Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **9700/35**

Paper 3 Advanced Practical Skills 1 **May/June 2019**

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 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.

For Examiner's Use	
1	
2	
Total	

This document consists of **12** printed pages and **4** blank pages.

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Cambridge Assessment International Education

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

Plan the use of the **two hours** to make sure that you **finish** the whole of Question 1 and Question 2.

If you have enough time, think about how you can improve the confidence in your results, for example by recording one or more additional measurements.

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

1 Blood plasma contains proteins. The concentration of protein in blood plasma may change according to the health of a person.

The concentration of protein in blood plasma can be measured to identify possible health problems.

In this investigation you will be using protein solutions, **P** and **U**, instead of blood plasma.

You will need to:

- prepare a serial dilution of solution **P**
- carry out the test for protein on each concentration of protein solution
- carry out the test for protein on the unknown concentration of protein, **U**
- estimate the concentration of protein in **U**.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume/cm^3
P	1% protein solution	none	30
U	protein solution of unknown concentration	none	10
W	distilled water	none	100
K	5% potassium hydroxide solution	harmful irritant	20
C	0.15% copper sulfate solution	none	20

If any solution comes into contact with your skin, wash off immediately under cold water.
It is recommended that you wear suitable eye protection.

[Turn over

(a) You will need to:

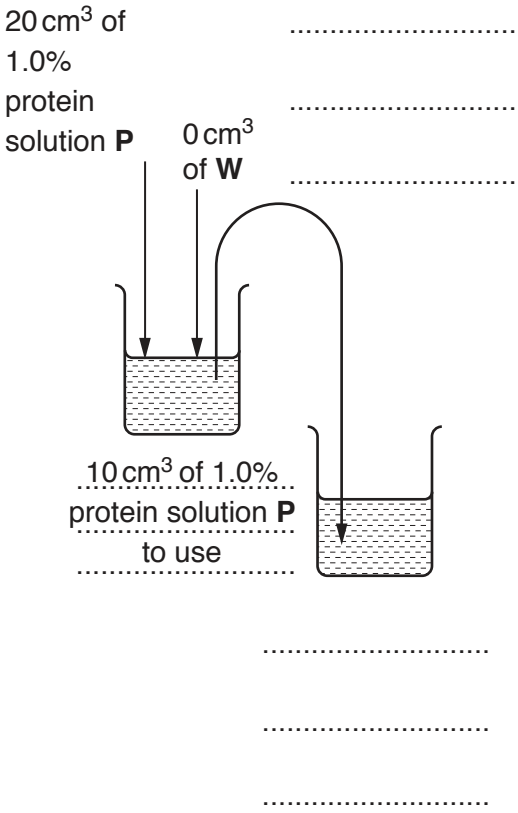
- make a **serial** dilution of 1.0% protein solution, **P**, which reduces the concentration by **half** between each successive dilution
- prepare 10 cm^3 of each concentration of protein solution.

Fig. 1.1 shows the first two beakers you will use to make your serial dilution.

(i) Complete Fig. 1.1 by drawing as many extra beakers as you need for your serial dilution.

For each beaker:

- state, under the beaker, the volume and concentration of protein solution available for use in the investigation
- use one arrow with a label, above the beaker, to show the volume and concentration of protein solution added to prepare the concentration
- use another arrow with a label, above the beaker, to show the volume of **W** added to prepare the concentration.



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[3]

Fig. 1.1

Carry out the test for protein on the different concentrations of protein using step 1 to step 7.

1. Prepare the concentrations of protein solution as decided in **(a)(i)** and shown in Fig. 1.1.
   Use a glass rod to mix the protein solutions and water.

2. Label the test-tubes with the concentrations of the protein solutions prepared in step 1.

3. Put 1 cm^3 of each concentration into the appropriately labelled test-tube.

4. Label another test-tube **0.0%** and put 1 cm^3 of **W** into this test-tube.

5. Put 1 cm^3 of **K** into each test-tube. Shake gently to mix.

6. Put 1 cm^3 of **C** into each test-tube. Shake gently to mix.

7. Leave the test-tubes for at least 2 minutes. Shake gently to mix.

You will see a range of colours depending on the concentration of protein present.

Table 1.2 shows the range of colours and the letters you will use to record your observations in **(a)(ii)**.

Table 1.2

colour	letters to use
very pale blue/colourless	VP
pale blue	PB
blue	B
pale purple	PP
purple	P
dark purple	DP

(ii) After step 7 you will see some of the colours in Table 1.2.

Record the colours, in an appropriate table, by using the letters in Table 1.2.

You may use the same letters for more than one test-tube.

It may help to observe the colour with a piece of white card behind the test-tube.

[5]

You now need to estimate the concentration of **U** using your results.

8. Label a test-tube **U** and put 1 cm^3 of **U** into this test-tube.

9. Repeat step 5 to step 7 then record the colour of **U** in **(a)(iii)**.

(iii) State the colour of **U** after step 7. ..... [1]

(iv) Complete Fig. 1.2 to show the position on the line of each of the percentage concentrations of protein solution in **(a)(i)**.

Using your results in **(a)(ii)** and **(a)(iii)**, put the label **U** on Fig. 1.2 to show an estimate of the concentration of protein in **U**.

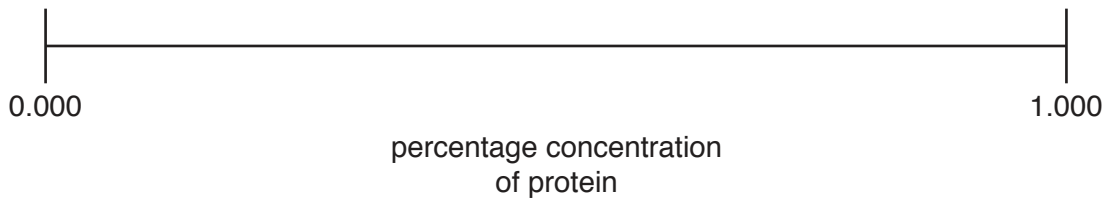

Fig. 1.2

[1]

(v) Suggest how you could change the independent variable to have more confidence in your estimate of the concentration of protein in **U**.

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..... [2]

(vi) Suggest the apparatus that could be used to measure the concentration of protein in **U** more accurately.

..... [1]

(b) The concentration of protein in blood plasma from five people with the same infection was measured for 11 days.

The results are shown in Table 1.3.

Table 1.3

time / days	concentration of protein in blood plasma / g dm^{-3}					
	person 1	person 2	person 3	person 4	person 5	mean
0	57	53	52	59	54	55
3	91	89	94	90	86	90
6	120	115	115	120	130	120
8	87	106	82	81	86	
11	53	62	59	54	57	57

(i) Complete Table 1.3 by calculating the mean at 8 days.

Space for working.

[1]

(ii) Plot a graph of the mean values shown in Table 1.3 on the grid in Fig. 1.3.

Use a sharp pencil for drawing graphs.

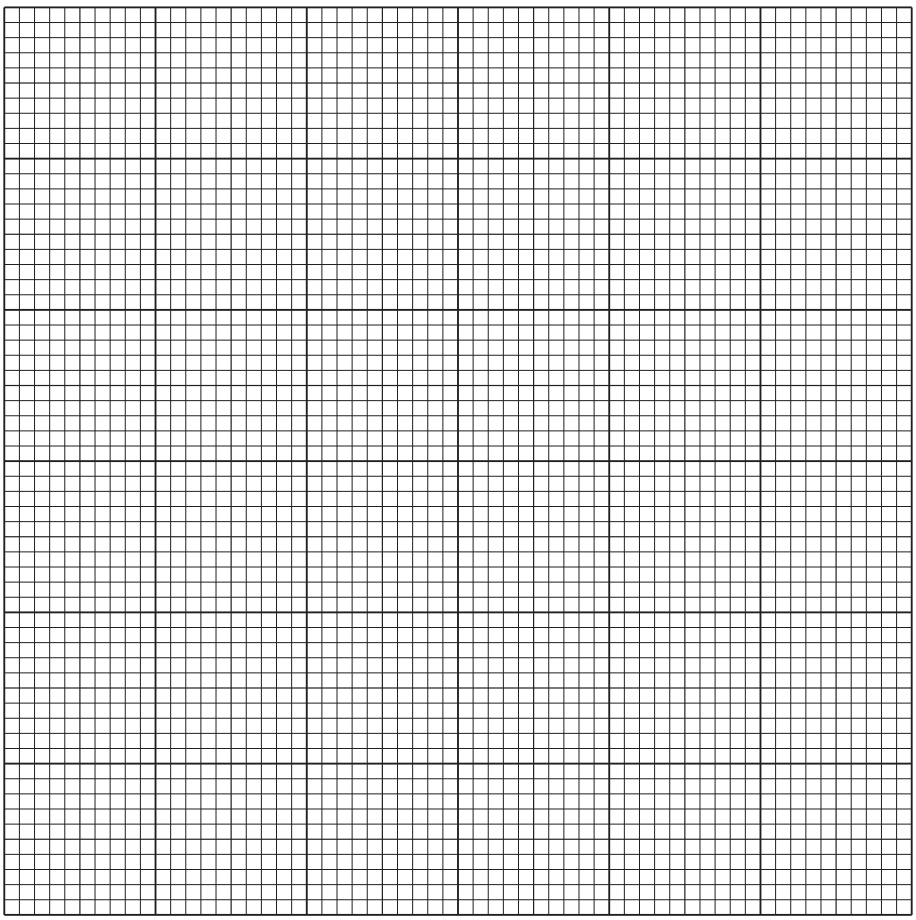

Fig. 1.3

[4]

(iii) Explain, using your knowledge of the immune system, the increase in the concentration of protein in blood plasma between day 0 and day 6.

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..... [3]

[Total: 21]

2 **L1** is a slide of a stained transverse section through a plant leaf.
You are not expected to be familiar with this specimen.

The transverse section may contain more than one bulge, as shown in Fig. 2.1.

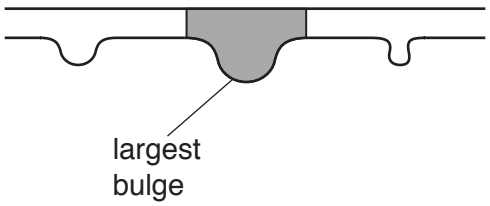


Fig. 2.1

(a) Select a field of view so that you can observe:

- the **largest** bulge
- the different tissues shown by the shaded area in Fig. 2.1.

Use a sharp pencil for drawing.

You are expected to draw the correct shape and proportions of the different tissues.

(i) Draw a large plan diagram from the selected field of view which has:

- part of the epidermis
- the vascular tissue
- any other observable tissues.

Use **one** ruled label line and label to identify the upper epidermis.

[6]

(ii) Observe the upper epidermis of the leaf on **L1**.

Select **a line** of **four** adjacent, touching cells that make up this tissue.
Each cell must touch at least one of the other cells.

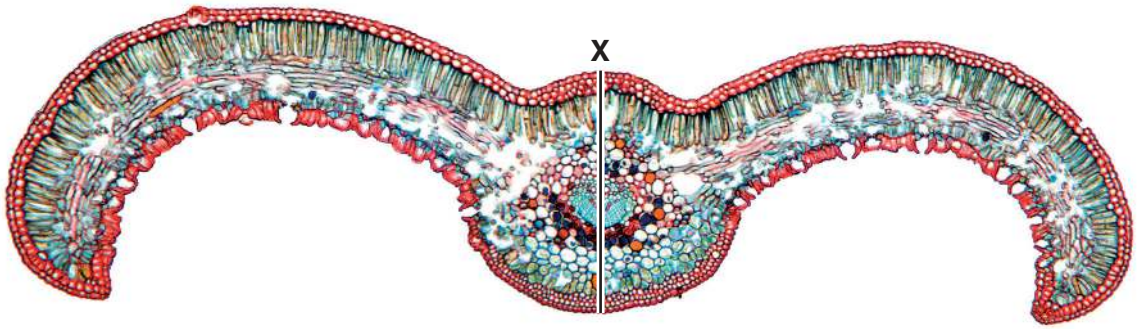
Make a large drawing of this line of **four** cells.

Use **one** ruled label line and label to identify the cell wall of **one** cell.

[5]

Fig. 2.2 is a photomicrograph of a stained transverse section through the leaf of a different type of plant.

You are not expected to be familiar with this specimen.



magnification ×14

Fig. 2.2

(b) Use the magnification and the line **X** on Fig. 2.2 to calculate the actual depth of the midrib.

Show all the steps in your working and use appropriate units.

actual depth of midrib = ... [5]

(c) Identify the observable differences between the leaf on **L1** and the leaf in Fig. 2.2.

Record the observable differences in Table 2.1.

Table 2.1

feature	L1	Fig. 2.2

[3]

[Total: 19]

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