will be used.

3 Insects will eat something else.

4 Less fertiliser will be needed.

4D An ethical concern about this technique is that . . .

1 it will make farmers richer.

2 it will increase biodiversity.

3 it is interfering with nature.

4 it is sustainable.

Turn over for the next question

4.7.3.3 Land use

Question 17

June 2010 | BLY1BP | Original Q8 | Legacy

QUESTION EIGHT

Many scientists are concerned about global warming.

One way to reduce global warming is to replace fossil fuels with biofuels, such as ethanol. Forests are being cut down to grow crops that are used to produce ethanol.

8A When biofuels are burned, . . .

1 the volume of carbon dioxide they give off is about equal to the volume of carbon dioxide the plants take in.

2 the volume of carbon dioxide they give off is larger than the volume of carbon dioxide the plants take in.

3 the volume of methane they give off is equal to the volume of carbon dioxide the plants take in.

4 the volume of carbon dioxide they give off is equal to the volume of methane the plants take in.

8B One effect of cutting down forests is that . . .

1 more paper is recycled.

2 less renewable energy is used.

3 there may be a reduction in biodiversity.

4 less land is available for food production.

4.7.3.3 Land use

Question 17 · continued

The table shows the yield of ethanol from four biofuel crops.

Plant material	Volume of ethanol produced in litres per kg of plant material	Volume of ethanol produced in litres per m^2 of land
Cassava	0.18	0.4
Maize	0.36	0.2
Sugar cane	0.07	1.2
Sweet potato	0.12	0.5

8C Which of the plant materials would result in the least amount of deforestation to produce 1000 litres of fuel?

1 Cassava

2 Maize

3 Sugar cane

4 Sweet potato

8D Global warming means that the average temperature of the Earth's atmosphere is gradually increasing.

What causes this increase in temperature?

1 more energy from the Sun entering the Earth's atmosphere

2 more energy being produced by human activity

3 more energy being radiated by the Earth

4 more energy being re-radiated back to Earth

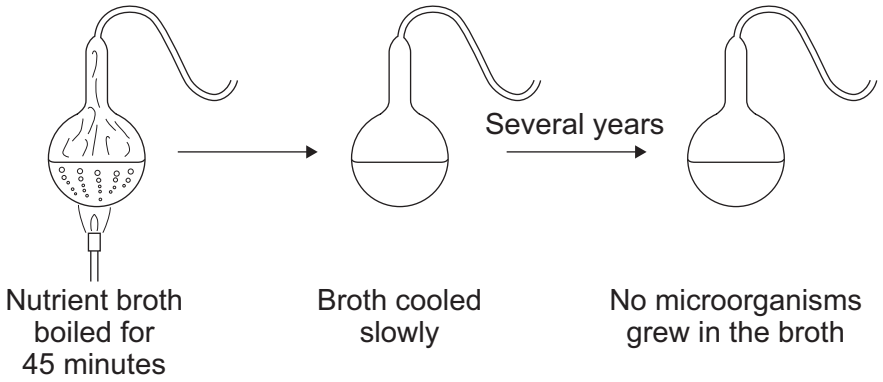
4.7.3.3 Land use

Question 18

June 2010 | BLY3H | Original Q2 | Legacy

2 **Diagram 1** shows some details of an investigation carried out by Louis Pasteur.

Diagram 1



2 (a) (i) Why did Pasteur boil the nutrient broth?

.....

.....

(1 mark)

2 (a) (ii) Because of the shape of the flask, no microorganisms grew even after several years.

Explain why.

.....

.....

(1 mark)

2 (b) Pasteur repeated the investigation several times.

Why is it useful to repeat a scientific investigation several times?

.....

.....

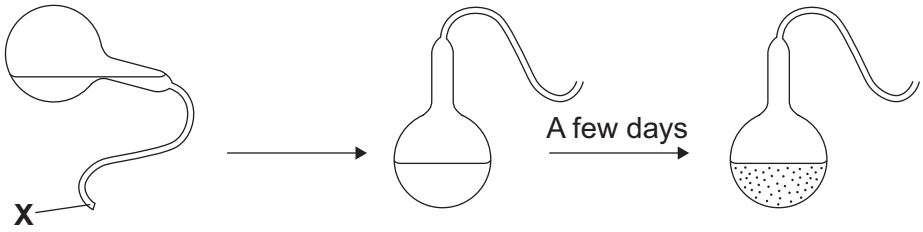
(1 mark)

4.7.3.3 Land use

Question 18 · continued

2 (c) After several years, some of Pasteur's flasks were tilted so that the broth flowed to point **X**, as shown in **Diagram 2**. The flasks were then returned to the upright position and left for a few days.

Diagram 2



Flask tilted so broth flowed to point **X**

Flask returned to upright position

Microorganisms grew in the broth

Microorganisms grew in the broth.

Explain why.

.....

.....

.....

.....

(2 marks)

2 (d) Complete the sentence.

This investigation provides evidence for the theory of ..... .

(1 mark)

6

4.7.3.3 Land use

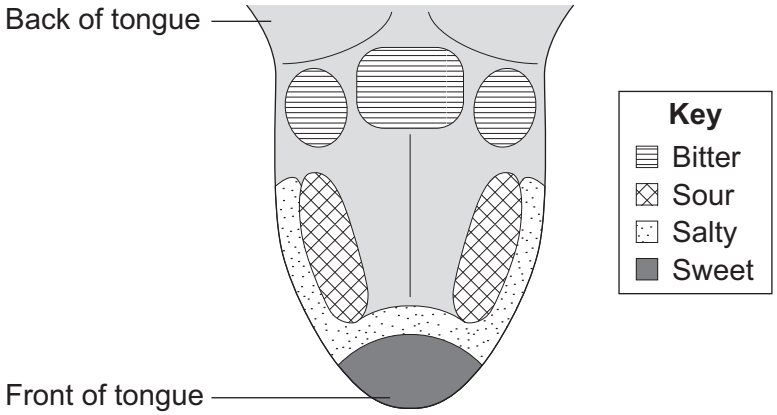
Question 19

November 2010 | BLY1AP | Original Q3 | Legacy

QUESTION THREE

A student found **diagram 1** in a science book.
Diagram 1 shows how different areas of the tongue are sensitive to different tastes.

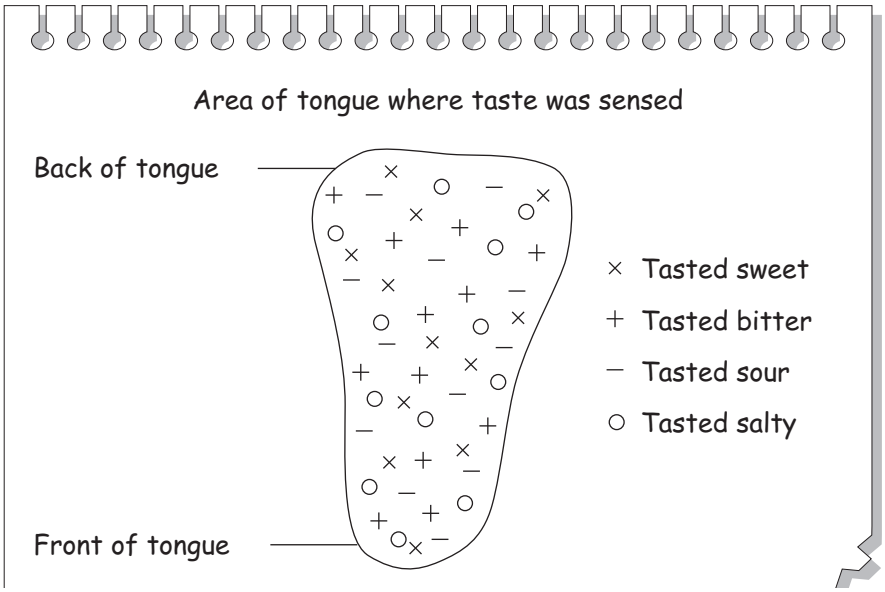
Diagram 1



The student decided to find out if the book was correct.
She tested three people.

- She put a small drop of a sweet-tasting liquid on different parts of each person's tongue.
- She recorded each part of the tongue where the sweet-tasting liquid could be tasted.
- This was repeated for the other tastes.
- Her results are shown in **diagram 2**.

Diagram 2



Question 19 · continued

3A The cells in the tongue that sense the different tastes are called . . .

1 stimuli.

2 effectors.

3 receptors.

4 synapses.

3B These results would have been more reliable if . . .

1 a teacher had carried out the investigation.

2 more than three students had been tested.

3 more concentrated solutions had been used.

4 more areas of the tongue had been tested.

3C The best description of the student's results is that . . .

1 bitter tastes are sensed at the back of the tongue.

2 there are areas of the tongue where particular tastes are grouped.

3 sour tastes are always sensed at the sides of the tongue.

4 there are no definite areas of the tongue for sensing particular tastes.

3D The information about the tongue in the science book . . .

1 is not supported by the student's data.

2 must be correct.

3 proves that the student's data is not valid.

4 proves that the student's method is wrong.

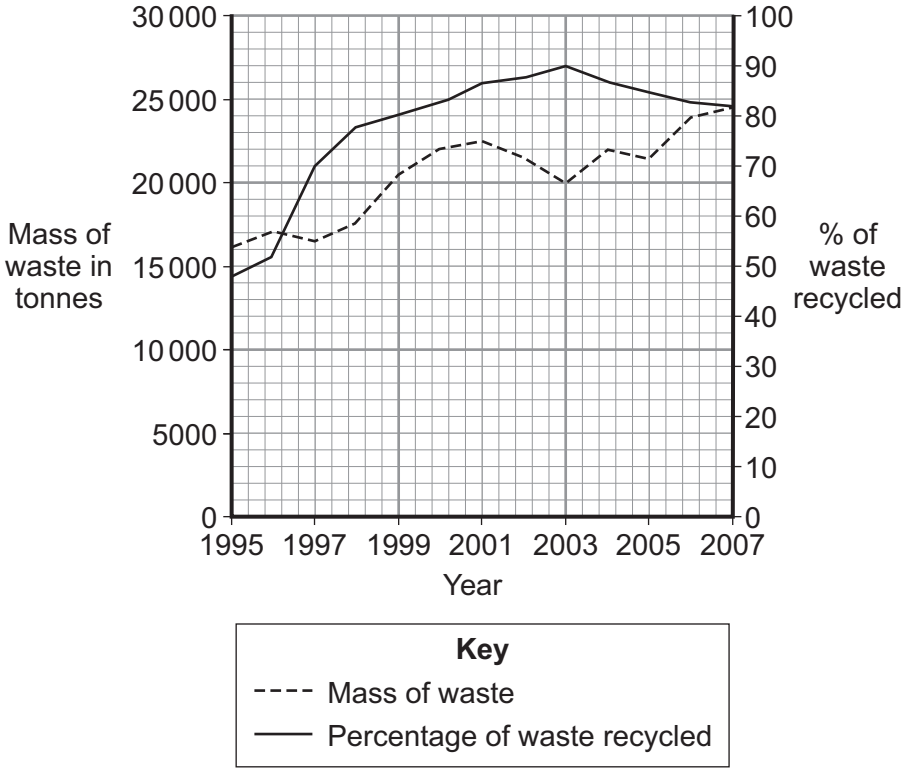
4.7.3.3 Land use

Question 20

November 2010 | BLY1BP | Original Q5 | Legacy

QUESTION FIVE

The graph shows how waste is managed at an airport.



5A What mass of waste was **recycled** in 2003?

1 2 000 tonnes

2 18 000 tonnes

3 20 000 tonnes

4 22 000 tonnes

5B Which were the most successful years at this airport for waste prevention and recycling?

1 1995 to 1997

2 1998 to 2000

3 2001 to 2003

4 2004 to 2006

4.7.3.3 Land use

Question 20 · continued

5C Some waste can be burned.

One **disadvantage** of this method is that the sulfur dioxide produced will add to . . .

1 global warming.

2 the greenhouse effect.

3 climate change.

4 acid rain.

5D There are advantages in burning waste.

Burning the waste could . . .

1 reduce the use of fossil fuels.

2 reduce air pollution.

3 increase the amount of carbon dioxide in the air.

4 increase the amount of landfill.

4.7.3.3 Land use

Question 21

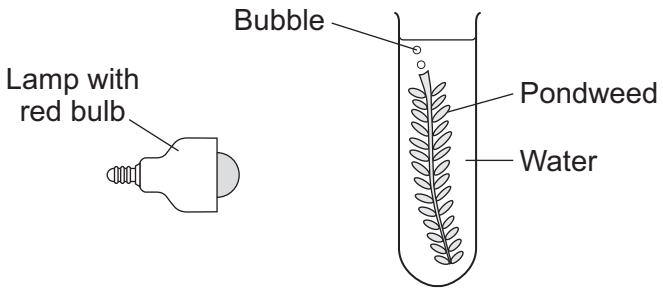
January 2011 | BLY2H | Original Q1 | Legacy

1 A group of pupils investigated the way in which the colour of light affects photosynthesis.

The pupils:

- put a piece of pondweed into a test tube of water
- shone light from a lamp with a red light bulb onto the pondweed
- counted the bubbles of gas produced by the pondweed every minute for three minutes.

The diagram shows the experiment.



The pupils repeated their experiment using a yellow light bulb, a green light bulb and a blue light bulb.

1 (a) (i) What was the independent variable in the investigation?

.....

(1 mark)

1 (a) (ii) To make the investigation fair the pupils needed to control some variables.

Suggest **one** variable that the pupils should have controlled during their investigation.

.....

(1 mark)

1 (a) (iii) It is better to count the bubbles every minute for three minutes than to count all the bubbles in three minutes.

Why?

.....

.....

(1 mark)

4.7.3.3 Land use

Question 21 · continued

1 (b) The table shows the pupils' results.

Colour of bulb	Number of bubbles produced in one minute			
	1st minute	2nd minute	3rd minute	Mean
Red	24	19	21	21
Yellow	18	14	15	16
Green	6	4	3	4
Blue	32	34	32	33

Algae are tiny organisms that photosynthesise.
In natural light algae grow very quickly on the sides of a fish tank.
The algae make it difficult to see the fish.

1 (b) (i) What would be the best colour of light bulb to illuminate the fish tank to reduce the growth of algae?

Use the results in the table to help you to decide.

Draw a ring around **one** answer.

red **yellow** **green** **blue**

(1 mark)

1 (b) (ii) Explain why the colour you have chosen is the best.

.....

.....

.....

.....

(2 marks)

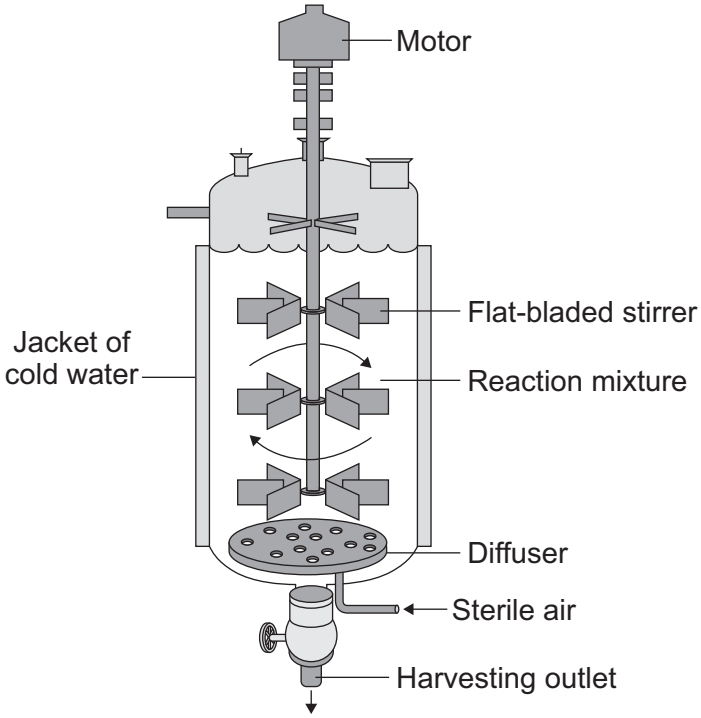
6

4.7.3.3 Land use

Question 22

January 2011 | BLY3H | Original Q6 | Legacy

6 The diagram shows a fermenter.
This fermenter can be used to grow a fungus which makes a protease enzyme.



6 (a) Explain, in detail, why the fermenter needs to be surrounded by a jacket of cold water.

.....

.....

.....

.....

.....

.....

.....

.....

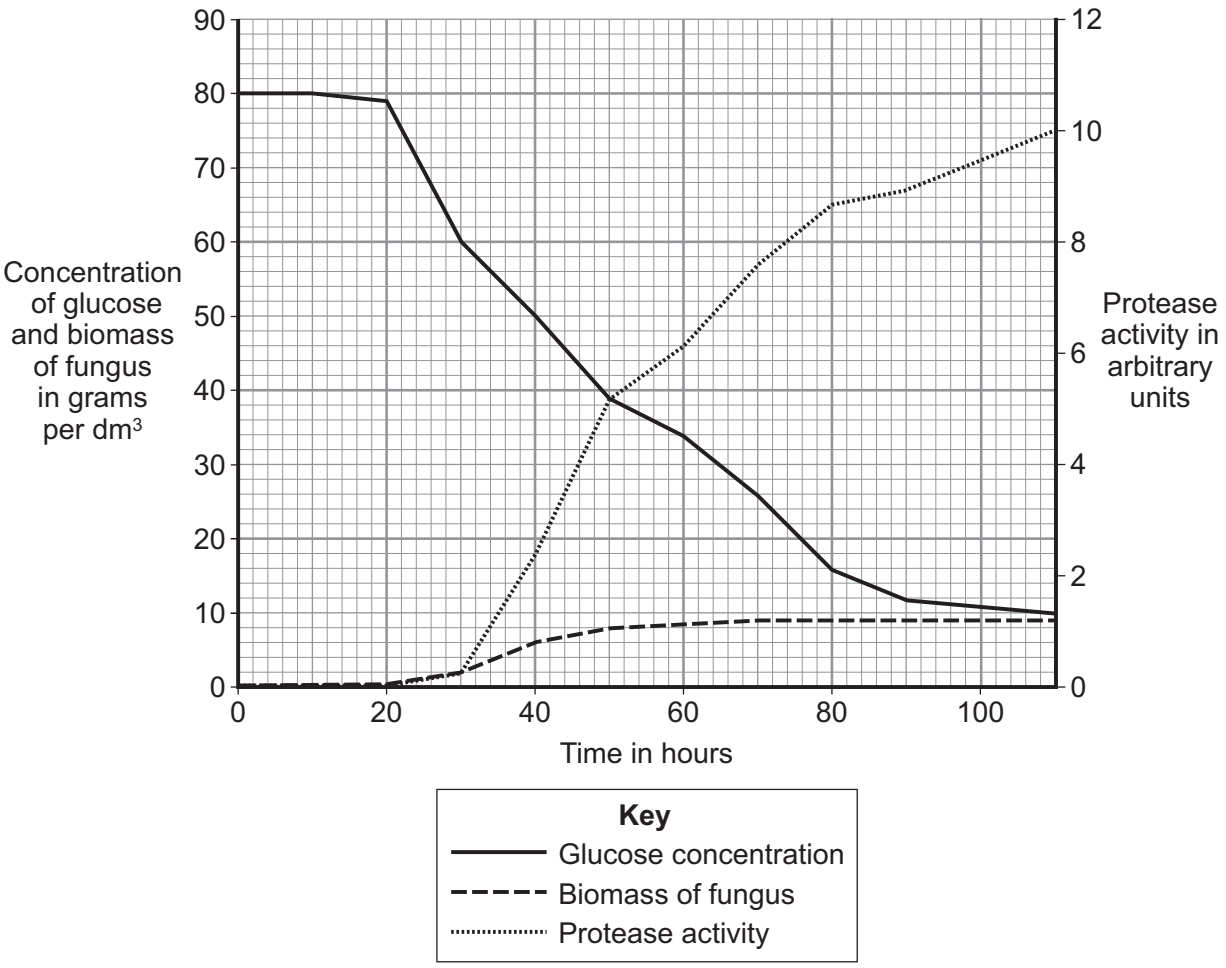
.....

(3 marks)

Question 6 continues on the next page

Question 22 · continued

6 (b) Scientists investigated the effect of glucose concentration on the growth of the fungus and on the production of the protease enzyme.
The graph shows the results when the glucose concentration in the fermenter at the start was 80 grams per dm^3.



There was no measurable amount of protease activity in the reaction mixture until after 20 hours.

Suggest an explanation for this.

.....

.....

.....

.....

.....

.....

4.7.3.3 Land use

Question 22 · continued

.....

.....

.....

.....

(4 marks)

6 (c) The scientists repeated the investigation using 40 grams of glucose per dm^3 and using 60 grams of glucose per dm^3.

The table shows all of their results.

Concentration of glucose in grams per dm^3	Yield of fungus biomass in grams per gram of glucose consumed	Protease activity in arbitrary units per gram of glucose consumed	Protease activity in arbitrary units per gram of fungus biomass produced
40	0.09	0.83	8.93
60	0.11	0.22	1.92
80	0.13	0.14	1.11

The scientists plan to set up the fermenter for commercial production of the protease enzyme.

Which concentration of glucose should they use in the fermenter?

..... grams per dm^3

Explain, in detail, why you chose this concentration.

.....

.....

.....

.....

(2 marks)

9

4.7.3.3 Land use

Question 23

March 2011 | BLY1BP | Original Q3 | Legacy

QUESTION THREE

The picture shows part of a forest burning in Mexico.



3A The main reason for burning forests like this is to . . .

1 reduce the need for fertilisers.

2 use the land for agriculture.

3 use the land for roads.

4 reduce the 'greenhouse effect'.

4.7.3.3 Land use

Question 23 · continued

3B Many scientists believe that large-scale deforestation has led to an increase in the carbon dioxide concentration in the atmosphere.

Which row in the table shows the effects of deforestation?

	Amount of carbon dioxide locked up in wood	Amount of carbon dioxide released by burning	Amount of carbon dioxide released by microorganisms
1	increases	decreases	increases
2	decreases	increases	increases
3	increases	increases	increases
4	decreases	decreases	decreases

3C Deforestation affects biodiversity.

What does the biodiversity of a habitat measure?

1 the total number of all living things in the habitat

2 the number of animal and plant species that have become extinct in the habitat

3 the number of different species in the habitat

4 the total number of animals of the most common species in the habitat

3D Sometimes cattle may be kept on areas that have been deforested.

Which gas in the atmosphere is produced in large amounts by cattle but not by humans?

1 carbon dioxide

2 methane

3 oxygen

4 sulfur dioxide

4.7.3.3 Land use

Question 24

March 2011 | BLY1BP | Original Q7 | Legacy

QUESTION SEVEN

Algae are small plants that live in water. Algae photosynthesise to gain energy to grow. An alga that grows off the coast of Hawaii makes a high proportion of vegetable oils in its cells.

A fuel company is planning to farm this alga to produce biodiesel fuel from the vegetable oils. The company says that the plans will result in sustainable development.

7A What does the company mean by *sustainable development* (for producing biodiesel)?

1 The algae will always grow in the sea around Hawaii.

2 The biodiesel will be produced using fossil fuels.

3 The biodiesel will be produced without affecting future generations.

4 The company can keep making the biodiesel for a long time.

7B Which of the following statements is the most important reason for promoting the algae as a sustainable source of biodiesel?

1 The trial growth project is in the sea around Hawaii where conditions are best for the algae farming.

2 The cost of the biodiesel produced is 8 times greater than diesel produced from fossil fuels.

3 The algae absorb carbon dioxide from the atmosphere, which increases the 'greenhouse effect'.

4 Using food crops to produce biodiesel may lead to starvation in some poor countries.

7C Some people say that burning fossil fuels adds to global warming.

Why does burning fossil fuels add to global warming?

1 Burning fossil fuels releases heat.

2 Burning fossil fuels releases carbon dioxide.

3 Fossil fuels are easily available.

4 Carbon in fossil fuels did not come from plants.

4.7.3.3 Land use

Question 24 · continued

7D Methane contributes to global warming because methane . . .

1 traps heat radiation from the Earth and re-radiates it out to space.

2 traps heat radiation from the Earth and re-radiates it back to the Earth.

3 traps heat radiation directly from the Sun and re-radiates it back to the Earth.

4 reflects heat radiation from the Sun back out to space.

Turn over for the next question

4.7.3.3 Land use

Question 25

March 2011 | BLY1BP | Original Q9 | Legacy

QUESTION NINE

Read the information about rice growing.

- Rice growing can contribute to global warming.
- Most rice is grown in wetland areas, where other crops cannot grow.
- Methane is produced by bacteria which live in soil water that has very little oxygen in it.
- Rice can be grown on drier land, but yields are reduced.
- Other crops are more profitable in these drier areas.
- Allowing the soil to dry out for a short time increases the amount of oxygen in the soil and increases rice yields.

9A In wetland areas, rice is a very important crop for people's diet and for the economy of these areas.

For people who live in these wetland areas, the best way of reducing methane in the atmosphere is . . .

1 to invest money in new drainage systems.

2 to stop producing rice in wetland areas.

3 to grow more rice in drier areas.

4 to grow other crops in wetland areas.

9B Over its growing period, a rice crop will . . .

1 reduce the amount of carbon dioxide in the atmosphere.

2 reduce the amount of oxygen in the atmosphere.

3 reduce the amount of methane in the atmosphere.

4 have no effect on the composition of the atmosphere.

9C Some varieties of rice plant cause 30 % less methane to be released into the atmosphere. However, these rice plants produce less rice.

Which of the following might produce a high yielding rice plant **and** release less methane?

1 cloning

2 embryo transplantation

3 sexual reproduction

4 tissue culture

4.7.3.3 Land use

Question 25 · continued

March 2011 | BLY1BP | Original Q9 | Legacy

9D A new strain of rice has been genetically modified to produce extra vitamins.

The final decision whether to allow this strain of rice to be grown on a large scale should be taken by . . .

1 farmers.

2 industrialists.

3 politicians.

4 scientists.

END OF TEST

4.7.3.3 Land use

Question 26

June 2011 | BLY1AP | Original Q6 | Legacy

QUESTION SIX

Sometimes, athletes train in hot countries. The athletes need to get used to hot conditions.

In an investigation:

- eight athletes did three different physical exercises before starting to train in hot conditions
- the sweat from the athletes was analysed after each exercise
- the athletes trained in hot conditions for ten days
- the athletes repeated the three different exercises that they had done before training in hot conditions
- the athletes' sweat was analysed after each exercise.

6A The athletes were told that it did not matter if they ate a lot of salt (containing sodium ions) during the 10 days of training in hot conditions.

The athletes could eat a lot of salt because the excess sodium ions . . .

1 are removed by sweating.

2 are removed by the kidneys.

3 cannot be carried by the blood.

4 cannot enter the blood.

6B The athletes were told that they must not go without sodium ions in their diet because . . .

1 the athletes would lack the energy to carry out their exercises.

2 the athletes' blood would become too concentrated.

3 the athletes' body cells would not work efficiently.

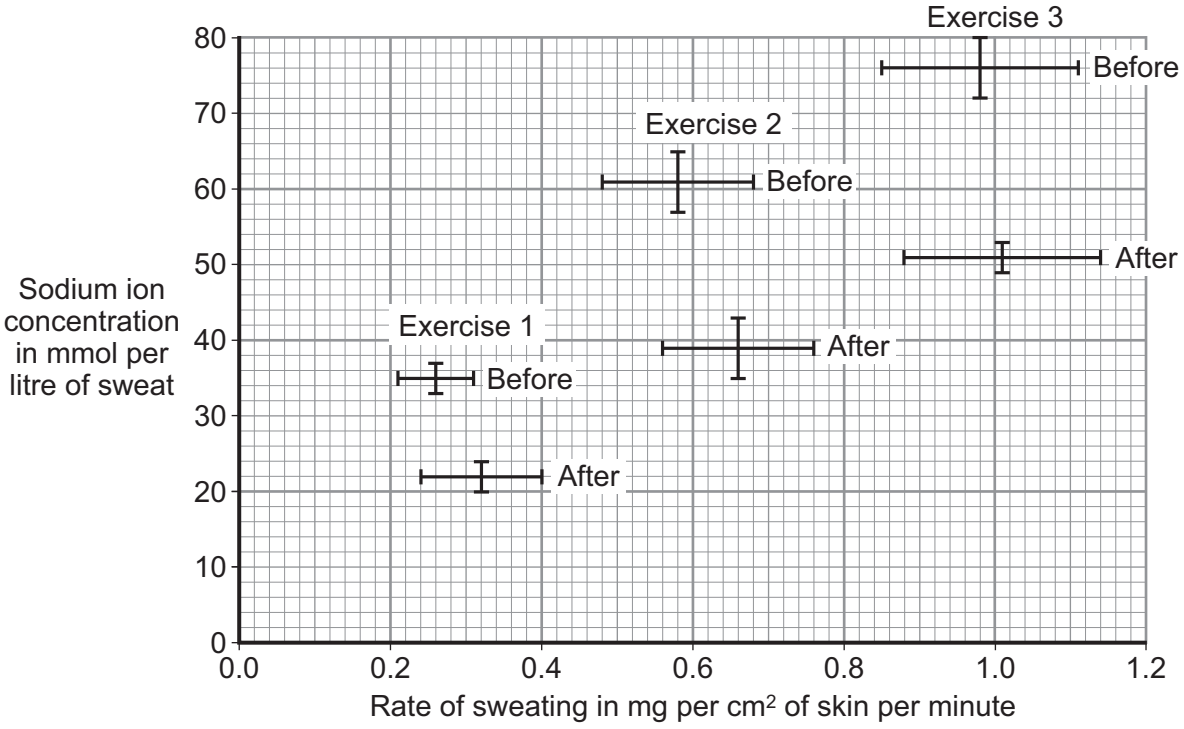
4 the athletes' blood pressure would increase.

Question 26 · continued June 2011 | BLY1AP | Original Q6 | Legacy

The graph below shows the results of the investigation for each of the three exercises before and after 10 days of training in hot conditions.

The bars at each plot show:

- the range of the rate of sweating (horizontal bar)
- the range of the concentration of sodium ions in the sweat (vertical bar).



6C The data suggests that for each of the three physical exercises after 10 days of training in hot conditions, . . .

1 there was a large difference in the sodium ion concentration but not in the rate of sweating.

2 there was a large difference in the rate of sweating but not in the sodium ion concentration.

3 there was a large difference in the sodium ion concentration and a large difference in the rate of sweating.

4 there was no difference in the sodium ion concentration and no difference in the rate of sweating.

6D The best conclusion from the graph is that . . .

1 training in hot conditions increases the concentration of sodium ions in sweat.

2 an increase in the rate of sweating reduces the concentration of sodium ions lost in sweat.

3 the rate of sweating is decreased by training in hot conditions.

4 training in hot conditions reduces the concentration of sodium ions lost in sweat.

4.7.3.3 Land use

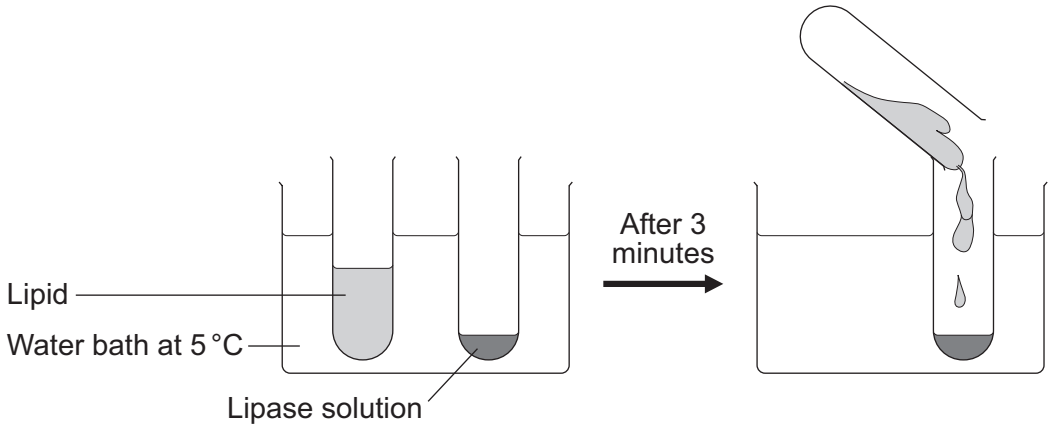
Question 27

June 2011 | BLY2H | Original Q3 | Legacy

3 A group of students investigated the effect of temperature on the action of the enzyme lipase.

The students:

- put 1 cm^3 of lipase solution into a test tube
- put 5 cm^3 of lipid into a different test tube
- put both tubes in a water bath at 5°C for 3 minutes
- mixed the lipid with the lipase solution.



Every five minutes the students tested a sample of the mixture for lipid, until no lipid remained.
The students repeated the experiment at different temperatures.

3 (a) To make their investigation fair the students needed to control some variables.

Give **one** variable the students controlled in their investigation.

.....

(1 mark)

3 (b) The tubes of lipase solution and lipid were kept separately in the water bath for 3 minutes before mixing. Why?

Tick (✓) **one** box.

So that the lipase broke down the lipid quickly ☐

So that the lipase and the lipid reached the right temperature ☐

To give enough time for the lipase to break down the lipid ☐

To give enough time for the water bath to heat up ☐

(1 mark)

4.7.3.3 Land use

Question 27 · continued

The table shows the students' results.

Temperature in °C	Time taken until no lipid remained in minutes
5	40
20	15
35	5
50	30
95	lipid still there after 120 minutes

3 (c) Describe the effect on the breakdown of the lipid of increasing the temperature from 5 °C to 50 °C.

.....

.....

.....

.....

(2 marks)

3 (d) Suggest **two** ways in which the students could have improved their investigation.

Use information from the students' method and the results table to help you.

1 .....

.....

.....

2 .....

.....

.....

(2 marks)

Question 3 continues on the next page

4.7.3.3 Land use

Question 27 · continued

3 (e) (i) The lipase did **not** break down the lipid at 95°C.

Why?

.....

.....

(1 mark)

3 (e) (ii) At 35°C the lipase broke down the lipid after 5 minutes.

What new substances will be in the tube?

Draw a ring around **one** answer.

amino acids **fatty acids and glycerol** **sugars**

(1 mark)

8

4.7.3.3 Land use

Question 28

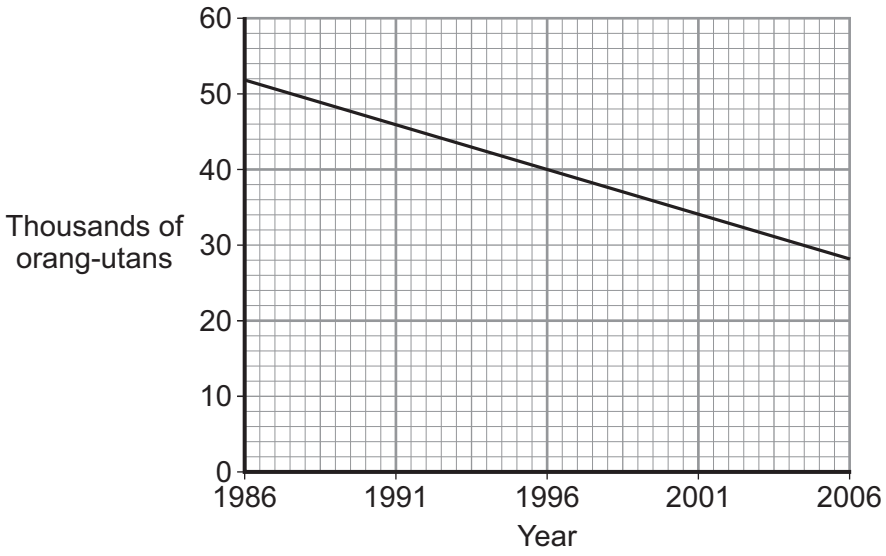
November 2011 | BLY1BP | Original Q8 | Legacy

QUESTION EIGHT

The decrease in the total area of tropical rainforest on Earth is reducing biodiversity and affecting the climate.

Scientists surveyed the numbers of orang-utans in Borneo.

Their results are shown in the graph.



8A What was the annual rate of decrease in orang-utan numbers between 1986 and 2006?

1 1200 per year

2 2400 per year

3 2800 per year

4 5200 per year

8B Biodiversity is . . .

1 the number of different species living in a habitat.

2 the number of individuals living in a habitat.

3 the maintenance of tropical rainforests.

4 the number of endangered species in a habitat.

4.7.3.3 Land use

Question 28 · continued

8C Forests in Borneo are being cut down to clear land for growing crops.

Keeping forests rather than cutting them down for growing crops helps to reduce global warming because . . .

1 carbon dioxide can be 'locked-up' in wood for many years.

2 growing crop plants increases the number of microorganisms in the soil.

3 forests release large amounts of carbon dioxide.

4 some crop plants remove sulfur dioxide from the atmosphere.

8D How does an increase in the amount of greenhouse gases in the atmosphere lead to an increase in global warming?

1 More of the radiation from the Sun passes into the atmosphere.

2 The atmosphere radiates more energy back to Earth.

3 The Earth radiates more energy back into the atmosphere.

4 The sea absorbs more energy from the Sun.

4.7.3.3 Land use

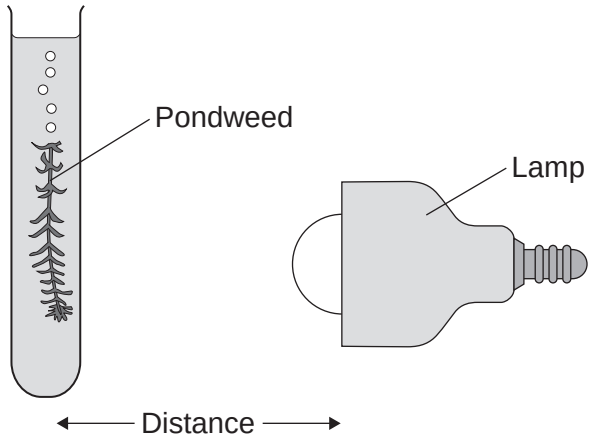
Question 29

January 2013 | BL2HP | Original Q1 | Legacy

1 Some students investigated the effect of light intensity on the rate of photosynthesis.

They used the apparatus shown in **Diagram 1**.

Diagram 1



The students:

- placed the lamp 10 cm from the pondweed
- counted the number of bubbles of gas released from the pondweed in 1 minute
- repeated this for different distances between the lamp and the pondweed.

1 (a) The lamp gives out heat as well as light.

What could the students do to make sure that heat from the lamp did **not** affect the rate of photosynthesis?

.....

.....

(1 mark)

4.7.3.3 Land use

Question 29 · continued

1 (b) The table shows the students' results.

Distance in cm	Number of bubbles per minute
10	84
15	84
20	76
40	52
50	26

1 (b) (i) At distances between 15cm and 50cm, light was a limiting factor for photosynthesis.

What evidence is there for this in the table?

.....

.....

(1 mark)

1 (b) (ii) Give **one** factor that could have limited the rate of photosynthesis when the distance was between 10cm and 15cm.

.....

(1 mark)

Question 1 continues on the next page

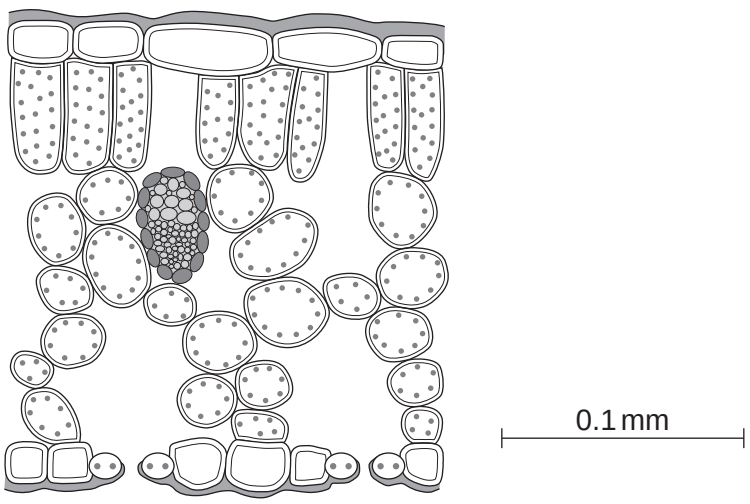
4.7.3.3 Land use

Question 29 · continued

1 (c) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Diagram 2 shows a section through a plant leaf.

Diagram 2



Describe the structure of the leaf and the functions of the tissues in the leaf.

You should use the names of the tissues in your answer.

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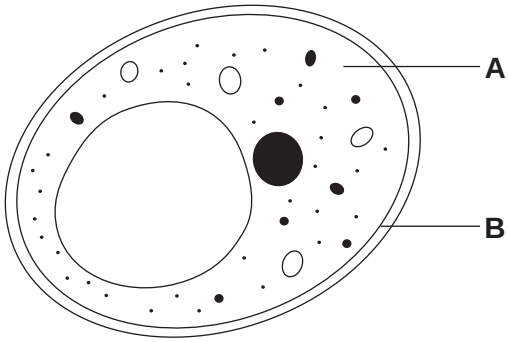
4.7.3.3 Land use

Question 30

June 2013 | BL2HP | Original Q4 | Legacy

4 **Diagram 1** shows a yeast cell.

Diagram 1



4 (a) Name structures **A** and **B**.

A .....

B .....

(2 marks)

4 (b) Yeast cells can respire anaerobically.

The equation for anaerobic respiration in yeast is:

glucose ⟶ alcohol + carbon dioxide (+ energy)

Give **one** way in which anaerobic respiration in yeast cells is different from anaerobic respiration in human muscle cells.

.....

.....

(1 mark)

4.7.3.3 Land use

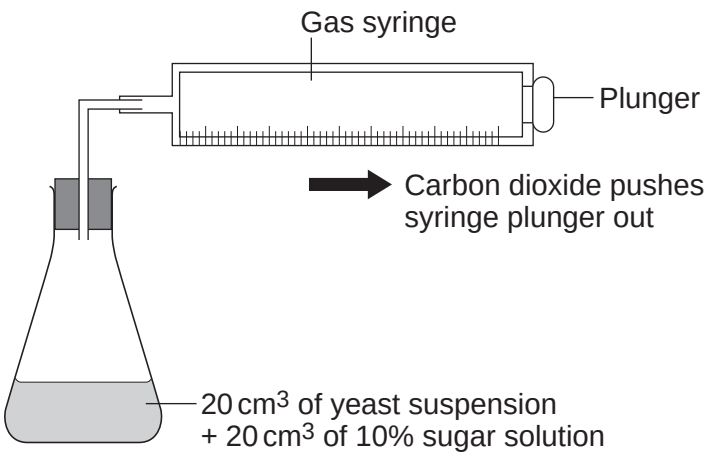
Question 30 · continued

4 (c) Yeast can use other types of sugar instead of glucose.
Some scientists investigated the effect of three different types of sugar on the rate of anaerobic respiration in yeast.

The scientists:

- used the apparatus shown in **Diagram 2** with glucose sugar
- kept the apparatus at 20 °C
- repeated the investigation with fructose sugar and then with mannose sugar
- repeated the investigation with water instead of the sugar solution.

Diagram 2



4 (c) (i) Give **two** control variables the scientists used in this investigation.

.....

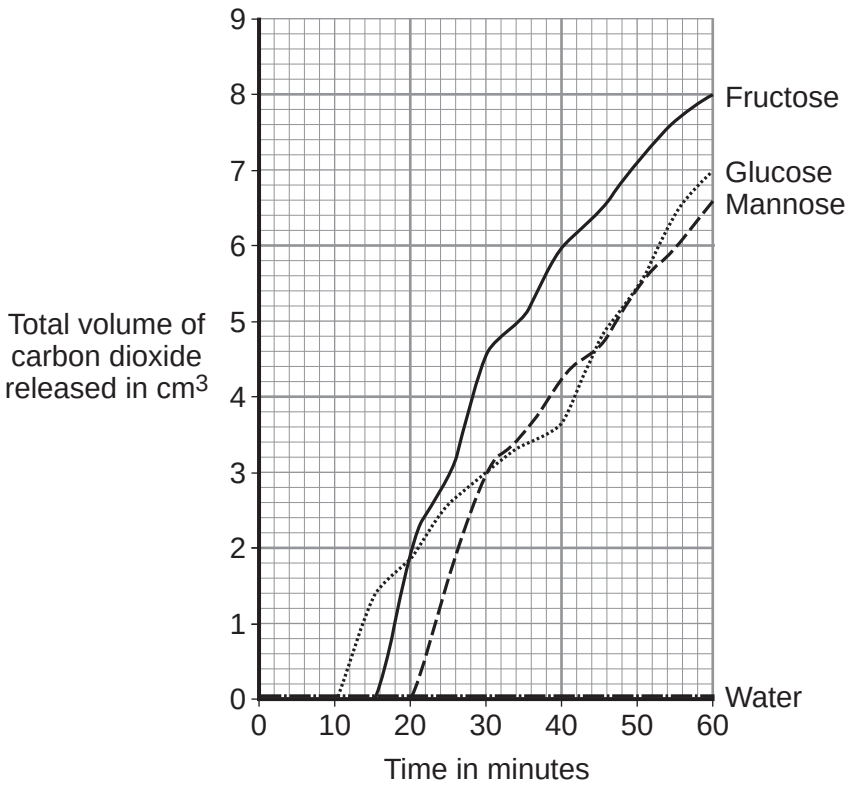
.....

(2 marks)

Question 4 continues on the next page

Question 30 · continued

4 (c) (ii) The graph shows the scientists' results.



From this information, a company decided to use fructose to produce alcohol and **not** mannose or glucose.

Explain the reason for the company's choice.

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(2 marks)

7

4.7.3.3 Land use

Question 31

June 2013 | BL2HP | Original Q8 | Legacy

8 The photographs show the flowers of two closely-related species of plant.

Species A



Species B



The drawings show chromosomes from one cell in the root of each plant during cell division.

Species A



Species B



8 (a) The drawings show that each chromosome has two strands of genetic material.

8 (a) (i) How does a chromosome become two strands?

.....

.....

(1 mark)

4.7.3.3 Land use

Question 31 · continued

8 (a) (ii) Explain why each chromosome must become two strands before the cell divides.

.....

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.....

.....

(2 marks)

8 (b) For sexual reproduction, the plants produce gametes.

8 (b) (i) Name the type of cell division that produces gametes. .....

(1 mark)

8 (b) (ii) How many chromosomes would there be in a gamete from each of these two plant species?

Species A ☐ **Species B** ☐

(1 mark)

8 (b) (iii) It is possible for gametes from **Species A** to combine with gametes from **Species B** to produce healthy offspring plants.

How many chromosomes would there be in each cell of one of the offspring plants?

☐

(1 mark)

Question 8 continues on the next page

4.7.3.3 Land use

Question 31 · continued

8 (c) (i) Look back at the information at the start of the question and the information from part **(b)**.

What evidence from these two pieces of information supports the belief that **Species A** and **Species B** evolved from a common ancestor?

.....

.....

.....

.....

(2 marks)

8 (c) (ii) For successful gamete production to take place, chromosomes that contain the same genes must pair up.

The drawings showing the chromosomes of **Species A** and of **Species B** are repeated below.

Species A



One chromosome

Species B



One chromosome

The offspring plants cannot reproduce sexually.

Suggest an explanation for this.

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.....

(2 marks)

10

4.7.3.3 Land use

Question 32

June 2014 | BL2HP | Original Q3 | Legacy

3 **Figure 2** shows an athlete running on a treadmill.

Figure 2



After running for several minutes, the athlete's leg muscles began to ache.
This ache was caused by a high concentration of lactic acid in the muscles.

3 (a) The equation shows how lactic acid is made.

glucose ⟶ lactic acid (+ energy)

Name the process that makes lactic acid in the athlete's muscles.

[1 mark]

.....

3 (b) Scientists investigated the production of lactic acid by an athlete running at different speeds.

In the investigation:

- the athlete ran on the treadmill at 4 km per hour
- the scientists measured the concentration of lactic acid in the athlete's blood after 2 minutes of running.

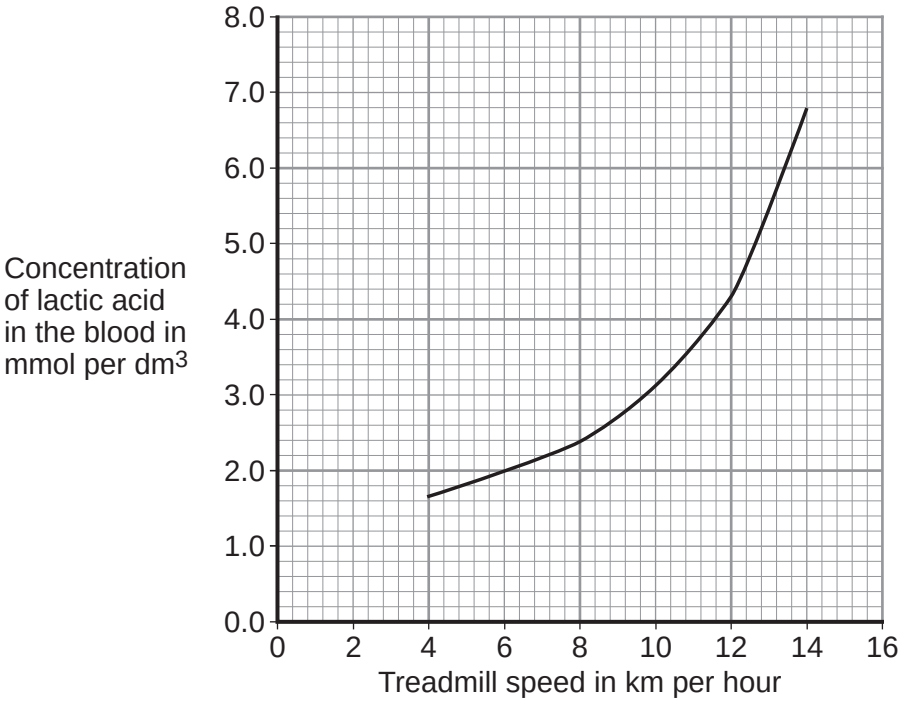
The investigation was repeated for different running speeds.

Figure 3 shows the scientists' results.

4.7.3.3 Land use

Question 32 · continued

Figure 3



3 (b) (i) How much more lactic acid was there in the athlete's blood when he ran at 14 km per hour than when he ran at 8 km per hour?

[2 marks]

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Answer = ... mmol per dm^3

3 (b) (ii) Why is more lactic acid made in the muscles when running at 14 km per hour than when running at 8 km per hour?

[3 marks]

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6

4.7.3.3 Land use

Question 33

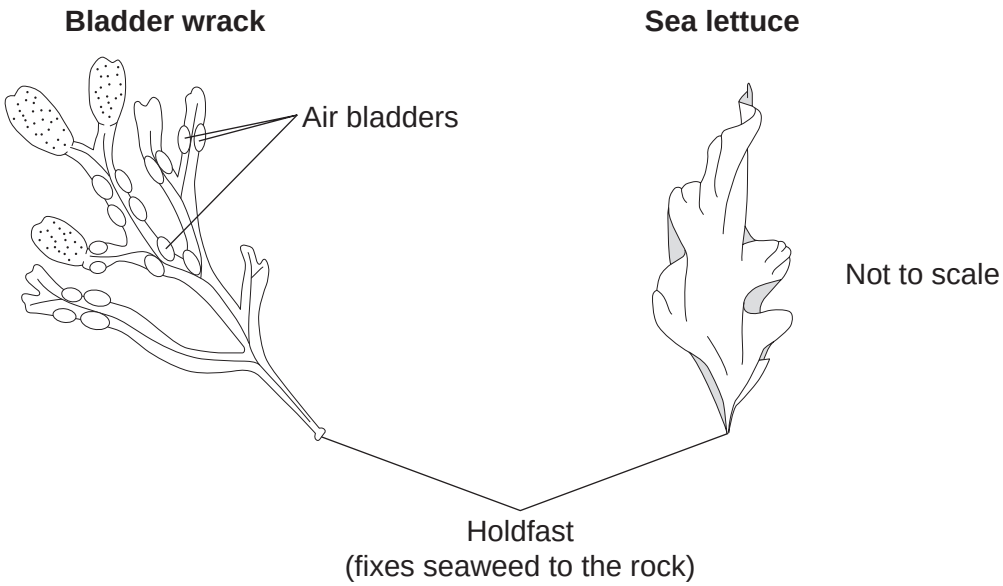
June 2014 | BL2HP | Original Q5 | Legacy

5 At the seashore, the tide comes in and goes out twice each day.

Some students investigated whether two different species of seaweed could live only at certain positions on a rocky shore.
Seaweeds are plant-like organisms that make their food by photosynthesis.

Figure 6 shows the two species of seaweed that the students investigated.

Figure 6



5 (a) The students:

1 placed a 50-metre tape measure on the rocks at right angles to the sea

2 placed a quadrat next to the tape measure

3 recorded whether each species was present or not.

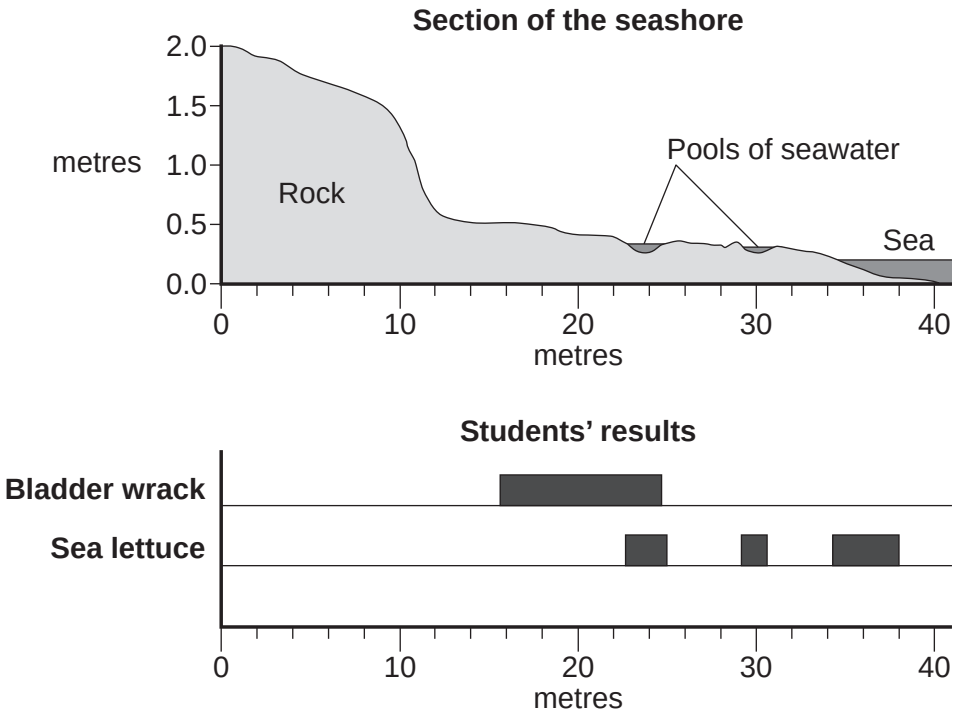
The students repeated steps 2 and 3 every metre down the shore.

Figure 7 shows a section of the seashore and the students' results.

4.7.3.3 Land use

Question 33 · continued

Figure 7



5 (a) (i) The students placed the quadrat at regular intervals along a transect line rather than placing the quadrat at random positions anywhere on the rocky shore.

Explain why.

[2 marks]

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5 (a) (ii) How could the students have improved their investigation to ensure that they produced valid data?

[2 marks]

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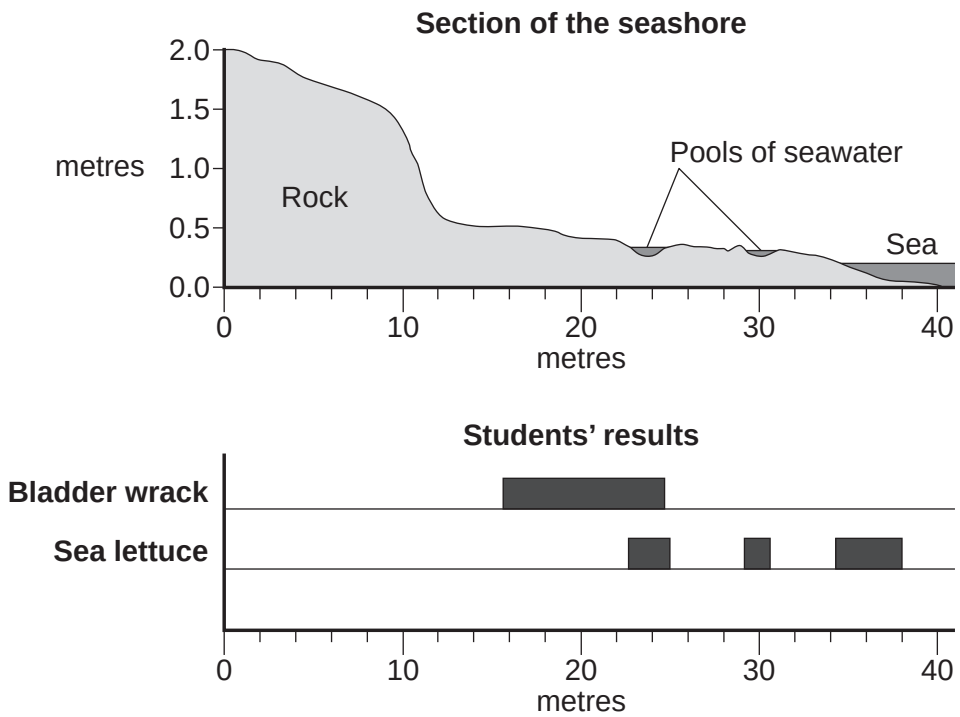
Question 5 continues on the next page

4.7.3.3 Land use

Question 33 · continued

5 (a) (iii) **Figure 7** is repeated here to help you answer this question.

Figure 7



The students concluded that bladder wrack is better adapted than sea lettuce to survive in dry conditions.

What is the evidence for this conclusion?

Use information from **Figure 7**.

[2 marks]

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4.7.3.3 Land use

Question 33 · continued

5 (b) The bladder wrack has many air bladders.
The air bladders help the bladder wrack to float upwards when the sea covers it.

Suggest how this helps the bladder wrack to survive.

[2 marks]

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8

Turn over for the next question

4.7.3.3 Land use

Question 34

June 2014 | BL3HP | Original Q2 | Legacy

2 **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Deforestation affects the environment.

Deforestation is causing a change in the amounts of different gases in the atmosphere. This change causes global warming and climate change.

Figure 2 shows an area of deforestation.

Figure 2



Give the reasons why deforestation is taking place.

Describe how deforestation is causing the change in the amounts of different gases in the atmosphere.

[6 marks]

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4.7.3.3 Land use

Question 35

June 2014 | BL3HP | Original Q5 | Legacy

5 The leaves of most plants have stomata.

5 (a) (i) Name the cells which control the size of the stomata.

[1 mark]

.....

5 (a) (ii) Give **one** function of stomata.

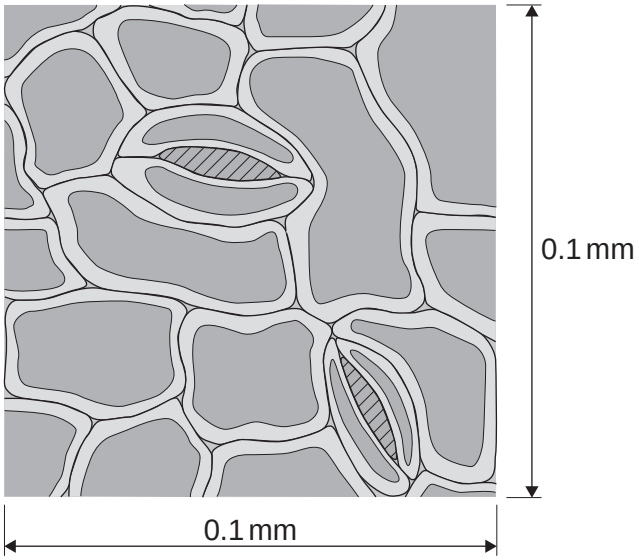
[1 mark]

.....

.....

5 (b) **Figure 5** shows part of the surface of a leaf.

Figure 5



The length and width of this piece of leaf surface are both 0.1 mm.

5 (b) (i) Calculate the number of stomata per mm^2 of this leaf surface.

[2 marks]

.....

.....

..... per mm^2

4.7.3.3 Land use

Question 35 · continued

5 (b) (ii) A different plant species has 400 stomata per mm^2 of leaf surface.

Having a large number of stomata per mm^2 of leaf surface can be a disadvantage to a plant.

Give **one** disadvantage.

[1 mark]

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.....

5 (c) A student investigated the loss of water from plant leaves.

The student did the following:

- Step 1: took ten leaves from a plant
- Step 2: weighed all ten leaves
- Step 3: hung the leaves up in a classroom for 4 days
- Step 4: weighed all ten leaves again
- Step 5: calculated the mass of water lost by the leaves
- Step 6: repeated steps **1** to **5** with grease spread on the upper surfaces of the leaves
- Step 7: repeated steps **1** to **5** with grease spread on both the upper and lower surfaces of the leaves.

All the leaves were taken from the same type of plant.

Table 2 shows the student's results.

Table 2

Treatment of leaves	Mass of water the leaves lost in g
No grease was used on the leaves	0.98
Grease on upper surfaces of the leaves	0.86
Grease on upper and lower surfaces of the leaves	0.01

4.7.3.3 Land use

Question 35 · continued

5 (c) (i) What mass of water was lost in 4 days through the upper surfaces of the leaves?

[1 mark]

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Mass = ... g

5 (c) (ii) Very little water was lost when the lower surfaces of the leaves were covered in grease.

Explain why.

[3 marks]

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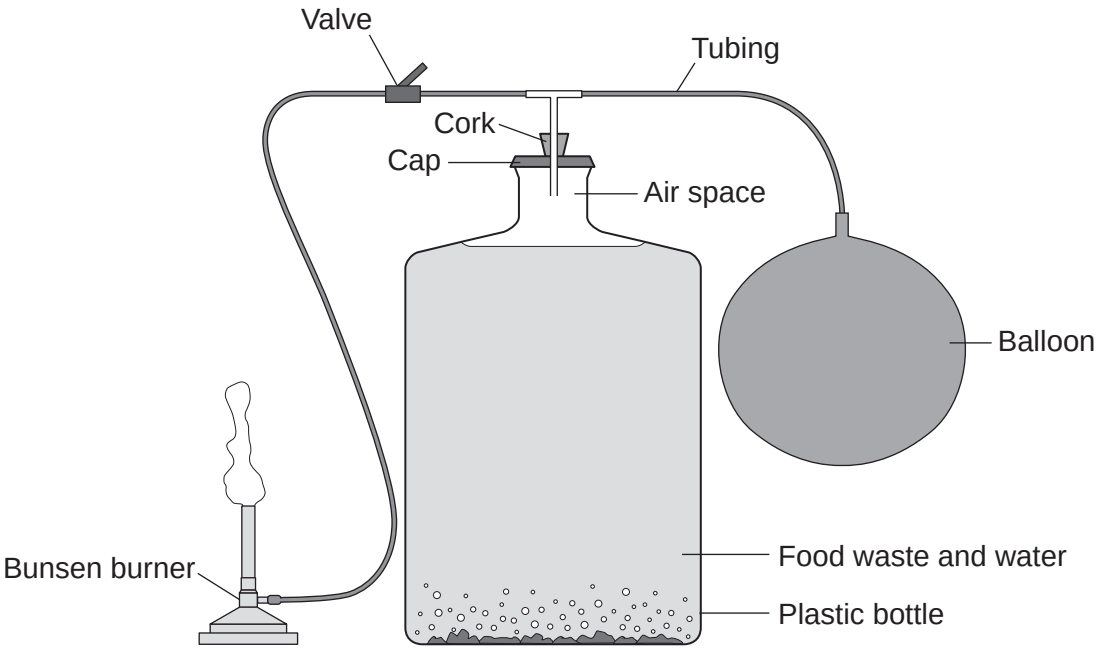
4.7.3.3 Land use

Question 36

June 2014 | BL3HP | Original Q7 | Legacy

7 **Figure 7** shows a model biogas generator.

Figure 7



Students used the model biogas generator to investigate which type of food waste produces the greatest yield of biogas.

Gas collects in the balloon. The gas is then released through the valve and is burned at the Bunsen burner.

The students:

- put 500 g of potato peelings in the plastic bottle with some water and sealed the apparatus
- released the gas from the balloon after day two and timed how long the gas burned for
- released the gas that had collected in the balloon from day two to day four and timed how long the gas burned for
- repeated the investigation using 500 g of cooked rice, then 500 g of cabbage leaves and then 500 g of cooked pasta.

4.7.3.3 Land use

Question 36 · continued

7 (a) **Table 3** shows the students' results.

Table 3

Type of food waste	Length of time the gas burned in seconds	
	After day two	From day two to day four
Potato peelings	0	175
Cooked rice	0	100
Cabbage leaves	0	150
Cooked pasta	0	160

7 (a) (i) Suggest why the gas collected in the balloon and released after day two did not burn.

[3 marks]

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7 (a) (ii) Suggest why potato peelings produced the most biogas.

[1 mark]

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Question 7 continues on the next page

4.7.3.3 Land use

Question 36 · continued

7 (b) Scientists investigated the production of biogas from different types of animal manure.

Table 4 shows the scientists' results.

Table 4

Type of manure	Volume of biogas produced in m^3 per kg of manure	Methane in the biogas as % of total volume
Cow	0.34	65
Pig	0.58	68
Hen	0.62	60
Horse	0.30	66
Sheep	0.61	67

7 (b) (i) Calculate the volume of methane produced from 1 kg of cow manure.

[2 marks]

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Volume of methane = ... m^3

7 (b) (ii) One scientist concluded that it would be better to use sheep manure in a biogas generator than to use cow manure.

What is the evidence for this conclusion?

Use information from **Table 4** in your answer.

[2 marks]

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4.7.3.3 Land use

Question 37

June 2015 | BL2HP | Original Q1 | Legacy

1 Lipase is an enzyme that digests fat.

1 (a) (i) Complete the equation to show the digestion of fat.

Use the correct answer from the box.

[1 mark]

glucose	**glycerol**	**glycogen**

fat $\xrightarrow{\text{lipase}}$ fatty acids + ...

1 (a) (ii) Name **one** organ that makes lipase.

[1 mark]

.....

1 (b) Some students investigated the effect of bile on the digestion of fat by lipase.

The students:
1 mixed milk and bile in a beaker
2 put the pH sensor of a pH meter into the beaker
3 added lipase solution
4 recorded the pH at 2-minute intervals
5 repeated steps 1 to 4, but used water instead of bile.

Suggest **two** variables that the students should have controlled in this investigation.

[2 marks]

1 .....

.....

2 .....

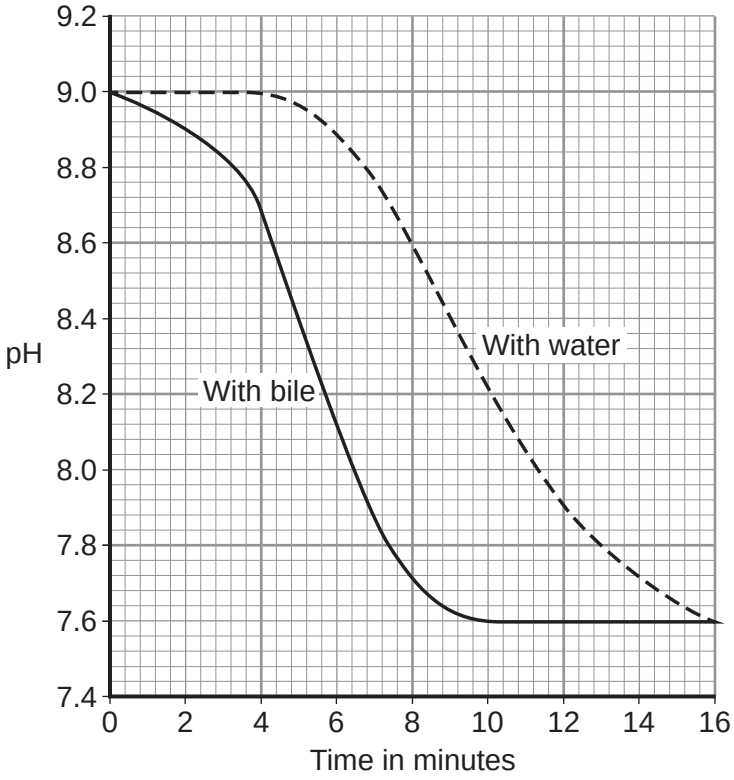
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4.7.3.3 Land use

Question 37 · continued

1 (c) **Figure 1** shows the students' results.

Figure 1



1 (c) (i) Why did the pH decrease in both investigations?

[1 mark]

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1 (c) (ii) Bile helps lipase to digest fat.

What evidence is there in **Figure 1** to support this conclusion?

[1 mark]

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1 (c) (iii) Suggest **one** reason why the contents of both beakers had the same pH at the end of the investigations.

[1 mark]

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7

4.7.3.3 Land use

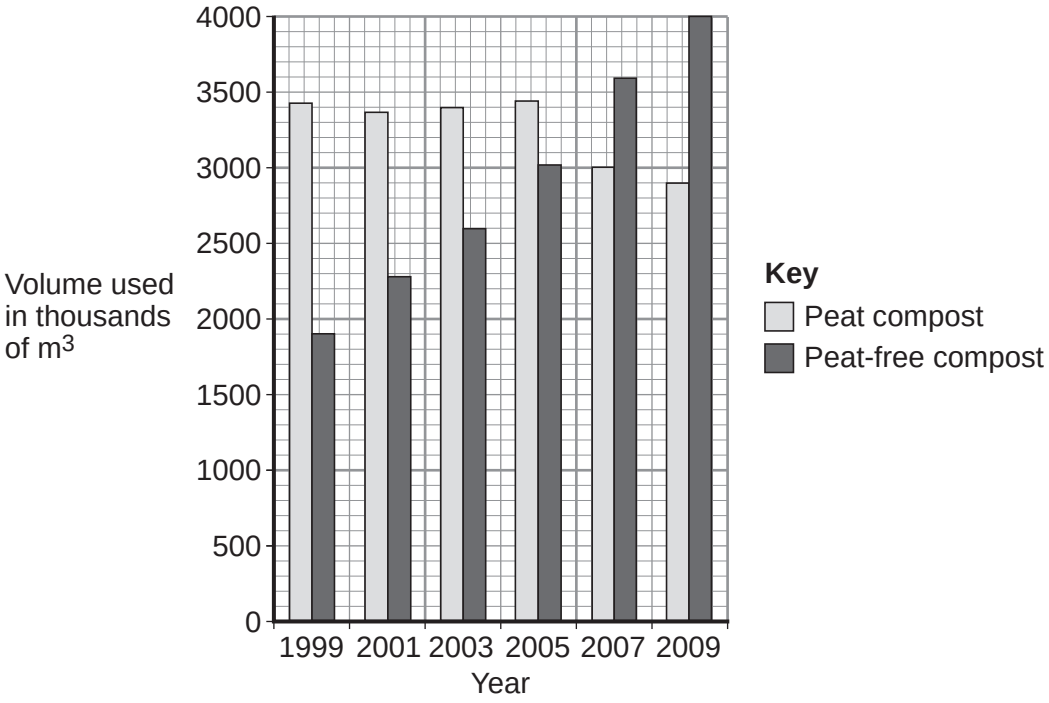
Question 38

June 2015 | BL3HP | Original Q3 | Legacy

3 Human activities have many effects on our ecosystem.

Figure 3 shows the volume of peat compost and peat-free compost used in gardening from 1999 to 2009.

Figure 3



3 (a) Describe the trends shown in **Figure 3**.

[2 marks]

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4.7.3.3 Land use

Question 38 · continued

3 (b) What effect does the destruction of peat bogs have on the gases in the atmosphere?

[1 mark]

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3 (c) Deforestation is also damaging ecosystems.

Describe **one** effect of deforestation on ecosystems.

[1 mark]

.....

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4

Turn over for the next question

4.7.3.3 Land use

Question 39

June 2015 | BL3HP | Original Q4 | Legacy

4 In many areas of the world the mass of household waste produced each year is increasing.

4 (a) Give **two** reasons why the mass of household waste is increasing each year.

[2 marks]

1 .....

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2 .....

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4 (b) **Table 1** shows how the mass of household waste in the UK has changed from 2004 to 2012.

Table 1

Year	Total mass of household waste in thousands of tonnes (including total household recycling)	Total mass of household recycling in thousands of tonnes	Percentage of household waste recycled
2004	25 658	5785	22.5
2006	25 775	7976	30.9
2008	24 334	9398	38.6
2010	23 454	9733	
2012	22 643	9782	43.2

4 (b) (i) Calculate the percentage of household waste recycled in 2010.

[2 marks]

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..... %

4.7.3.3 Land use

Question 39 · continued

4 (b) (ii) The UK government has been encouraging a 'zero waste economy'.

In a 'zero waste economy', we reduce, reuse and recycle as much waste as possible.

A newspaper concluded that: **'The government's 'zero waste economy' has been successful.'**

Use information from **Table 1** to describe the reasons for and against the newspaper's conclusion.

[4 marks]

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4 (c) (i) Some waste releases carbon dioxide and methane into the atmosphere.
An increase in carbon dioxide and methane contributes to global warming.

Global warming can cause sea levels to rise.

Describe **two** other possible effects of global warming on our environment.

[2 marks]

1 .....

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2 .....

.....

4 (c) (ii) Storing the carbon dioxide helps to prevent more global warming.
Carbon dioxide can be stored (sequestered) in trees when they photosynthesise.

Give **one** different way in which carbon dioxide is sequestered in our environment.

[1 mark]

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11

4.7.3.3 Land use

Question 40

June 2015 | BL3HP | Original Q5 | Legacy

5 Many runners drink sports drinks to improve their performance in races.

A group of students investigated the effects of three brands of sports drink, **A**, **B** and **C**, on the performance of three runners on a running machine. One of the runners is shown in **Figure 4**.

Figure 4



Table 2 gives information for each drink.

Table 2

	Brand of sports drink		
Nutrient per dm^3	**A**	**B**	**C**
Glucose in g	63	31	72
Fat in g	9	0	2
Ions in mg	312	332	495

4.7.3.3 Land use

Question 40 · continued

5 (a) (i) In the investigation, performance was measured as the time taken to reach the point of exhaustion.

Exhaustion is when the runners could not run anymore.

All three runners:
- ran on a running machine until the point of exhaustion
- each drank 500 cm^3 of a different brand of sports drink
- rested for 4 hours to recover
- ran on the running machine again and recorded how much time they ran until the point of exhaustion.

The speed at which the runners ran was the same and all other variables were controlled.

The students predicted that the runner drinking brand **B** would run for the shortest time on the second run before reaching the point of exhaustion.

Use information from **Table 2** to suggest an explanation for the students' prediction.

[2 marks]

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5 (a) (ii) If the balance between ions and water in a runner's body is not correct, the runner's body cells will be affected.

Describe **one** possible effect on the cells if the balance between ions and water is **not** correct.

[1 mark]

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5 (b) When running, a runner's body temperature increases.

Describe how the brain monitors body temperature.

[3 marks]

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4.7.3.3 Land use

Question 40 · continued

5 (c) (i) **Table 2** is repeated here to help you answer this question.

Table 2

	Brand of sports drink		
Nutrient per dm^3	**A**	**B**	**C**
Glucose in g	63	31	72
Fat in g	9	0	2
Ions in mg	312	332	495

People with diabetes need to be careful about drinking too much sports drink.

Use information from **Table 2** to explain why drinking too much sports drink could make people with diabetes ill.

[3 marks]

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5 (c) (ii) Other than paying attention to diet, how do people with diabetes control their diabetes?

[1 mark]

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10

4.7.3.3 Land use

Question 41

June 2017 | BL2HP | Original Q3 | Legacy

3 Amylase is an enzyme that breaks down starch.

3 (a) Complete the equation to show the breakdown of starch.

[1 mark]

Starch $\xrightarrow{\text{amylase}}$ _____

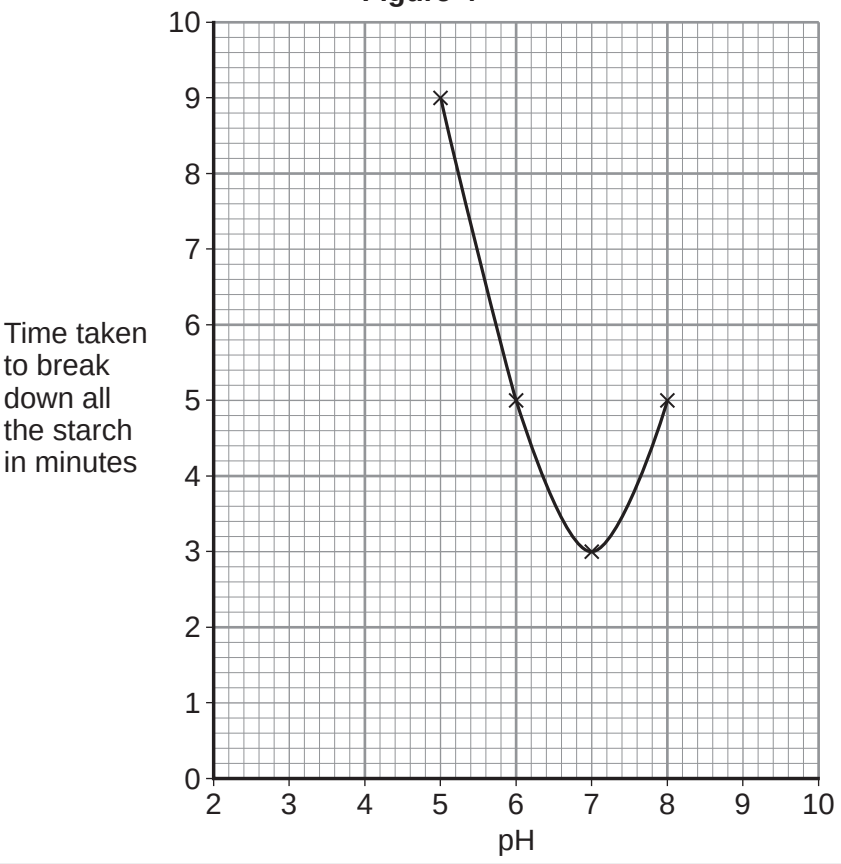
3 (b) Some students investigated the effect of pH on the activity of amylase.

The students:

- put 5 cm^3 of pH5 solution + 1 cm^3 of amylase solution into a test tube
- put 4 cm^3 of starch suspension into a second test tube
- left both test tubes at room temperature for 5 minutes
- mixed the contents of the two test tubes
- removed a small sample of the mixture at 1-minute intervals
- tested each sample for starch
- timed how long it took to break down all the starch
- repeated each of the above steps at pH6, pH7 and pH8.

Figure 4 shows the students' results.

Figure 4



4.7.3.3 Land use

Question 41 · continued

3 (b) (i) Give **two** variables which were controlled in this investigation.

[2 marks]

1 _____

_____

2 _____

_____

3 (b) (ii) The students tested samples of the reaction mixture for starch.
In each test, they added one drop of the reaction mixture to one drop of iodine solution on a white tile.

- Iodine solution = light brown colour
- Iodine solution + starch = dark blue colour

Predict the colour seen in the iodine test on the samples of the pH6 reaction mixture at 4 minutes and at 6 minutes.

[1 mark]

4 minutes _____

6 minutes _____

3 (b) (iii) The students concluded that amylase works best at pH7.
This may **not** be a valid conclusion.

Suggest **two** improvements to the investigation that would increase the validity of the students' conclusion.

[2 marks]

1 _____

_____

2 _____

_____

Question 3 continues on the next page

4.7.3.3 Land use

Question 41 · continued

3 (b) (iv) The students repeated the investigation at pH3.

What result would you expect at pH3?

Give a reason for your answer.

[2 marks]

8

4.7.3.3 Land use

Question 42

June 2017 | BL3HP | Original Q5 | Legacy

5 Plants have transport systems.

5 (a) In **Table 2**, name **two** tissues that transport substances through a plant. For each tissue, name **one** substance that it transports.

[2 marks]

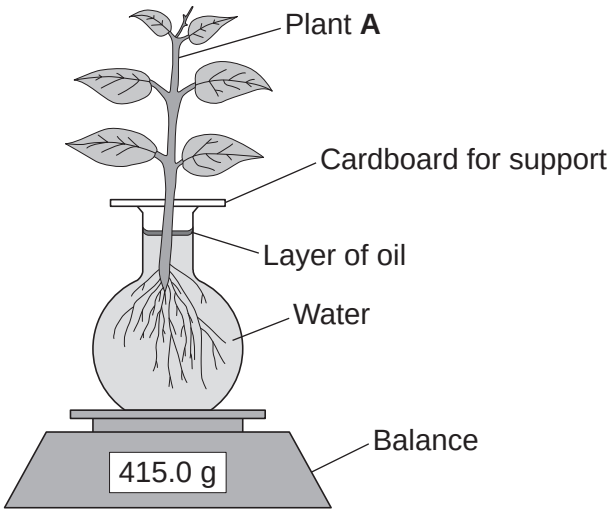
Table 2

Tissue	Substance transported
1 _____	_____
2 _____	_____

5 (b) A student investigated the rate of transpiration in four different plant species, **A**, **B**, **C** and **D**.

He set up the apparatus for plant **A** as shown in **Figure 4**.

Figure 4



In each experiment he:

- recorded the mass of the apparatus at the start of the experiment
- recorded the mass every 5 minutes for 30 minutes
- repeated the experiment with plants **B**, **C** and **D**.

4.7.3.3 Land use

Question 42 · continued

Figure 5 shows his results.

Figure 5

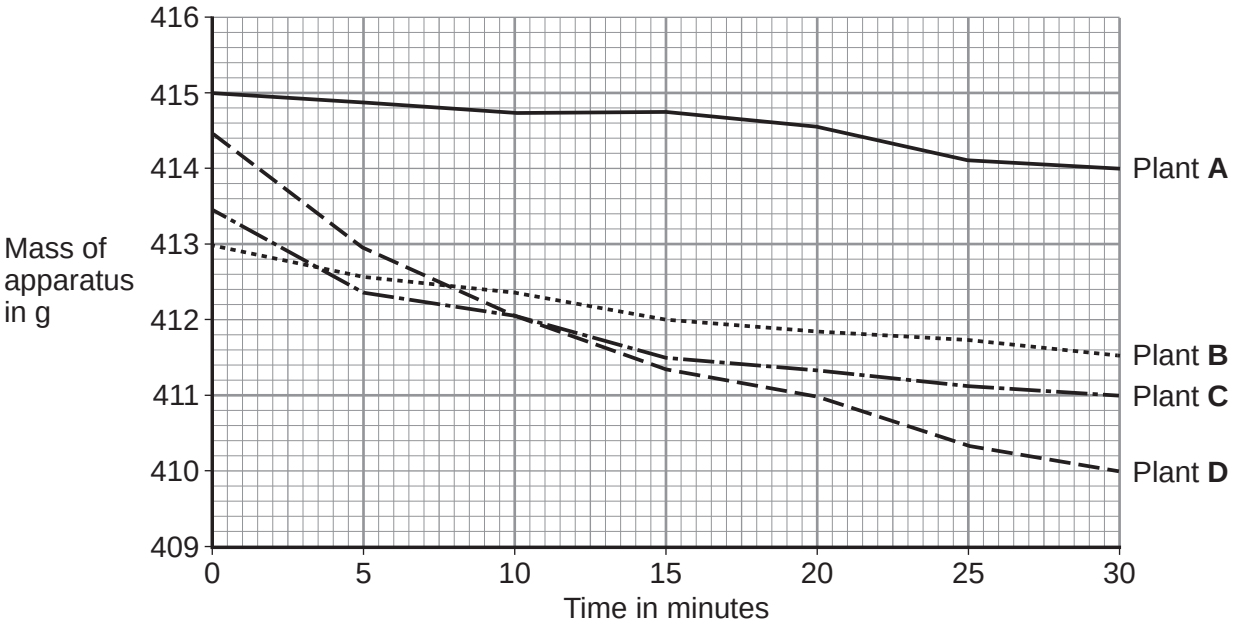


Table 3 shows information about the four plant species.

Table 3

Plant species	Mean number of stomata per mm^2 of leaf
Bellflower	42.74
Caraway	117.50
Goosegrass	6.94
Clover	387.33

5 (b) (i) The student concluded that plant **D** was clover.

Use information from **Figure 5** and **Table 3** to suggest an explanation for the student's conclusion.

[3 marks]

4.7.3.3 Land use

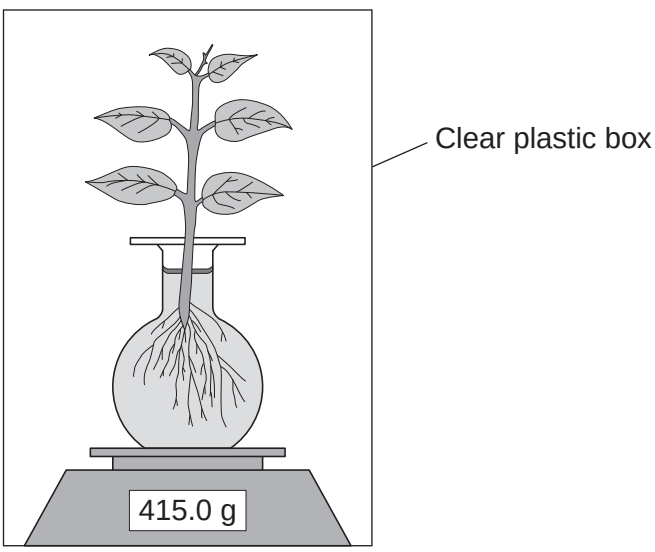
Question 42 · continued

5 (b) (ii) The student carried out another experiment using plant **A**.

The student used the same apparatus and method.

In this experiment the apparatus was placed in a clear plastic box for the 30 minutes, as shown in **Figure 6**.

Figure 6



Explain what would happen to the rate of water loss due to transpiration in this experiment compared to the first investigation.

[3 marks]

8

4.7.3.3 Land use

Question 43

June 2018 | 8461/1H | Original Q1

0 1 Eating food containing *Salmonella* bacteria can cause illness.

0 1 . 1 Two symptoms of infection by *Salmonella* are vomiting and diarrhoea.

What causes these symptoms?

[1 mark]

0 1 . 2 Give **two** ways a person with a mild infection of *Salmonella* can help prevent the spread of the bacteria to other people.

[2 marks]

1

2

0 1 . 3 In very serious infections of *Salmonella*, a doctor can prescribe drugs to kill the bacteria.

What type of drug can the doctor prescribe to kill the bacteria?

[1 mark]

0 1 . 4 A person with AIDS may take longer than a healthy person to recover from a *Salmonella* infection.

Explain why.

[2 marks]

Question 43 · continued

0 1 . 5 *Salmonella* bacteria can be transmitted from chickens to humans. Chickens can be vaccinated to prevent the transmission of *Salmonella* bacteria to humans.

Suggest **one** other way farmers could prevent the transmission of *Salmonella* from chickens to humans.

[1 mark]

A restaurant owner employed a scientist to test the effectiveness of two kitchen cleaning liquids.

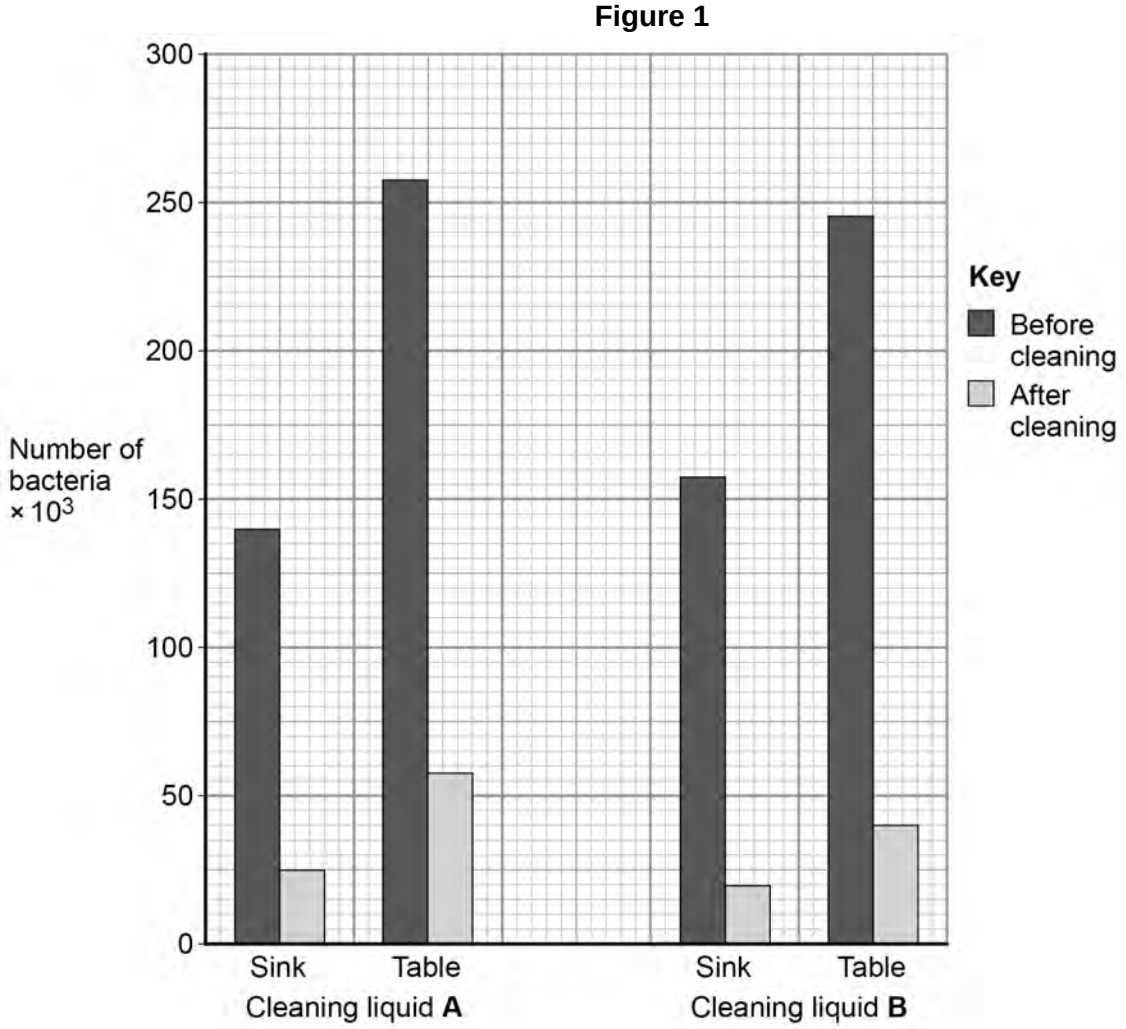
The scientist took samples from two work surfaces:

- before the surfaces had been cleaned with the cleaning liquids
- after the surfaces had been cleaned with the cleaning liquids.

The samples were then analysed for the number of bacteria they contained.

The results are shown in **Figure 1**.

Figure 1



4.7.3.3 Land use

Question 43 · continued

0 1 . 6 Which cleaning liquid is the more effective?

Give a reason for your answer.

[1 mark]

Cleaning Liquid _____

Reason _____

_____

_____

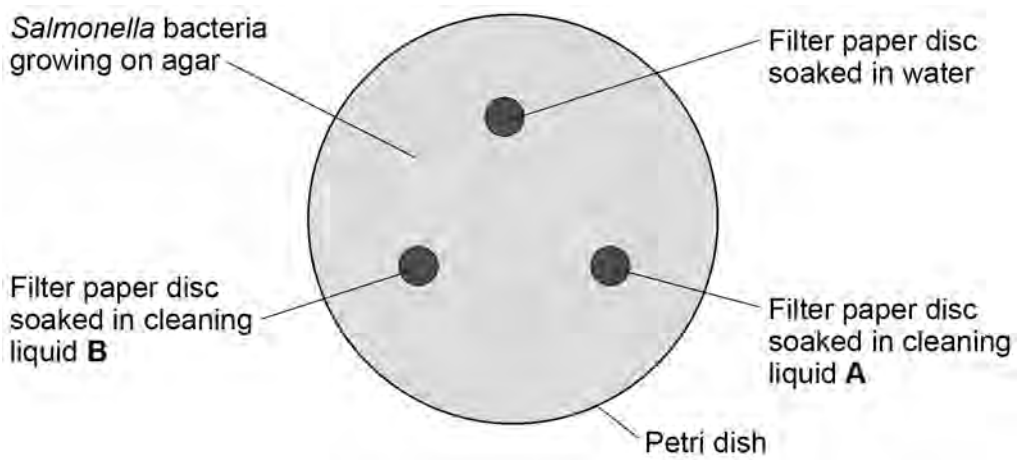
Question 1 continues on the next page

Question 43 · continued

The scientist investigated the effect of cleaning liquid **A** and cleaning liquid **B** on *Salmonella* bacteria grown in a laboratory.

Figure 2 shows the way the investigation was set up.

Figure 2



The Petri dish was placed in an incubator at 25 °C for 48 hours.

After 48 hours, the scientist calculated the area around each paper disc where no bacteria were growing.

The results are shown in **Table 1**.

Table 1

Filter paper disc	Area around disc with no bacteria growing in cm^2
Water	0
Cleaning liquid **A**	11
Cleaning liquid **B**	13

0 1 . 7 What measurement would the scientist need to take to calculate the area where no bacteria were growing?

[1 mark]

4.7.3.3 Land use

Question 43 · continued

0 1 . 8 Give **one** change to the investigation that would allow the scientist to check if the results are repeatable.

[1 mark]

0 1 . 9 The scientist showed the results to the restaurant owner.

Both cleaning liquids cost the same per dm^3.

Suggest **one** other factor the restaurant owner should consider when choosing which cleaning liquid to use.

[1 mark]

11

4.7.3.3 Land use

Question 44

June 2019 | 8461/1H | Original Q3

0 3 This question is about photosynthesis.

0 3 . 1 Complete the word equation for photosynthesis:

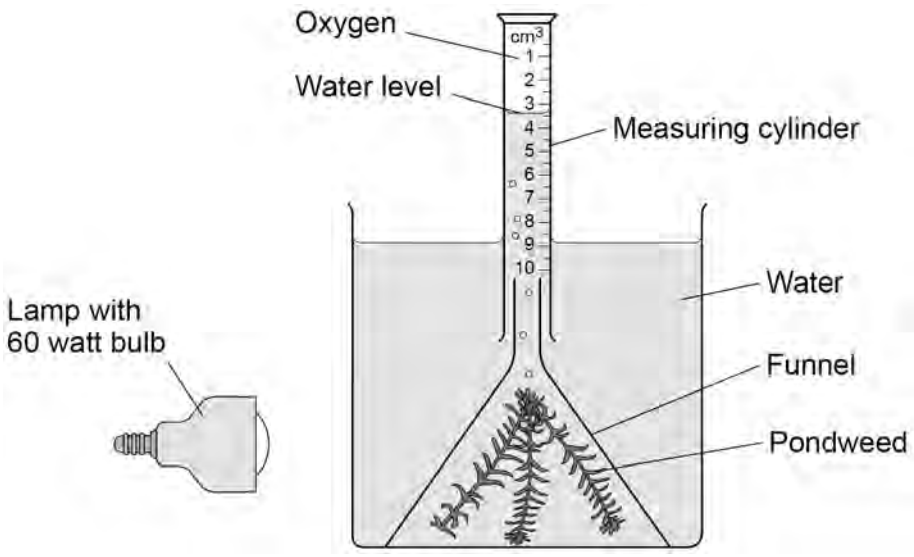
[2 marks]

_____ + _____ ⟶ _____ + oxygen

A student investigated photosynthesis using pondweed.

Figure 3 shows the apparatus the student used.

Figure 3



This is the method used.

1. Set up the apparatus as shown in **Figure 3**.
2. Switch on the lamp.
3. After 20 minutes, record the volume of oxygen collected in the measuring cylinder.
4. Repeat steps 1–3 using bulbs of different power output.

4.7.3.3 Land use

Question 44 · continued

0 3 . 2 What was the independent variable in the investigation?

[1 mark]

Tick (✓) **one** box.

- Power output of bulb ☐
- Rate of photosynthesis ☐
- Time to collect oxygen ☐
- Volume of oxygen collected ☐

0 3 . 3 Suggest **two** ways the method could be improved so the results would be more valid.

[2 marks]

1 _____

_____

2 _____

_____

Question 3 continues on the next page

4.7.3.3 Land use

Question 44 · continued

Table 3 shows the student's results.

Table 3

Power output of bulb in watts	Volume of oxygen collected in 20 minutes in cm^3	Rate of photosynthesis in cm^3/hour
60	0.5	1.5
100	0.8	2.4
150	1.1	**X**
200	1.2	3.6
250	1.2	3.6

0 3 . 4 Calculate value **X** in **Table 3**.

[1 mark]

X = _____ cm^3/hour

Question 44 · continued

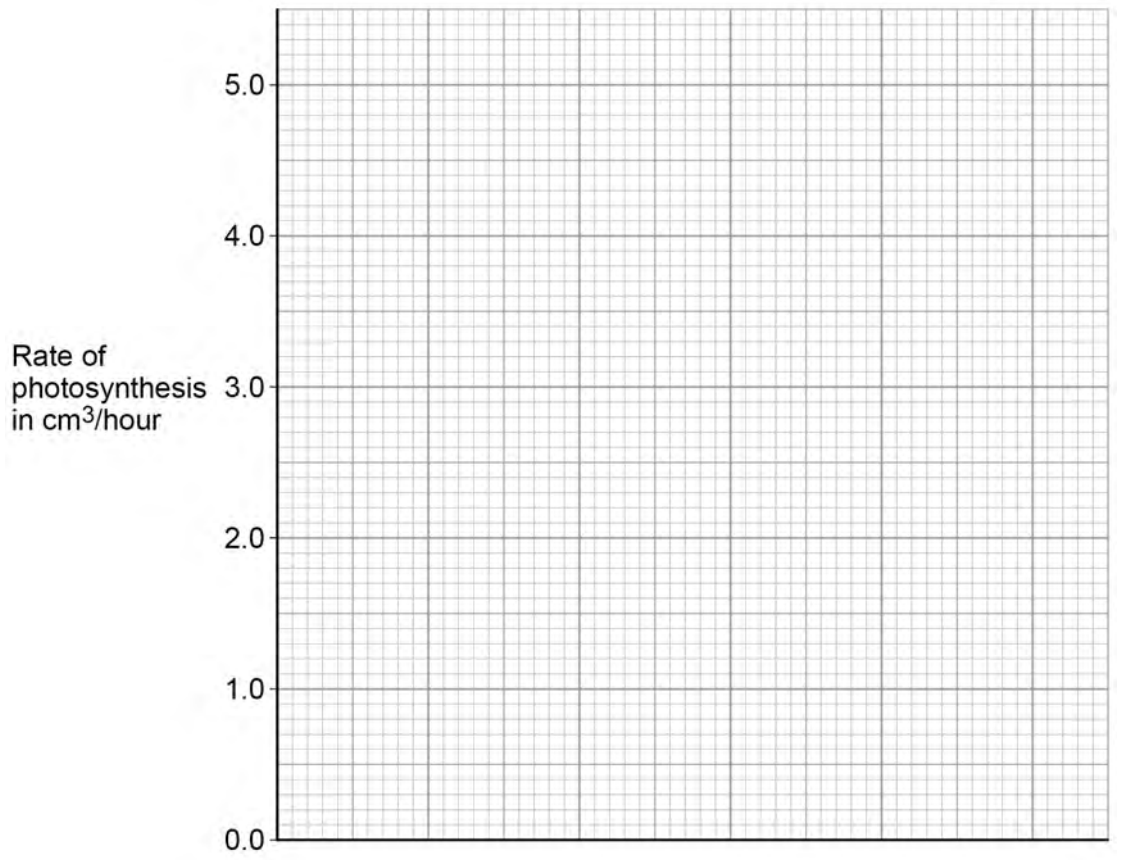
0 3 . 5 Complete **Figure 4**.

[4 marks]

You should:

- label the x-axis
- use a suitable scale
- plot the data from **Table 3** and your answer to Question **03.4**
- draw a line of best fit.

Figure 4



0 3 . 6 Determine the expected rate of photosynthesis with a bulb of power output 75 watts.

Use **Figure 4**.

[1 mark]

Rate of photosynthesis at 75 watts = _____ cm^3/hour

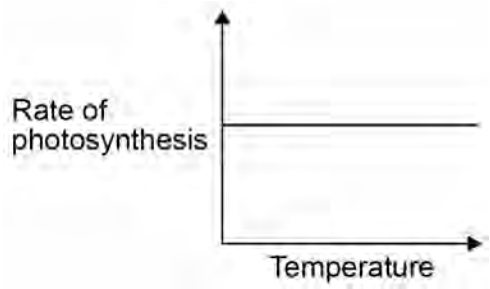
4.7.3.3 Land use

Question 44 · continued

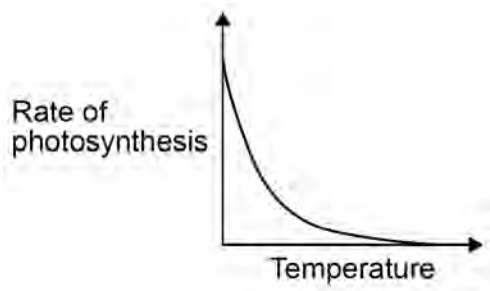
0 3 . 7 Which graph shows the effect of temperature on the rate of photosynthesis?

[1 mark]

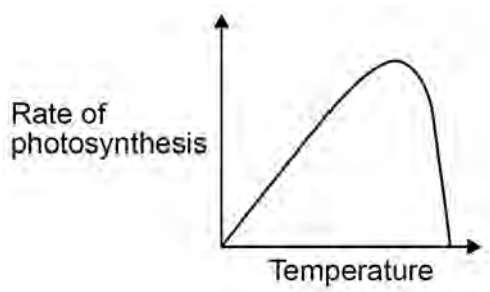
Tick (✓) **one** box.



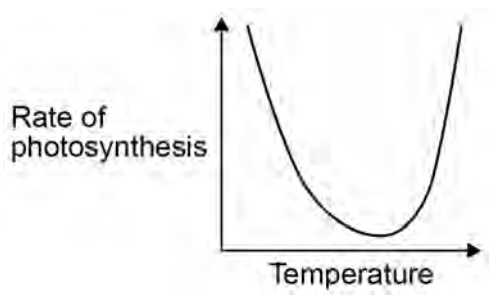
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12

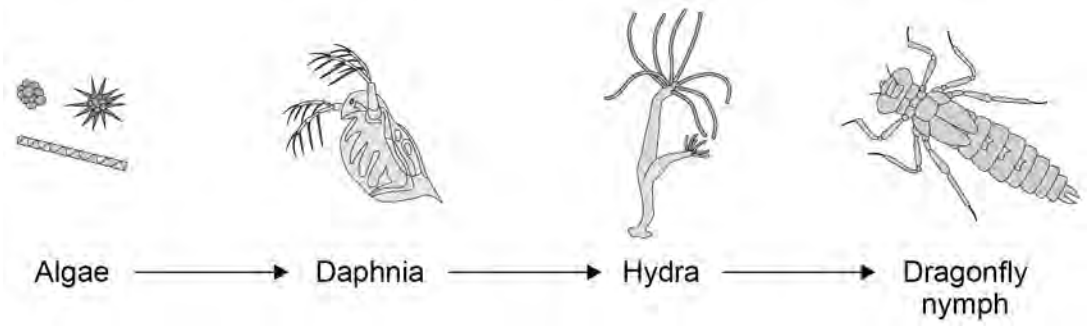
4.7.3.3 Land use

Question 45

June 2019 | 8461/2H | Original Q1

0 1 **Figure 1** shows a food chain in a pond.

Figure 1



0 1 . 1 Which term describes the Daphnia in this food chain?

[1 mark]

Tick (✓) **one** box.

- Apex predator ☐
- Primary consumer ☐
- Producer ☐
- Secondary consumer ☐

4.7.3.3 Land use

Question 45 · continued

0 1 . 2 Draw a pyramid of biomass for the food chain.

Label each trophic level.

[2 marks]

0 1 . 3 Give **one** reason why the total biomass of the Daphnia in the pond is different from the total biomass of the algae.

[1 mark]

_____

_____

Question 1 continues on the next page

Question 45 · continued

Students investigated the size of the population of Daphnia in the pond.

This is the method used.

1. Collect 1 dm^3 of pond water from near the edge of the pond.
2. Pour the water through a fine net.
3. Count the number of Daphnia caught in the net.
4. Repeat steps 1–3 four more times.

Table 1 shows the results.

Table 1

Sample number	Number of Daphnia in 1 dm^3 water
1	5
2	21
3	0
4	16
5	28

0 1 . 4 Calculate the mean number of Daphnia in 1 m^3 of pond water.

1 m^3 = 1000 dm^3

[2 marks]

Mean number of Daphnia in 1 m^3 of pond water = _____

4.7.3.3 Land use

Question 45 · continued

0 1 . 5 The pond was a rectangular shape, measuring:

- length = 2.5 metres
- width = 1.5 metres
- depth = 0.5 metres.

Calculate the estimated number of Daphnia in the pond.

Use your answer from Question **01.4**.

Give your answer in standard form.

[4 marks]

Number of Daphnia in the pond = _____

Question 1 continues on the next page

4.7.3.3 Land use

Question 45 · continued

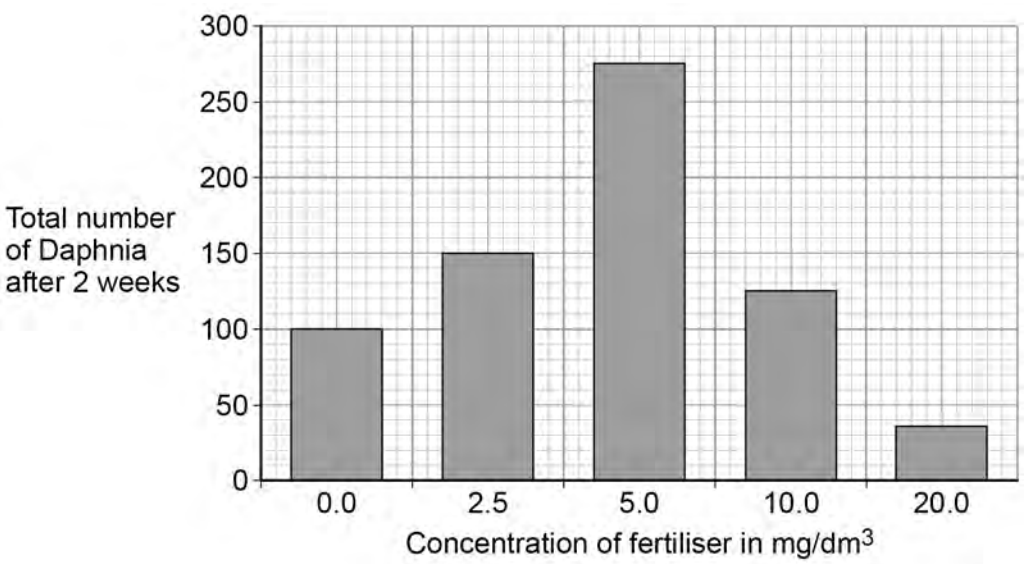
Rainfall can cause fertiliser to be washed from farmland into a pond.

The students investigated the effect of fertiliser on the population of Daphnia in water from the pond.

- The students put 20 Daphnia in each of five different concentrations of fertiliser.
- The students counted the total number of Daphnia in each concentration of fertiliser after 2 weeks.

Figure 2 shows the results.

Figure 2



0 1 . 6 A concentration of 5.0 mg/dm^3 of fertiliser caused a large increase in the population of Daphnia.

Explain why.

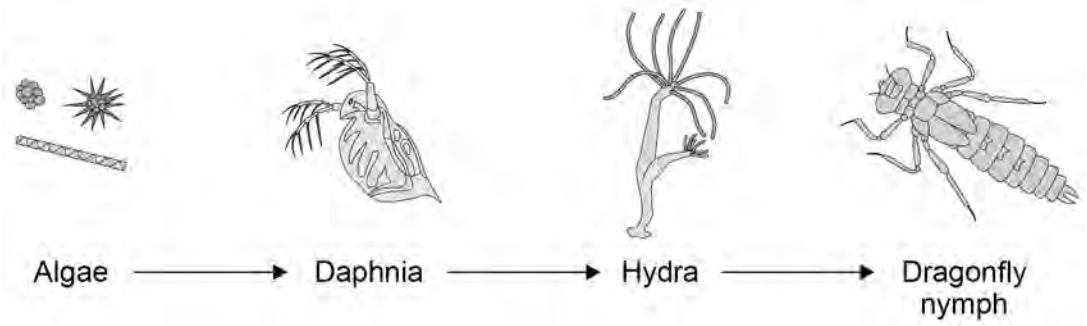
[2 marks]

4.7.3.3 Land use

Question 45 · continued

0 1 . 7 **Figure 1** is repeated below.

Figure 1



The population of **Hydra** will decrease when 20 mg/dm^3 of fertiliser is added to the pond.

Explain why.

[2 marks]

14

4.7.3.3 Land use

Question 46

November 2020 | 8461/1H | Original Q1

0 1 This question is about photosynthesis.

0 1 . 1 Complete the word equation for photosynthesis.

[2 marks]

_____ + _____ → _____ + oxygen

0 1 . 2 Describe how energy for the photosynthesis reaction is gained by plants.

[2 marks]

Students investigated the effect of temperature on the rate of photosynthesis.

The students shone light from a lamp onto pondweed and measured the volume of oxygen produced per hour.

Table 1 shows the results.

Table 1

Temperature in °C	Rate of photosynthesis in cm^3/hour			
	Test 1	Test 2	Test 3	Mean
20	18.5	19.3	19.5	**X**
25	32.6	34.1	32.9	33.2
30	41.9	45.2	44.9	44.0
35	38.6	39.8	44.0	40.8
40	23.1	20.5	22.4	22.0
45	1.9	14.2	2.2	2.1

Question 46 · continued

0 1 . 3 Calculate mean value **X**.

[2 marks]

X = _____ cm^3/hour

The students identified one anomalous result in **Table 1**.

0 1 . 4 Draw a ring around the anomalous result in **Table 1**.

[1 mark]

0 1 . 5 Suggest **one** possible cause of the anomalous result.

[1 mark]

0 1 . 6 How did the students deal with the anomalous result?

[1 mark]

0 1 . 7 Give **one** factor the students should have kept constant in this investigation.

[1 mark]

4.7.3.3 Land use

Question 46 · continued

Table 1 is repeated below.

Table 1

Temperature in °C	Rate of photosynthesis in cm^3/hour			
	Test 1	Test 2	Test 3	Mean
20	18.5	19.3	19.5	**X**
25	32.6	34.1	32.9	33.2
30	41.9	45.2	44.9	44.0
35	38.6	39.8	44.0	40.8
40	23.1	20.5	22.4	22.0
45	1.9	14.2	2.2	2.1

0 1 . 8 Why did the rate of photosynthesis decrease from 35 °C to 45 °C?

[1 mark]

4.7.3.3 Land use

Question 46 · continued

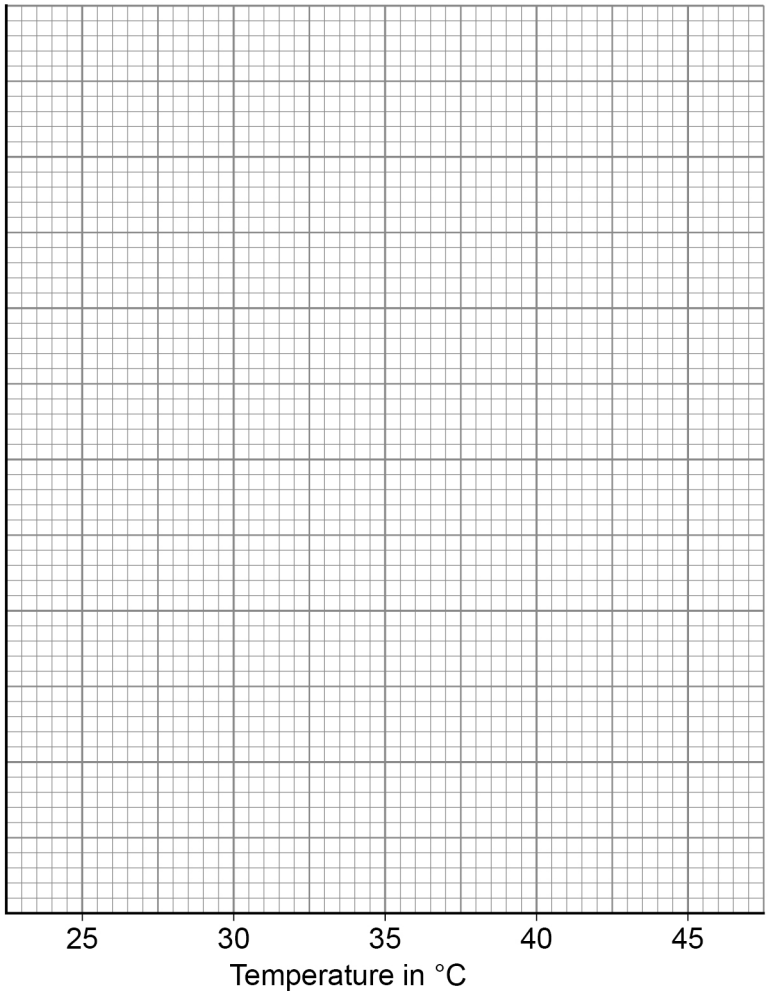
0 1 . 9 Complete **Figure 1** using data from **Table 1**.

You should:

- label the y-axis
- use a suitable scale for the y-axis
- plot the mean data from **Table 1** for temperatures from 25 °C to 45 °C
- draw a line of best fit.

[5 marks]

Figure 1



16

4.7.3.3 Land use

Question 47

November 2020 | 8461/1H | Original Q6

0 6 Data from 'The Million Women' survey in the UK was collected for over 15 years.

Scientists analysed the data to study the effect of consuming alcohol on liver disease.

The scientists:

- included 400 000 women who regularly consumed alcohol
- included 400 000 women who did **not** consume alcohol
- excluded women who already had a liver disease.

0 6 . 1 Age and gender were two factors controlled in this analysis.

Many other factors were also controlled.

Suggest **two** other factors which the scientists would have controlled.

[2 marks]

1 _____

_____

2 _____

_____

Question 6 continues on the next page

Question 47 · continued

The data was analysed for:

- women who drank alcohol with meals
- women who drank alcohol **not** with meals
- women who did **not** drink alcohol.

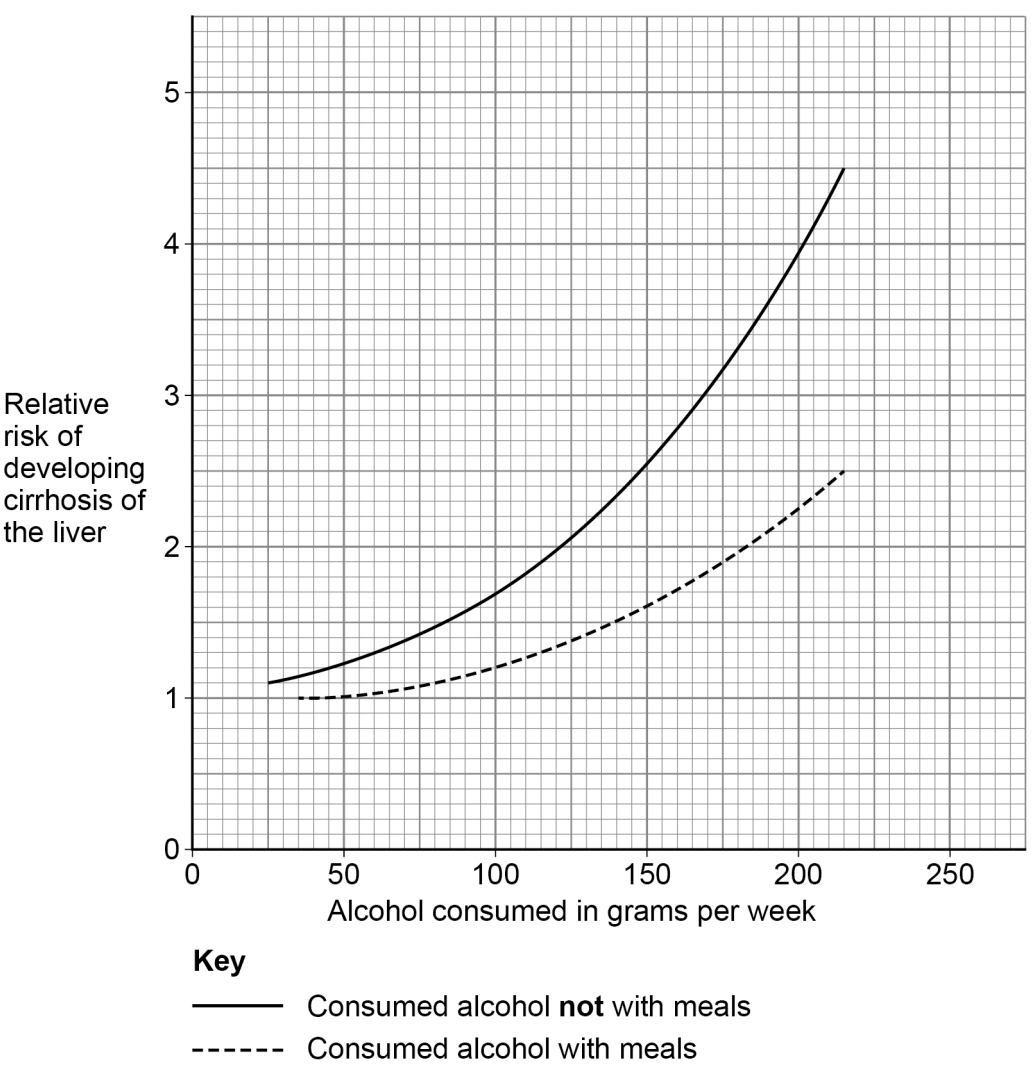
During the survey approximately 1500 women developed a liver disease called cirrhosis of the liver.

Scientists calculated the relative risk of developing cirrhosis of the liver for each group who consumed alcohol.

A relative risk of 1.0 means there was no statistical difference between the groups who did consume alcohol and the group who did **not** consume alcohol.

Figure 10 shows a summary of the results.

Figure 10



4.7.3.3 Land use

Question 47 · continued

0 6 . 2 A woman drinks 150 g of alcohol per week **not** with meals.

The woman decides to change to drinking 150 g of alcohol per week with meals.

Calculate the percentage decrease in relative risk of developing cirrhosis of the liver for this woman.

[2 marks]

Percentage decrease = _____ %

0 6 . 3 One glass of wine contains 12 g of alcohol.

A different woman drinks two glasses of wine each day with her meals.

Calculate the relative risk of developing cirrhosis of the liver for this woman.

[2 marks]

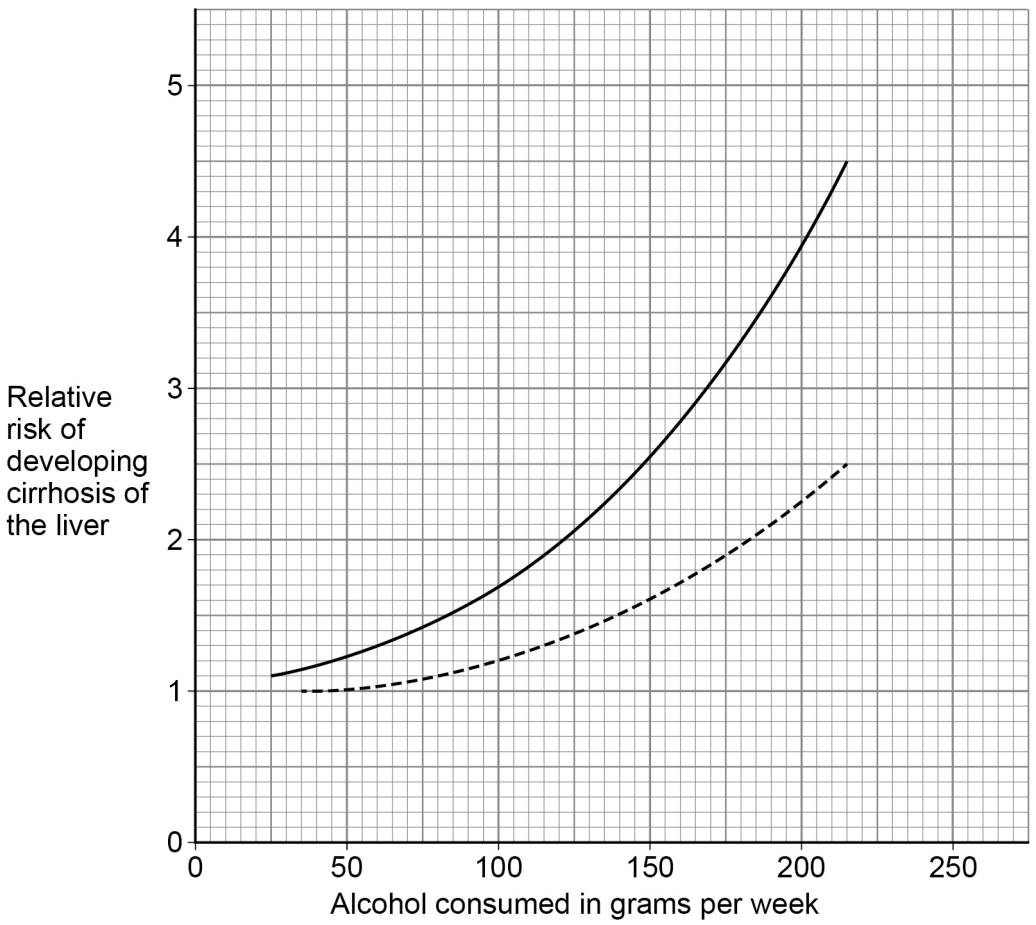
Relative risk = _____

Question 6 continues on the next page

Question 47 · continued

Figure 10 is repeated below.

Figure 10



0 6 . 4 Consuming alcohol with meals instead of not with meals decreases the relative risk of developing cirrhosis of the liver.

Give **two** other conclusions about the relative risk of developing cirrhosis of the liver related to alcohol consumption.

Use data from **Figure 10** in your answer.

[2 marks]

1 _____

_____

_____

2 _____

_____

_____

4.7.3.3 Land use

Question 47 · continued

0 6 . 5 Suggest **two** reasons why the data is considered to be valid.

[2 marks]

1 _____

_____

2 _____

_____

0 6 . 6 Suggest **one** aspect of the survey which might reduce validity.

[1 mark]

_____

_____

0 6 . 7 Cirrhosis of the liver leads to liver failure.

Describe the effects of liver failure on the human body.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

15

4.7.3.3 Land use

Question 48

November 2020 | 8461/2H | Original Q1

0 1 This question is about the decay of milk.

0 1 . 1 Name **two** types of microorganism that cause decay.

[2 marks]

1 _____

2 _____

0 1 . 2 Cows' milk is pH 6.6.

As milk decays, lipids in the milk are broken down.

One of the products of the breakdown of lipids causes the pH of milk to decrease.

Name the product that causes the pH to decrease.

[1 mark]

_____

4.7.3.3 Land use

Question 48 · continued

A student investigated the effect of temperature on the time taken for different types of milk to decay.

This is the method used.

1. Put cows' milk in six test tubes.

2. Keep each test tube at a different temperature.

3. Measure the pH of the milk in each tube every day for 12 days.

4. Record the number of days taken to reach pH 5.

5. Repeat steps 1 to 4 with goats' milk and with almond milk.

0 1 . 3 Give **one** way the pH can be measured.

[1 mark]

_____

0 1 . 4 Give **two** control variables the student should have used in this investigation.

[2 marks]

1 _____

2 _____

Question 1 continues on the next page

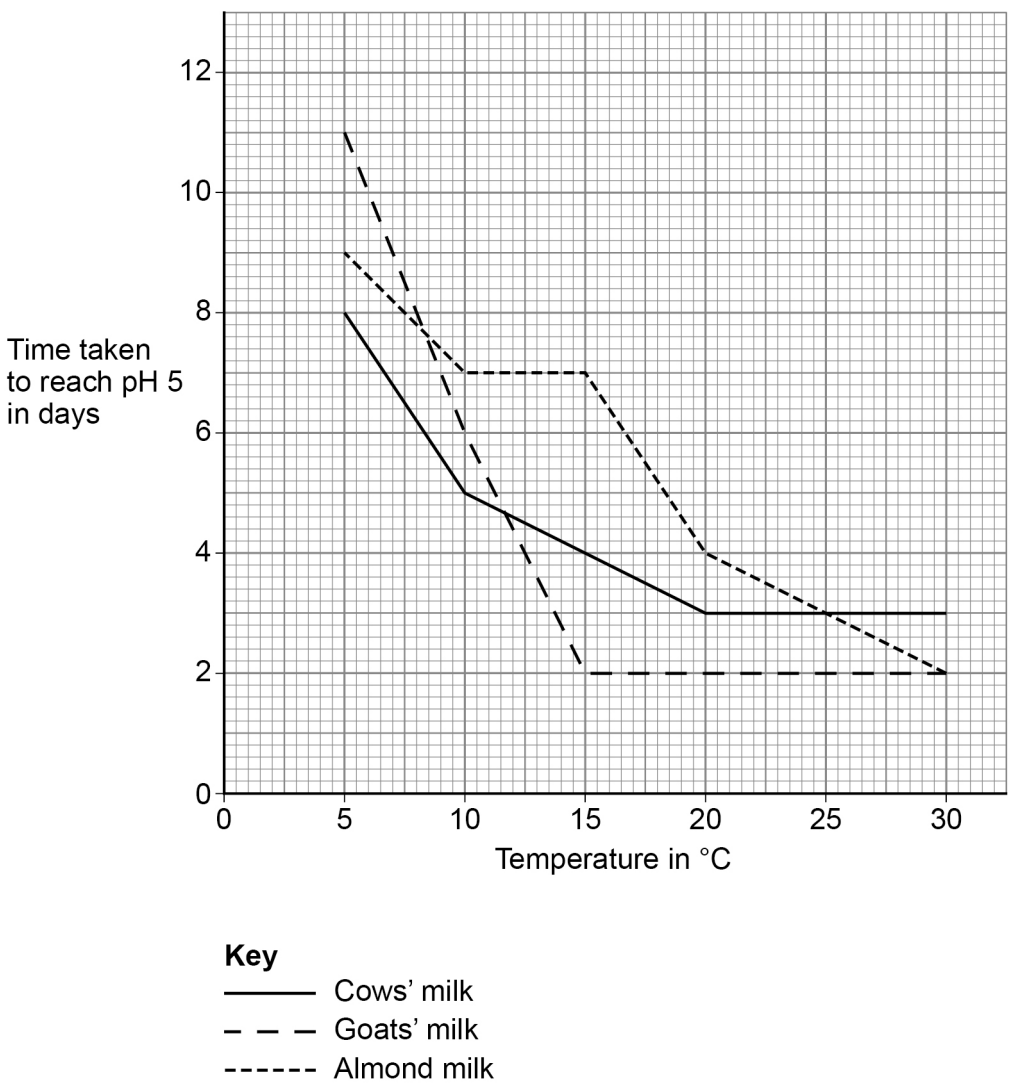
4.7.3.3 Land use

Question 48 · continued

The student improved the investigation to produce valid results.

Figure 1 shows the results.

Figure 1



0 1 . 5 Which type of milk stays fresh the longest at 10 °C?

[1 mark]

4.7.3.3 Land use

Question 48 · continued

0 1 . 6 Describe the effect of temperature on the time taken for **goats'** milk to reach pH 5.

Use data from **Figure 1** in your answer.

[2 marks]

0 1 . 7 The time taken for cows' milk to reach pH 5 at 10 °C is less than the time taken for cows' milk to reach pH 5 at 5 °C.

Suggest **one** reason why.

[1 mark]

0 1 . 8 Suggest **two** reasons why the different types of milk took different lengths of time to reach pH 5.

[2 marks]

1

2

Question 1 continues on the next page

4.7.3.3 Land use

Question 48 · continued

0 1 . 9 The student said:

‘The temperature milk is stored at affects how likely the milk is to cause food poisoning.’

How can the investigation be developed to find out if the student is correct?

[1 mark]

Tick (✓) **one** box.

Determine the types of bacteria present in the milk ☐

Record the pH every 12 hours ☐

Use more than three different types of milk ☐

13

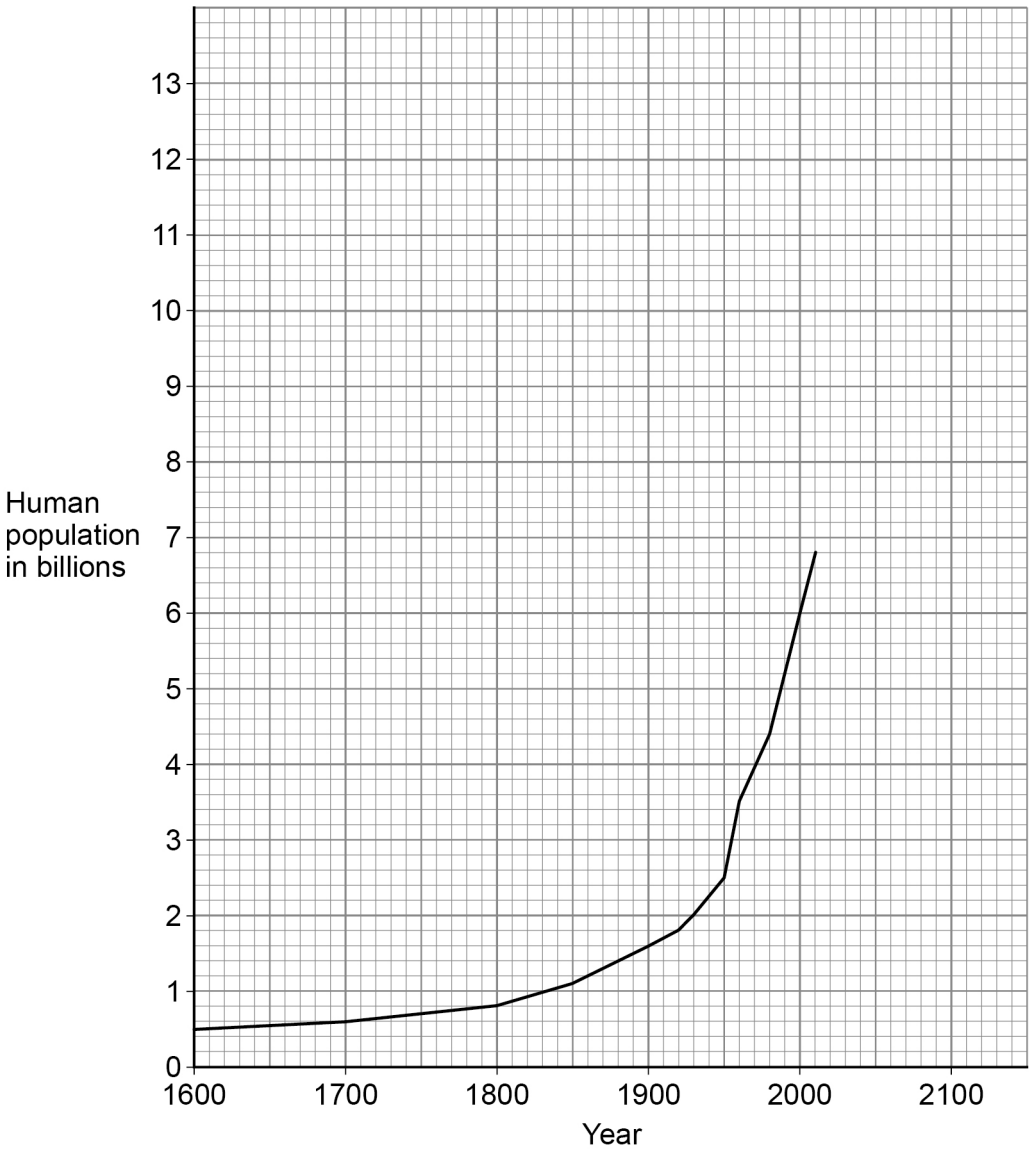
4.7.3.3 Land use

Question 49

November 2020 | 8461/2H | Original Q2

0 2 **Figure 2** shows the human population from 1600 to 2010.

Figure 2



In 1900 the human population was 1.6 billion.

0 2 . 1 Calculate how many times greater the human population was in the year 2000 compared with the year 1900.

[2 marks]

Number of times greater = _____

4.7.3.3 Land use

Question 49 · continued

0 2 . 2 In 1950 the human population was 2.5 billion.

Calculate the mean annual increase in the human population between 1900 and 1950.

[2 marks]

Mean annual increase = _____ billion per year

0 2 . 3 Predict the human population in 2050 if the current rate of population increase continues.

You should draw an extrapolation line on **Figure 2**.

[2 marks]

Predicted human population = _____

0 2 . 4 The increasing human population has caused a decline in fish stocks.

Describe how fishing quotas can help to return fish stocks to a sustainable level.

[2 marks]

Question 2 continues on the next page

4.7.3.3 Land use

Question 49 · continued

0 2 . 5 Farming techniques have changed in recent years.

Describe:

- why more land is being used for farming
- how increased farming has decreased biodiversity.

[6 marks]

4.7.3.3 Land use

Question 49 · continued

0 2 . 6 Genetic modification of crop plants can help meet the demands of the increasing human population.

Golden rice is a genetically modified (GM) crop.

What is the advantage of golden rice compared with non-GM rice?

[1 mark]

Tick (✓) **one** box.

Golden rice contains protein-rich mycoprotein ☐

Golden rice has improved nutritional value ☐

Golden rice produces human insulin ☐

0 2 . 7 Suggest **one** reason why some people are concerned about the use of golden rice.

[1 mark]

_____

_____

16

4.7.3.3 Land use

Question 50

November 2021 | 8461/1H | Original Q5

0 5 Amylase is an enzyme that breaks down starch.

0 5 . 1 Amylase is a polymer of smaller molecules.

Name the type of smaller molecule.

[1 mark]

_____

0 5 . 2 Name the **three** parts of the human digestive system that produce amylase.

[2 marks]

1 _____

2 _____

3 _____

0 5 . 3 Explain how amylase breaks down starch.

Answer in terms of the 'lock and key theory'.

[3 marks]

_____

_____

_____

_____

_____

_____

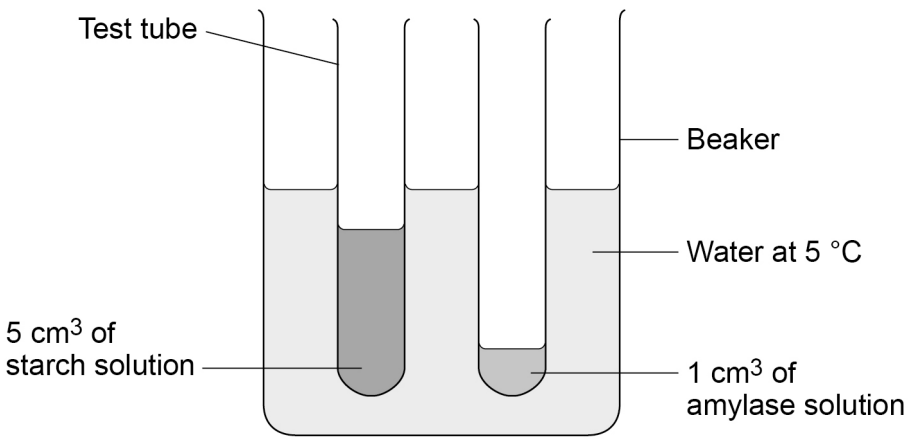
Question 5 continues on the next page

Question 50 · continued

A student investigated the effect of temperature on the activity of amylase.

Figure 8 shows the apparatus used.

Figure 8



This is the method used.

1. Set up the apparatus as shown in **Figure 8**.
2. After 5 minutes, pour the starch solution into the amylase solution and mix.
3. Remove one drop of the starch-amylase mixture and place onto a spotting tile.
4. Immediately add two drops of iodine solution to the starch-amylase mixture on the spotting tile.
5. Record the colour of the iodine solution added to the starch-amylase mixture.
6. Repeat steps 3 to 5 every minute until the iodine solution stays yellow-brown.
7. Repeat steps 1 to 6 using water at different temperatures.

4.7.3.3 Land use

Question 50 · continued

0 5 . 4 Name **two** control variables the student used in the investigation.

[2 marks]

1 _____

2 _____

0 5 . 5 Why did the student leave the starch solution and amylase solution for 5 minutes before mixing them?

[1 mark]

_____

_____

Question 5 continues on the next page

4.7.3.3 Land use

Question 50 · continued

Table 3 shows the results of the investigation.

Table 3

Temperature in °C	Time taken until iodine solution stays yellow-brown in minutes
5	did not become yellow-brown
20	5
35	2
50	7
65	14
80	did not become yellow-brown

0 5 . 6 What conclusion can be made about the effect of temperature on amylase activity between 20 °C and 65 °C?

[1 mark]

4.7.3.3 Land use

Question 50 · continued

0 5 . 7 Explain the results at 5 °C and at 80 °C.

Use **Table 3**.

[5 marks]

0 5 . 8 The student investigated the effect of temperature on amylase activity.

Describe how the student could extend the investigation to determine the effect of a different factor on amylase activity.

[2 marks]

17

4.7.3.3 Land use

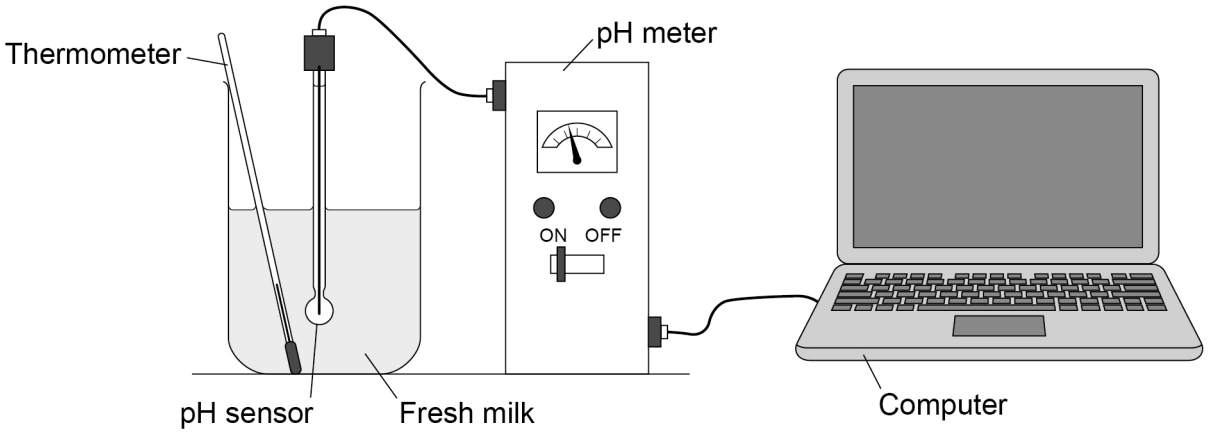
Question 51

November 2021 | 8461/2H | Original Q2

0 2 A student investigated the effect of temperature on the decay of milk.

Figure 3 shows the apparatus the student used.

Figure 3



This is the method used.

1. Set up the apparatus as shown in **Figure 3** with the milk at 20 °C.
2. Record the pH over 5 days using the computer.
3. Repeat with another batch of fresh milk at 25 °C.

0 2 . 1 How could the student keep the milk at a constant temperature for 5 days?

[1 mark]

0 2 . 2 Give **one** variable the student should keep constant.

Do **not** refer to temperature in your answer.

[1 mark]

Question 2 continues on the next page

Question 51 · continued

Table 1 shows the student's results for the milk at 20 °C.

Table 1

Time in days	0	1	2	3	4	5
pH	6.7	6.7	6.3	5.3	4.6	4.4

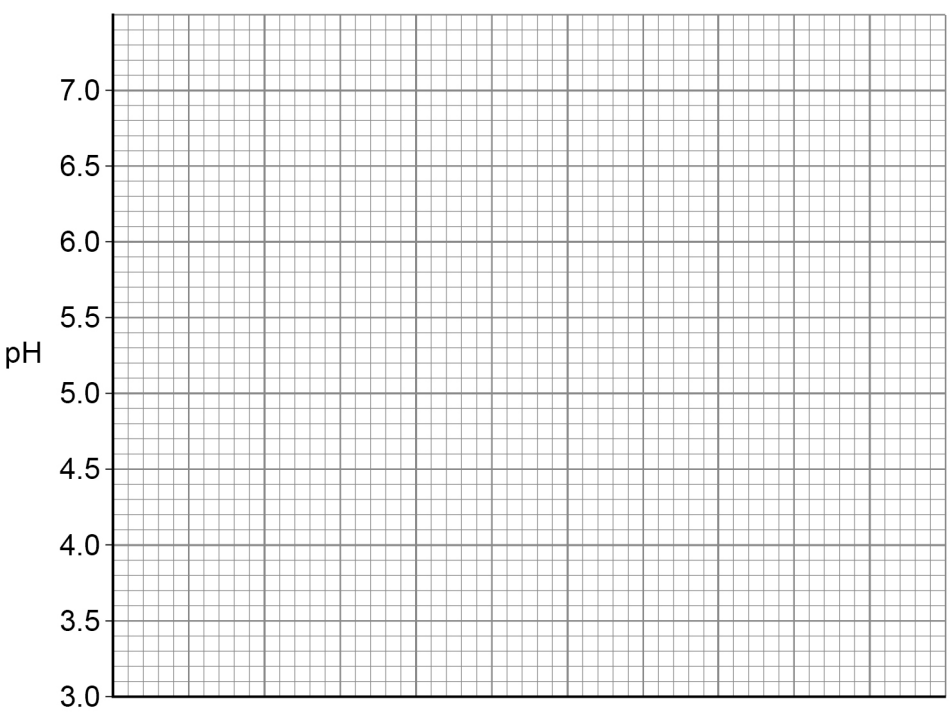
0 2 . 3 Complete **Figure 4**.

[4 marks]

You should:

- label the x-axis
- use a suitable scale for the x-axis
- plot the data from **Table 1**
- draw a line of best fit.

Figure 4



0 2 . 4 The data you plotted in Question **02.3** were obtained at 20 °C.

Sketch a line on **Figure 4** to show the results you would expect at 25 °C.

Label this line '25 °C'.

[2 marks]

8

4.7.3.3 Land use

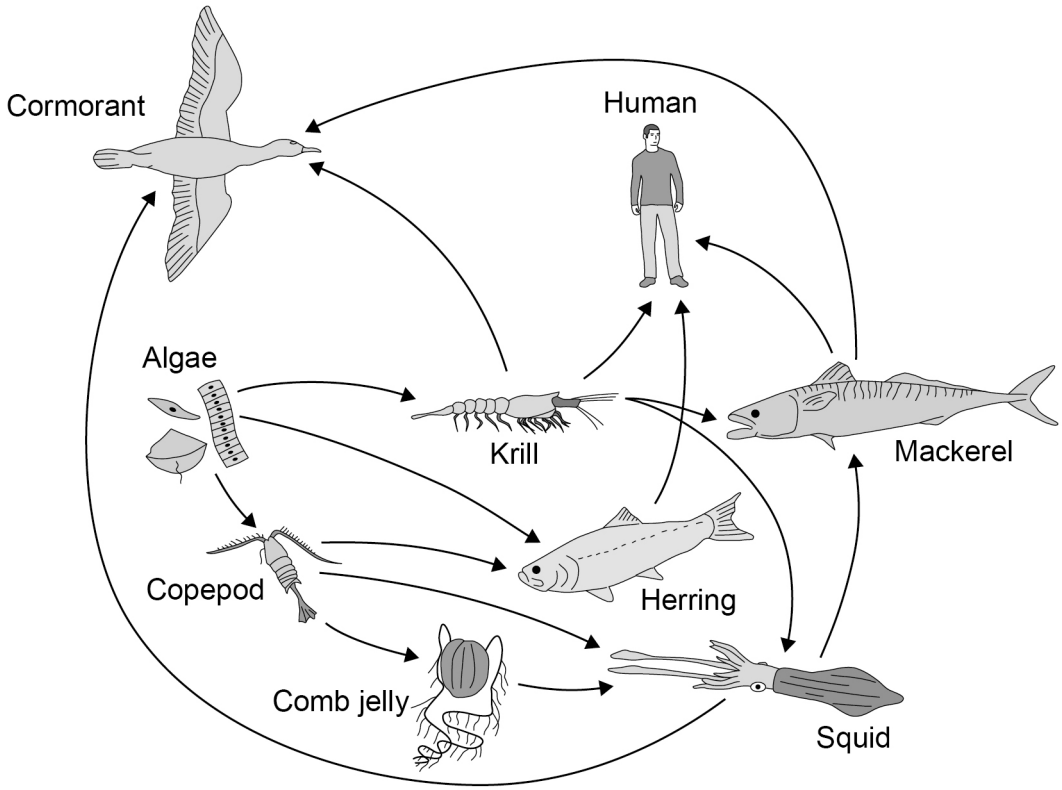
Question 52

November 2021 | 8461/2H | Original Q7

0 7 A food web contains several food chains.

Figure 9 shows a food web.

Figure 9



0 7 . 1 The animals in **Figure 9** get their energy by eating other organisms.

Describe how the algae get energy.

[2 marks]

0 7 . 2 Name **one** primary consumer in **Figure 9**.

[1 mark]

4.7.3.3 Land use

Question 52 · continued

0 7 . 3 Name **one** producer in **Figure 9**.

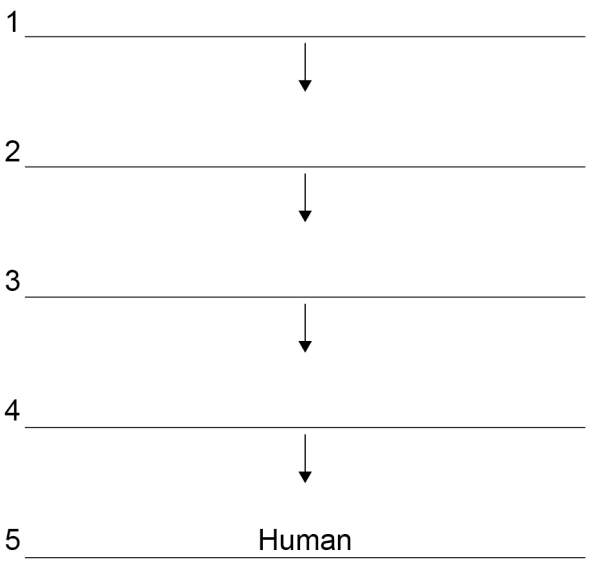
[1 mark]

0 7 . 4 The different food chains in **Figure 9** have different numbers of organisms.

Complete **Figure 10** to show a food chain in **Figure 9** with **five** organisms, including the human.

[1 mark]

Figure 10



0 7 . 5 **Figure 9** shows that mackerel eat krill and squid.

The biomass of mackerel is much less than the combined biomass of krill and squid.

One reason for this is that the mackerel cannot digest all parts of the krill and squid.

Give **two** other reasons.

[2 marks]

1

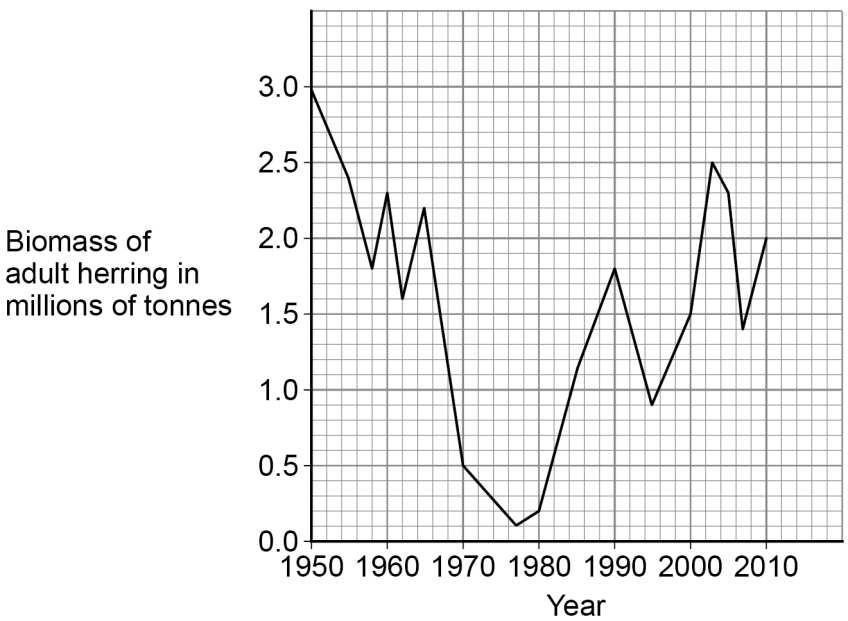
2

4.7.3.3 Land use

Question 52 · continued

Figure 11 shows how the biomass of adult herring in the North Sea has changed between 1950 and 2010.

Figure 11



0 7 . 6 Calculate the percentage decrease in the biomass of herring between 1960 and 1977.

Give your answer to the nearest whole number.

[4 marks]

Percentage decrease = _____ %

Question 52 · continued

0 7 . 7 Too many herring were caught by fishermen between 1960 and 1977.

Herring can live for up to 12 years and begin to reproduce when 3 to 4 years old.

Laws have been introduced to help conserve herring:

- 1977 to 1981 – herring fishing was banned in the North Sea
- 1984 to present day – control of mesh size of fishing nets
- 1997 to present day – fishing quotas were introduced
- 1998 to present day – herring fishing was banned in breeding grounds during the breeding season.

Figure 12 shows how a minimum mesh size helps to conserve herring.

Figure 12

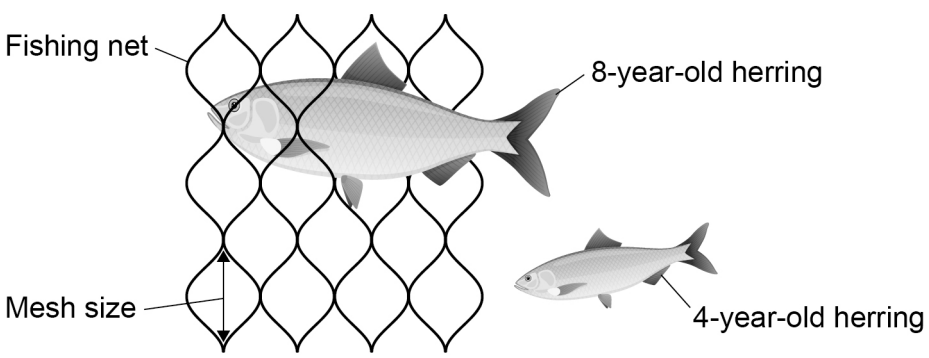
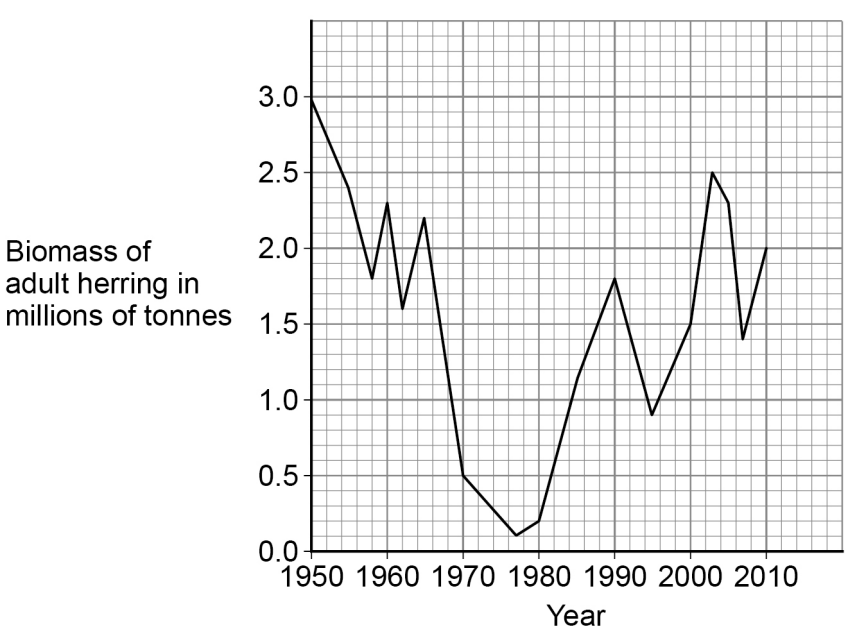


Figure 11 is repeated below.

Figure 11



4.7.3.3 Land use

Question 52 · continued

Evaluate the effect of these laws on the conservation of herring stocks.

Use data from **Figure 11** and information from **Figure 12** in your answer.

[6 marks]

17

4.7.3.3 Land use

Question 53

June 2022 | 8461/1H | Original Q1

0 1 This question is about cells and transport.

0 1 . 1 Complete **Table 1**.

[3 marks]

Table 1

Name of cell part	Function of cell part
	Contains genetic information
Mitochondria	
	Controls the movement of substances into and out of the cell

Cells in potatoes are plant cells.

Cells in potatoes do **not** contain chloroplasts.

0 1 . 2 What is the function of chloroplasts?

[1 mark]

0 1 . 3 Name **one** type of cell in a potato plant that does **not** contain chloroplasts.

[1 mark]

Question 1 continues on the next page

4.7.3.3 Land use

Question 53 · continued

A student investigated the effect of salt concentration on pieces of potato.

This is the method used.

1. Cut three pieces of potato of the same size.
2. Record the mass of each potato piece.
3. Add 150 cm^3 of 0.4 mol/dm^3 salt solution to a beaker.
4. Place each potato piece into the beaker.
5. After 30 minutes, remove each potato piece and dry the surface with a paper towel.
6. Record the mass of each potato piece.
7. Repeat steps 1 to 6 using different concentrations of salt solution.

0 1 . 4 What is the independent variable in the investigation?

[1 mark]

Tick (✓) **one** box.

- Concentration of salt solution ☐
- Mass of potato piece ☐
- Time potato is left in salt solution ☐
- Volume of salt solution ☐

0 1 . 5 Why did the student dry the surface of each potato piece with a paper towel in step **5**?

[1 mark]

Question 53 · continued

The student calculated the percentage change in mass of each potato piece.

0 1 . 6 For one potato piece:

- the starting mass was 2.5 g
- the end mass was 2.7 g.

Calculate the percentage increase in mass of the potato piece.

[2 marks]

Use the equation:

$$\text{percentage increase in mass} = \frac{\text{increase in mass}}{\text{starting mass}} \times 100$$

Percentage increase in mass = _____ %

Question 1 continues on the next page

Question 53 · continued

The student used the results from each potato piece to calculate the mean percentage change in mass at each concentration.

Table 2 shows the results.

Table 2

Concentration of salt solution in mol/dm^3	Mean percentage (%) change in mass
0.0	9.8
0.1	9.5
0.2	7.0
0.3	0.4
0.4	−1.4

0 1 . 7 Complete **Figure 1**.

You should:

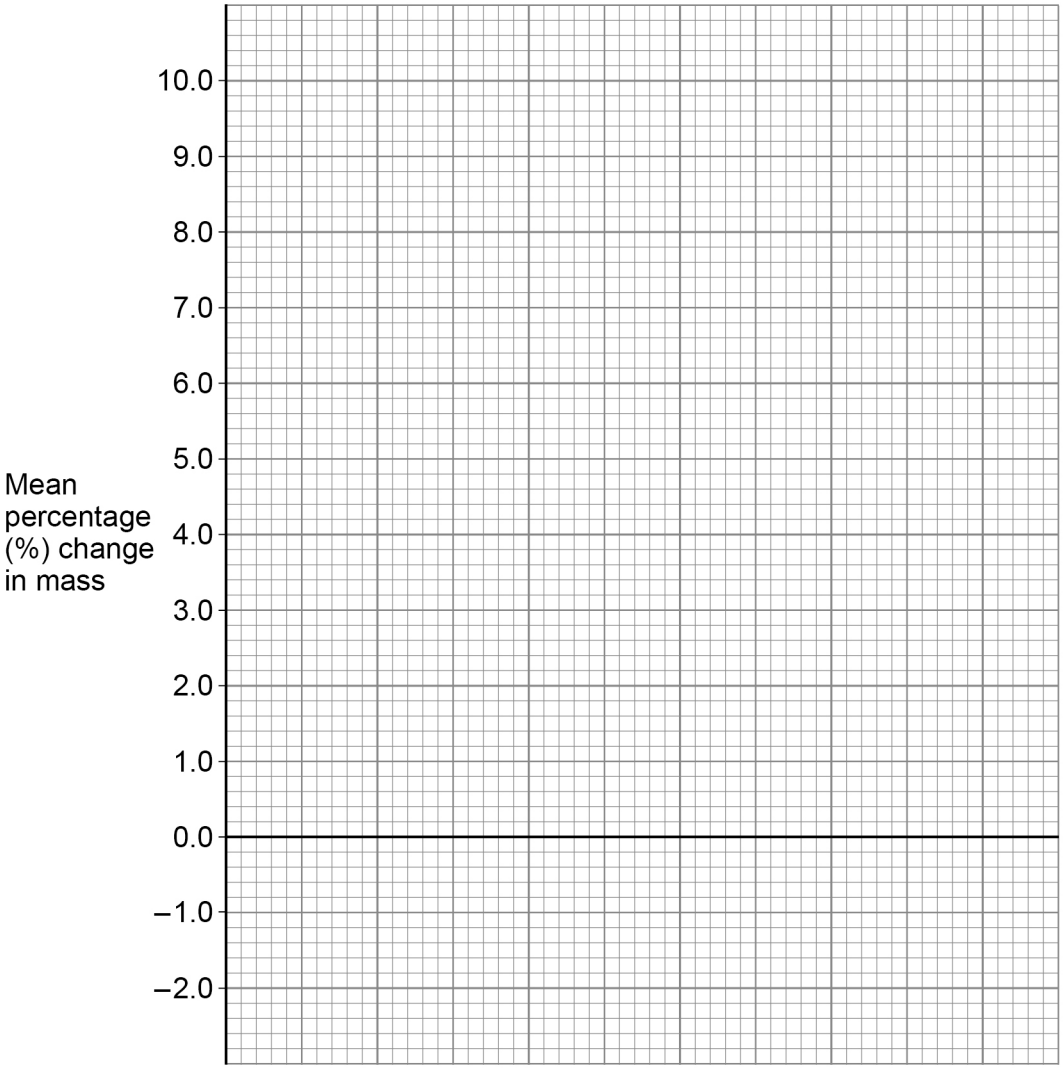
- label the x-axis
- use a suitable scale for the x-axis
- plot the data from **Table 2**
- draw a line of best fit.

[4 marks]

4.7.3.3 Land use

Question 53 · continued

Figure 1



0 1 . 8 What concentration of salt solution was equal to the concentration of the solution inside the potato pieces?

Use **Figure 1**.

[1 mark]

Concentration = _____ mol/dm^3

Question 1 continues on the next page

4.7.3.3 Land use

Question 53 · continued

0 1 . 9 Explain why the potato pieces in the 0.4 mol/dm^3 salt solution decreased in mass.

[3 marks]

17

4.7.3.3 Land use

Question 54

June 2022 | 8461/1H | Original Q6

0 6 **Table 6** shows information about five different organisms.

Table 6

Organism	Surface area in m^2	Volume in m^3	Surface area to volume ratio
A	6.04×10^{-8}	1.65×10^{-12}	36606:1
B	3.21×10^{-3}	1.25×10^{-6}	2568:1
C	9.96×10^{-3}	1.35×10^{-4}	**X**:1
D	4.61×10^{-1}	1.57×10^{-2}	29:1
E	1.99×10^{1}	6.12×10^{0}	3:1

0 6 . 1 Calculate value **X** in **Table 6**.

Give your answer to the nearest whole number.

[3 marks]

X (nearest whole number) = _____

0 6 . 2 What is the relationship between the size of an organism and its surface area to volume ratio?

Use **Table 6**.

[1 mark]

4.7.3.3 Land use

Question 54 · continued

0 6 . 3 Organism **B** exchanges gases with the environment directly through its skin.

Organism **D** exchanges gases with the environment using its respiratory system.

Explain why organism **D** requires a respiratory system, but organism **B** does **not** require a respiratory system.

[2 marks]

Question 6 continues on the next page

Question 54 · continued

Table 6 is repeated below.

Table 6

Organism	Surface area in m^2	Volume in m^3	Surface area to volume ratio
A	6.04×10^{-8}	1.65×10^{-12}	36606:1
B	3.21×10^{-3}	1.25×10^{-6}	2568:1
C	9.96×10^{-3}	1.35×10^{-4}	**X**:1
D	4.61×10^{-1}	1.57×10^{-2}	29:1
E	1.99×10^{1}	6.12×10^{0}	3:1

Table 7 shows information about organism **D** and organism **E**.

Table 7

Organism	Metabolic rate in arbitrary units
D	890
E	75

4.7.3.3 Land use

Question 54 · continued

0 6 . 4 Organisms **D** and **E** both keep a constant body temperature (warm-blooded).

Explain why the metabolic rate of organism **D** is greater than the metabolic rate of organism **E**.

Use information from **Table 6** and **Table 7**.

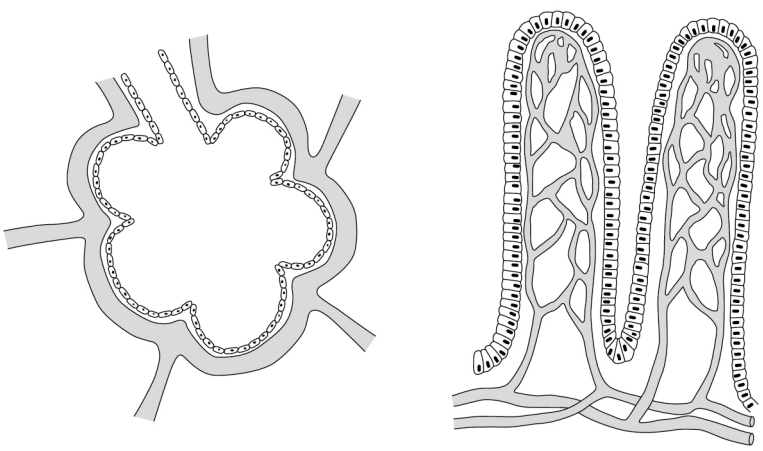
[4 marks]

Question 6 continues on the next page

0 6 . 5 Organism **D** and organism **E** both have alveoli in the lungs and villi in the small intestine.

Figure 8 shows some alveoli and some villi.

Figure 8



Alveoli **Villi**

Describe how the alveoli and the villi are adapted to increase absorption.

[4 marks]

14

4.7.3.3 Land use

Question 55

June 2022 | 8461/2H | Original Q7

0 7 A scientist found a polluted pond which had a new type of blue algae in the water.

The blue colour of the algae was caused by a mutation.

0 7 . 1 What is a mutation?

[1 mark]

Question 7 continues on the next page

Question 55 · continued

The scientist measured the number of blue algal cells in a sample of the pond water.

The scientist used a special slide which has a counting grid.

This is the method used.

1. Dilute 2.5 cm^3 of pond water to a volume of 10 cm^3 with distilled water.
2. Place a drop of the diluted pond water on the special slide, as shown in **Figure 8**.
3. Place a thick coverslip over the diluted pond water to give a depth of 0.1 mm of pond water.
4. Use a microscope to count the number of algal cells in a 0.2 mm × 0.2 mm square on the counting grid.

Figure 8 shows a side view of the special slide.

Figure 8

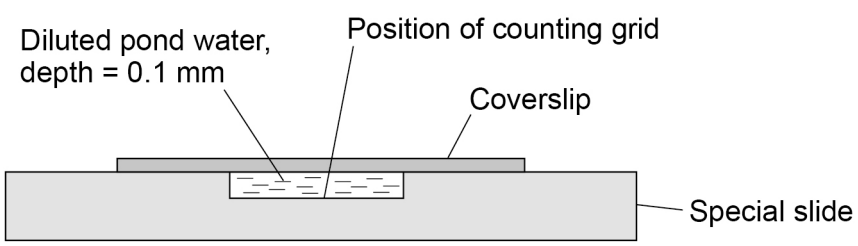
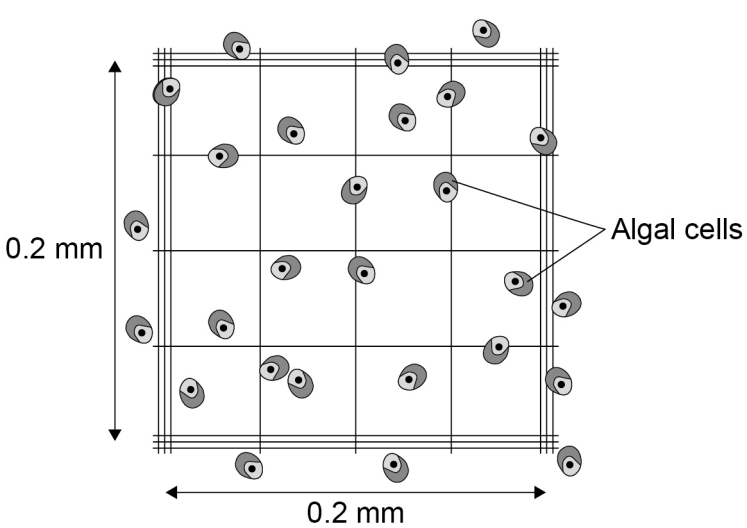


Figure 9 shows the view of the counting grid through a microscope.

Figure 9



Question 55 · continued

0 7 . 2 How many algal cells are in the 0.2 mm × 0.2 mm square in **Figure 9**?

Use the following procedure:

- Count all cells that are completely within the 0.2 mm × 0.2 mm square in the counting grid.
- Count cells that are touching the left side or the lower side of the square.
- Do **not** count cells that are touching the right side or the top side of the square.

[1 mark]

Number of algal cells in the 0.2 mm × 0.2 mm square = _____

0 7 . 3 One week later the scientist repeated the test and counted 14 cells on the 0.2 mm × 0.2 mm counting grid.

Calculate the number of algal cells in 1.0 mm^3 of **undiluted** pond water.

Use the scientist's second count of 14 cells.

[6 marks]

Number of algal cells in 1.0 mm^3 of undiluted pond water = _____

Question 7 continues on the next page

4.7.3.3 Land use

Question 55 · continued

0 7 . 4 Suggest why the scientist diluted the pond water before placing it on the special slide.

[1 mark]

0 7 . 5 A student repeated the scientist's method.

The student used a thin coverslip over the diluted pond water instead of the thick coverslip.

The liquid pulled the thin coverslip downwards slightly.

Explain how the use of the thin coverslip would affect the results for the cell count.

[2 marks]

11

4.7.3.3 Land use

Question 56

June 2023 | 8461/1H | Original Q6

0 6 This question is about photosynthesis.

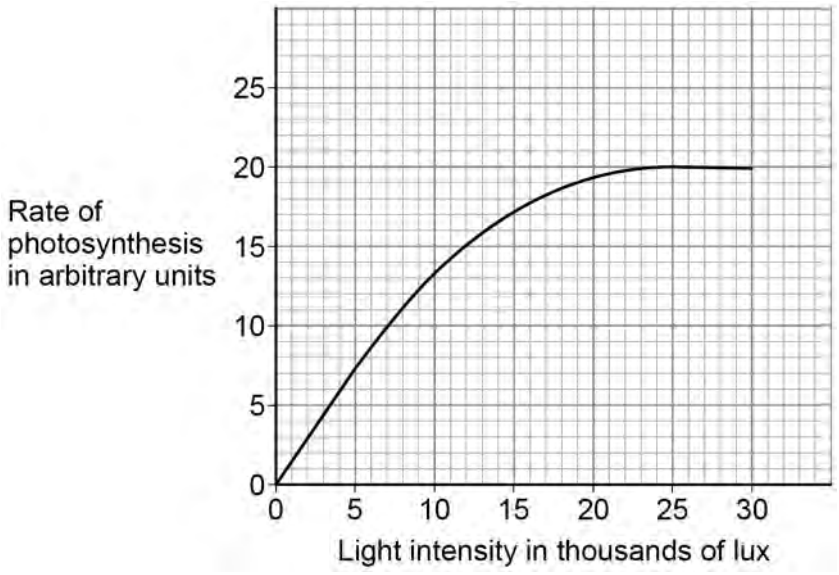
0 6 . 1 Complete the symbol equation for photosynthesis.

[1 mark]

6 _____ + 6 _____ → $C_6H_{12}O_6$ + 6 _____

Figure 8 shows how the rate of photosynthesis changes with light intensity.

Figure 8



4.7.3.3 Land use

Question 56 · continued

0 6 . 2 Which part of the graph could be represented by the equation $y = mx + c$?

[1 mark]

Tick (✓) **one** box.

From 0 to 5 000 lux ☐

From 10 000 to 15 000 lux ☐

From 15 000 to 20 000 lux ☐

From 20 000 to 25 000 lux ☐

Question 6 continues on the next page

Question 56 · continued

A student investigated the effect of colour of light on the rate of photosynthesis in leaves.

Figure 9 shows how the investigation was set up.

Figure 9

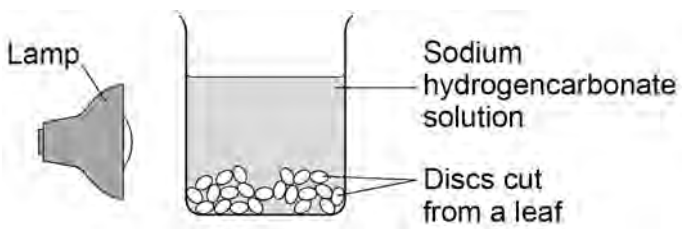


Table 5 shows the results.

Table 5

Colour of light	Time taken for 10 leaf discs to reach the surface of the solution in seconds
Blue	115
Green	831
Red	397

0 6 . 3 Give **one** way the student could change the colour of the light shining on the leaf discs.

[1 mark]

4.7.3.3 Land use

Question 56 · continued

0 6 . 4 Give the independent variable and the dependent variable in this investigation.

[2 marks]

Independent variable _____

Dependent variable _____

0 6 . 5 All of the air had to be removed from the leaf discs before placing them in the beaker.

Suggest **one** reason why.

[1 mark]

0 6 . 6 The leaf discs were placed in a beaker of sodium hydrogencarbonate ($NaHCO_3$) solution.

Explain why sodium hydrogencarbonate solution was used instead of water.

[2 marks]

0 6 . 7 Explain why the leaf discs moved to the surface of the solution during the investigation.

[2 marks]

Question 56 · continued

There are two types of chlorophyll in leaves.

Figure 10 shows the percentage of different wavelengths of light that the two types of chlorophyll absorb.

Figure 10

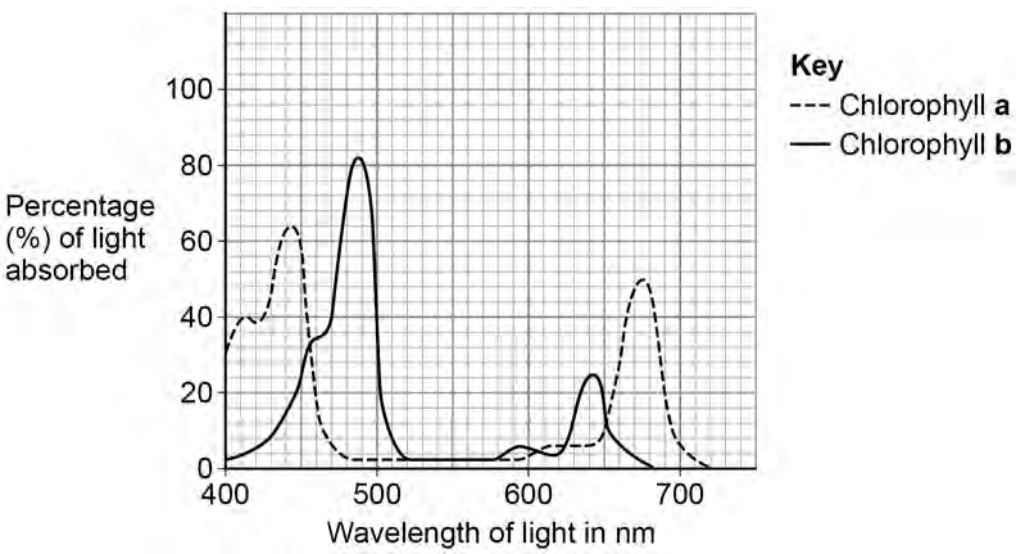


Table 6 shows the colour of different wavelengths of light.

Table 6

Range of wavelength of light in nm	380 − 435	450 − 499	500 − 570	571 − 590	620 − 720
Colour of light	violet	blue	green	yellow	red

0 6 . 8 Suggest the advantage to a plant of having two types of chlorophyll.

[1 mark]

4.7.3.3 Land use

Question 56 · continued

0 6 . 9 **Table 5** is repeated below.

Table 5

Colour of light	Time taken for 10 leaf discs to reach the surface of the solution in seconds
Blue	115
Green	831
Red	397

The leaf discs in the investigation are green.

Explain the results in **Table 5** for blue light and for green light.

Use data from **Figure 10** and **Table 6**.

[4 marks]

15

4.7.3.3 Land use

Question 57

June 2023 | 8461/2H | Original Q6

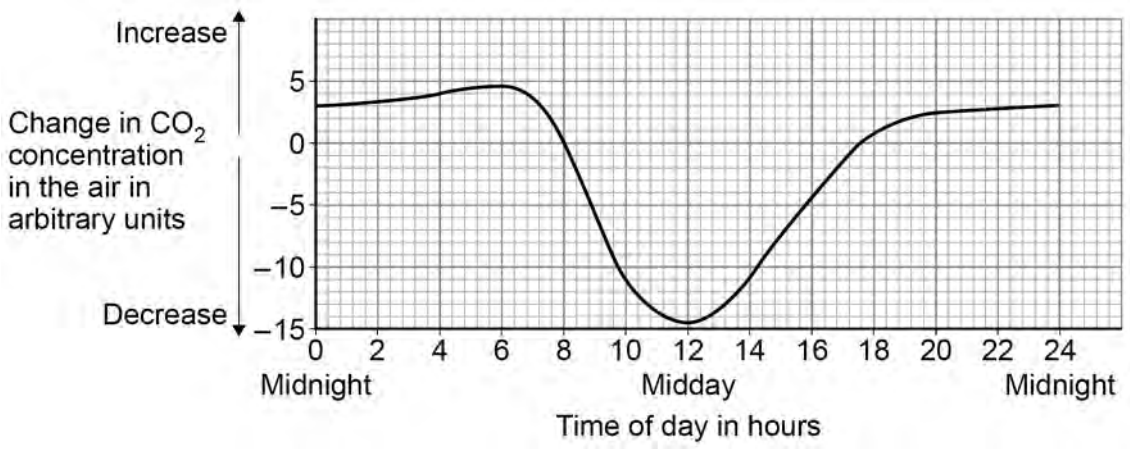
0 6 This question is about the effects of deforestation and agriculture.

The processes of photosynthesis and respiration affect the carbon dioxide concentration in the air.

Figure 9 shows the changes in the carbon dioxide concentration in the air in a tropical rainforest during one day.

The data are mean daily values over a whole year.

Figure 9



0 6 . 1 Explain what causes the changes in the carbon dioxide concentration in the air:

- from 0 to 6 hours
- from 8 to 12 hours.

Use information from **Figure 9**.

[4 marks]

0 to 6 hours _____

_____

_____

_____

8 to 12 hours _____

_____

_____

_____

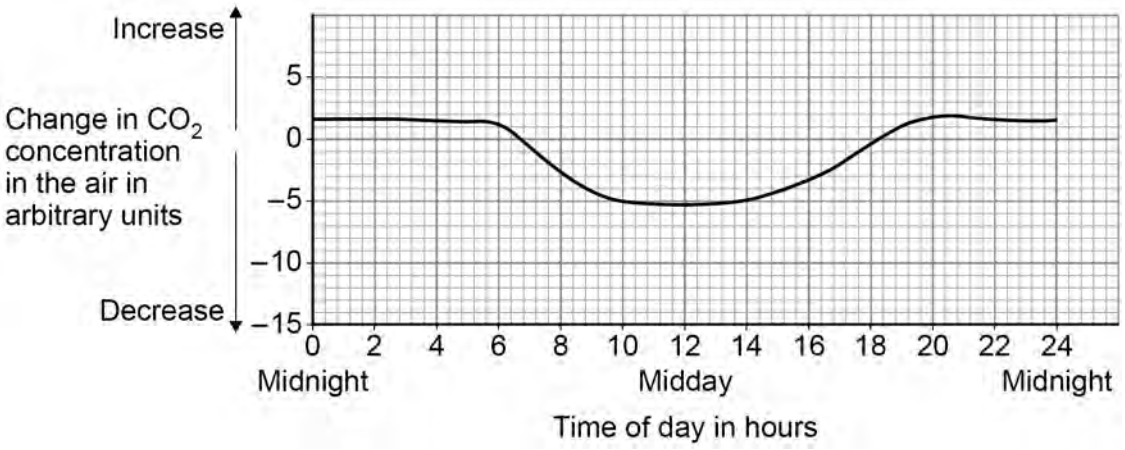
0 6 . 2 An area of rainforest is cut down and replaced with a field of maize plants.

Only one crop of maize is grown each year.

Figure 10 shows the changes in the carbon dioxide concentration in the air in the field of maize during one day.

The data are mean daily values over the 6-month growing period.

Figure 10



The maize grows for only 6 months of the year.

Explain why replacing rainforest with maize will increase the carbon dioxide concentration in the air after one year.

Use information from **Figure 9** and **Figure 10**.

[2 marks]

Question 6 continues on the next page

4.7.3.3 Land use

Question 57 · continued

A tropical rainforest can contain over 1000 different tree species.

Large areas of tropical rainforest have been cut down during the last 100 years so crops can be grown.

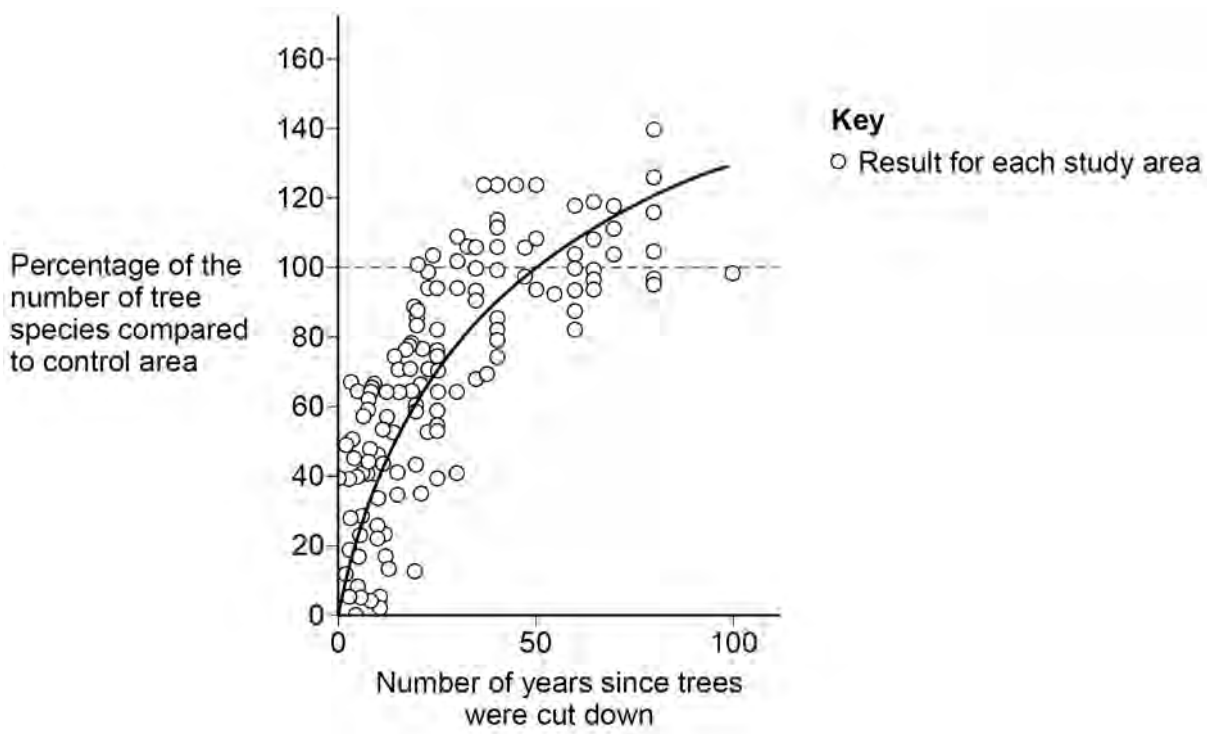
Scientists studied the regeneration of different areas of tropical rainforest.

The scientists:

- investigated areas of rainforest that had been cut down at different times during the previous 100 years
- recorded the number of tree species that re-grew in each area
- compared each area with a control area next to it. The control areas were undisturbed rainforest which had never been cut down.

Figure 11 shows the scientists' results.

Figure 11



4.7.3.3 Land use

Question 57 · continued

0 6 . 3 The values plotted in **Figure 11** are percentages of the results for the control areas.

Explain why the scientists presented their results as **percentages**.

[2 marks]

During the 100 years, the biodiversity of trees in the regenerating rainforest increases.

0 6 . 4 Give **one** other conclusion you can make from **Figure 11**.

[1 mark]

0 6 . 5 Give **two** reasons why an increase in the diversity of trees in the rainforest leads to an increase in animal diversity.

[2 marks]

1

2

11

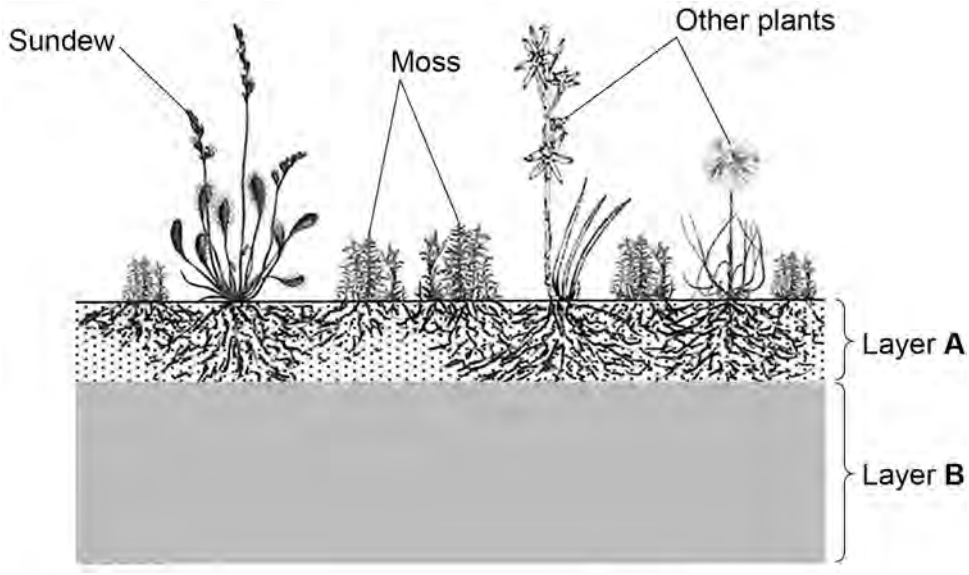
4.7.3.3 Land use

Question 58

0 2 Peat bogs are estimated to contain twice as much carbon as all the world's forests.

Figure 2 shows a section through part of a peat bog.

Figure 2



Layer **A** contains a lot of air.

Layer **B**:

- contains the dead remains of plants
- has a low pH
- contains very little oxygen
- contains carbon dioxide and methane.

4.7.3.3 Land use

Question 58 · continued

0 2 . 1 Explain why most of the dead remains of plants in layer **B** do **not** decay.

[3 marks]

0 2 . 2 The peat bog in **Figure 2** is a stable community.

The moss produces biomass at a rate of 340 g/m^2/year.

What is the approximate biomass of the moss that becomes biomass in primary consumers?

[1 mark]

Tick (✓) **one** box.

- 0.34 g/m^2/year ☐
- 3.4 g/m^2/year ☐
- 34 g/m^2/year ☐
- 340 g/m^2/year ☐

Question 2 continues on the next page

Question 58 · continued

The sundew plant shown in **Figure 2** on page 4 has leaves with sticky hairs that trap and digest insects.

Digestion of the insects releases phosphates and simple compounds of nitrogen that are used by the sundew plant.

0 2 . 3 What substance can the sundew plant make using the **phosphates**?

[1 mark]

Tick (✓) **one** box.

- Cellulose ☐
- DNA ☐
- Glycerol ☐
- Starch ☐

0 2 . 4 What substance can the sundew plant make using the **nitrogen**?

[1 mark]

Tick (✓) **one** box.

- Fatty acid ☐
- Glucose ☐
- Lactic acid ☐
- Protein ☐

4.7.3.3 Land use

Question 58 · continued

0 2 . 5 Humans have destroyed large areas of peat bog to collect peat.

The peat provides fuel and provides compost for gardeners to use.

The peat comes from layer **B** in **Figure 2** on page 4.

Layer **B**:

- contains the dead remains of plants
- has a low pH
- contains very little oxygen
- contains carbon dioxide and methane.

Figure 3 shows the removal of peat from a peat bog.

Figure 3



Explain how the destruction of peat bogs and the use of peat affects the temperature of the Earth's atmosphere.

[4 marks]

10

4.7.3.3 Land use

Question 59

June 2024 | 8461/2H | Original Q3

0 3 Frogs are animals that lay their eggs in water. The eggs hatch as tadpoles.

Students investigated the number of tadpoles in a pond for 8 weeks.

This is the method used.

1. Collect 10 dm^3 of pond water in a bucket.
2. Count the number of tadpoles collected.
3. Put the tadpoles back into the pond.
4. Repeat steps 1 to 3 another three times in different parts of the pond.
5. Repeat steps 1 to 4 at intervals for 8 weeks.

0 3 . 1 Suggest **one** improvement to the method.

[1 mark]

Question 3 continues on the next page

Question 59 · continued

Table 1 shows the results.

Table 1

Sample number	Number of tadpoles in each sample					
	0 weeks	1 week	2 weeks	3 weeks	5 weeks	8 weeks
1	11	17	8	9	5	0
2	15	11	12	7	0	5
3	23	16	14	10	7	3
4	11	14	16	**X**	4	4
Totals	60	58	50	32	16	12

0 3 . 2 Value **X** is the number of tadpoles in sample 4, at 3 weeks.

Calculate value **X**.

[1 mark]

Value **X** = _____

4.7.3.3 Land use

Question 59 · continued

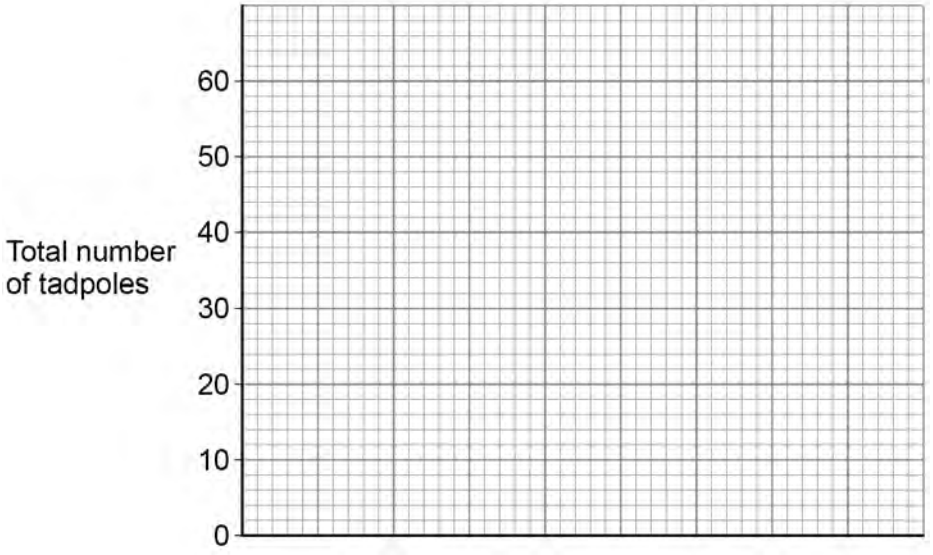
0 3 . 3 Complete **Figure 4** to show how the **total** number of tadpoles changed over the 8 weeks.

[4 marks]

You should:

- label the x-axis
- use a suitable scale for the x-axis
- plot the data for the **total** numbers of tadpoles from **Table 1**
- draw a line of best fit.

Figure 4



0 3 . 4 After 0 weeks, no more tadpoles hatched in the pond.

Calculate the percentage of the tadpoles that would still be found in the pond at 4 weeks compared with 0 weeks.

Use information from **Figure 4**.

[3 marks]

Percentage of tadpoles found at 4 weeks = _____ %

4.7.3.3 Land use

Question 59 · continued

0 3 . 5 After 4 weeks many of the tadpoles had died.

Suggest **two** reasons why the tadpoles died.

[2 marks]

1 _____

_____

2 _____

_____

11

4.7.3.3 Land use

Question 60

June 2024 | 8461/2H | Original Q4

0 4 A student investigated the effect of gravity on the growth of bean seedlings.

The student put ink marks on the root of each bean seedling.

Figure 5 shows a bean seedling with ink marks.

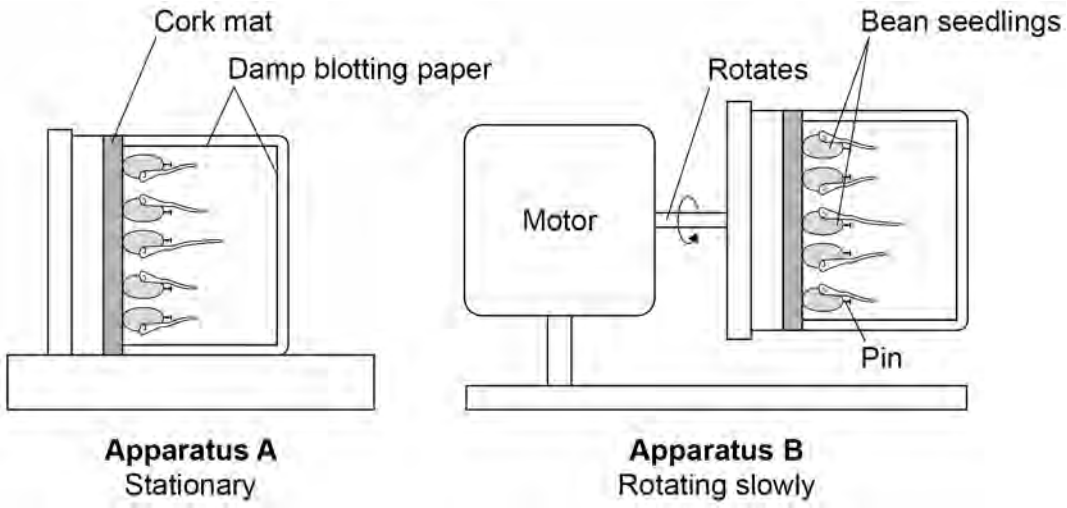
Figure 5



The student set up apparatus **A** and apparatus **B**.

Figure 6 shows both sets of apparatus.

Figure 6



The student left both sets of apparatus in a dark cupboard for 24 hours.

Question 60 · continued

0 4 . 1 Give the reason why the student placed both sets of apparatus in the dark.

[1 mark]

0 4 . 2 What are **two** reasons for surrounding the seedlings with damp blotting paper?

[2 marks]

Tick (✓) **two** boxes.

- To prevent photosynthesis in the roots ☐
- To prevent the growth of mould on the roots ☐
- To prevent water affecting the direction of root growth ☐
- To provide enough water for root growth ☐
- To provide the roots with mineral ions ☐

0 4 . 3 Apparatus **B** is a control.

Explain why apparatus **B** is needed.

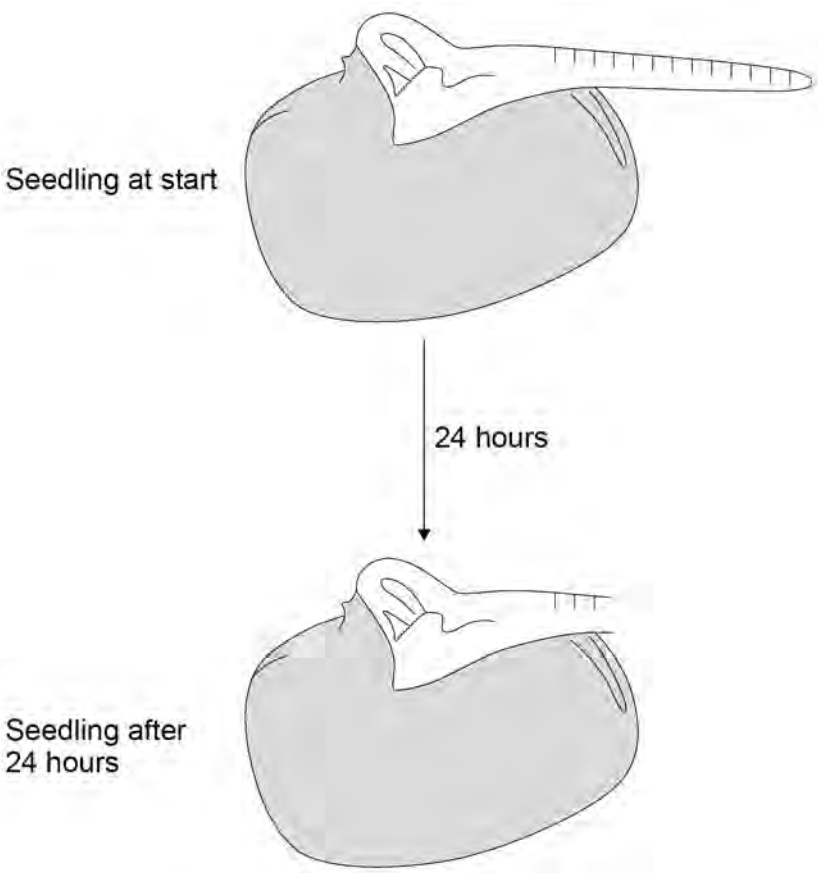
[2 marks]

Question 4 continues on the next page

0 4 . 4 **Figure 7** shows one seedling from apparatus **A** at the start of the investigation and after 24 hours.

The drawing of the seedling after 24 hours is **not** complete.

Figure 7



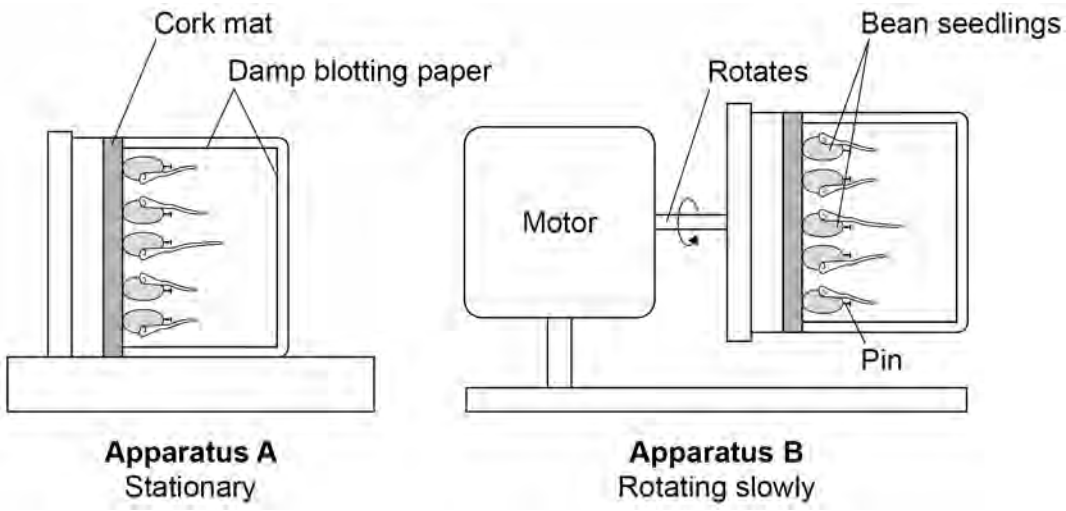
Complete **Figure 7** to show:

- the appearance of the root after 24 hours
- the ink marks on the root after 24 hours.

[3 marks]

Figure 6 is repeated below.

Figure 6



The student left both sets of apparatus in a dark cupboard for 24 hours.

0 4 . 5 Describe how a root from apparatus **B** would look different from the root you drew in Question **04.4**.

[1 mark]

0 4 . 6 Auxin is a plant hormone.

Explain how auxin causes the results in apparatus **A**.

[2 marks]

Question 4 continues on the next page

4.7.3.3 Land use

Question 60 · continued

Farmers can use plant hormones to control the growth of plants.

0 4 . 7 Give **two** uses of auxin.

[2 marks]

1 _____

_____

2 _____

_____

0 4 . 8 A farmer sprayed an apple tree with gibberellin.

Suggest **two** reasons why the farmer sprayed the apple tree with gibberellin.

[2 marks]

1 _____

_____

2 _____

_____

15

4.7.3.3 Land use

Question 61

June 2025 | 8461/1H | Original Q3

0 3 A student investigated osmosis in pieces of potato.

This is the method used.

1. Cut a piece of potato into a cube.
2. Record the mass of the cube.
3. Place the cube into a beaker containing 0.4 mol/dm^3 salt solution.
4. After some time, remove the cube and record the mass.
5. Calculate the change in the mass of the cube.
6. Repeat steps 1 to 5 using two more different concentrations of salt solution.

0 3 . 1 Evaluate the student's method.

You should include how the student could improve the validity of their results.

[6 marks]

4.7.3.3 Land use

Question 61 · continued

0 3 . 2 Why would a potato cube placed into distilled water increase in mass?

[1 mark]

Tick (✓) **one** box.

- The solution in the potato cells was less concentrated than the distilled water. ☐
- The solution in the potato cells was more concentrated than the distilled water. ☐
- The volume of water in the potato cells was greater than the volume of distilled water. ☐
- The volume of water in the potato cells was less than the volume of distilled water. ☐

0 3 . 3 Active transport is another process used by potato cells.

Give **one** way active transport is different from osmosis.

[1 mark]

_____

_____

8

4.7.3.3 Land use

Question 62

0 2 Students investigated how many daisy plants were growing in a field at different distances from a tree.

This is the method used.

1. Place a 20-metre tape measure on the ground, with the tree at 0 metres.

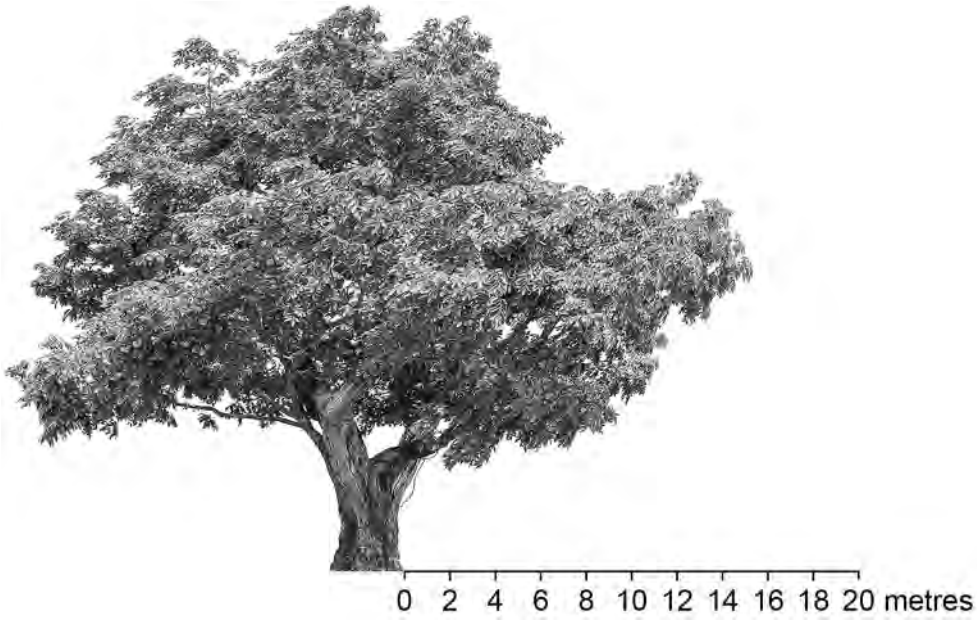
2. Place a 1 m^2 quadrat on the ground every 4 metres along the tape measure.

3. Count the number of daisy plants in each quadrat.

4. Take a soil sample from each quadrat to find the percentage of water in the soil.

Figure 2 shows the tree and the tape measure.

Figure 2



This is the method used for finding the percentage of water in each soil sample (step 4):

5. Weigh an empty container.

6. Place the soil sample in the container and weigh again.

7. Heat the container of soil in an oven at 100 °C for several hours.

8. Allow the container of soil to cool and weigh again.

9. Repeat steps 7 and 8 until there is no further change in mass.

4.7.3.3 Land use

Question 62 · continued

0 2 . 1 Suggest why the students repeated steps **7** and **8** until there was no further change in mass.

[1 mark]

Question 2 continues on the next page

Question 62 · continued

Table 2 shows the results.

Table 2

	Distance from the tree in metres				
	4	**8**	**12**	**16**	**20**
Mass of fresh soil in grams	250	266	260	248	252
Mass of dried soil in grams	225	234	209	184	181
Mass of water lost from soil in grams	25	32	51	64	71
Percentage of water in soil	10	12	20	26	**X**
Number of daisies per m^2	0	7	15	28	32

0 2 . 2 Calculate percentage **X** in **Table 2**.

Give your answer to the nearest whole number.

[3 marks]

Percentage **X** (nearest whole number) = _____ %

0 2 . 3 Describe the effect of distance from the tree on the percentage of water in the soil between 4 metres and 16 metres.

Use **Table 2**.

[1 mark]

4.7.3.3 Land use

Question 62 · continued

0 2 . 4 A student concluded:

‘As the water content of the soil increases, so does the number of daisy plants.’

Describe **two** changes to the investigation that would increase the validity of the student’s conclusion.

[2 marks]

1 _____

_____

2 _____

_____

0 2 . 5 The percentage of water in the soil is an abiotic factor.

Suggest **three** other **abiotic** factors that might have caused more daisy plants to grow further away from the tree.

Do **not** refer to water in your answer.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

10

4.7.3.3 Land use

Question 63

June 2025 | 8461/2H | Original Q5

0 5 Peat bog is a specialised habitat for some living organisms.

0 5 . 1 Peat has been removed from peat bogs so that the land can be used for farming or forestry.

Give **two** uses of the peat removed from peat bogs.

[2 marks]

1 _____

_____

2 _____

_____

The destruction of peat bogs can affect biodiversity.

0 5 . 2 What is meant by 'biodiversity'?

[1 mark]

_____

_____

4.7.3.3 Land use

Question 63 · continued

0 5 . 3 Explain how the destruction of peat bogs can affect biodiversity:

- in the local area
- globally.

[6 marks]

Extra space

9

4.7.3.3 Land use

Question 64

0 7 Two students investigated reaction time.

This is the method used.

1. Student **A** holds a metre rule just above student **B**'s hand, as shown in **Figure 7**.

2. Student **A** lets go of the metre rule.

3. Student **B** catches the metre rule as quickly as possible.

4. Student **A** writes down the reading from the scale on the metre rule.

5. Students **A** and **B** repeat steps 1 to 4 another six times.

Figure 7

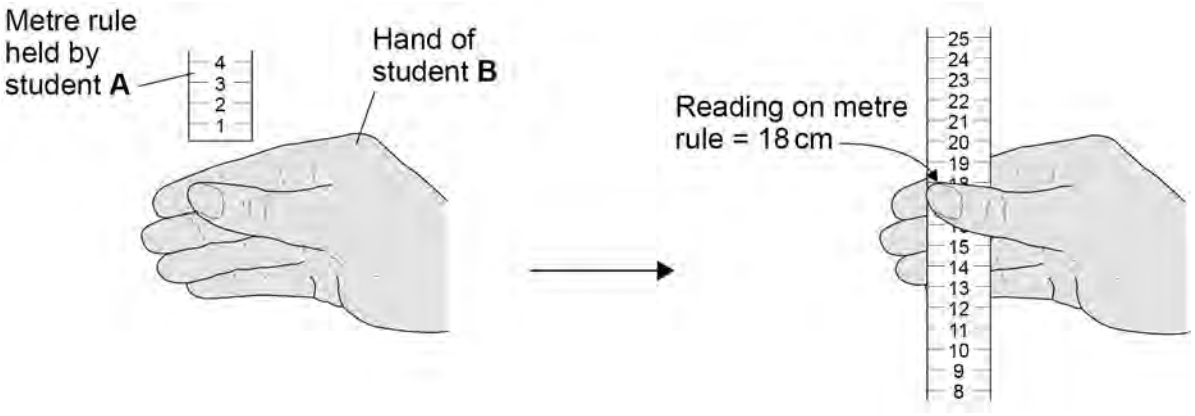


Table 3 shows the results.

Table 3

Test	Reading on metre rule in cm
1	18
2	15
3	12
4	16
5	14
6	23
7	14
Mean	16

4.7.3.3 Land use

Question 64 · continued

0 7 . 1 What is the median result in **Table 3**?

[1 mark]

Tick (✓) **one** box.

14 cm ☐ 15 cm ☐ 16 cm ☐ 18 cm ☐

0 7 . 2 Calculate student **B**'s mean reaction time.

Use the equation:

$$t = \sqrt{\frac{2d}{980}}$$

d = mean distance in cm
t = mean reaction time in s

Give your answer in milliseconds.

Give your answer to 3 significant figures.

Use data from **Table 3**.

[4 marks]

Mean reaction time (3 significant figures) = _____ milliseconds

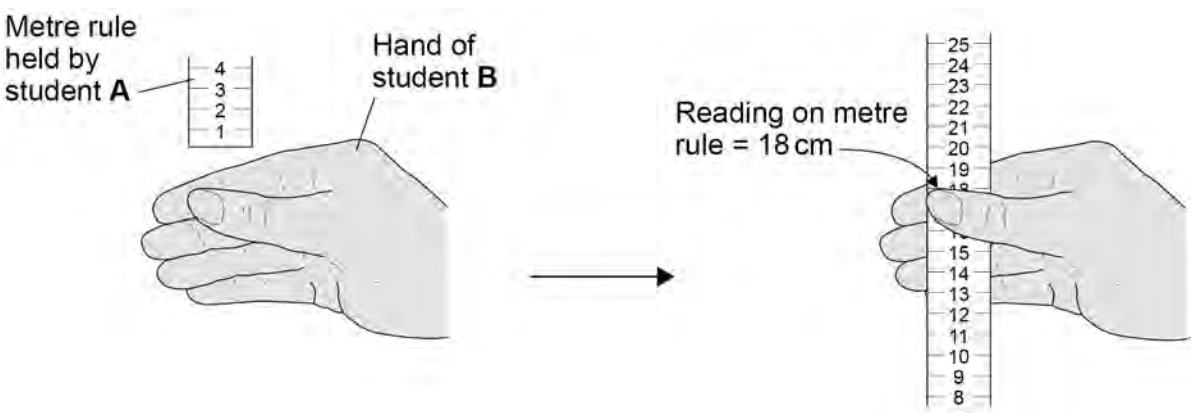
Question 7 continues on the next page

Question 64 · continued

The method and **Figure 7** are repeated below.

1. Student **A** holds a metre rule just above student **B**'s hand, as shown in **Figure 7**.
2. Student **A** lets go of the metre rule.
3. Student **B** catches the metre rule as quickly as possible.
4. Student **A** writes down the reading from the scale on the metre rule.
5. Students **A** and **B** repeat steps 1 to 4 another six times.

Figure 7



0 7 . 3 Describe **two** ways the students could improve the investigation.

Do **not** refer to repeating results in your answer.

[2 marks]

1 _____

_____

2 _____

_____

4.7.3.3 Land use

Question 64 · continued

0 7 . 4 Catching the rule was a response to a stimulus.

Describe how student **B**'s response was coordinated by the nervous system.

[6 marks]

Extra space

13