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**Cambridge International Examinations**
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

**BIOLOGY** **0610/42**

Paper 4 Theory (Extended) **February/March 2018**

**1 hour 15 minutes**

Candidates answer on the Question Paper.

No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **17** printed pages and **3** blank pages.

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**1 (a) (i)** Fig. 1.1 is a branching key used to identify different species of bacteria.

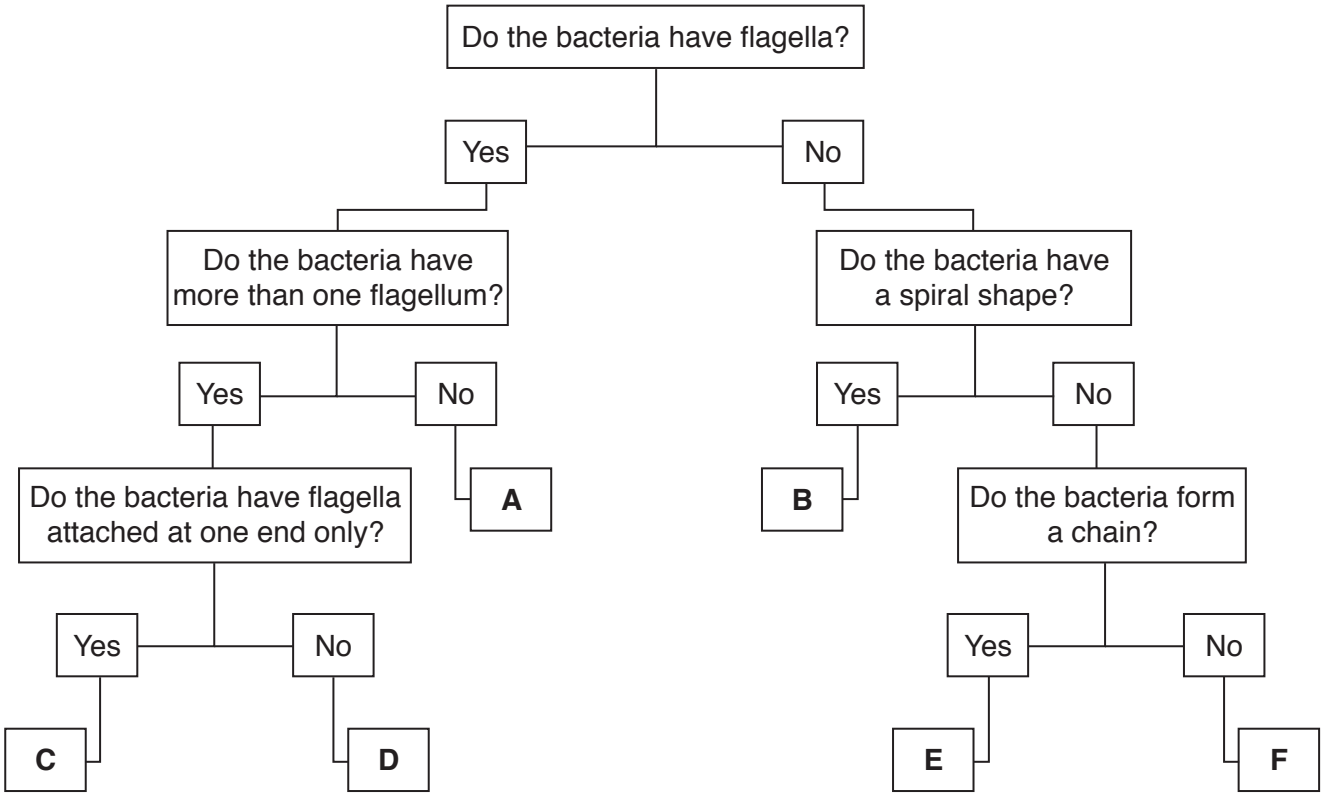
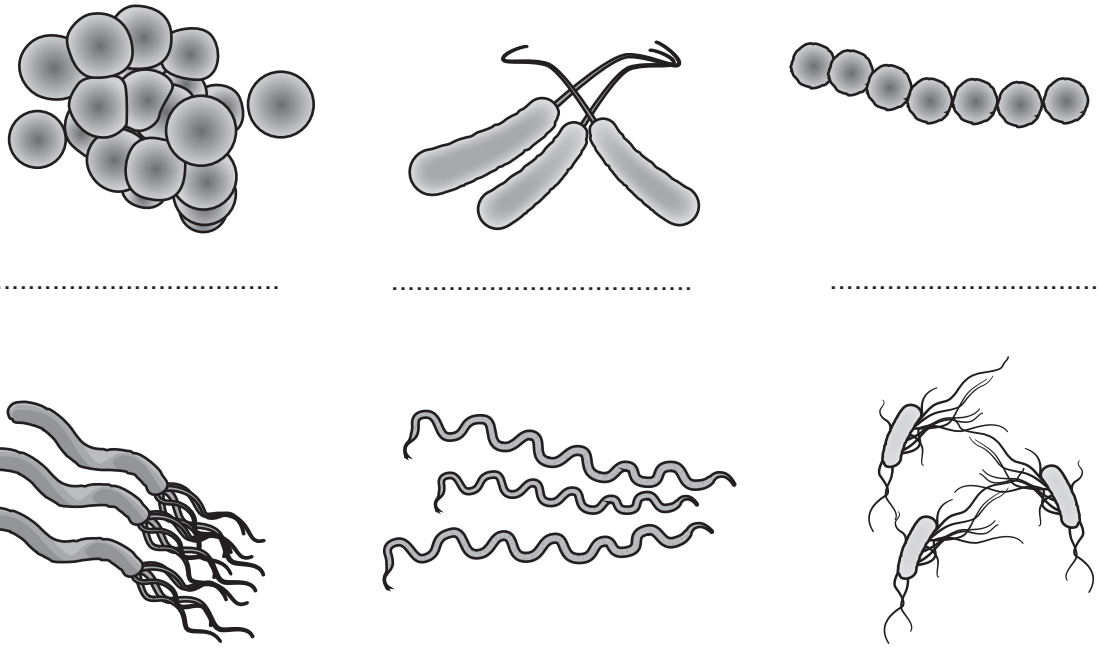



**Fig. 1.1**

Fig. 1.2 shows six different species of bacteria.

Use the key to identify the six different species of bacteria.

Write the letters on the lines in Fig. 1.2.



..... ..... .....

..... ..... .....

[5]

**Fig. 1.2**

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**(ii)** State the name of the kingdom that bacteria belong to.

..... [1]

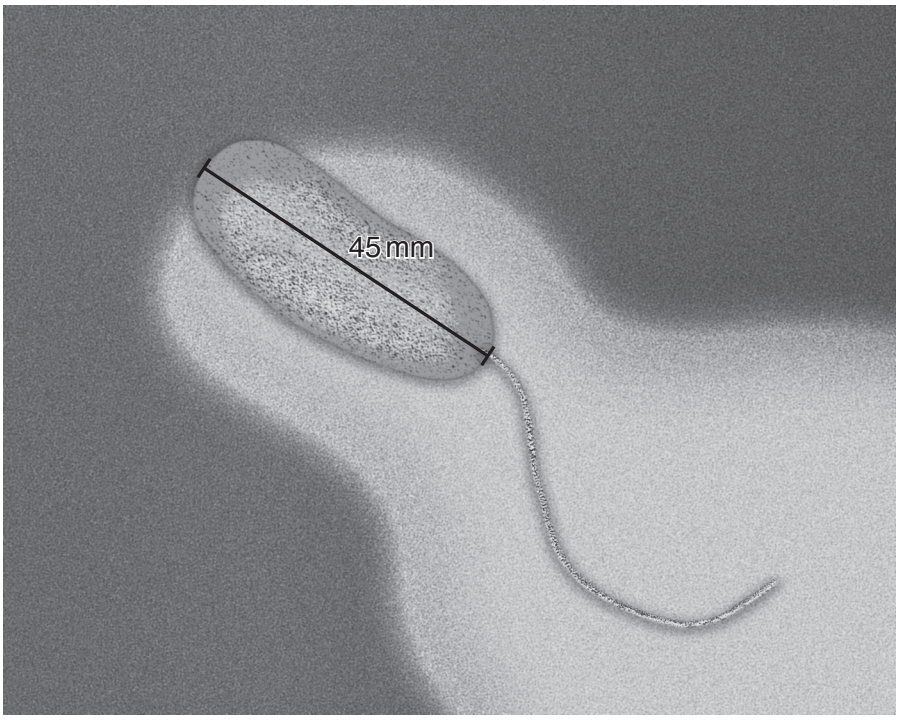
**(b)** State **one** similarity between the structure of bacteria and the structure of viruses.

.....

.....

.....[1]

**(c)** Fig. 1.3 is a photomicrograph of *Vibrio cholerae*, the bacterium that causes cholera.




magnification ×17 300

**Fig. 1.3**

**(i)** Write the formula that would be used to calculate the actual length of the bacterium (not including the flagellum) in Fig. 1.3.

[1]

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**(ii)** The actual length of the bacterium shown in Fig. 1.3 is 0.0026 mm.

Convert this value to micrometres (μm).

Space for working.

..... μm [1]

**(d) (i)** Describe **and** explain the effects of cholera bacteria on the gut.

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.....[4]

**(ii)** Suggest **one** treatment for cholera.

.....[1]

[Total: 14]

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**2** A study estimated the number of people with chronic obstructive pulmonary disease (COPD) in India. Data were collected from two groups of people, those who lived in cities and those who lived in villages.

Fig. 2.1 shows the results.

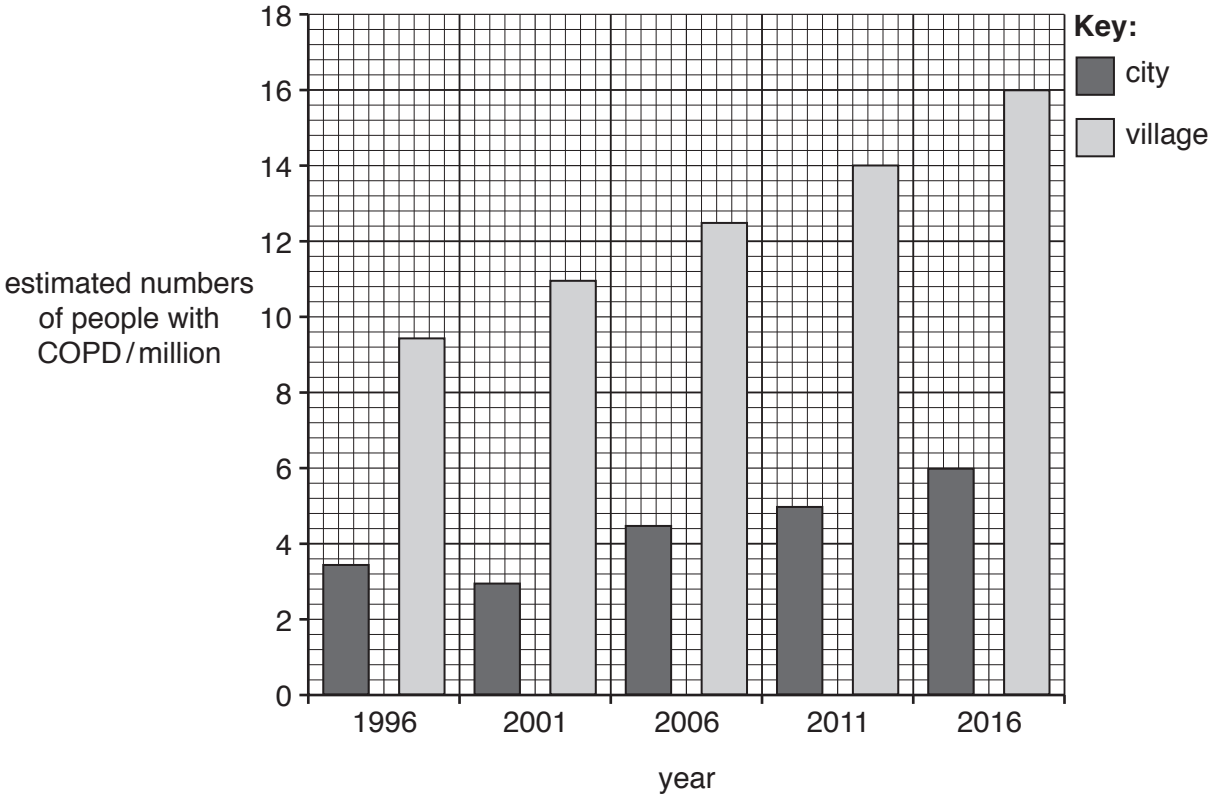



**Fig. 2.1**

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**(a)** Compare the number of people with COPD in cities with the number of people with COPD in villages **and** suggest reasons for the differences.

Use the data in Fig. 2.1 to support your answer.

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.....[6]

**(b)** **(i)** Explain how the body prevents particles in inspired air from reaching the gas exchange surfaces.

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.....[4]

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**[Turn over**

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**(ii)** State **two** ways in which the composition of inspired air differs from the composition of expired air.

1 .....

2 .....
[2]

**(c)** Alveoli are well-ventilated to provide efficient gas exchange.

**(i)** State the name of the muscles that cause the ribs to move during ventilation.

.....[1]

**(ii)** During inspiration the pressure and volume in the thorax changes.

State these changes.

pressure .....

volume .....
[1]

[Total: 14]

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**3** **(a)** Ecologists studied an area of woodland and estimated the biomass of each trophic level for one of the food chains in the woodland.

Some students wanted to use the data to draw a pyramid of biomass for the food chain.

Table 3.1 shows the students' table.

The students added a column to calculate the width of the bars they would need to draw.

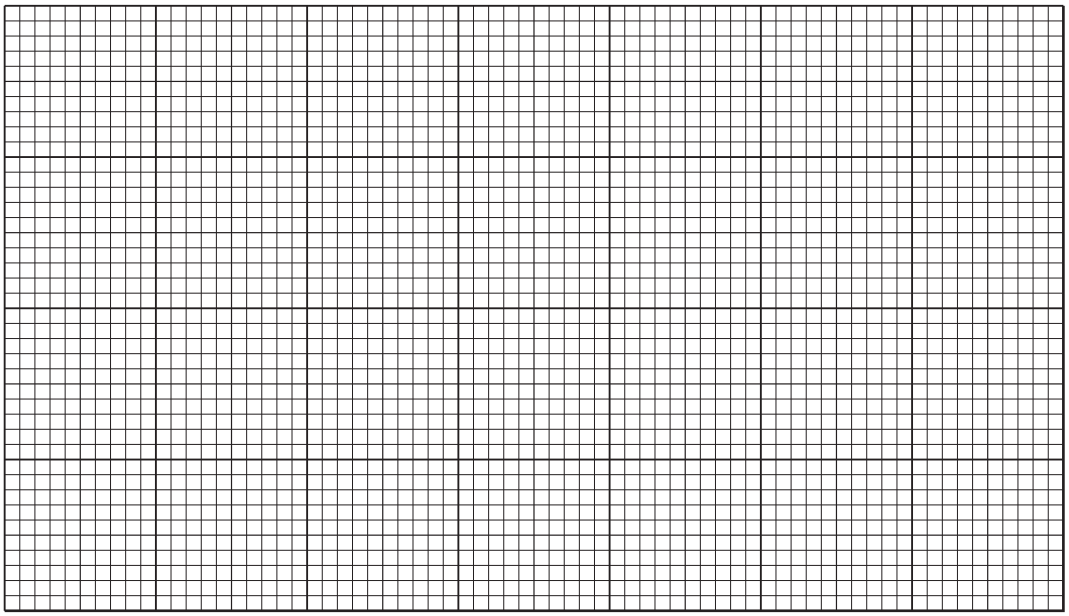
**Table 3.1**

| trophic level | | biomass / g m$^{-2}$ | width of bar / cm |
|---|---|---|---|
| 1 | producer | 120 | 12.0 |
| 2 | primary consumer | 48 | 4.8 |
| 3 | secondary consumer | 16 | 1.6 |
| 4 | tertiary consumer | 2 | |

**(i)** Complete Table 3.1 by calculating the missing value and writing it in the table. [1]

**(ii)** Using the information in Table 3.1, draw a pyramid of biomass.

Label each bar with the trophic level.



[3]

**(b)** A type of organism gains energy from waste organic material from all trophic levels.

State the name of this type of organism.

.....[1]

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**(c)** **(i)** Outline how organisms in the first trophic level of the woodland food chain produce biomass using energy from the Sun.

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.....[3]

**(ii)** Explain why the fourth trophic level has the least biomass in this food chain.

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.....[3]

**(d)** The woodland is a conservation area.

Outline the possible benefits of conserving this specific area of woodland.

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.....[3]

[Total: 14]

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**4** Fig. 4.1 is a diagram of the human female reproductive system.

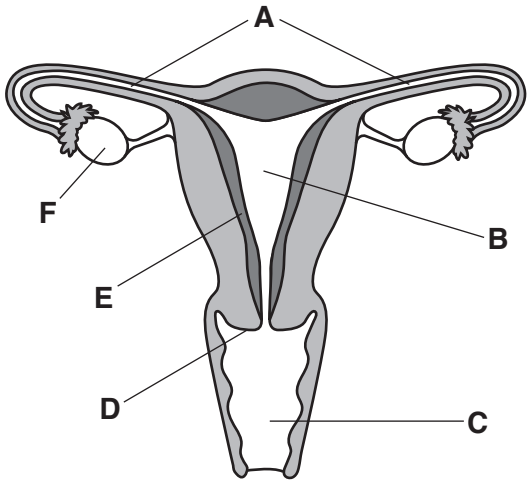



**Fig. 4.1**

**(a)** Complete Table 4.1 to show the letter and the name of each of the structures that perform these functions.

**Table 4.1**

| function | letter | name |
|---|---|---|
| releases oestrogen | | |
| site of fertilisation | | |
| site of implantation | | |
| dilates during the process of birth | | |

[4]

**(b)** Fertilisation is the fusion of the nuclei of a male gamete and a female gamete resulting in a zygote.

State the number of chromosomes present in a human:

female gamete .....

zygote .....

[2]

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**[Turn over**

**(c)** Chlamydia is a sexually transmitted infection (STI).

Fig. 4.2 shows the number of reported cases of chlamydia in females in each age group in one country.

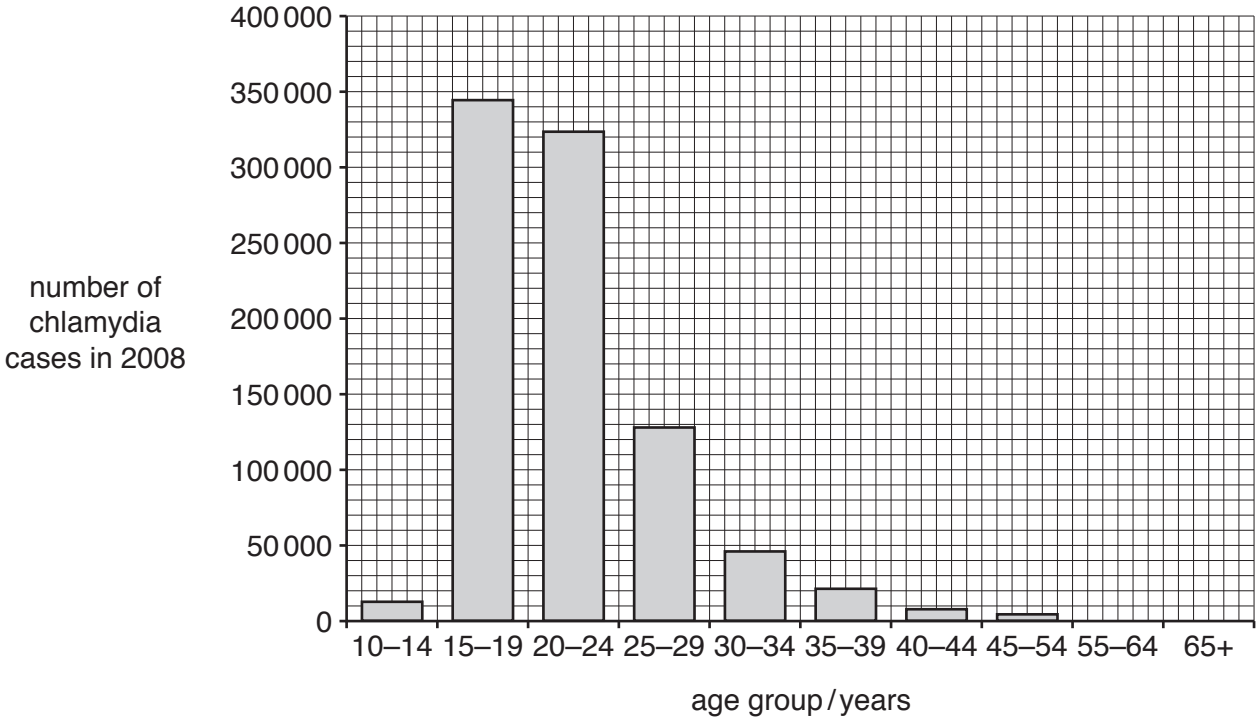



**Fig. 4.2**

Describe the results shown by the data in Fig. 4.2.

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.....[3]

**(d)** Chlamydia is caused by a bacterium.

**(i)** Suggest a treatment for chlamydia.

.....[1]

**(ii)** State the name of **one other** STI.

.....[1]

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**(iii)** Complete the sentences about the spread of STIs.

STIs are transmitted through the transfer of ..... during sexual contact. One way individuals can avoid the spread of STIs is to use a type of ..... contraception. One example of this type of contraception is ..... .

[3]

[Total: 14]

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**[Turn over**

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**5** 2,4-D is a synthetic plant auxin that is used as a weedkiller.

Researchers investigated the effectiveness of different treatments of 2,4-D on the control of the weed *Conyza canadensis* in fields of maize, *Zea mays*.

The results are shown in Table 5.1.

**Table 5.1**

| treatment | time of treatment | | | mean dry mass of weeds / g per $m^2$ | weed density / number of weeds per $m^2$ |
|---|---|---|---|---|---|
| | day 7 | day 23 | day 33 | | |
| **A** | ✓ | | | 7.40 | 6.20 |
| **B** | | ✓ | | 3.90 | 4.90 |
| **C** | | | ✓ | 0.50 | 1.20 |
| **D** | ✓ | ✓ | | 0.66 | 1.90 |
| **E** | ✓ | | ✓ | 0.18 | 0.98 |
| **F** | | ✓ | ✓ | 0.07 | 0.29 |
| **G** | ✓ | ✓ | ✓ | 0.08 | 0.51 |

**(a) (i)** Maize farmers that had been using treatment **C** were advised by the researchers to change to treatment **F**.

Discuss the advantages and disadvantages of changing to treatment **F**.

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.....[4]

**(ii)** Suggest **two** factors that could decrease the effectiveness of 2,4-D.

1 .....

2 .....

[2]

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**(iii)** Explain how 2,4-D acts as a weedkiller.

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.....[3]

**(b)** Auxin causes the shoots of a plant to grow away from gravity.

State the name of this response.

.....[2]

[Total: 11]

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**[Turn over**

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**6** **(a)** Define the term *chemical digestion*.

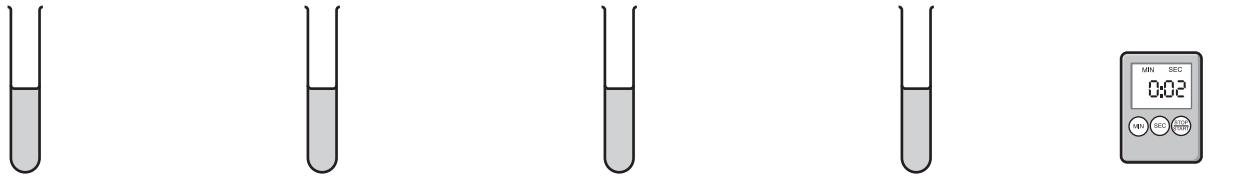
.....

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.....[2]

**(b)** A student investigated the activity of the digestive enzyme pepsin.

Fig. 6.1 shows the apparatus used in the investigation.




test-tube 1
egg white solution and pepsin

test-tube 2
egg white solution, pepsin and hydrochloric acid

test-tube 3
egg white solution, boiled pepsin and hydrochloric acid

test-tube 4
egg white solution and hydrochloric acid

stop-clock

**Fig. 6.1**

The appearance of the four test-tubes was recorded at 0 and 5 minutes.

The protein in the egg white solution gives the solution a cloudy appearance.

The cloudy appearance clears when the protein in the egg white solution breaks down.

Table 6.1 shows the results.

**Table 6.1**

| test-tube | contents | appearance at 0 mins | appearance after 5 mins |
|---|---|---|---|
| **1** | egg white solution, pepsin | cloudy | less cloudy |
| **2** | egg white solution, pepsin, hydrochloric acid | cloudy | clear |
| **3** | egg white solution, boiled pepsin, hydrochloric acid | cloudy | cloudy |
| **4** | egg white solution, hydrochloric acid | cloudy | cloudy |

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**(i)** Explain the results shown for test-tubes **1**, **2** and **3** in Table 6.1.

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.....[5]

**(ii)** Explain the purpose of test-tube **4**.

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.....

.....[2]

**(iii)** State the name of the organ in the body that produces pepsin.

.....[1]

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**[Turn over**

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**(c)** Maltase is another digestive enzyme.

Describe the action of maltase **and** state where it acts in the alimentary canal.

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.....[3]

[Total: 13]

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