Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8971393140

BIOLOGY **9700/33**

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 **14** printed pages and **2** blank pages.

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 Milk protein concentrates (MPCs) are used for manufacturing food products such as cheese and ice cream.

Different types of milk contain different concentrations of protein. It is important for the food industry to know the concentration of protein in the milk used in the production of MPCs.

The concentration of protein in milk can be measured using potassium hydroxide solution and copper sulfate solution.

You will need to:

- prepare a serial dilution of the proteins in the milk, **M**
- carry out the test for protein on each concentration of milk.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume / cm^3
M	100% milk	none	25
W	distilled water	none	100
P	5% potassium hydroxide solution	harmful irritant	25
C	0.15% copper sulfate solution	none	25

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

You will need to make a **serial** dilution of 100% milk, **M**.
The concentration of the milk should decrease by a **factor of ten** between each successive dilution.

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

(a)(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 **M** available for use in the investigation
- use one arrow with a label, above the beaker, to show the volume and concentration of **M** 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.

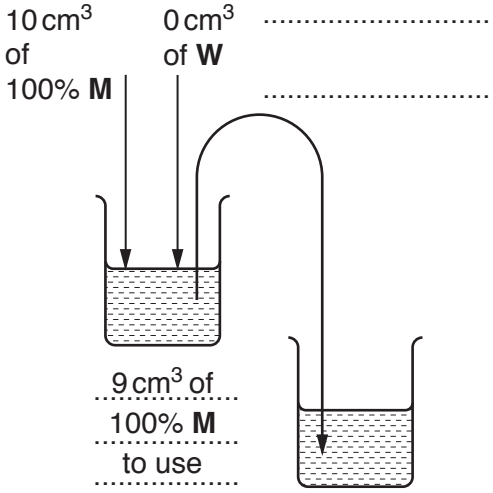

Fig. 1.1

[3]

Carry out the test for protein on different concentrations of milk using step 1 to step 9.

The syringe labelled **M** must be used **only** for the 100% **M**.

1. Prepare the concentrations of milk as decided in **(a)(i)** and as shown in **Fig. 1.1**.

   Use a glass rod to mix the milk solution and water.

2. Label the test-tubes with the concentrations of milk as 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 **P** 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.

   Fig. 1.2 shows the key you need to use to record your results.

   A blue colour indicates that the concentration of protein is too low to be detected.

   Key

colour	**symbol**
pink/purple	++++++
dark purple	+++++
purple	++++
pale purple	+++
blue	++
pale blue	+

   Fig. 1.2

8. After step 7 observe the test-tubes.

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

   You may observe the same colour for more than one test-tube.

9. Record your results in **(a)(ii)** using the symbols shown in the key in Fig. 1.2.

(ii) Record your results in an appropriate table for the known concentrations of milk.

[4]

You are provided with a different type of milk, **X**. The concentration of protein in **X** is unknown.

You now need to:

- carry out the test for protein on **X** using step 10 to step 12
- use your results in **(a)(ii)** to estimate the concentration of protein in **X**.

10. Label a test-tube with the letter **X**.
11. Put 1 cm^3 of **X** into the test-tube labelled **X**.
12. Repeat step 5 to step 7, with **X**.

(iii) After step 12, record your result for **X** using one of the symbols shown in the key in Fig. 1.2.

*result for **X*** ..... [1]

(iv) The 100% **M** contains 12 g of protein in 100 cm^3.

Using your results in **(a)(ii)** and **(a)(iii)**, estimate the concentration of protein in **X**.

Space for working

concentration of protein in **X** = ... g per 100 cm^3

[1]

[Turn over

(v) Identify **one** significant source of error in the investigation described in step 1 to step 12.

Explain why this is a source of error.

source of error .....

explanation .....

.....

[1]

(vi) Suggest **three** improvements to this investigation (step 1 to step 12) so that a more accurate estimate of the concentration of protein in **X** can be obtained.

.....

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.....

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..... [3]

(b) A student carried out some research into the percentage mass of protein in the milk from different mammals.

The results are shown in Table 1.2.

Table 1.2

type of mammal	percentage mass of protein
buffalo (B)	4.05
camel (C)	2.35
horse (H)	0.80
goat (G)	3.60
sheep (S)	3.25

Plot a bar chart of the data in Table 1.2 on the grid in Fig. 1.3.

Use a sharp pencil for drawing graphs.

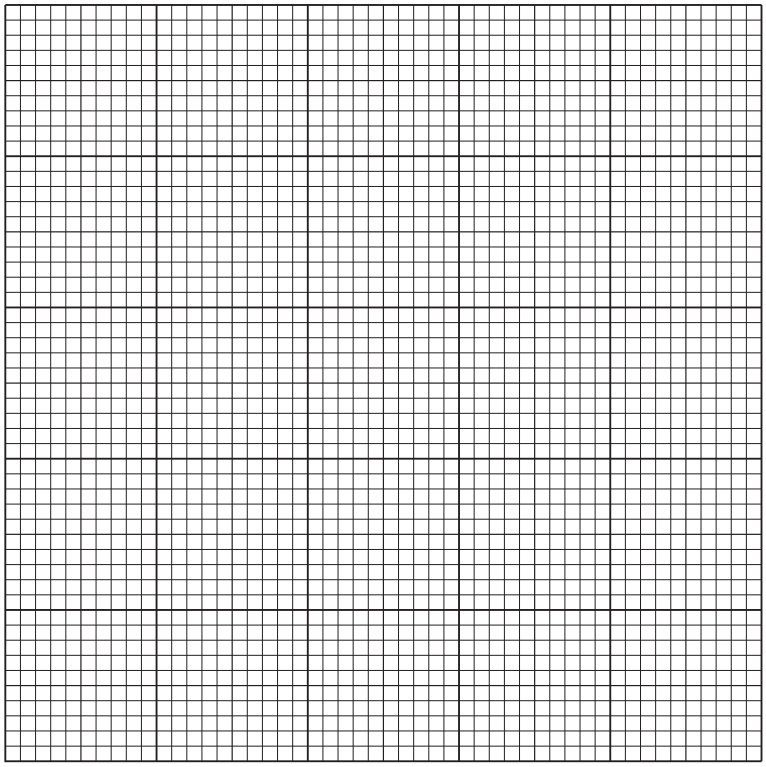

Fig. 1.3

[4]

(c) Pepsin is an enzyme that breaks down proteins.

A student investigated the effect of changing pH on the activity of pepsin.

After mixing the milk, buffer and pepsin, the activity of pepsin was measured by recording the mass of protein **remaining**, in arbitrary units.

All other variables were standardised.

The student plotted a graph of the results, shown in Fig. 1.4.

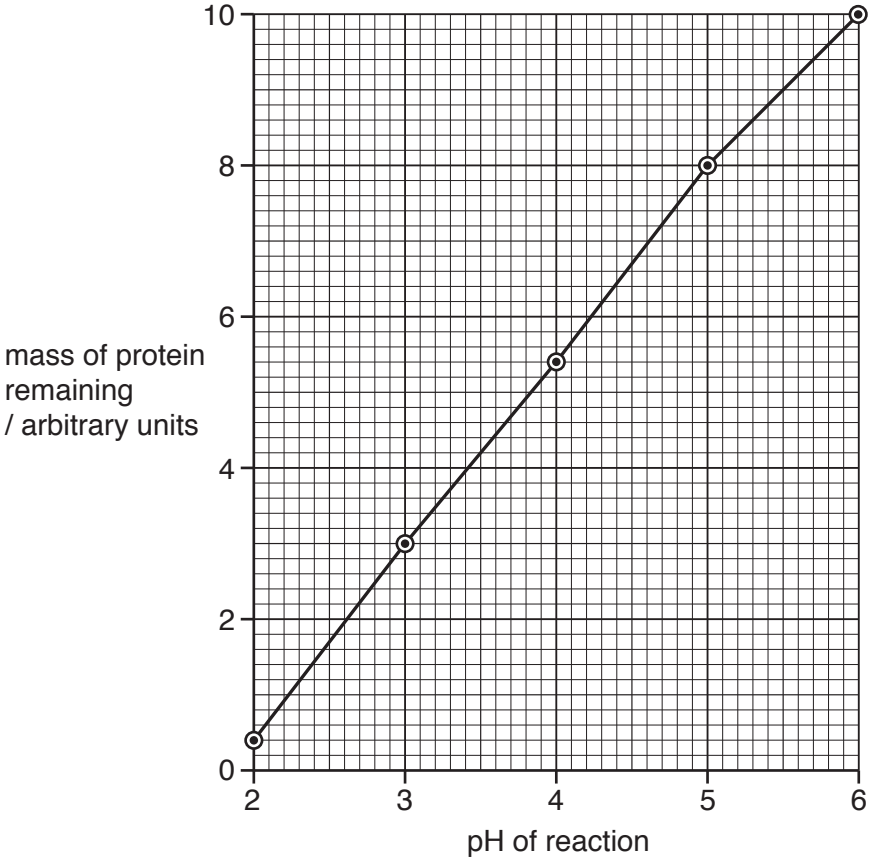

Fig. 1.4

(i) Describe the trend shown in Fig. 1.4.

.....

..... [1]

(ii) Suggest an explanation for the results between pH2 and pH6.

.....

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.....

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.....

.....

..... [3]

[Total: 21]

2 **K1** is a slide of a stained transverse section through a plant stem.

You are not expected to be familiar with this specimen.

Use a sharp pencil for drawings.

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

(a) **(i)** Draw a large plan diagram of the transverse section through the plant stem on **K1**.

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

[5]

(ii) Observe the central region of the plant stem on **K1**.

Select **four** adjacent, touching cells. Each cell must touch at least two other cells.

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

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

[5]

[Turn over

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

You are not expected to be familiar with this specimen.

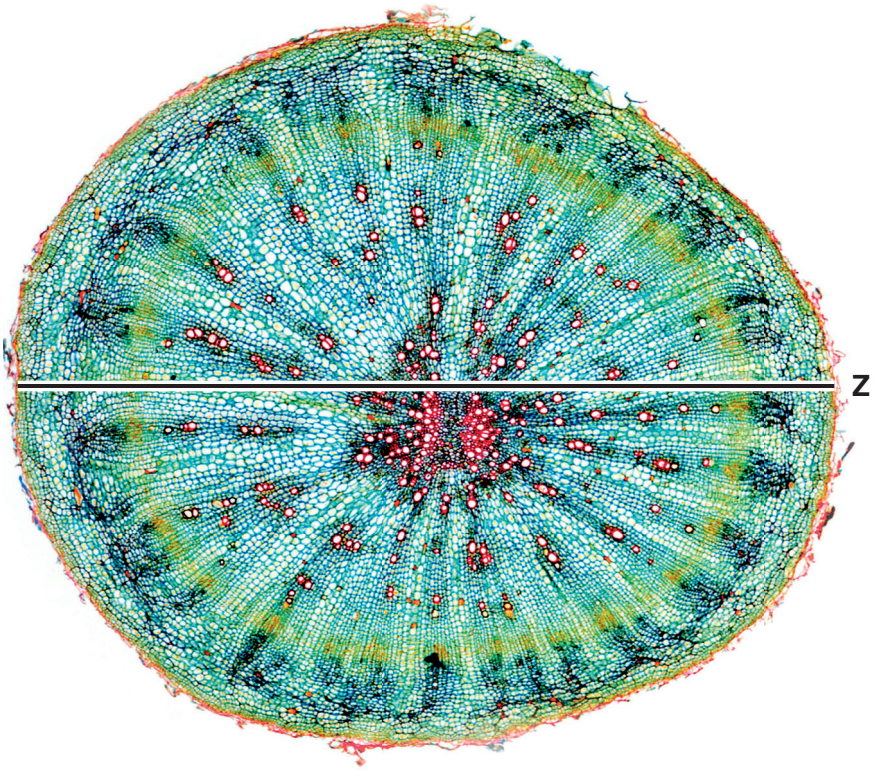

Fig. 2.1

(i) Use the scale bar and the line **Z** on Fig 2.1 to calculate the actual width of the root.

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

actual width of the root = ... [5]

(ii) Prepare an appropriate table for you to record observable differences between the stem on **K1** and the root in Fig. 2.1.

Record the observable differences in your table.

[4]

[Total: 19]

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