UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

7459711852

BIOLOGY **9700/33**

Advanced Practical Skills 1 **October/November 2013**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

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 ink.
You may use a pencil for any diagrams, graphs or rough working.
Do **not** use red ink, staples, paper clips, highlighters, 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.

For Examiner's Use	
1	
2	
Total	

This document consists of **16** printed pages.

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You are reminded that you have **only one hour** for each question in the practical examination.

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You should:

- read carefully through **the whole** of Question 1 and Question 2
- then plan your use of **the time** to make sure that you finish all the work that you would like to do.

You will **gain marks** for recording your results according to the instructions.

1 Lipase is an enzyme which catalyses the hydrolysis (breakdown) of triglycerides into fatty acids and glycerol.

The substrate for lipase will be the triglycerides present in milk, labelled **M**.

The end-point of this hydrolysis can be determined by using an indicator, **P**, which changes colour when the fatty acids are produced as shown in Fig. 1.1.

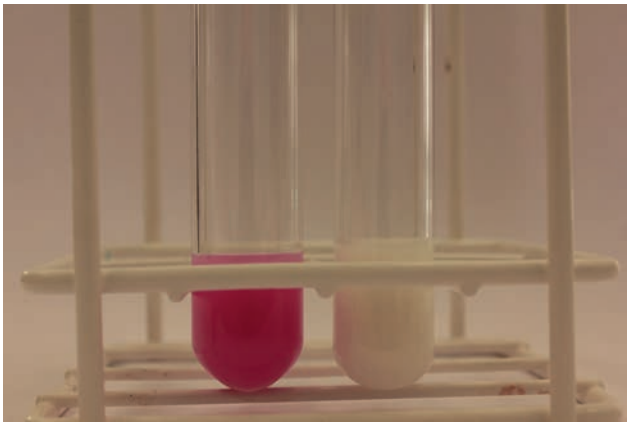


Fig. 1.1

You are required to investigate the effect of substrate concentration in **M** (independent variable) on the lipase-catalysed reaction.

You are provided with:

labelled	contents	hazard	volume / cm^3
M	milk	none	70
W	distilled water	none	100
A	alkali solution	irritant	100
P	indicator solution	flammable	10
E	lipase solution	irritant	20

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Proceed as follows:

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You may assume that the triglyceride content of the milk, **M**, is 5%.
You are required to dilute this 5% milk, **M**, to provide a range of known concentrations of triglycerides using **simple dilution**.

(a) (i) Decide which three further concentrations of triglycerides to make, then complete Table 1.1.

- The difference between each concentration should be 1%.
- You will need to make up 20 cm^3 of each concentration.

Table 1.1

volume of milk solution / cm^3	**volume of distilled water / cm^3**	**percentage concentration of triglycerides in milk**
20	0	5

[2]

(ii) State the concentration of triglycerides which you would expect to reach the end-point (pink to white) in the shortest time.

.....[1]

1. Prepare **all** the concentrations of triglycerides as in Table 1.1 in the containers provided.

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[Turn over

2. Put 20 cm^3 of **A** into each of the concentrations which you prepared in step 1 and mix well.
3. Put 3 cm^3 of each mixture, as made in Step 2, into separate test-tubes.
4. Put five drops of **P** into each of the test-tubes and gently shake so that all the mixture turns pink. (Note that each of the concentrations might not be the same shade of pink).
5. Set up a water-bath and adjust the temperature of the water to between 45 °C and 50 °C. You will need to add hot water/cold water to maintain the temperature of the water-bath between 45 °C and 50 °C for steps 6 to 9.
6. Put the test-tubes from Step 4 into the water-bath for five minutes.
7. Put 3 cm^3 of **M** in a test-tube to act as a standard to help you recognise the end-point. Put this test-tube in the water-bath.

When you start the timer after adding **E** to the first test-tube in Step 8, you must **not** stop the timer at any of the end-points, just record the time.

The reaction will start as soon as you add **E***, so read steps 8 to 13 before proceeding.*

Continue as follows:

8. Put 2 cm^3 of **E** into the test-tube containing the **lowest** concentration of triglycerides and mix well, then return it to the water-bath.
9. Start timing and record start time on Fig. 1.2.
10. Immediately, put 2 cm^3 of **E** into the next test-tube containing next highest concentration of triglycerides and mix well, then return it to the water-bath.
11. Record start time on Fig. 1.2.
12. Immediately repeat steps 10 and 11 for the remaining concentrations.
13. Observe the four test-tubes and record the time on Fig. 1.2 when each end-point is reached. This is your raw data.

Using the colour of ***M*** *may help you recognise the end-point.*

If the time taken to reach the end-point for any one concentration is longer than 5 minutes record 'more than 300'.

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Space for you to calculate time to reach end-point

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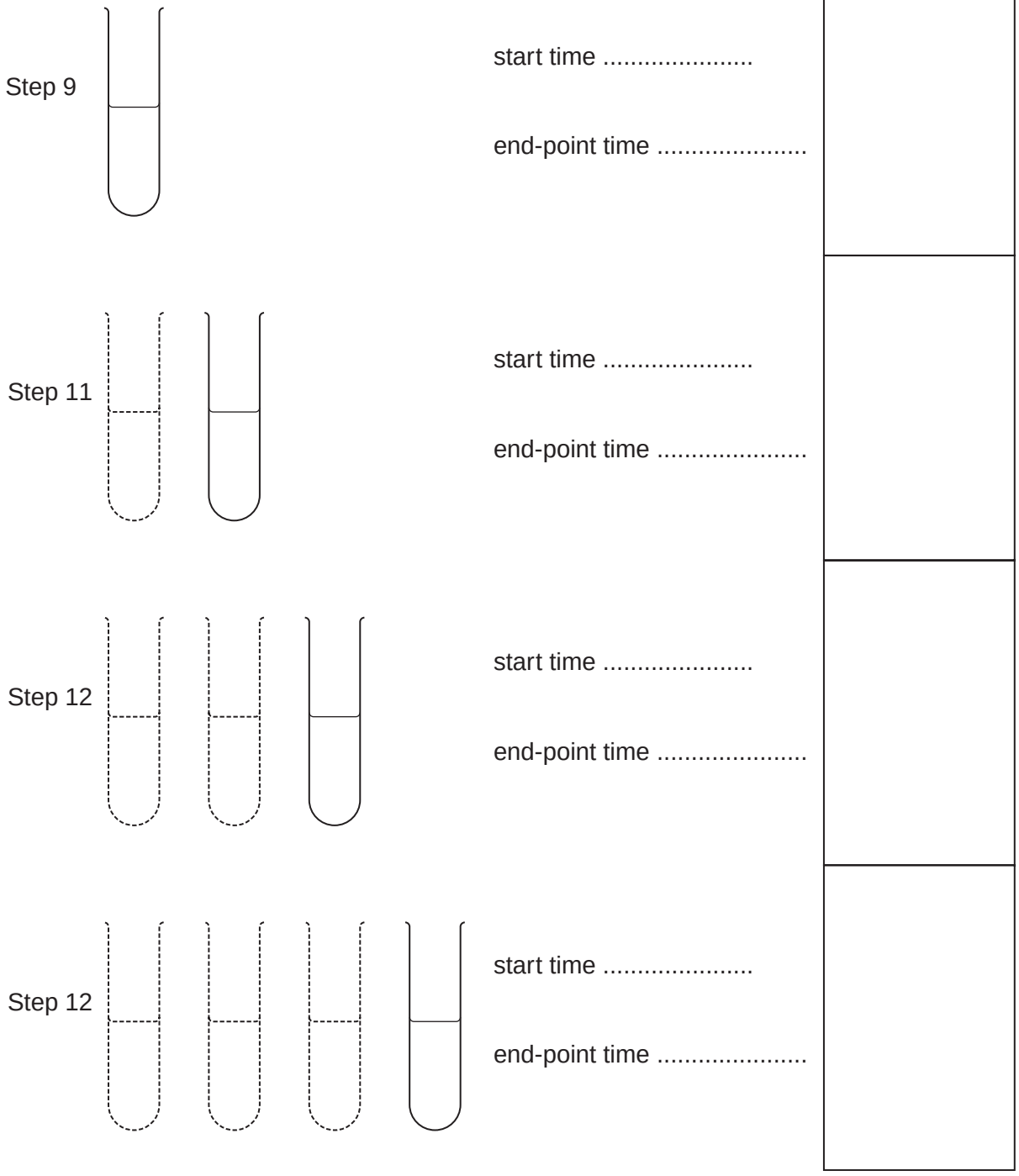


Fig. 1.2

From your timer readings you will be required to calculate the time taken to reach the end-point in each test-tube.

14. Process your raw data to find the time taken to reach the end-point for each concentration (these are your **processed** results).

    If you have time check your results.

    (iii) Prepare the space below to record your **processed** results.

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[5]

(iv) Calculate the rate of lipase activity for the 5% concentration of triglycerides.

..... [1]

(v) Describe how you could set up a control for this investigation using the apparatus provided.

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.....

..... [1]

(vi) Identify **one** significant source of error in this investigation.

.....

.....

..... [1]

Some scientists investigated the effect of the triglycerides in different types of milk (independent variable) on the time taken to reach the end-point. They used the same method as in your investigation.

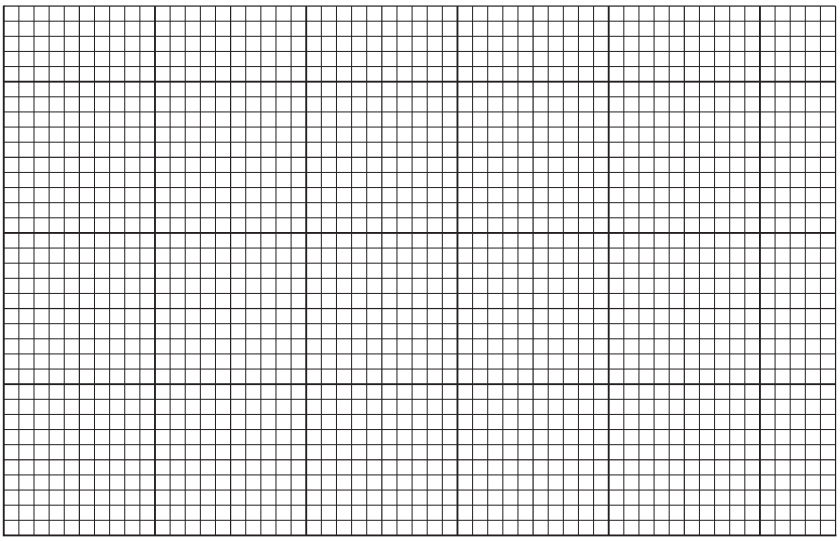
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The results are shown in Table 1.2.

Table 1.2

type of milk	time taken to reach the endpoint / s
full fat (F)	130
evaporated (V)	120
low fat (L)	215
condensed (C)	150
dried (D)	265

(b) (i) Plot a chart of the data shown in Table 1.2.



[4]

(ii) Suggest **one** reason for the difference in the time taken to reach the end-point between evaporated milk (V) and dried milk (D).

.....

.....

..... [1]

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A student carried out an investigation into the effect of immobilised lipase on the hydrolysis of triglycerides in milk. The student used the apparatus in Fig. 1.3.

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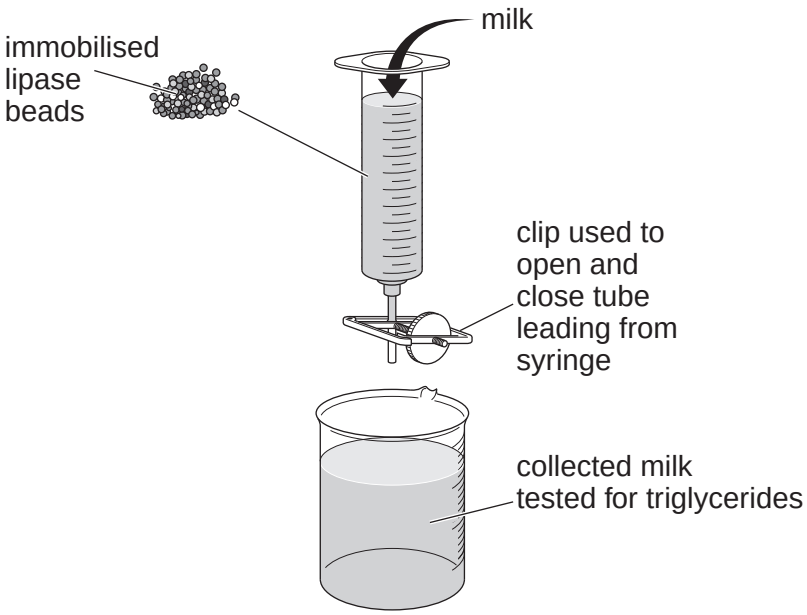


Fig. 1.3

(c) Identify **two** variables that the student would need to standardise to compare the activity of different concentrations of lipase immobilised in alginate beads.

Describe how **one** of these variables would be standardised.

.....

.....

.....

.....

.....[2]

[Total: 18]

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2 **K1** is a slide of a transverse section through a plant leaf. This plant grows in the Mediterranean region.

(a) **(i)** Draw a large plan diagram of the part of the leaf indicated by the shaded sector in Fig. 2.1.

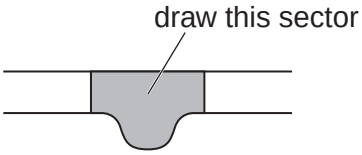


Fig. 2.1

On your diagram, use a ruled label line and label to show an epidermis.

[4]

(ii) Find an area on the specimen in **K1** showing a group of four xylem vessels. Choose one group of four whole xylem vessels.

Make a drawing of this group, as observed on the specimen on **K1**.

On your drawing, use a label line and label to show one lumen.

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[5]

Question 2 continues on page 13

Fig. 2.2 shows a photomicrograph of a stage micrometer viewed through a microscope.

The smallest measurement on this stage micrometer is 0.1 mm.

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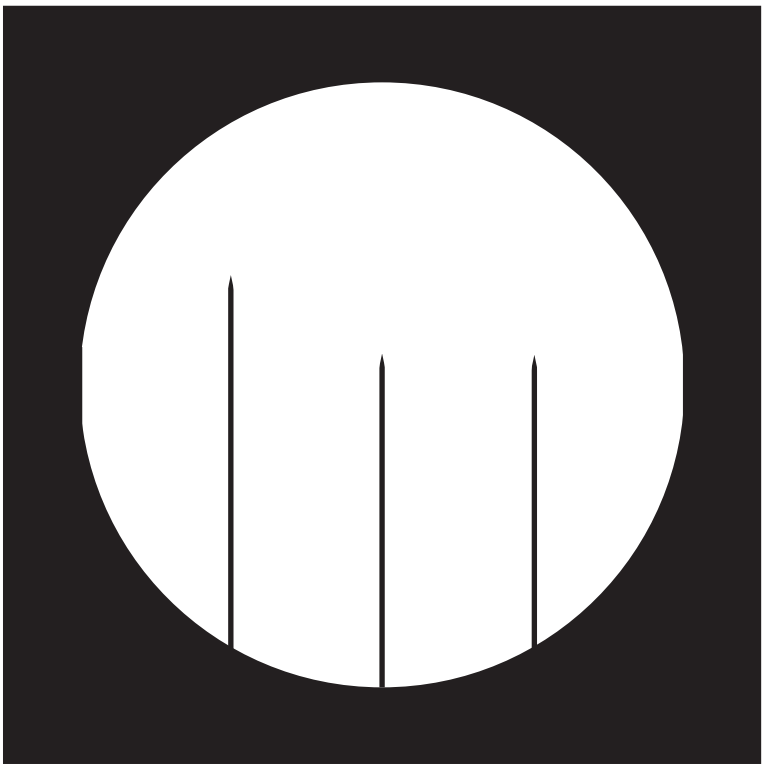


Fig. 2.2

You are required to:
- find the area of the field of view, using Fig. 2.2
- count the number of chloroplasts in a quarter of the field of view, using Fig. 2.3 (on page 14)
- calculate the number of chloroplasts per mm^2.

(b) (i) Calculate the area of the field of view, using:

- the formula for the area of a circle πr^2
- $\pi = 3.14$
- r = radius of the field of view.

You will lose marks if you do not show your working or if you do not use appropriate units.

area of field of view ..... mm^2 [2]

Fig. 2.3 is a photomicrograph showing leaf cells, with the same field of view as in Fig. 2.2.

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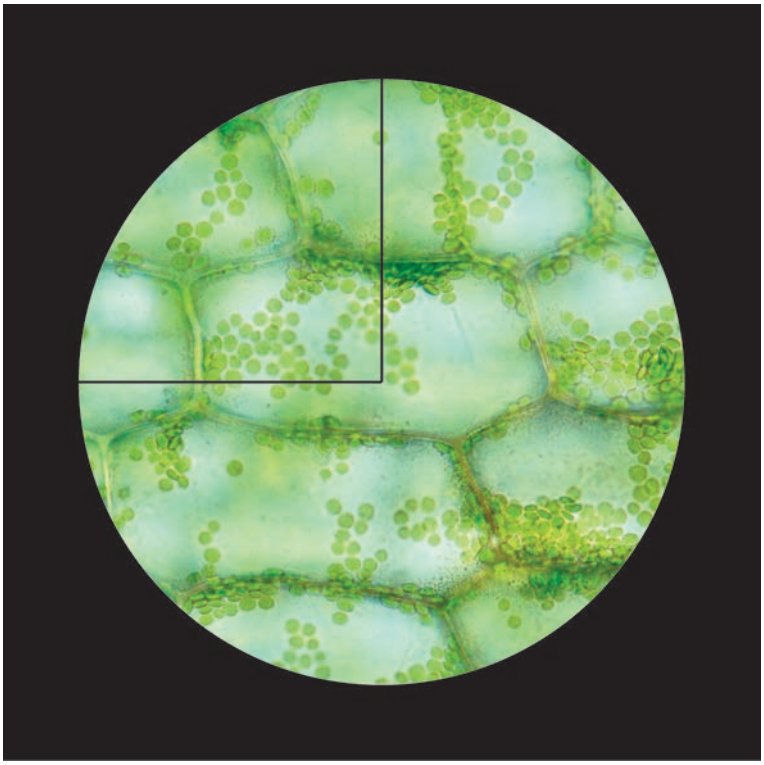


Fig. 2.3

Fig. 2.3 shows chloroplasts in leaf cells. There are too many chloroplasts to count, so the technique of sampling may be used to estimate the number of chloroplasts in the field of view.

A sample should be counted in a known smaller portion and then the result multiplied to obtain an estimate of the number of chloroplasts in the whole field of view.

For example, if the number of chloroplasts is counted in a quarter of the field of view then this number would be multiplied by 4 to obtain the estimate of the total number in the field of view.

(ii) Count and record the **sample number** of chloroplasts in the quarter of the field of view.

- Mark clearly **on Fig. 2.3** each of the chloroplasts counted.
- Estimate the total number in the whole field of view.

Calculate the number of chloroplasts per mm^2.

You will lose marks if you do not show your working.

number of chloroplasts ..... mm^{-2} [4]

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Fig. 2.4 is a photomicrograph of a one-celled organism which lives in fresh-water. You are not expected to have studied this organism. The organism has engulfed some green algae (**R**) which it uses for food.

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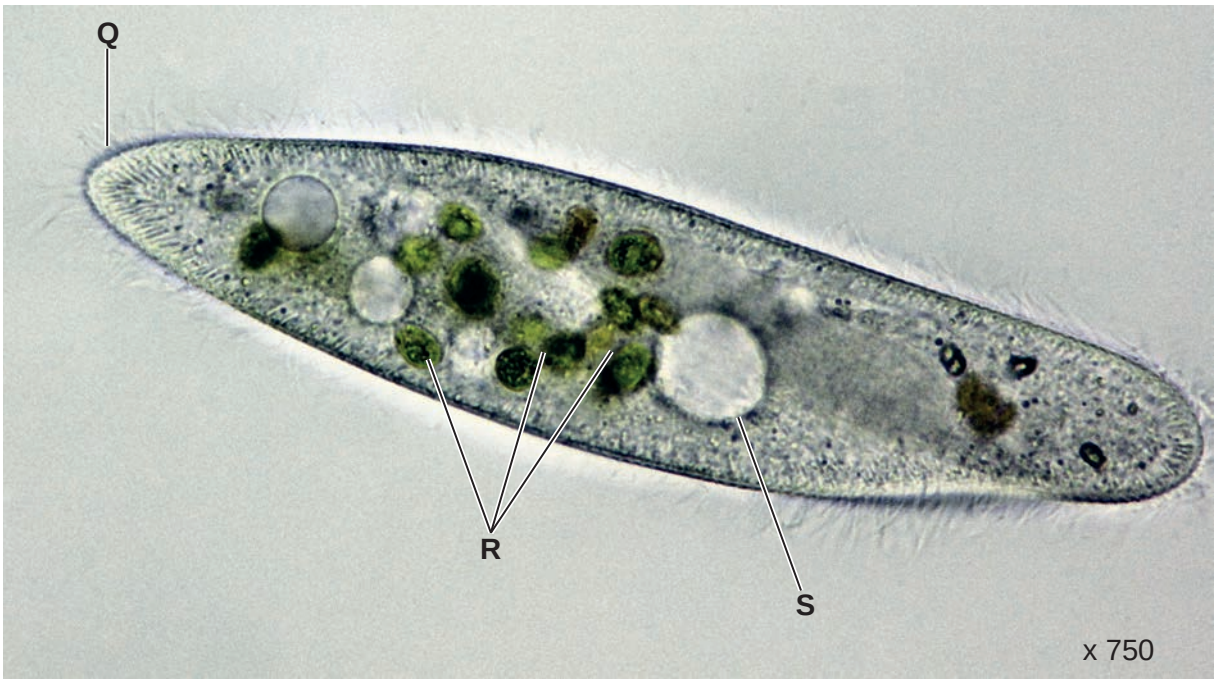


Fig. 2.4

(c) (i) Prepare the space below so that it is suitable for you to record the observable differences between Fig. 2.3 and Fig. 2.4.

To help you some of the structures on Fig. 2.4 have been labelled with letters.

Record your observations in the space you have prepared.

[5]

Question 2(c)(ii) starts on page 16

The organism you have observed in Fig. 2.4 is part of a food web.

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(ii) State the trophic level of the organism in Fig. 2.4.

.....

Describe one **observable** feature of the specimen in Fig. 2.4 which supports this conclusion.

.....

.....

.....[2]

[Total: 22]

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Fig. 2.4 © MICHAEL ABBEY/SCIENCE PHOTO LIBRARY.

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