Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

BIOLOGY **9700/33**

Paper 3 Advanced Practical Skills 1 **May/June 2023**

2 hours

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

For Examiner's Use	
1	
2	
Total	

This document has **16** pages. Any blank pages are indicated.

DC (KN/CB) 305602/2
© UCLES 2023

1 When milk is dropped into a test-tube containing copper sulfate solution, the drop of milk sinks to the bottom of the test-tube. The speed at which the drop of milk sinks will depend on the amount of protein, fat and other solids that are present in the milk.

You will investigate the effect of different concentrations of milk on the time taken for the drop to sink to the bottom of the test-tube.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume / cm^3
C	copper sulfate solution	irritant	200
M	100% milk	none	50
W	distilled water	none	30

If any solution comes into contact with your skin, wash off immediately with cold water.

It is recommended that you wear suitable eye protection.

Carry out step 1 to step 3 to practise releasing one drop of **M** from a pipette.

step 1 Put some of **M** into a pipette.

step 2 Hold the pipette containing **M** over an empty test-tube, as shown in Fig. 1.1.
Squeeze the pipette gently to release **one** drop. It is important that the drop does **not** contain air bubbles.

step 3 Repeat step 2 until you can release **one** drop at a time.

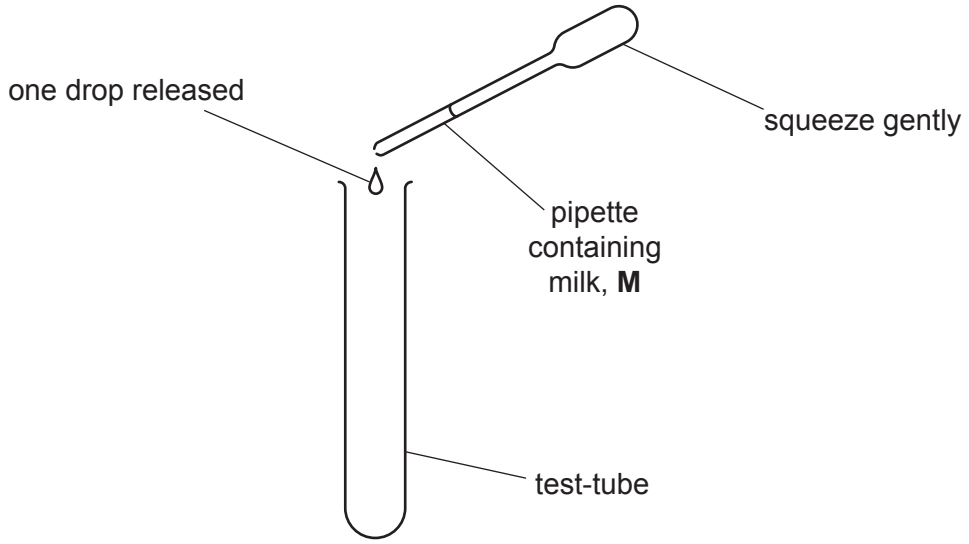

Fig. 1.1

You will investigate the effect of different concentrations of milk on the time taken for **one** drop of milk to sink through copper sulfate solution.

You will need to:
- prepare different concentrations of milk
- record the time taken for **one** drop of each concentration of milk to sink through copper sulfate solution.

(a) You will need to use proportional dilution to make different concentrations of milk, **M**, between 95% and 55%.

You will need to prepare 10 cm^3 of each concentration, using **M** and **W**.

Table 1.2 shows two of the concentrations of milk you will use and how to prepare one of the concentrations.

Decide which other concentrations of milk you will use.

(i) Complete Table 1.2 to show how you will prepare the concentrations of milk you will use.

Table 1.2

percentage concentration of milk	volume of **M** / cm^3	volume of **W** / cm^3
95.0		
55.0	5.5	4.5

[2]

Carry out step 4 to step 14.

step 4 Prepare the concentrations of milk, shown in Table 1.2, in the beakers provided.

step 5 Draw a line 2 cm from the top of a clean, dry test-tube, as shown in Fig. 1.2.
You will start timing from this line in your investigation.

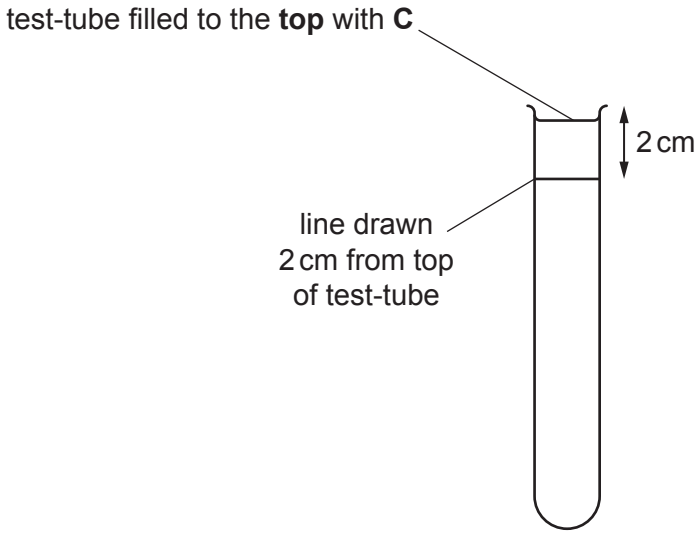

Fig. 1.2

step 6 Fill this test-tube with **C**, up to the top, as shown in Fig. 1.2.

step 7 Stir the 95% concentration of milk.

step 8 Put some of the 95% milk into a pipette.

step 9 Put **one** drop of 95% milk into the test-tube containing **C**, as shown in Fig. 1.3.
Start timing when the drop passes the line you have drawn.

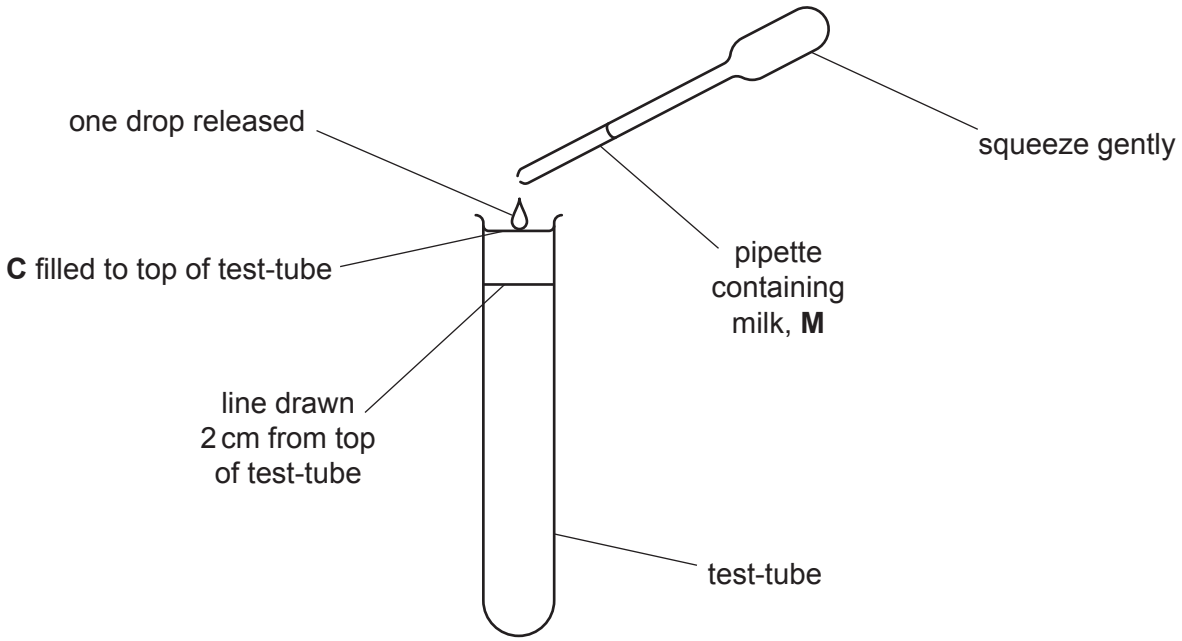

Fig. 1.3

step 10 Stop timing when the drop reaches the bottom of the test-tube.

If the drop has **not** reached the bottom of the test-tube after 120 seconds, stop timing and record 'more than 120'.

step 11 Record your result in **(a)(ii)**.

step 12 Carry out step 7 to step 10 as many times as you need, so that you are confident in your results for 95% milk. Remove any milk remaining at the surface of **C** with a pipette between each trial **and** add fresh **C** up to the top of the test-tube.

Record all your results in **(a)(ii)**.

step 13 When you are confident in your results for 95% milk, empty the contents of the test-tube into the container labelled **For waste** and rinse out the test-tube.

step 14 Repeat step 6 to step 13 for the other concentrations of milk you prepared in step 4.

(ii) Record your results in an appropriate table.

[5]

(iii) Describe the trend in your results in **(a)(ii)**.

.....

.....

..... [1]

(iv) Using Table 1.1 **and** step 4 to step 13, assess the risk of this procedure as **low**, **medium** or **high**. Give **one** reason for your answer.

risk .....

reason .....

.....

.....
[1]

(v) Complete Table 1.3 to identify **two** possible sources of error in this investigation **and** describe how you could improve the procedure to reduce the effect of each source of error.

Table 1.3

error	improvement

[4]

Turn over for Question **1(b)**.

(b) A student investigated the effect of temperature on the density of a milk sample.

The results from the investigation are shown in Table 1.4. The density of milk is shown in arbitrary units (au).

Table 1.4

temperature / °C	density of milk / au
5	34
10	33
20	31
25	26
30	24
35	21

(i) Plot a graph of the data shown in Table 1.4 on the grid in Fig. 1.4.

Use a sharp pencil.

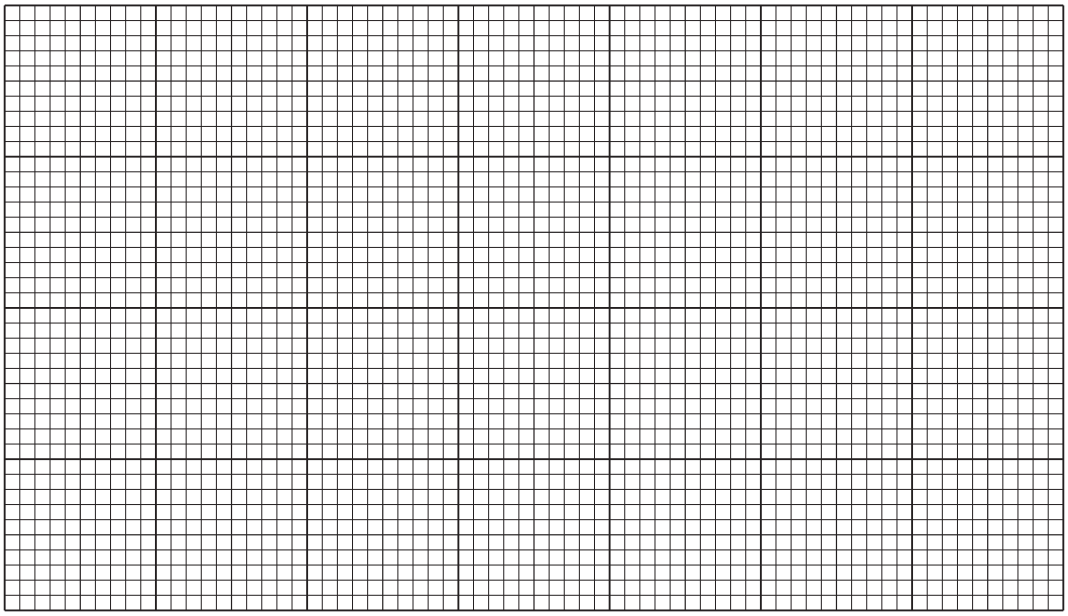

Fig. 1.4

[4]

(ii) The student measured the temperature of the laboratory as 23 °C. Use your graph to determine the density of milk at 23 °C.

density of milk = ... au [1]

(iii) A student suggested the hypothesis:

As the temperature increases by 10 °C the density of the milk decreases by 2 au.

Explain whether or not the data provides evidence to support the hypothesis.

.....

.....

.....

.....

..... [2]

[Total: 20]

2 **L1** is a slide of a stained transverse section through a plant root.

(a) **(i)** Draw a large plan diagram of the whole section on **L1**. Use a sharp pencil.

Use **one** ruled label line and label to identify the cortex.

[5]

(ii) Observe the xylem on the section of the root on **L1**.

Select a group of **four** adjacent xylem vessel elements.

Each xylem vessel element must touch at least **two** other xylem vessel elements.

- Make a large drawing of this group of **four** xylem vessel elements.
- Use **one** ruled label line and label to identify the cell wall of **one** xylem vessel element.

[5]

(iii) Describe **one** observable feature that you used to identify the cells on **L1** as xylem vessel elements.

..... [1]

(b) Fig. 2.1 is a photomicrograph of a stained transverse section through a different plant and a different organ.

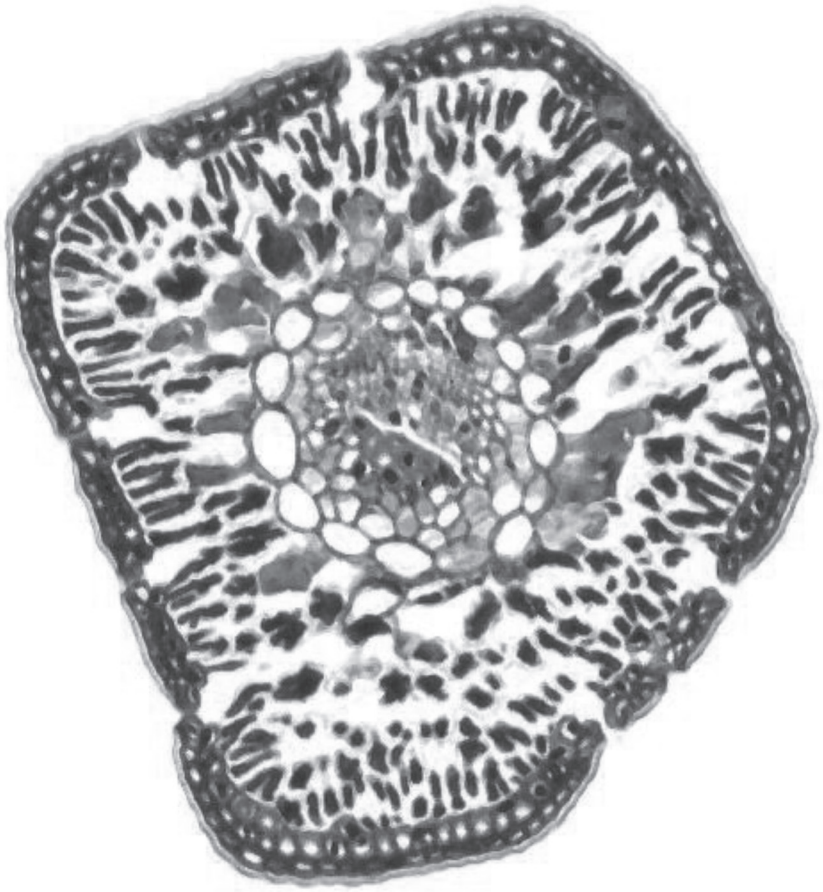

Fig. 2.1

(i) Identify **three** observable **differences**, other than colour, between the section on **L1** and the section in Fig. 2.1.

Record the **three** observable **differences** in Table 2.1.

Table 2.1

feature	L1	Fig. 2.1

[4]

(ii) Describe **one** observable **similarity** between the vascular bundle on **L1** and the vascular bundle in Fig. 2.1, other than that they both contain xylem and phloem.

.....

.....

..... [1]

(c) Fig. 2.2 is the same photomicrograph as that shown in Fig. 2.1 with the line **P**–**Q** added.

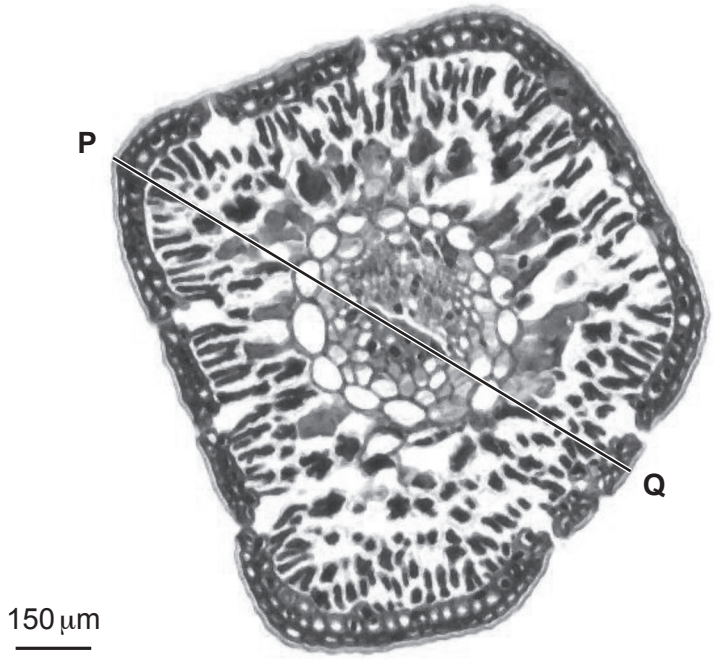

Fig. 2.2

Use the scale bar to calculate the actual length of line **P**–**Q**.

Show your working and use appropriate units.

actual length of **P**–**Q** = ... [4]

[Total: 20]

BLANK PAGE

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

© UCLES 2023