AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE
BIOLOGY

F

Foundation Tier Paper 2F

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:
- a ruler
- a scientific calculator.

Instructions
- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information
- The maximum mark for this paper is 100.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
TOTAL	

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Answer **all** questions in the spaces provided.

0 1 The theory of evolution states that organisms alive today evolved by natural selection from other species that are now extinct.

0 1 . 1 Which **two** scientists proposed the theory of evolution by natural selection?

[2 marks]

Tick (✓) **two** boxes.

- Alexander Fleming ☐
- Alfred Russel Wallace ☐
- Carl Linnaeus ☐
- Carl Woese ☐
- Charles Darwin ☐

Fossils provide evidence for evolution.

Figure 1 shows a fossil footprint of a dinosaur.

Figure 1



Do not write outside the box

0 1 . 2 What is a fossil?

[2 marks]

0 1 . 3 How was the fossil in **Figure 1** formed?

[1 mark]

Tick (✓) **one** box.

Body parts were replaced by minerals. ☐

The animal walked on mud. ☐

The animal was frozen in ice. ☐

0 1 . 4 Dinosaurs are extinct.

Give **two** causes of extinction.

[2 marks]

1

2

Question 1 continues on the next page

Do not write outside the box

0 1 . 5 Which **two** of the following provide evidence for evolution?

[2 marks]

Tick (✓) **two** boxes.

Bacteria can become resistant to an antibiotic. ☐

Early forms of life lived in the ocean. ☐

Older fossils are simpler than more recent ones. ☐

Older layers of rock are closer to the surface. ☐

9

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ANSWER IN THE SPACES PROVIDED

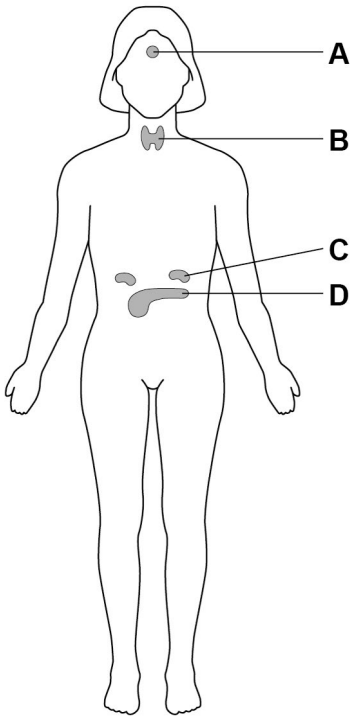
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0 2 Many internal processes of the human body are controlled by hormones.

Hormones are produced by glands.

Figure 2 shows glands in a woman's body.

Figure 2



0 2 . 1 Which gland is the pituitary gland?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 2 . 2 Which gland is the pancreas?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Do not write outside the box

The hormone insulin helps to decrease the blood glucose concentration.

Insulin causes its target organs to take in glucose from the blood.

0 2 . 3 Which of the following is a target organ for insulin?

[1 mark]

Tick (✓) **one** box.

Bladder ☐

Heart ☐

Liver ☐

0 2 . 4 The glucose is stored as an insoluble substance.

What is the insoluble storage substance that is formed from glucose?

[1 mark]

Tick (✓) **one** box.

Glycogen ☐

Protein ☐

Urea ☐

Question 2 continues on the next page

Do not write outside the box

Scientists investigated the effect of a glucose drink on the concentration of glucose in a person's blood.

This is the method used.

1. Take a small sample of blood from the person.

2. Measure the concentration of glucose in the person's blood.

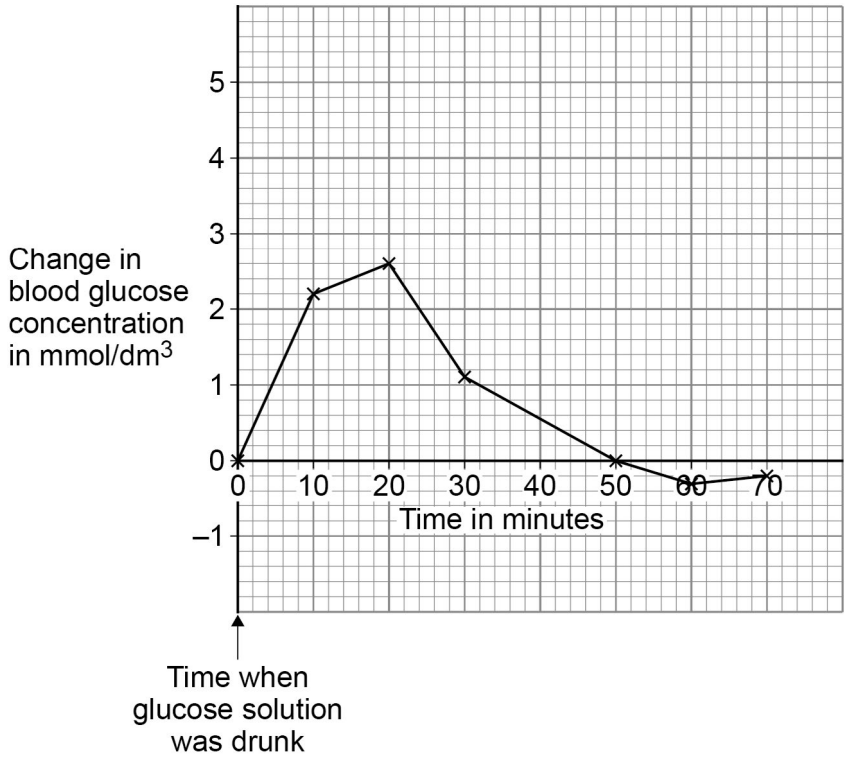
3. Give the person a drink containing 50 grams of glucose.

4. Measure the concentration of glucose in the person's blood at intervals.

5. Calculate the **change** in blood glucose concentration from the starting value.

Figure 3 shows the results.

Figure 3



Do not write outside the box

Figure 3 shows the **change** in blood glucose concentration.

0 2 . 5 At the start of the investigation, the blood glucose concentration was 5 mmol/dm^3.

Calculate the highest blood glucose concentration during the investigation.

Use information from **Figure 3** in your answer.

[2 marks]

Highest blood glucose concentration = _____ mmol/dm^3

0 2 . 6 What is the time taken for the blood glucose concentration to decrease from its highest value back to the starting value?

Use data from **Figure 3** in your answer.

[1 mark]

Time taken = _____ minutes

0 2 . 7 Why can you **not** be certain that your answer to Question **02.6** is accurate?

[1 mark]

0 2 . 8 **Figure 3** shows the results for a person who does **not have** Type 2 diabetes.

Sketch a line on **Figure 3** to show the results you would expect for a person who **has** Type 2 diabetes.

[2 marks]

10

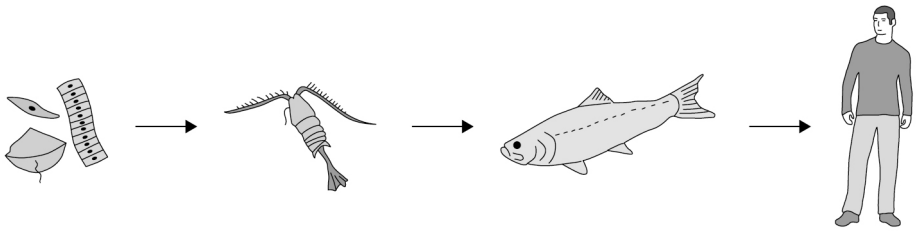
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0 3 People eat fish caught in the North Sea.

Figure 4 shows a food chain.

Figure 4



Not to scale

0 3 . 1 The algae make glucose by photosynthesis.

Which **two** substances do the algae need for photosynthesis?

[2 marks]

Tick (✓) **two** boxes.

- Carbon dioxide ☐
- Nitrogen ☐
- Oxygen ☐
- Starch ☐
- Water ☐

Do not write outside the box

0 3 . 2 What is the source of energy for photosynthesis?

[1 mark]

Tick (✓) **one** box.

Light ☐

Mineral ions ☐

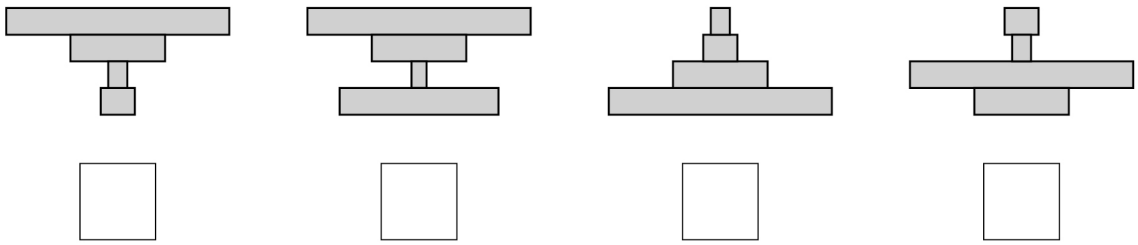
Protein ☐

Water ☐

0 3 . 3 Which pyramid of biomass is correct for the food chain shown in **Figure 4**?

[1 mark]

Tick (✓) **one** box.

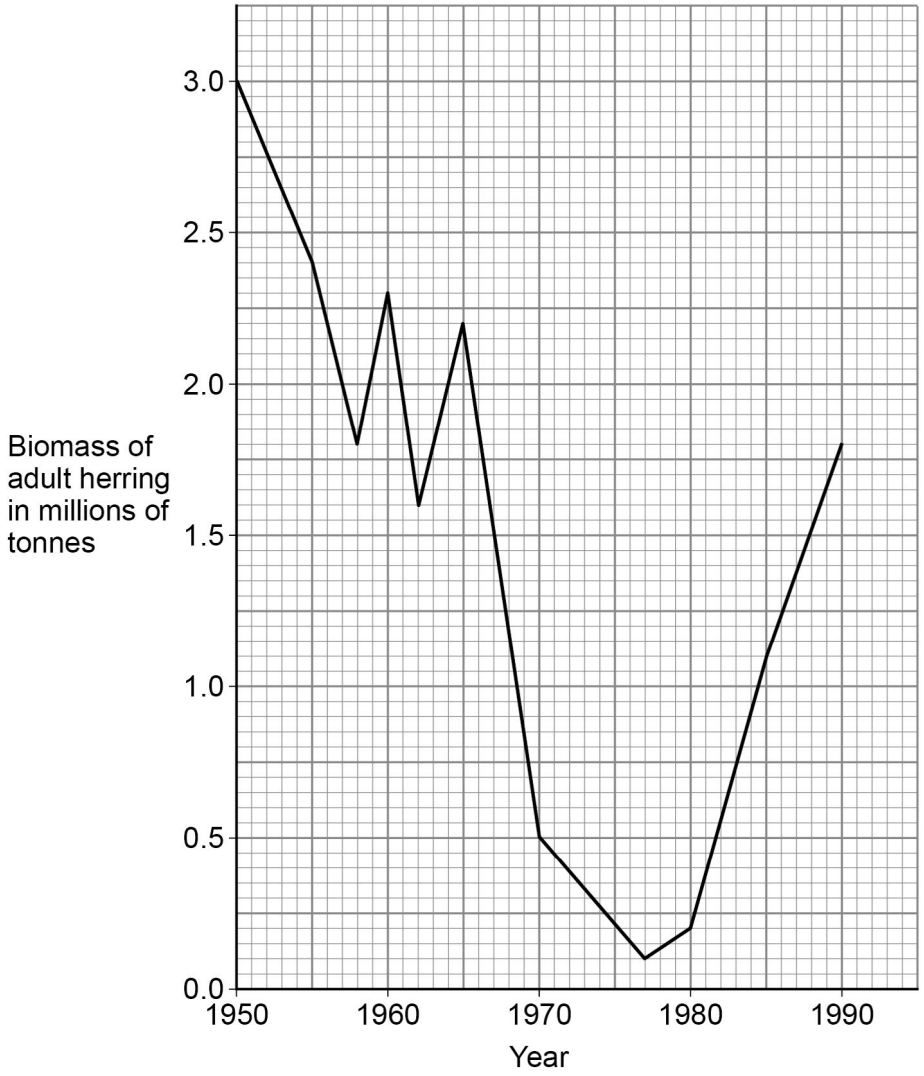


Question 3 continues on the next page

Do not write outside the box

Figure 5 shows the biomass of adult herring in the North Sea between 1950 and 1990.

Figure 5



Do not write outside the box

0 3 . 4 Too many herring were caught in the 1960s.

Calculate the percentage decrease in the biomass of adult herring between 1960 and 1970.

Use the equation:

$$\text{percentage decrease} = \frac{(\text{biomass in 1960} - \text{biomass in 1970})}{\text{biomass in 1960}} \times 100$$

Give your answer to the nearest whole number.

[4 marks]

Percentage decrease = _____ %

From 1977, laws were introduced to help conserve herring.

0 3 . 5 Describe the change in biomass of adult herring from 1977 to 1990.

Use data from **Figure 5** in your answer.

[2 marks]

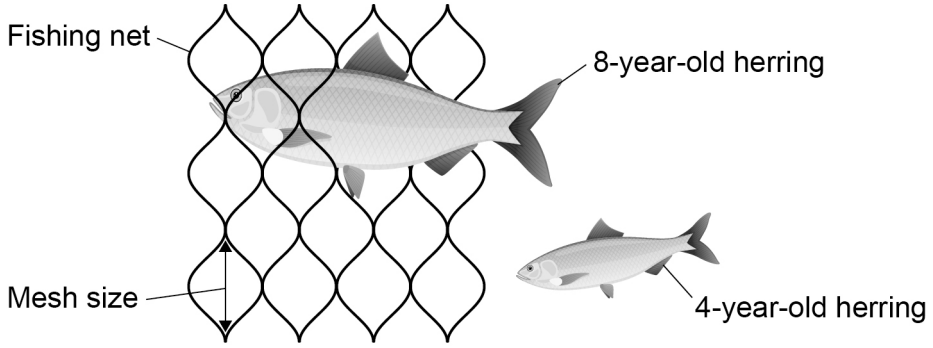
Question 3 continues on the next page

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0 3 . 6 One of the laws was to control mesh size of fishing nets.

Figure 6 shows a fishing net with a legal mesh size.

Figure 6



Herring can live for up to 12 years.

Herring start to reproduce when they are 3 to 4 years old.

Explain how the control of mesh size of fishing nets has helped to conserve stocks of herring.

[2 marks]

12

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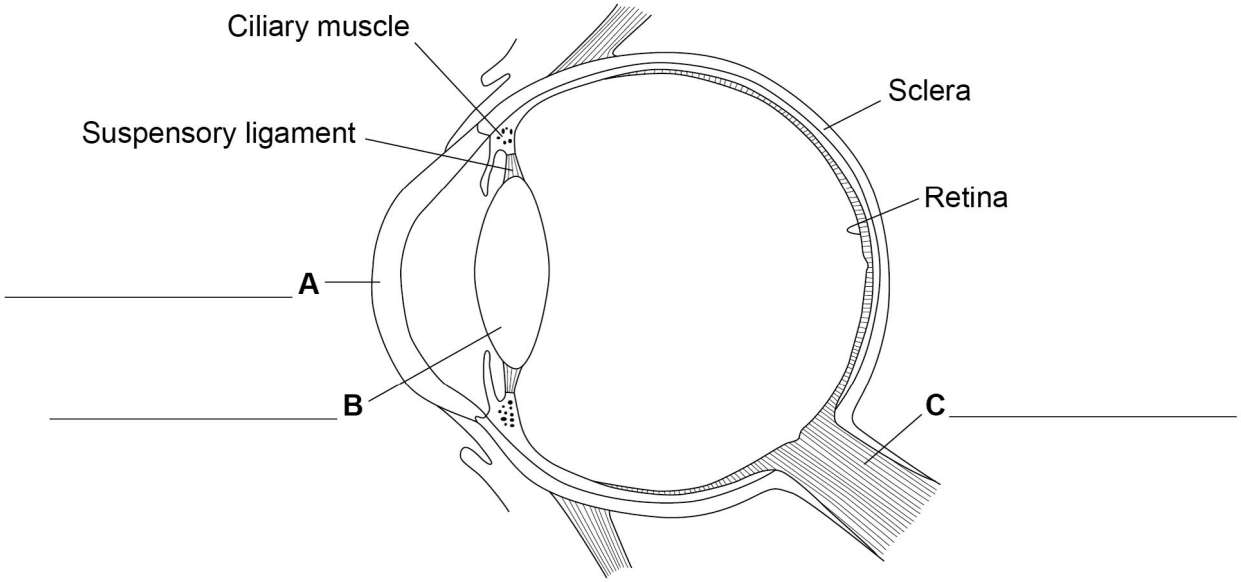
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0 4 The human eye can form images of objects that are at different distances away from the eye.

Figure 7 is a diagram of the eye.

Figure 7



0 4 . 1 Label structures **A**, **B** and **C** on **Figure 7**.

[3 marks]

Choose answers from the box.

cornea	**eyelid**	**iris**	**lens**	**optic nerve**

Do not write outside the box

The eye in **Figure 7** is focused on a distant object.

If the eye then focuses on the words in a book, changes would occur in the eye.

The light rays would be refracted more by the lens.

0 4 . 2 How does the lens refract the light more?

[1 mark]

Tick (✓) **one** box.

By becoming longer ☐

By becoming thicker ☐

By becoming transparent ☐

0 4 . 3 Which **two** structures control the shape of the lens?

[2 marks]

Tick (✓) **two** boxes.

Ciliary muscles ☐

Cornea ☐

Iris ☐

Sclera ☐

Suspensory ligaments ☐

0 4 . 4 To form a clear image, the light rays entering the eye must focus on one structure in the eye.

Name the structure.

[1 mark]

_____

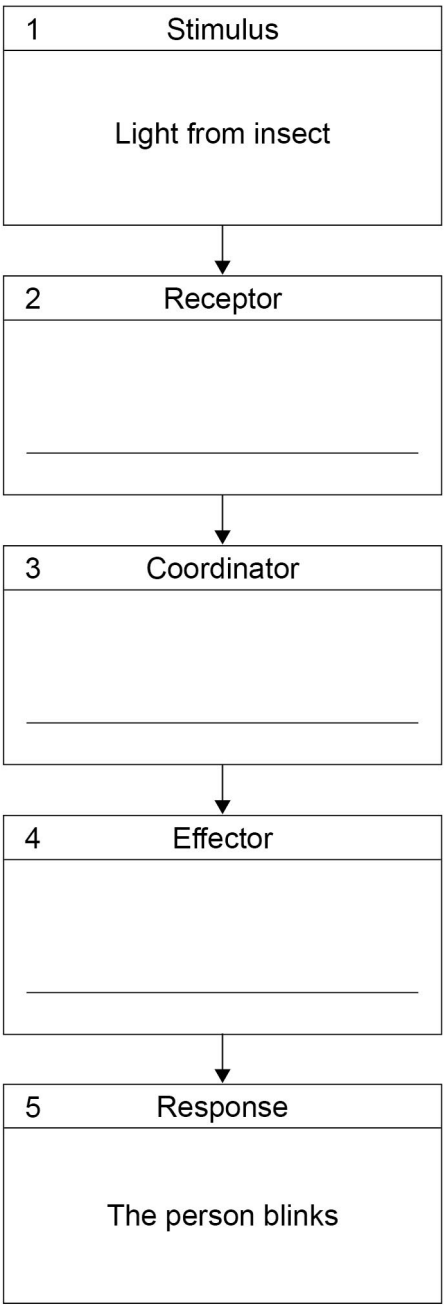
Question 4 continues on the next page

Do not write outside the box

0 4 . 5 An insect flies near a person's eye. The person blinks.
This is a reflex action.

Figure 8 shows the coordination system for this reflex action.

Figure 8



Complete **Figure 8**.

[2 marks]

Choose answers from the box below.

Write **one** word in each of boxes **2**, **3** and **4** of **Figure 8**.

brain	**cornea**	**iris**	**muscles**	**retina**

9

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0 5 Potato blight is a disease of potato plants.

Potato blight is caused by the fungus *Phytophthora infestans.*

0 5 . 1 What is the genus of the fungus that causes potato blight?

[1 mark]

Tick (✓) **one** box.

infestans ☐

Phytophthora ☐

Phytophthora infestans ☐

0 5 . 2 The fungus grows near the surface of the potato.

How does growing near the surface help the fungus to respire?

[1 mark]

Tick (✓) **one** box.

The fungus can get nitrogen from the soil. ☐

The fungus can get oxygen from the air. ☐

The fungus can get water from the potato. ☐

Question 5 continues on the next page

Do not write outside the box

A farmer sprays his potato plants with a pesticide.

The pesticide kills the fungus that causes potato blight.

Spraying the crop with a pesticide could decrease biodiversity in a river flowing through his farm.

0 5 . 3 What does 'biodiversity in a river' mean?

[1 mark]

Tick (✓) **one** box.

The variety of species of animals in the river. ☐

The variety of species of organisms in the river. ☐

The variety of species of plants in the river. ☐

0 5 . 4 The farmer sprayed pesticide on his potato plants. The next day it rained heavily.

Explain why the biodiversity in the river decreased.

[2 marks]

Another method of preventing potato blight is to breed potatoes that are resistant to blight.

Resistance to potato blight is controlled by two alleles:

R = a dominant allele for having resistance to blight.

r = a recessive allele for **not** having resistance to blight.

A scientist crosses two potato plants. Each plant has the genotype **Rr**.

Do not write outside the box

0 5 . 5 Complete **Figure 9** to show the possible genotypes of the offspring produced.

[2 marks]

Figure 9

Male gametes

Female gametes	**R**	**r**
R	**RR**	
r		

0 5 . 6 Draw a ring around **one** of the homozygous genotypes in **Figure 9**.

[1 mark]

0 5 . 7 What percentage of the offspring in **Figure 9** will be resistant to potato blight?

[1 mark]

Tick (✓) **one** box.

25% ☐ 50% ☐ 75% ☐ 100% ☐

0 5 . 8 Potatoes can also reproduce asexually.

Potatoes from one plant can be planted in the ground to produce new potato plants.

All the new plants from a parent plant that is resistant to blight will also be resistant to blight.

Explain why.

[2 marks]

11

Turn over for the next question

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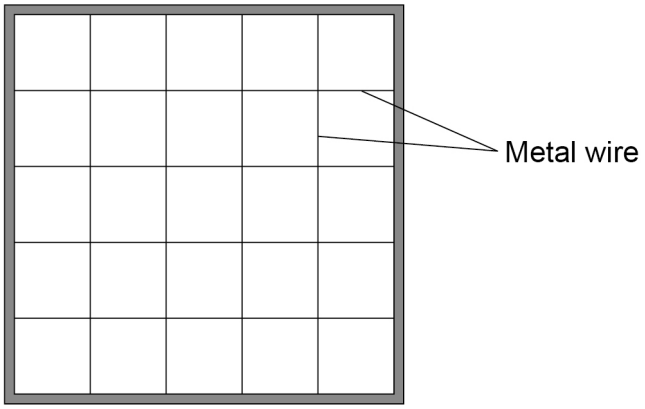
0 6 A student estimated the percentage cover of buttercup plants in a field.

The student used a quadrat.

The quadrat was divided into 25 equal squares.

Figure 10 shows the quadrat.

Figure 10



This is the method used.

1. Place the quadrat on the ground.
2. Record how many squares in the quadrat contain buttercup plants.
3. Place the quadrat in a new position in the field.
4. Record how many squares in the quadrat contain buttercup plants.
5. Repeat steps 3 and 4 another three times.

Do not write outside the box

0 6 . 1 What method should the student have used for placing the quadrat?

[1 mark]

Tick (✓) **one** box.

Place the quadrat where there are many buttercup plants. ☐

Place the quadrat only where there are no trees. ☐

Place the quadrat using random coordinates. ☐

Use the same person to place all the quadrats. ☐

The student calculated the percentage cover of buttercup plants for each quadrat.

Table 1 shows the student's results.

Table 1

Quadrat number	Number of squares containing buttercup plants	Percentage cover of buttercup plants
1	10	40
2	13	52
3	22	88
4	20	80
5	10	40
	Mean	**X**

0 6 . 2 Calculate mean value **X** in **Table 1**.

[2 marks]

X = _____ %

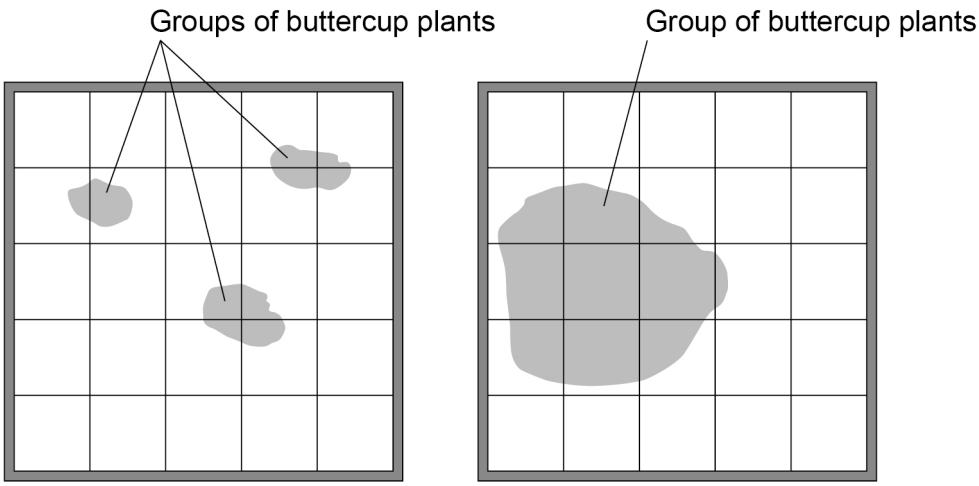
Question 6 continues on the next page

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Table 1 shows that quadrat **1** and quadrat **5** each had 40% cover of buttercup plants.

Figure 11 shows the results for quadrat **1** and quadrat **5**.

Figure 11



0 6 . 3 The student's method of estimating the percentage cover of buttercup plants is **not** accurate.

How does **Figure 11** show this?

[1 mark]

Tick (✓) **one** box.

Quadrat 1 has more groups of buttercup plants. ☐

The area of buttercup plants in quadrat 5 is much larger. ☐

The buttercup plants are in ten squares in both quadrats. ☐

Do not write outside the box

0 6 . 4 The student wanted to get a more valid estimate of the percentage cover of buttercup plants in the field.

Suggest **two** improvements to the method to make the results more valid.

[2 marks]

1 _____

_____

2 _____

_____

0 6 . 5 Give **three** environmental factors that would affect the growth of buttercup plants in a field.

[3 marks]

1 _____

2 _____

3 _____

9

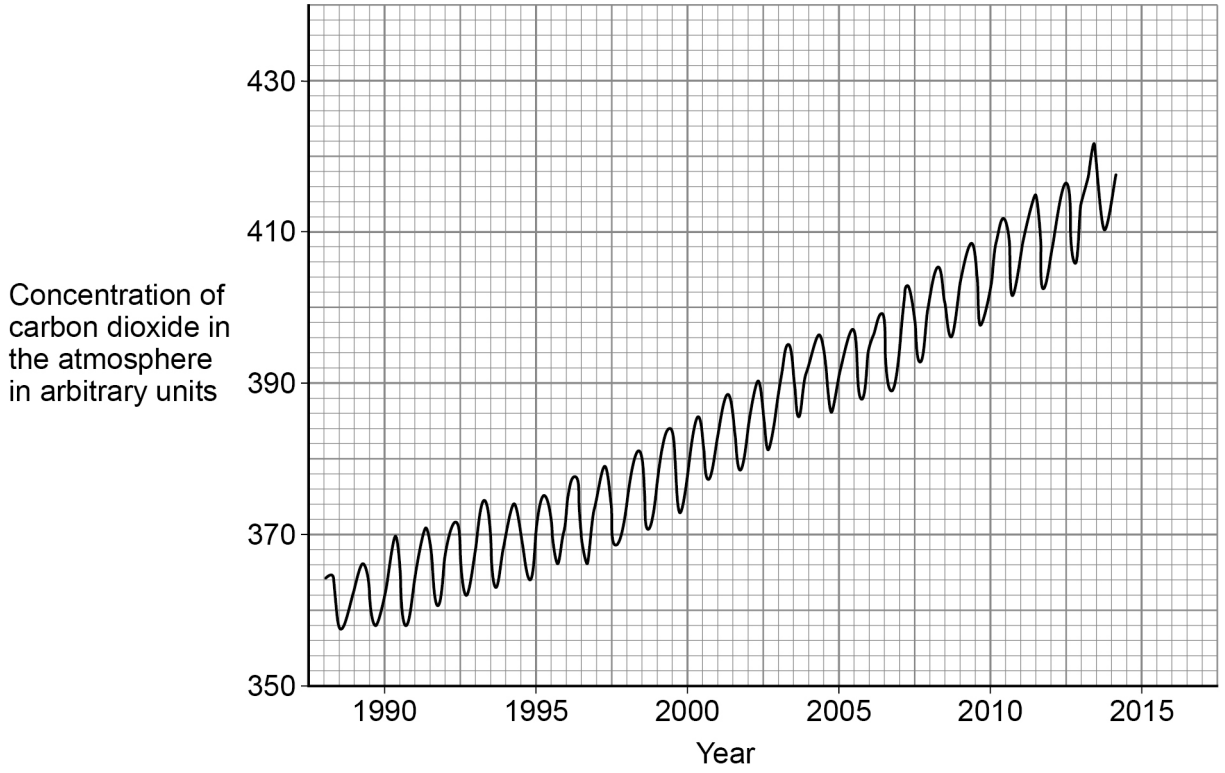
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0 7 Scientists are very concerned about the changes in concentration of carbon dioxide in the Earth's atmosphere.

Figure 12 shows the concentration of carbon dioxide in the atmosphere between 1988 and 2014.

Figure 12



0 7 . 1 Describe **two** patterns shown in **Figure 12**.

Use data from **Figure 12** in your answer.

[4 marks]

1 _____

_____

_____

_____

2 _____

_____

_____

_____

Do not write outside the box

0 7 . 2 Give **two** human activities that affect the concentration of carbon dioxide in the atmosphere.

[2 marks]

1 _____

_____

2 _____

_____

0 7 . 3 The trend shown in **Figure 12** may continue for many years.

Explain what effect the changing concentration of carbon dioxide in the atmosphere could have on living organisms.

[4 marks]

_____

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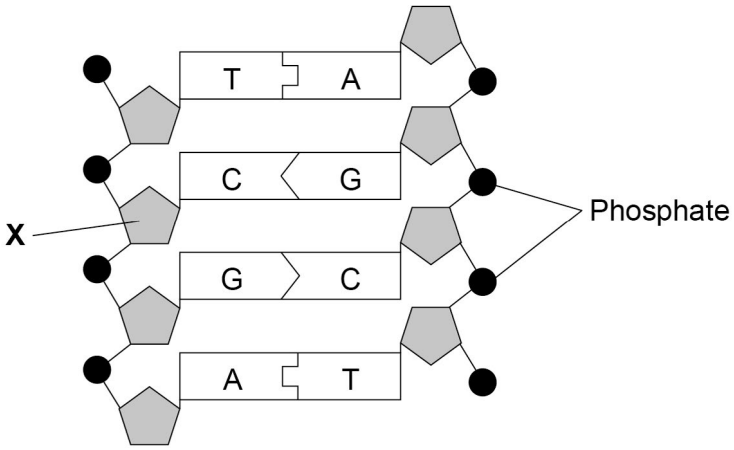
0 8 The nucleus of a cell contains DNA.

0 8 . 1 Name the structures inside the cell nucleus that contain DNA.

[1 mark]

Figure 13 shows part of a DNA molecule.

Figure 13



0 8 . 2 Name the part of the DNA molecule labelled **X**.

[1 mark]

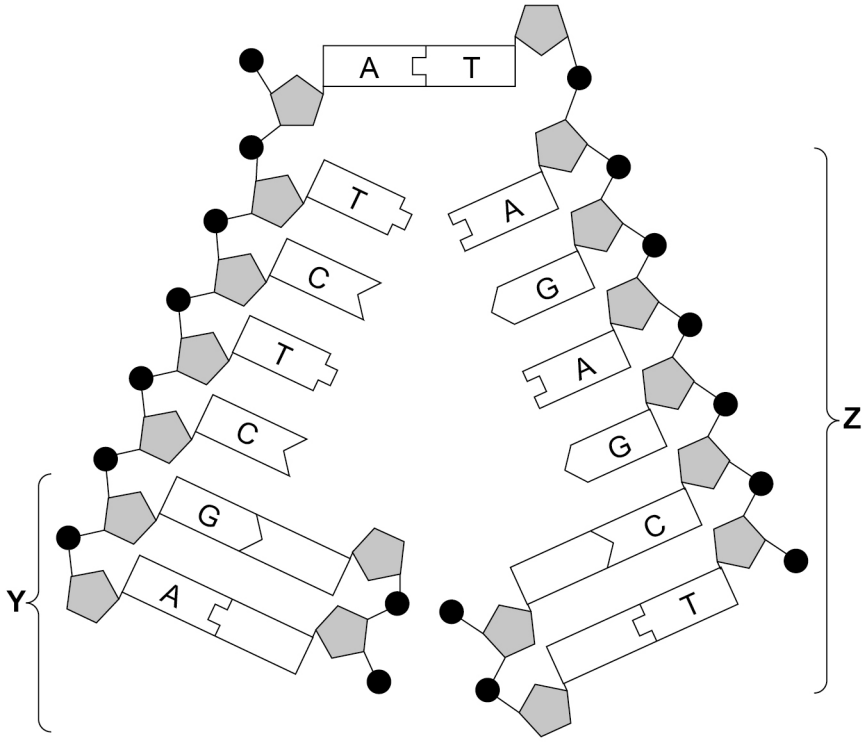
0 8 . 3 What type of substances are labelled **A**, **C**, **G** and **T** in **Figure 13**?

[1 mark]

Do not write outside the box

Figure 14 shows another section of a DNA molecule.

Figure 14



0 8 . 4 Four of the substances you named in Question **08.3** are **not** labelled in part **Y** of **Figure 14**.

Label each of these substances with the correct letter, **A**, **C**, **G** or **T**.

Use information from other parts of **Figure 14** to help you.

[1 mark]

0 8 . 5 What is happening to the DNA in part **Z** of **Figure 14**?

[1 mark]

Tick (✓) **one** box.

Differentiation ☐

Evolution ☐

Fertilisation ☐

Replication ☐

Turn over ►

Do not write outside the box

0 8 . 6 A gene is a length of DNA.

What type of substance does a gene code for?

[1 mark]

---

0 8 . 7 Most human body cells contain 6×10^{-12} grams of DNA.

What mass of DNA will a human sperm cell contain?

[1 mark]

Tick (✓) **one** box.

6×10^{-6} grams ☐

6×10^{-12} grams ☐

3×10^{-6} grams ☐

3×10^{-12} grams ☐

0 8 . 8 What is the name of the type of cell division that produces sperm cells?

[1 mark]

Tick (✓) **one** box.

Binary fission ☐

Differentiation ☐

Meiosis ☐

Mitosis ☐

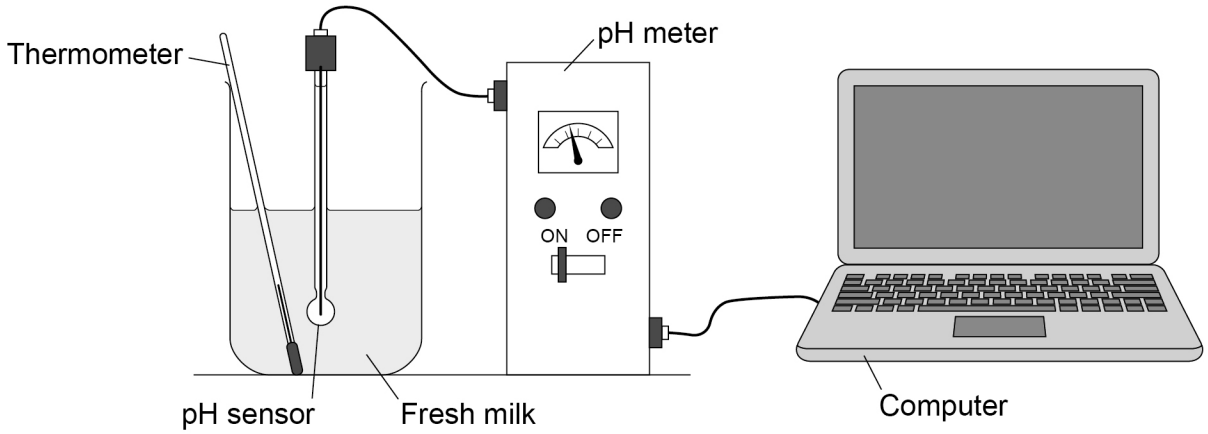
8

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0 9 A student investigated the effect of temperature on the decay of milk.

Figure 15 shows the apparatus the student used.

Figure 15



This is the method used.

1. Set up the apparatus as shown in **Figure 15** 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 9 . 1 How could the student keep the milk at a constant temperature for 5 days?

[1 mark]

0 9 . 2 Give **one** variable the student should keep constant.

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

[1 mark]

Question 9 continues on the next page

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Table 2 shows the student's results for the milk at 20 °C.

Table 2

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

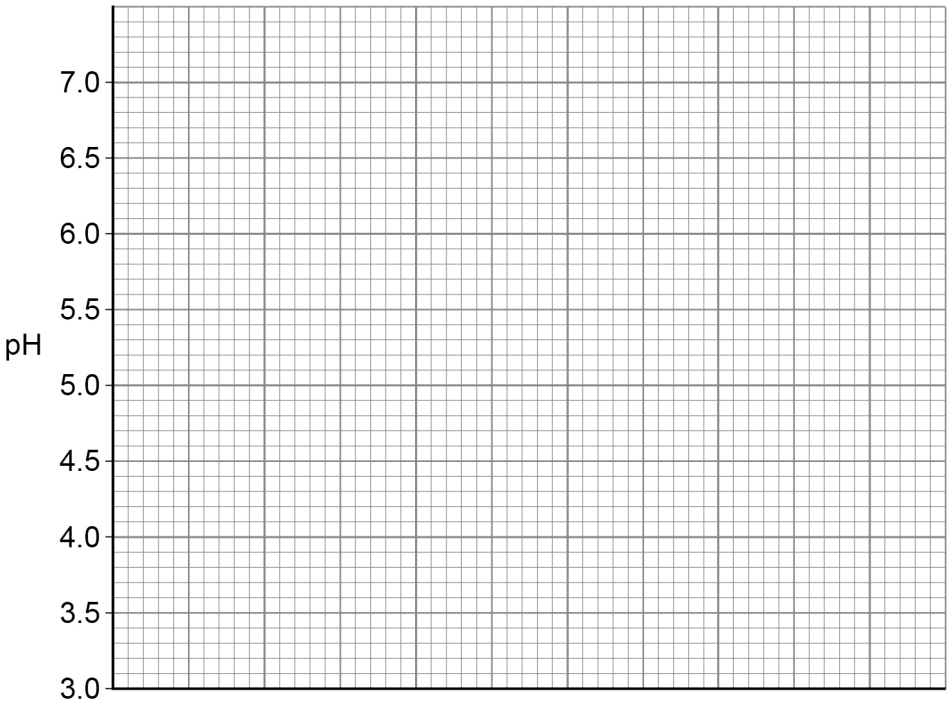
0 9 . 3 Complete **Figure 16**.

[4 marks]

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.

Figure 16



0 9 . 4 The data you plotted in Question **09.3** were obtained at 20 °C.

Sketch a line on **Figure 16** to show the results you would expect at 25 °C.

Label this line '25 °C'.

[2 marks]

8

Do not write outside the box

1 0 Human body temperature is controlled within very narrow limits.

Scientists investigated the effect of drinking ice-cold water on:

- internal body temperature
- the rate of sweating.

This is the method used.

1. Sit a person inside a room kept at a constant temperature of 25 °C.
2. Measure the person's internal body temperature near the brain.
3. Measure the person's rate of sweating.
4. After 20 minutes, give the person 500 cm^3 of ice-cold water to drink.
5. Continue to measure the person's internal body temperature and sweating rate for a further 50 minutes.

1 0 . 1 Give the reason why the person should **not** move during the investigation.

[1 mark]

Question 10 continues on the next page

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Figure 17 and **Figure 18** show the scientists' results.

Figure 17

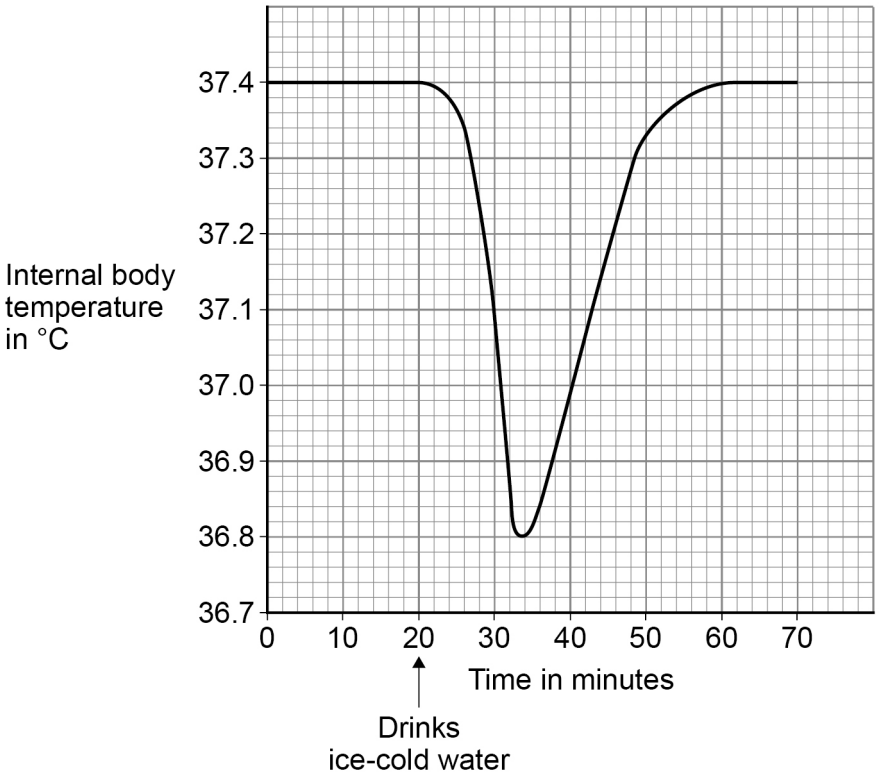
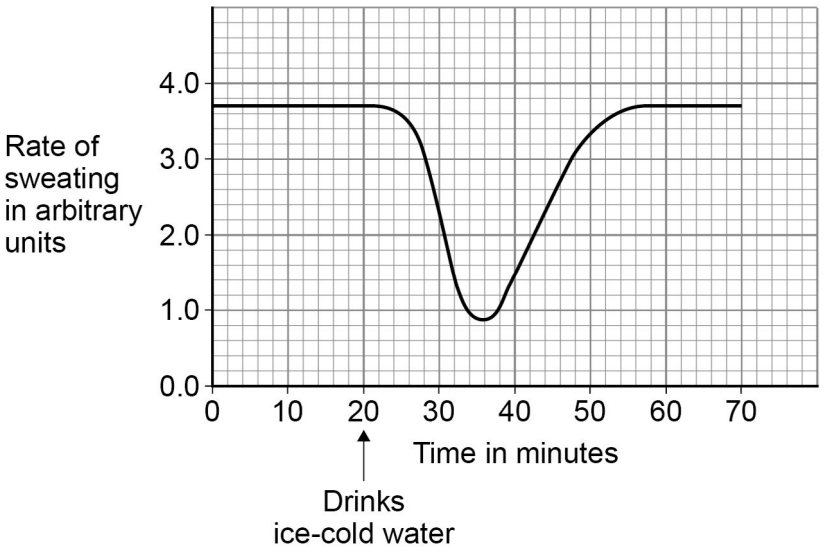


Figure 18



Do not write outside the box

1 0 . 2 What is this person's normal internal body temperature?

[1 mark]

Tick (✓) **one** box.

36.8 °C ☐ 37.0 °C ☐ 37.4 °C ☐

The results show that when the ice-cold water was drunk, the temperature near the brain decreased.

1 0 . 3 Explain why the temperature near the brain decreased.

[2 marks]

1 0 . 4 The thermoregulatory centre in the brain responds to the decrease in temperature.

How does the thermoregulatory centre send information to sweat glands in the skin?

[1 mark]

1 0 . 5 The rate of sweating changes between 24 minutes and 36 minutes.

Explain how this change helps to maintain the person's normal body temperature.

[2 marks]

Question 10 continues on the next page

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1 0 . 6 During exercise, the skin appears red.

What causes the skin to appear red?

[1 mark]

Tick (✓) **one** box.

Blood vessels moving closer to the skin surface ☐

Constriction of blood vessels in the skin ☐

Decrease in heart rate ☐

Dilation of blood vessels in the skin ☐

8

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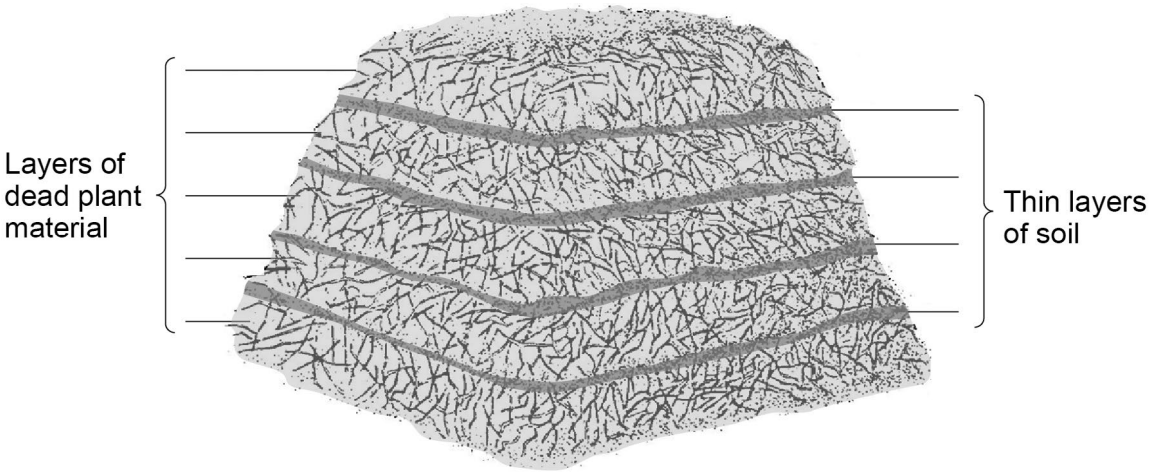
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ANSWER IN THE SPACES PROVIDED

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1 1 Decay occurs in a compost heap.

Figure 19 shows a compost heap.

Figure 19



Describe:

- how microorganisms in the layers of soil help to recycle chemicals in the dead plants
- how the chemicals are used again by living plants.

[6 marks]

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6

END OF QUESTIONS

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