Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **9700/33**

Advanced Practical Skills 1 **October/November 2014**

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 pen.
You may use an HB pencil for any diagrams, graphs or rough working.
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.

For Examiner's Use	
1	
2	
Total	

This document consists of **13** printed pages and **3** blank pages.

CAMBRIDGE International Examinations

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Before you proceed, read carefully through **the whole** of Question 1 and Question 2.

Plan the use of your **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.

If you have enough time, consider how you can improve the accuracy of your results, for example by obtaining and recording one or more additional measurements.

1 Plants translocate sap through phloem sieve tubes. Scientists discovered that aphids feed by pushing their stylet into a single phloem sieve tube as shown in Fig. 1.1.

By using stylets it is possible for scientists to collect the sap from a single phloem sieve tube.

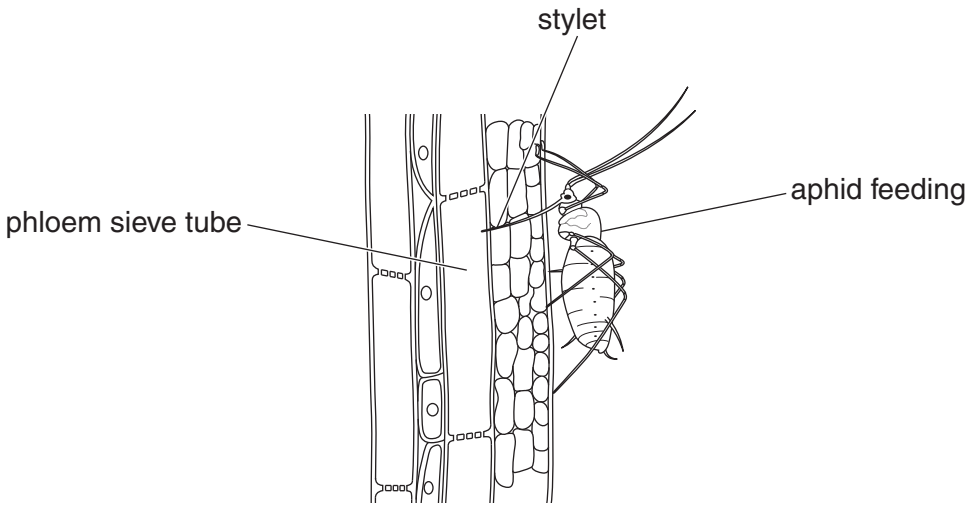


Fig. 1.1

You are required to estimate, as accurately as possible, the concentration of sucrose in a sample of sap, **P**, by:

- carrying out a trial using the concentrations of sucrose solutions **S1** and **S2**
- using the results of the trial to prepare further concentrations of sucrose solution
- obtaining more readings, so that you can estimate more accurately the concentration of sucrose in **P**.

[Turn over

A drop or small volume of **P** is placed into a known concentration of sucrose solution.

Fig 1.2 shows how the drop or small volume of **P** is released.

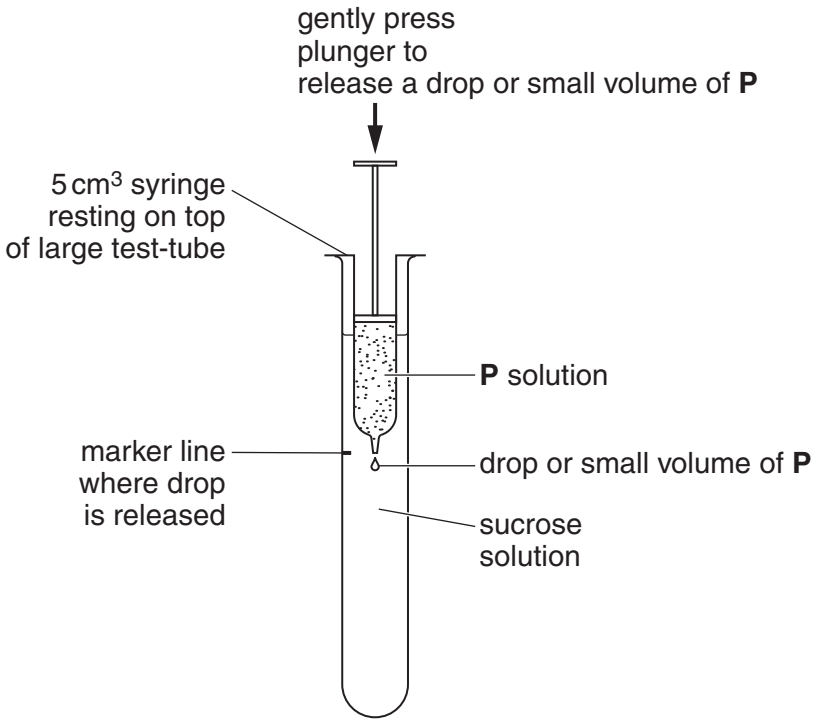


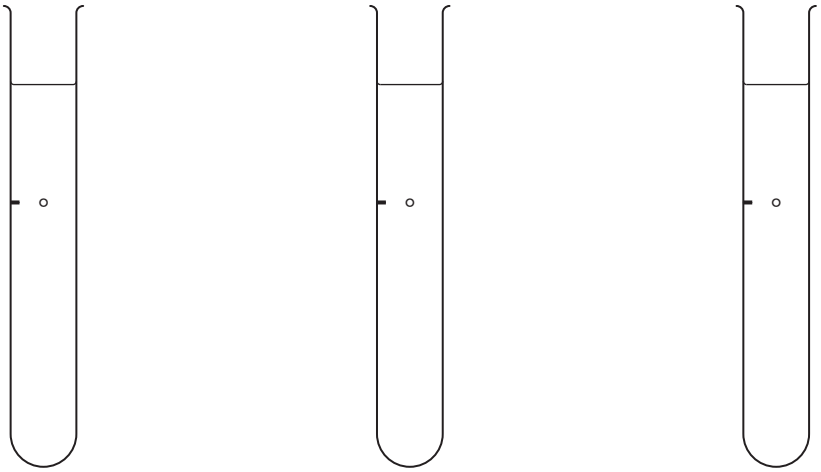
Fig. 1.2

Immediately the drop or small volume of **P** is released, the syringe is removed.

The drop of **P** may move up, move down or remain at the same level depending on the difference in the concentration between **P** and the sucrose solution.

(a) (i) Show clearly on the diagrams below, using the key, how you would expect to see the drop or small volume of **P** move if:

P is less concentrated than the sucrose solution	**P** is the same concentration the sucrose solution	**P** is more concentrated than the sucrose solution



Key:

↑ a drop or small volume of **P** moves up

↓ a drop or small volume of **P** moves down

→ a drop or small volume of **P** remains at same level

[1]

You are provided with:

labelled	**contents**	**hazard**	**volume /cm^3**
S1	0.10 mol dm^{-3} sucrose solution	none	200
S2	1.00 mol dm^{-3} sucrose solution	none	200
P	coloured sample of sap	none	20
W	distilled water	none	200

[Turn over

Read step 1 to step 8 before proceeding.

Proceed as follows:

You are required to estimate the concentration of **P** using **S1** and **S2**.

1. Place the 5 cm^3 syringe on top of the large test-tube and use the marker pen to draw a line on the test-tube at the same height as the end of the syringe nozzle as shown in Fig. 1.2 (page 4).

2. Use the same syringe to suck up 4.0 cm^3 of **P**.

3. Put 35 cm^3 of **S1** into the test-tube.

4. As shown in Fig. 1.2, release one drop or a small volume of **P** and **remove** the syringe from the sucrose solution.

*Note: **P** may come out without pushing the plunger, observe and record the direction of movement.*

5. Immediately observe the movement of the drop or small volume of **P**.

6. Record your observations.

7. Wash out this test-tube.

8. Repeat steps 3 to 7 using **S2**.

(ii) Prepare the space below to record your observations.

[3]

(iii) Complete the following by using one of the words '**more**' or '**less**'.

You may use each word once or more than once.

P is ..... concentrated than 0.1 mol dm^{-3} (**S1**).

P is ..... concentrated than 1.0 mol dm^{-3} (**S2**).

Use your results to estimate the concentration of sucrose in **P**.

estimate of concentration of sucrose in **P** .....[1]

(iv) State which solution, **S1** or **S2**, you will dilute to prepare further concentrations.

Use your results to explain the reason for your decision.

.....

.....[2]

You are required to prepare further concentrations of sucrose solution by **simple** dilution, using the solution stated in **(a)(iv)**.

Decide on the further concentrations of sucrose solution you will use in your investigation.

You will need 40 cm^3 of each sucrose solution.

(v) Prepare the space below to show:

- the concentration of each sucrose solution
- the volumes of sucrose solution
- the volumes of **W**.

[3]

9. Prepare **all** the concentrations of sucrose solution you have listed in **(a)(v)** in the containers provided.

10. Repeat steps 3 to 7 with each of the solutions.

(vi) Prepare the space below to record your observations.

[3]

(vii) Using these additional results from **(vi)** state a more accurate estimate of the concentration of sucrose in **P** than in **(iii)**.

.....[1]

(viii) Describe **how** you would modify this procedure to investigate the concentration of sucrose in **P**, using Benedict's solution.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 17]

You are required to use a sharp pencil for drawings and graphs.

2 Plants translocate sap through phloem sieve tubes. Scientists discovered that aphids feed by pushing their stylet into a single phloem sieve tube as shown in Fig. 2.1.
By using stylets it is possible for scientists to collect the sap from a single phloem sieve tube.

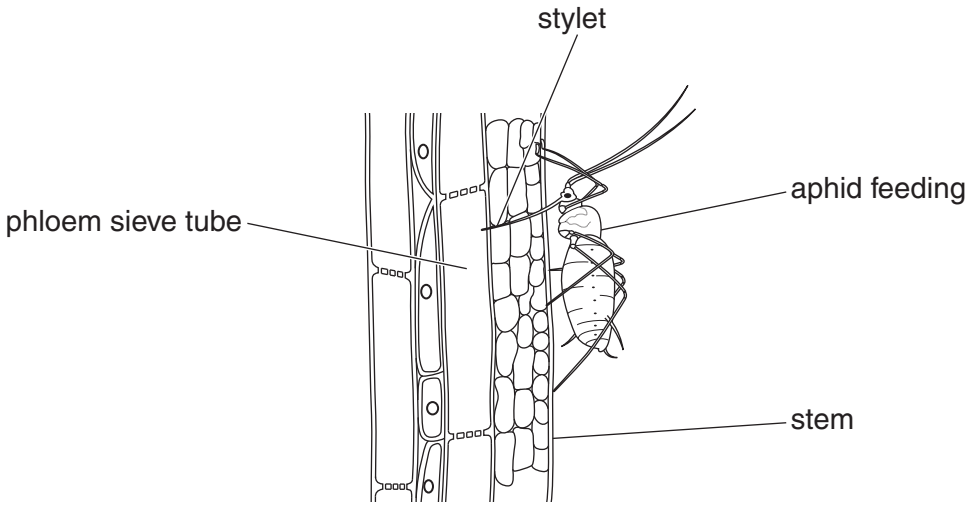


Fig. 2.1

Scientists have investigated the different rates of flow of sap in the stylets of aphids of different ages from hatching, **H**, up to the adult, **M**.

The results are shown in Table 2.1.

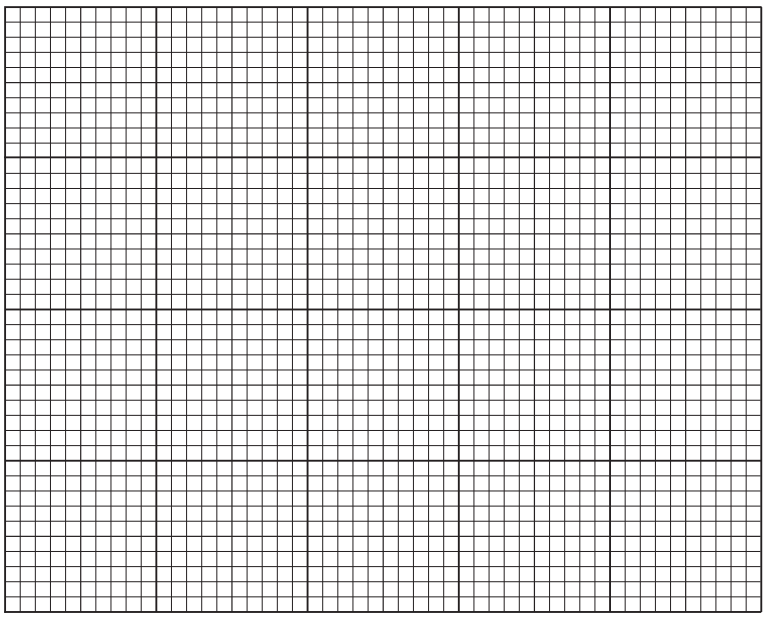
Table 2.1

different ages of aphid	rate of flow of sap /μl h^{-1}			
	trial 1	**trial 2**	**trial 3**	**mean**
H	0.452	0.448	0.451	0.450
J	0.726	0.722	0.726	0.725
K	0.977	1.232	0.973	
L	1.401	1.601	1.399	1.400
M	1.978	1.975	1.972	1.975

(a) (i) Circle the two anomalous results in Table 2.1. [1]

(ii) Complete the table by calculating the missing mean value. [1]

(iii) Plot a chart of the data in Table 2.1.



[4]

(iv) Describe the relationship between the age of the aphid and the rate of flow of sap.

.....

.....

.....[1]

(v) Suggest **two** reasons which might explain the relationship described in **(iv)**.

.....

.....

.....

.....

.....[2]

(b) **K1** is a slide of a stained transverse section through a plant stem.
This plant species grows widely including Europe, Asia and North America.

You are not expected to be familiar with this specimen.

To help draw a plan diagram with the correct shape and proportions of the tissues, an eyepiece graticule can be used to measure the layers of tissues, without the need to calibrate the eyepiece graticule scale.

(i) Draw a large plan diagram of the part of the specimen on **K1** indicated by the shaded sector in Fig. 2.2.

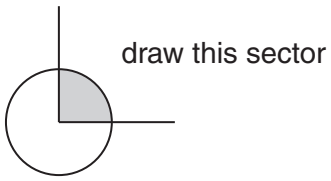


Fig. 2.2

Use **one** ruled label line and label to show the pith.

[5]

(ii) Observe the tissue between the xylem and the hollow centre of the specimen.

Select one group of three cells with:

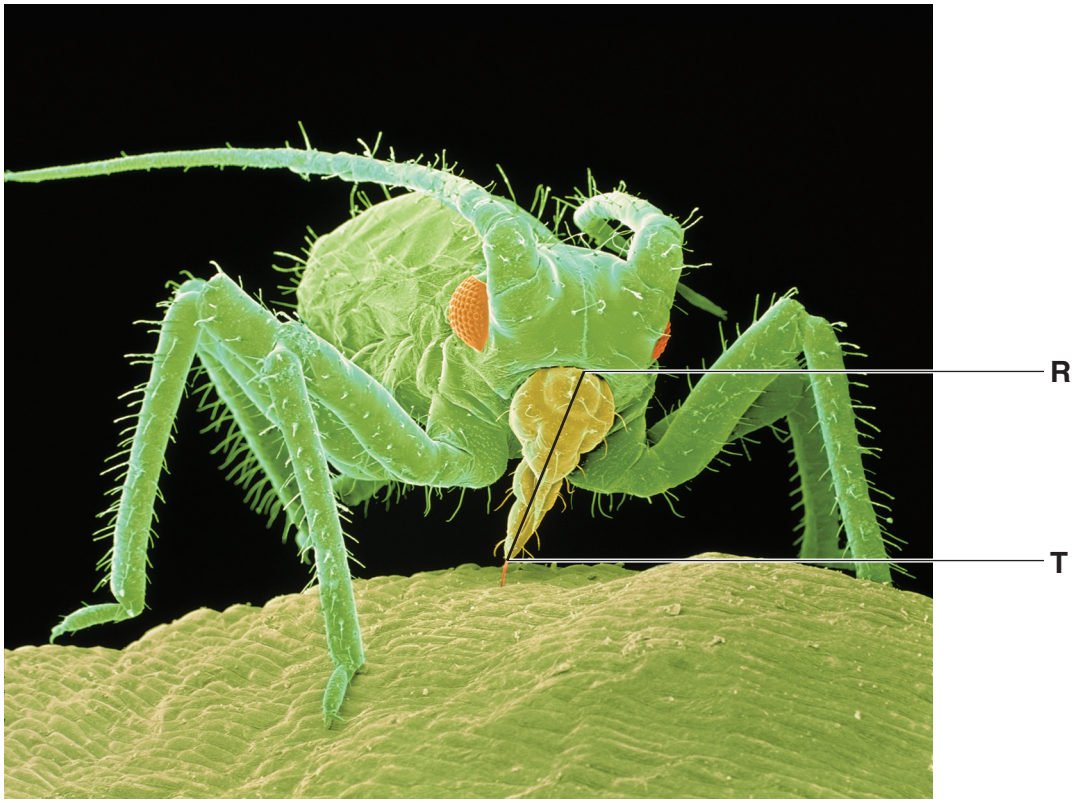
- one cell containing cell structures
- two cells which touch each other and also touch the cell which contains cell structures.

Make a large drawing of this group of **three** cells.

Use **one** ruled label line and label **D** to show **one** of the cell structures.

[5]

Fig. 2.3 is a photomicrograph of an aphid feeding on a plant.



magnification ×120

Fig. 2.3

(c) Calculate the actual length of the structure **R** to **T**, using the magnification, giving your answer in μm.

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

actual length ..... μm
[4]

[Total: 23]

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