Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
BIOLOGY

F

Foundation Tier

Paper 2F

Specimen 2018 (set 2)

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.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- 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	
TOTAL	

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

0 1 Living organisms are classified into the following groups:

- Kingdom
- Phylum
- Class
- Order
- Family
- Genus
- Species

0 1 . 1 Which scientist first suggested this type of classification system?

[1 mark]

Tick **one** box.

Alfred Russel Wallace ☐

Carl Linnaeus ☐

Charles Darwin ☐

Gregor Mendel ☐

Question 1 continues on the next page

The stone plant, *Lithops bromfieldi*, is adapted to live in very dry deserts.

Figure 1 shows several stone plants.

Figure 1

0 1 . 2 Give the genus to which the stone plant belongs.

[1 mark]

_____

0 1 . 3 The stone plant has many adaptations that help it to survive in the desert.

Draw **one** line from each adaptation to how the adaptation helps the stone plant to survive.

[4 marks]

Adaptation	**How the adaptation helps survival**
	Can trap a lot of light
Plants look like stones	Absorb water from deep in the ground
Leaves with thick, waxy cuticles	Help cross-pollination
Many long, branching roots	Are not easy to see and so are not eaten
Thick, fleshy leaves	Reduce water loss
	Store water

Question 1 continues on the next page

The jerboa is a small desert animal.

Figure 2 shows a jerboa.

Figure 2

The jerboa is adapted for survival in the desert.

The jerboa spends the daytime in its underground burrow.

The jerboa only leaves its burrow to look for food during the night.

0 1 . 4 Describe how these adaptations help the jerboa to survive in the desert.

[2 marks]

0 1 . 5 What type of adaptations are described in Question **01.4**?

[1 mark]

Tick **one** box.

Behavioural ☐

Functional ☐

Structural ☐

9

Turn over for the next question

0 2 Chromosomes carry genetic information.

Chromosomes are found in nearly all human cells.

0 2 . 1 How many chromosomes are there in most human body cells?

[1 mark]

Tick **one** box.

23 ☐

24 ☐

46 ☐

48 ☐

0 2 . 2 How many chromosomes are there in a human gamete cell?

[1 mark]

_____

0 2 . 3 Complete the sentences.

Choose the answers from the box.

[5 marks]

sexual reproduction	**binary fission**	**egg**	**fertilisation**	**meiosis**
mitosis	**ovary**	**sperm**	**testis**	**uterus**

The female gamete is called the _____ .

The male gamete is called the _____ .

The female gamete is produced in the _____ .

Gametes are produced by a type of cell division

called _____ .

Male and female gametes join together in a process

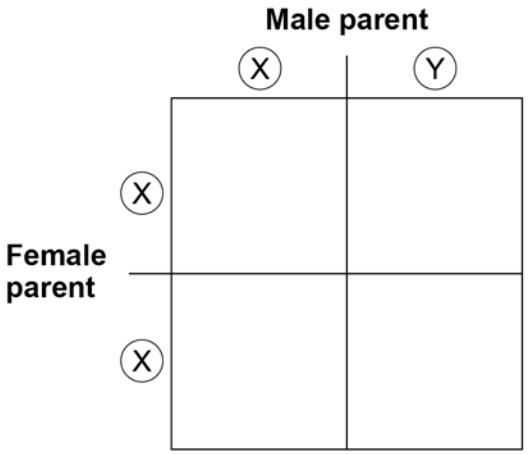
called _____ .

Question 2 continues on the next page

In humans, the sex chromosomes are called **X** and **Y**.

Figure 3 shows the inheritance of sex chromosomes.

Figure 3



0 2 . 4 Complete **Figure 3** to show the sex chromosomes inherited by the offspring.

[2 marks]

0 2 . 5 What is the chance that a child produced by these parents will be female?

[1 mark]

Tick **one** box.

1 in 2 ☐

1 in 3 ☐

1 in 4 ☐

3 in 4 ☐

0 2 . 6 The parents shown in **Figure 3** have five children.

Give **two** reasons why these children all look different from each other.

[2 marks]

1 _____

_____

2 _____

_____

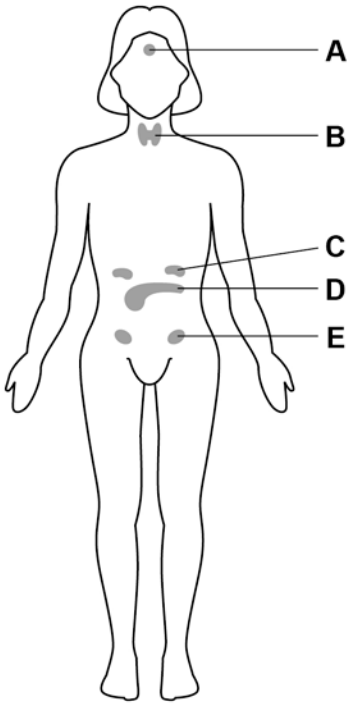
12

Turn over for the next question

0 3 The menstrual cycle in a woman is controlled by hormones.

Figure 4 shows some of the glands in a woman's body that produce hormones.

Figure 4



The hormones that control the menstrual cycle are produced by the pituitary gland and by the ovaries.

0 3 . 1 Which gland is the pituitary gland?

[1 mark]

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

0 3 . 2 Which gland is the ovary?

[1 mark]

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

0 3 . 3 Complete the sentence.

[1 mark]

In the menstrual cycle, one egg is released approximately every _____ days.

0 3 . 4 Which hormone is used in the oral contraceptive pill?

[1 mark]

Tick **one** box.

Adrenaline ☐

Insulin ☐

Progesterone ☐

Testosterone ☐

Question 3 continues on the next page

0 3 . 5 Describe how the oral contraceptive pill stops a woman becoming pregnant.

[2 marks]

0 3 . 6 Complete the sentences.

Choose the answers from the box.

[2 marks]

adrenaline	**insulin**	**oestrogen**	**progesterone**	**testosterone**

Development of the female secondary sex characteristics is controlled

by _____ .

Sperm production is stimulated by _____ .

8

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Turn over for the next question

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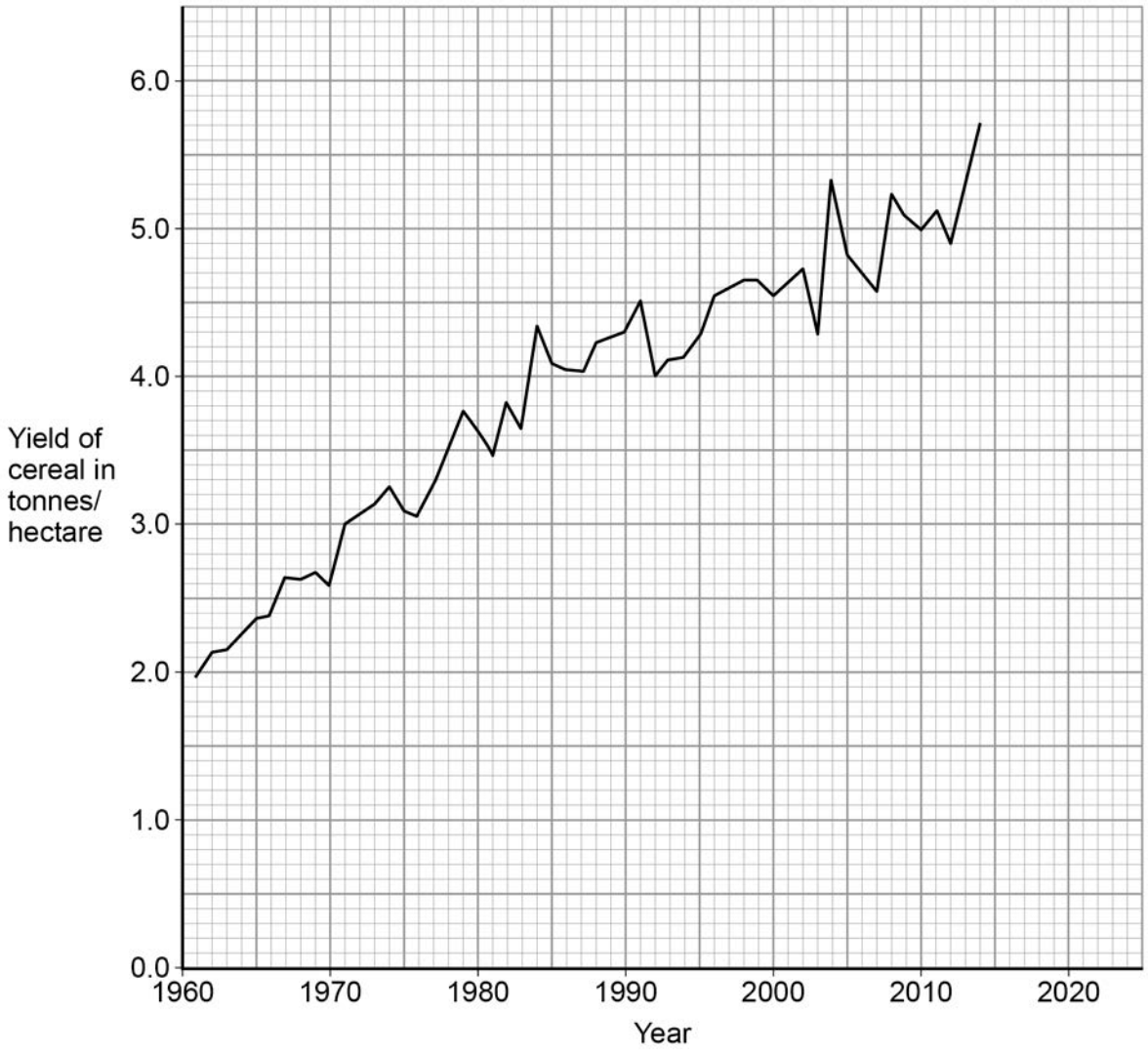
ANSWER IN THE SPACES PROVIDED

0 4 **Figure 5** shows information about the yield of cereal crops grown in the European Union.

Figure 5



0 4 . 1 Calculate the increase in the yield of cereal between 1970 and 2010.

[2 marks]

Increase in yield = _____ tonnes/hectare

0 4 . 2 Estimate by what fraction the yield of cereal increased between 1971 and 1992.

[1 mark]

Tick **one** box.

$\frac{1}{10}$ ☐ $\frac{1}{3}$ ☐ $\frac{1}{2}$ ☐ $\frac{3}{4}$ ☐

0 4 . 3 The increase in yield is partly due to increased use of nitrate fertilisers.

Which substance do plants make using nitrate ions?

[1 mark]

Tick **one** box.

Cellulose ☐

Fat ☐

Protein ☐

Starch ☐

0 4 . 4 The yield of cereal in 2004 was much greater than the yield in 2003.

Suggest **three** possible reasons for the increased yield in 2004.

[3 marks]

Tick **three** boxes.

A genetically-modified variety of seed was sown in 2004. ☐

A pathogenic fungus grew on the cereal in 2004. ☐

Farmers added more nitrate to the soil in 2003. ☐

More cereal seeds were sown in 2003. ☐

More rain fell in spring and early summer in 2004. ☐

The mean summer temperature was lower in 2003. ☐

Humans eat cereals.

Humans also eat the animals that feed on cereals.

Figure 6 and **Figure 7** show two food chains.

Figure 6

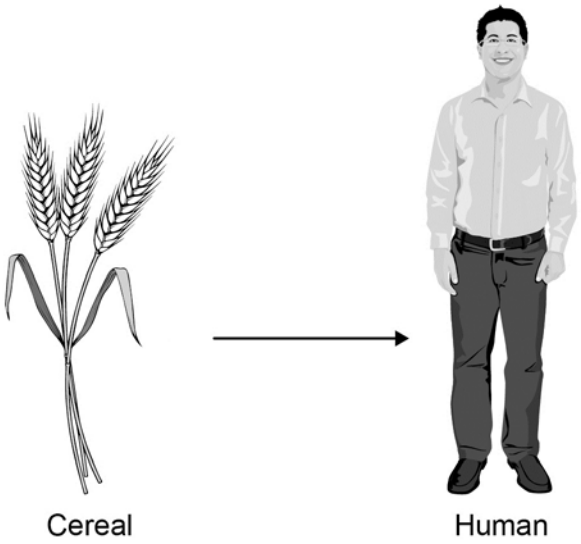
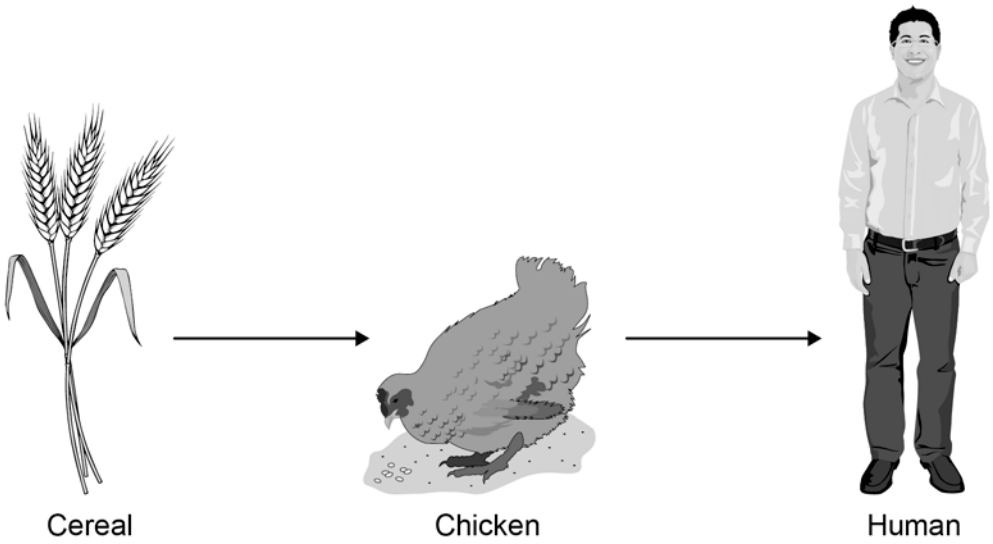


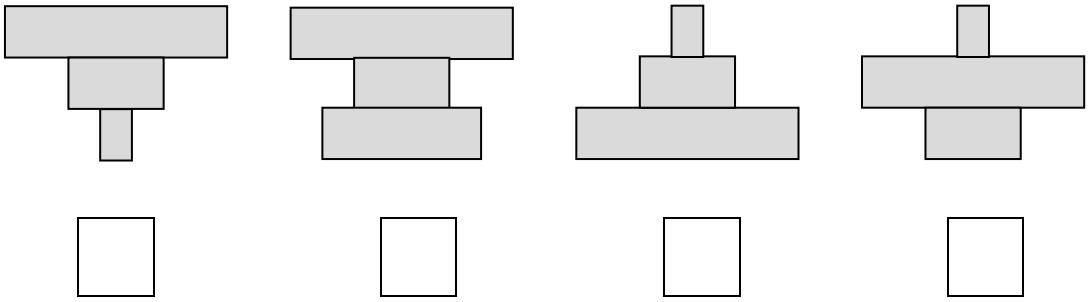
Figure 7



0 4 . 5 Which pyramid of biomass is correct for the food chain shown in **Figure 7**?

[1 mark]

Tick **one** box.



In **Figure 6**, 1 hectare of cereal crop would provide enough energy for 8 people for a year.

In **Figure 7**, 10 hectares of cereal crop would be needed to provide enough energy for only 1 person for a year.

0 4 . 6 It is much more efficient for humans to get energy by eating cereals than by eating chickens.

Calculate how many times more efficient.

[1 mark]

Answer = _____ times

Question 4 continues on the next page

0 4 . 7 Why is it more efficient for humans to get energy by eating cereals than by eating chickens?

[2 marks]

Tick **two** boxes.

Cereals gain extra energy from mineral ions in the soil. ☐

Chickens contain more protein per gram than cereals. ☐

Chickens use energy for movement and for keeping warm. ☐

Much of the food eaten by chickens is wasted as faeces. ☐

Not all parts of the cereal plants are edible. ☐

11

Do not write outside the box

Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

0 5 Fresh milk contains bacteria.

Some students investigated decay caused by the bacteria in fresh milk.

This is the method used:

1. Put 200 cm^3 of fresh milk in a sterilised flask.
2. Leave the flask for 3 days at 20 °C.
3. Measure the pH of the milk each day using universal indicator paper.

Figure 8 and **Figure 9** show the apparatus the students used.

Figure 8

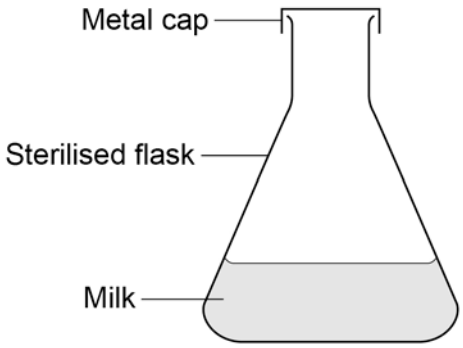
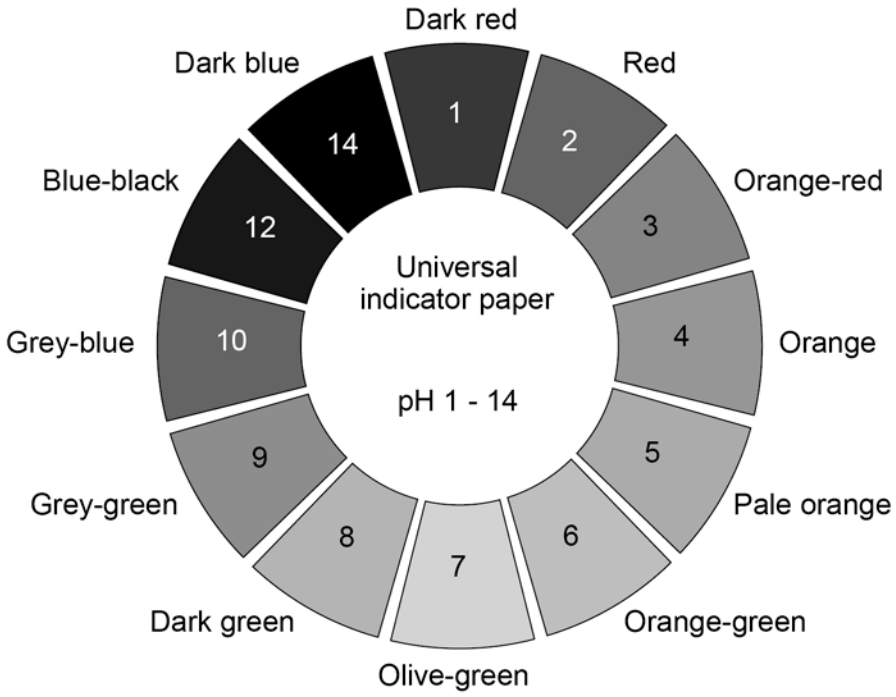


Figure 9



0 5 . 1 Give **one** reason why the students sterilised the flask before adding the milk.

[1 mark]

0 5 . 2 Describe how the students could sterilise the flask in a school laboratory.

[2 marks]

0 5 . 3 Why did the students put a cap on top of the flask?

[1 mark]

Question 5 continues on the next page

0 5 . 4 **Table 1** shows the students' results.

Table 1

Time in days	Colour of universal indicator paper	pH
0	Olive-green	
1	Olive-green	
2	Olive-green	
3	Orange-green	

Complete **Table 1**.

Use information from **Figure 9**.

[1 mark]

Do not write outside the box

Question 5 continues on the next page

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ANSWER IN THE SPACES PROVIDED

The students repeated their investigation with two changes to the method:

- they used a pH meter to measure the pH
- they left the apparatus set up for 6 days instead of for 3 days.

0 5 . 5 Suggest a reason why each of these changes improves the investigation.

[2 marks]

Using a pH meter _____

_____

Leaving the apparatus set up for 6 days _____

_____

Table 2 shows the results of the students' second investigation.

Table 2

Time in days	pH
0	7.0
1	7.0
2	6.7
3	6.0
4	5.0
5	4.5
6	4.5

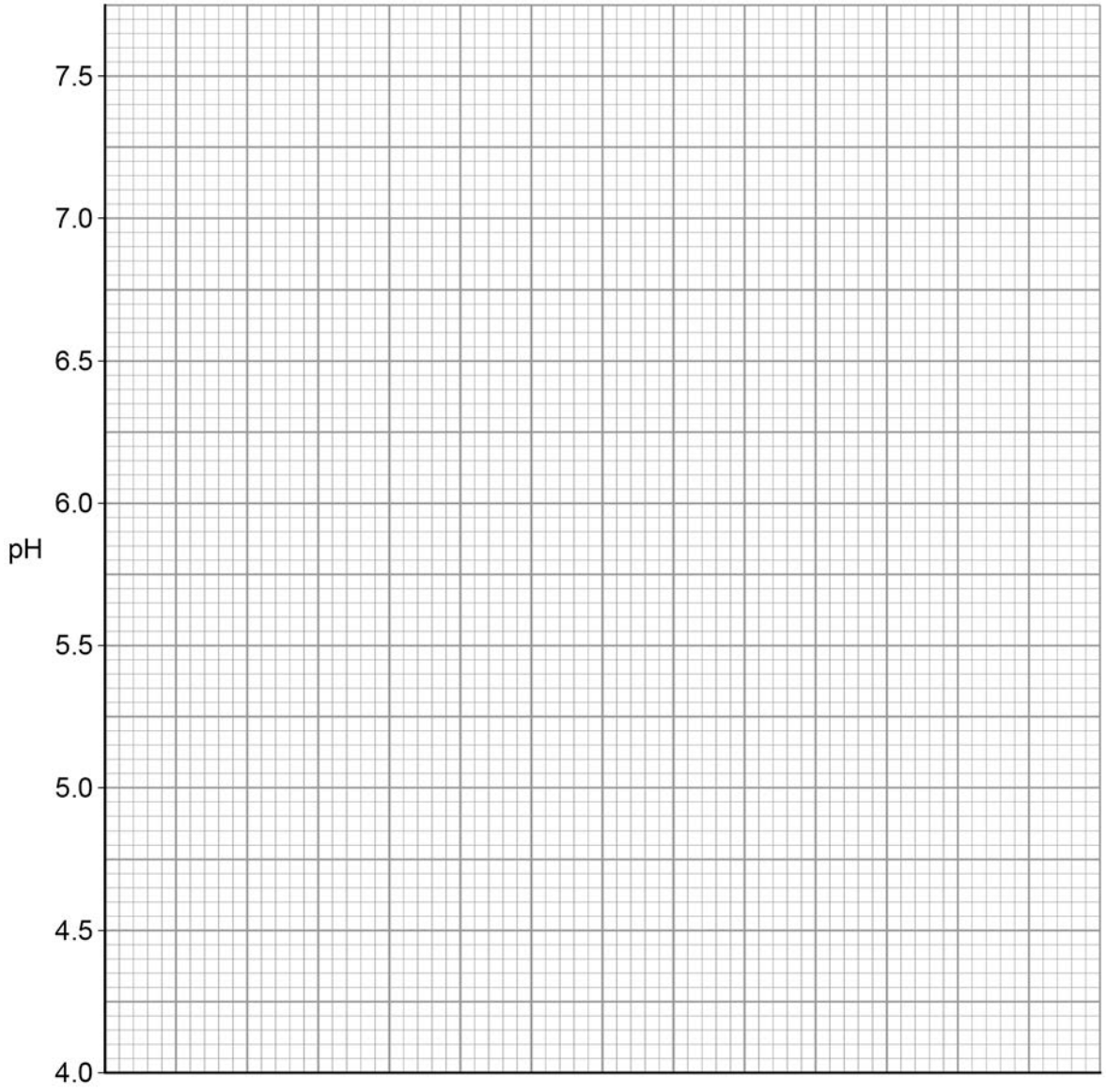
0 5 . 6 Complete **Figure 10**.

[4 marks]

You should:

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

Figure 10



Question 5 continues on the next page

Turn over ►

0 5 . 7 Give **one** reason for each of the following.

Use information from **Table 2** and **Figure 10**.

[3 marks]

The pH did not change during the first day: _____

_____

The pH decreased after day 1: _____

_____

There was no change in pH between days 5 and 6: _____

_____

0 5 . 8 The students did both of their investigations at 20 °C

The students then repeated the investigation with the pH meter, but at 25 °C

Predict how the new results would be:

- similar to the results at 20 °C
- different from the results at 20 °C

[2 marks]

Similarity _____

_____

Difference _____

_____

16

Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

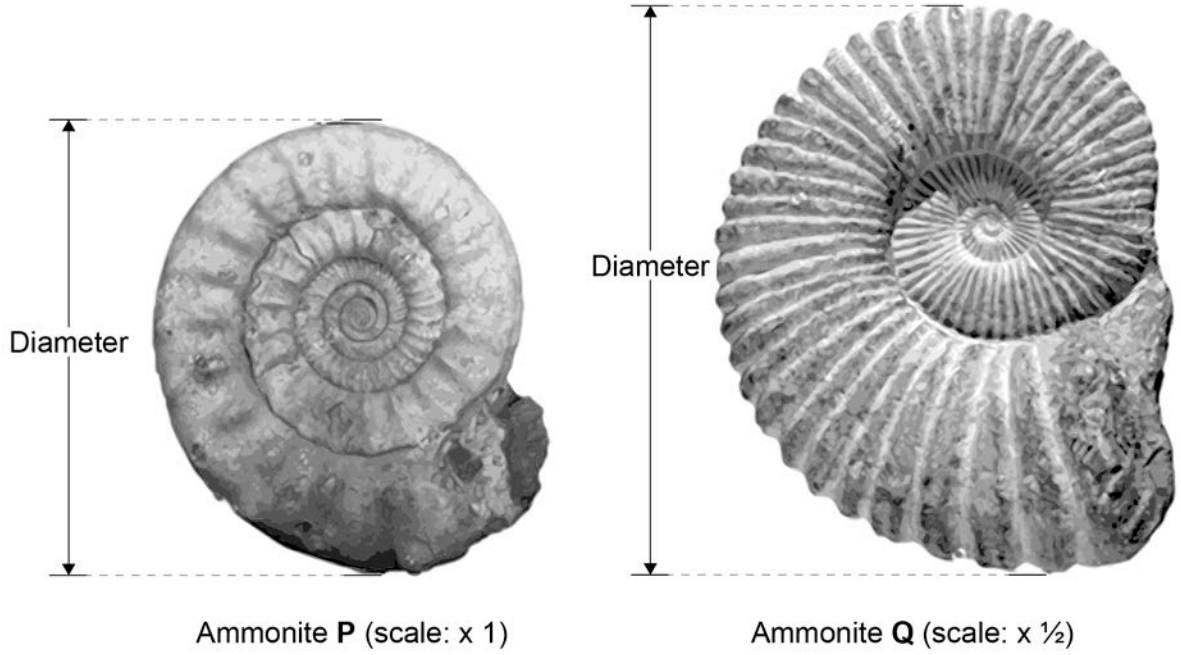
0 6 Fossils provide evidence about organisms that lived a long time ago.

0 6 . 1 Give **one** way a fossil may be formed.

[1 mark]

Figure 11 shows the fossils of two species of ammonite.

Figure 11



0 6 . 2 Use a ruler to measure the diameter of **P** and the diameter of **Q** in millimetres.

[1 mark]

Diameter of **P** = _____ mm

Diameter of **Q** = _____ mm

0 6 . 3 Calculate the diameter of the real fossil of ammonite **Q**.

Use your answer to Question **06.2** and the scale factor given in **Figure 11**.

[1 mark]

Diameter of the real fossil of ammonite **Q** = _____ mm

0 6 . 4 How many times larger is ammonite **Q** compared to ammonite **P**?

[1 mark]

Tick **one** box.

0.4 ☐ 0.8 ☐ 1.25 ☐ 2.5 ☐

0 6 . 5 Describe **two** ways the fossil of ammonite **Q** is different from the fossil of ammonite **P**.

Do **not** give answers referring to size.

[2 marks]

1 _____

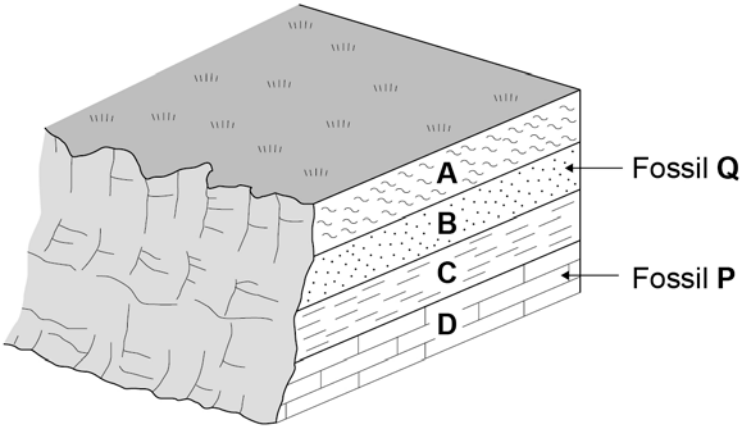
2 _____

Question 6 continues on the next page

0 6 . 6 **Figure 12** shows:

- four layers of rock, **A**, **B**, **C** and **D**
- where the fossils of ammonites **P** and **Q** were found.

Figure 12



Which statement is evidence that ammonite **Q** may have evolved from ammonite **P**?

[1 mark]

Tick **one** box.

P and **Q** are both found in limestone. ☐

Q was found in newer rocks than **P**. ☐

P is a darker colour than **Q**. ☐

Q has a smaller mass than **P**. ☐

0 6 . 7 Suggest how long ago ammonites **P** and **Q** were alive.

[1 mark]

Tick **one** box.

100 years ☐

1000 years ☐

100 million years ☐

100 billion years ☐

0 6 . 8 Ammonites are now extinct.

Suggest **three** possible causes of extinction.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

0 6 . 9 Give **one** reason why scientists cannot be sure about what caused the ammonites to become extinct.

[1 mark]

_____

_____

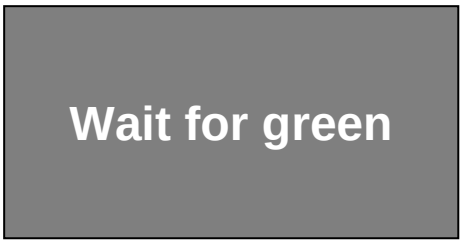
12

0 7 Three students measured their reaction times.

The students used a computer program.

Figure 13 shows the image displayed on the computer screen.

Figure 13



This is the method used:

1. Sit facing the computer screen.
2. Click the mouse button as quickly as possible when the computer screen turns green.
3. Record the time taken as shown on the computer screen.
4. Repeat steps 2 and 3 a further 9 times.

Table 3 shows the students' results.

Table 3

Attempt number	Time in milliseconds		
	Student A	**Student B**	**Student C**
1	275	260	272
2	259	268	268
3	251	251	275
4	261	256	266
5	260	244	270
6	263	280	283
7	259	468	274
8	256	258	278
9	255	255	286
10	248	277	275
Mean	259	282	275

(1 second = 1000 milliseconds)

0 7 . 1 Suggest why measuring reaction time with a computer is more accurate than measuring reaction time with a stopwatch.

[1 mark]

Question 7 continues on the next page

0 7 . 2 The students measured 10 reaction times for each person rather than 3 reaction times.

Explain why.

[2 marks]

0 7 . 3 Explain why the mean for student **B** has been calculated incorrectly.

Use information from **Table 3**.

[2 marks]

0 7 . 4 Calculate the ratio of student **C**'s mean reaction time to student **A**'s mean reaction time.

Give your answer to 3 significant figures.

[2 marks]

Ratio student **C** : student **A** = _____ : 1

0 7 . 5 Student **A** wanted to present his mean result in seconds, in standard form.

What is the correct way of doing this?

[1 mark]

Tick **one** box.

259×10^{-3} seconds ☐

0.259×10^{-3} seconds ☐

2.59×10^{-1} seconds ☐

0.259×10^{-4} seconds ☐

0 7 . 6 Student **C** said the results from this investigation showed that he had the fastest reactions.

Give **two** reasons why student **C**'s statement is **not** correct.

[2 marks]

1 _____

_____

2 _____

_____

0 7 . 7 The reaction the students investigated is **not** a reflex action.

Give the reason why.

[1 mark]

_____

_____

11

0 8 Blood is filtered in the kidneys.

Some substances are then reabsorbed.

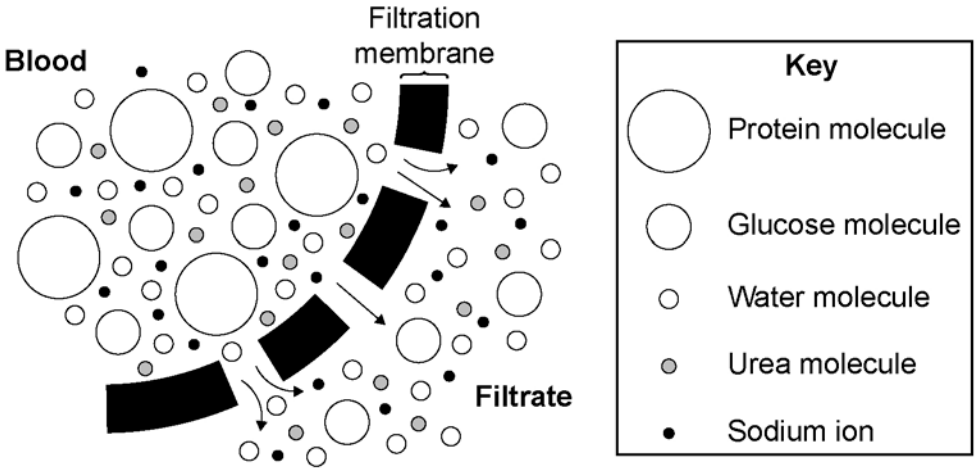
The amount of each substance reabsorbed varies.

Each day, a person:

- filters 180 dm^3 of water out of the blood
- produces 2 dm^3 of urine.

Figure 14 shows the process of filtration in the kidney.

Figure 14



0 8 . 1 Explain why protein is **not** found in the urine of a healthy person.

[2 marks]

0 8 . 2 Explain why glucose is **not** found in the urine of a healthy person.

[2 marks]

0 8 . 3 Explain:

- why urea and sodium ions are found in urine
- why their concentration is higher on a hot day than on a cold day.

[3 marks]

Question 8 continues on the next page

0 8 . 4 The information below gives some features of two types of treatment for kidney disease.

Dialysis treatment

- A dialysis session lasts about 8 hours.
- A person needs 3 dialysis sessions every week for the rest of their life.
- The person must have a diet low in protein and salt.
- Dialysis costs £30 000 per year.

Kidney transplant

- A kidney transplant requires surgery using general anaesthetic.
- A suitable kidney donor is needed.
- Drugs are used to suppress the immune system.
- A transplant, and the first year's medical care, costs £51 000.
- After the first year, the cost of drugs is £5 000 per year.

Evaluate the use of a kidney transplant instead of dialysis treatment for kidney disease.

[6 marks]

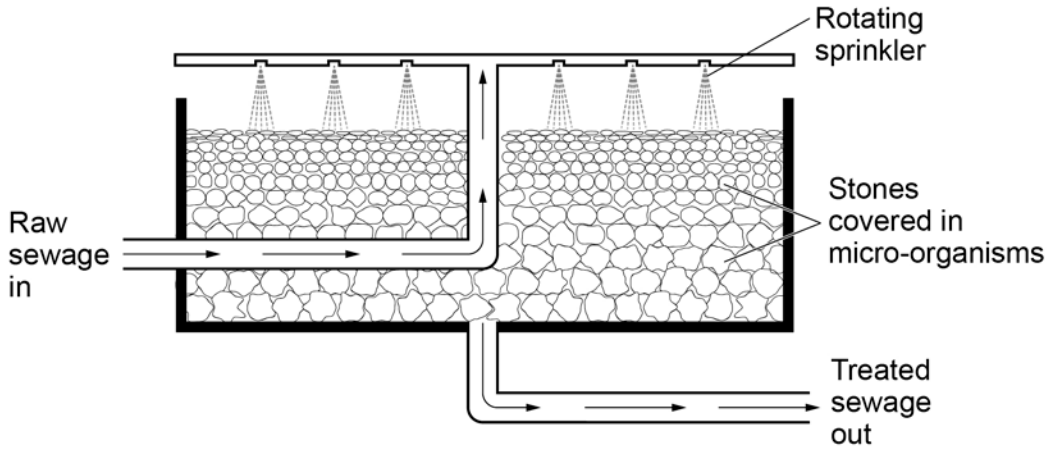
13

0 9 Pollution of rivers with untreated sewage can kill plants and animals.

Figure 15 shows a sprinkler bed at a sewage works.

The sewage trickles slowly downwards over the surfaces of the stones.

Figure 15



Some of the microorganisms on the stones feed on organic matter in the sewage.

The treated sewage is safe enough to pass into a river.

0 9 . 1 Most of the microorganisms in the sprinkler bed respire aerobically.

Describe **two** features of the sprinkler bed that encourage **aerobic** respiration.

Use information from **Figure 15**.

[2 marks]

1 _____

_____

2 _____

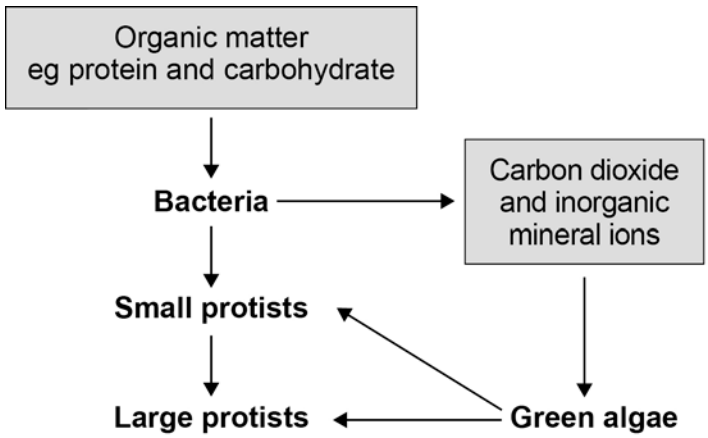
_____

Question 9 continues on the next page

Turn over ►

Figure 16 shows the feeding relationships between the microorganisms in the sprinkler bed.

Figure 16



0 9 . 2 Which organisms in **Figure 16** are producers?

[1 mark]

Tick **one** box.

Bacteria ☐

Green algae ☐

Large protists ☐

Small protists ☐

0 9 . 3 Name **one** organism in **Figure 16** which is both a primary and a secondary consumer.

[1 mark]

_____

0 9 . 4 The bacteria are decomposers.

Figure 16 shows that the bacteria change organic matter into carbon dioxide and inorganic mineral ions.

Describe how the bacteria do this.

[4 marks]

END OF QUESTIONS

8

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