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 2021**

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 **12** pages. Any blank pages are indicated.

DC (NF/CGW) 195855/3

[Turn over

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.

1 Some biological molecules produce a colour change when tested with a specific reagent.

You will investigate which biological molecules are present in four solutions, **S1**, **S2**, **S3**, and **S4**. Each solution contains **one** or **none** of the biological molecules: protein, starch, reducing sugar.

You will also investigate the contents of solution **U** which contains a mixture of biological molecules.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume / cm^3
C	0.15% copper sulfate solution	none	10
P	5% potassium hydroxide solution	harmful irritant	10
iodine	iodine solution	irritant	5
B	Benedict's solution	harmful irritant	20
S1	unknown solution	none	10
S2	unknown solution	none	10
S3	unknown solution	none	10
S4	unknown solution	none	10
U	unknown mixture of biological molecules	none	10

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 the test for protein on **S1**, **S2**, **S3**, and **S4**, using step 1 to step 9.

1. Label four test-tubes, **S1**, **S2**, **S3**, and **S4**.
2. Put 1 cm^3 of **S1** into the test-tube labelled **S1**.
3. Repeat step 2 for **S2**, **S3**, and **S4**.
4. Put 1 cm^3 of **P** into each test-tube. Shake gently to mix.
5. Put 1 cm^3 of **C** into each test-tube. Shake gently to mix.
6. Leave the test-tubes for at least 1 minute. Shake gently to mix.
7. Observe the colour in each test-tube and record your observations in **(a)(iii)**.
8. Identify the solution or solutions (**S1**, **S2**, **S3**, **S4**) that contain protein and record this in **(a)(iv)**.
9. Keep any test-tubes from step 8 that contain protein. Empty the test-tubes that do **not** contain protein into the container labelled '**For waste**'. Rinse the empty test-tubes for use in step 10.

(a) **(i)** State the reagent that is used to test for reducing sugar **and** the colour or colours produced if a reducing sugar is present.

reagent .....

colour or colours .....

Describe how you will use the reagent to carry out the test for reducing sugar.

.....

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.....

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.....

.....

[3]

10. Carry out the test for reducing sugar on each of the solutions using the labelled test-tubes from step 9. You do **not** need to test any solutions identified as containing protein in step 8.
11. Observe the colour in each test-tube and record your observations in **(a)(iii)**.
12. Identify the solution or solutions (**S1**, **S2**, **S3**, **S4**) that contain reducing sugar and record this in **(a)(iv)**.

[Turn over

13. Keep any test-tubes from step 12 that contain reducing sugar. Empty the test-tubes that do **not** contain reducing sugar into the container labelled '**For waste**'. Rinse the empty test-tubes for use in step 14.

(ii) State the reagent that is used to test for starch and the colour that is produced if starch is present.

reagent .....

colour .....

[1]

14. Carry out the test for starch on each of the solutions using the labelled test-tubes from step 13. You do **not** need to test any solutions identified as containing protein or reducing sugar in step 8 and step 12.

15. Observe the colour in each test-tube and record your observations in **(a)(iii)**.

16. Identify the solution or solutions (**S1**, **S2**, **S3**, **S4**) that contain starch and record this in **(a)(iv)**.

17. Identify the solution or solutions, if any, that do **not** contain protein, reducing sugar or starch. Record this as 'none' in **(a)(iv)**.

(iii) Record your observations in an appropriate table.

[4]

(iv) Identify the biological molecules present in solutions **S1**, **S2**, **S3** and **S4**. If any solution does **not** contain protein, reducing sugar or starch write the answer as 'none'.

S1 .....

S2 .....

S3 .....

S4 .....

[3]

18. Carry out the tests for protein, reducing sugar and starch using solution **U**.

19. Observe the colour from each test and record your observations in **(a)(v)**.

(v) Record the colours observed for each test for **U**.

protein test .....

reducing sugar test .....

starch test .....

[1]

(vi) Identify the biological molecules present in **U**.

.....

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.....

[1]

[Turn over

(b) A student carries out the same tests for protein, reducing sugar and starch on two unknown solutions, **Y** and **Z**. The student also carries out the test for the presence of lipid.

(i) Describe the test for lipid and the expected observation if a lipid is present.

.....

.....

.....

.....

observation if a lipid is present .....

[2]

From the observations for each test, the student concludes:

- solution **Y** contains protein and reducing sugar
- solution **Z** contains protein and lipid.

The student also carries out the test for non-reducing sugar on solution **Y** and on solution **Z**.

The student observes a positive result for the presence of a non-reducing sugar in solution **Y** and in solution **Z**.

The student concludes that a non-reducing sugar is present in solution **Y** and in solution **Z**.

(ii) Suggest why the student's conclusion may **not** be correct for solution **Y**.

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[1]

(iii) The student thought that the protein in solution **Z** could be the enzyme amylase.

Describe how the student could determine whether the protein in solution **Z** is amylase.

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[3]

[Total: 19]

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

(a) Set up the microscope so that you can observe the section on **L1**.

Use a sharp pencil for drawing.

(i) Draw a large plan diagram of the whole section of the leaf on **L1**. Your drawing should show the correct shapes and proportions of the different tissues.

Use **one** ruled label line and label to identify the palisade layer.

[5]

(ii) Observe the cells in the layer just below the epidermis of the section on **L1**.

Select a **line** of **four** adjacent cells that make up this tissue.

Each cell you draw 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]

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

Fig. 2.1

The leaf sections on **L1** and in Fig. 2.1 are from plants that are adapted to grow in dry environments (xerophytic plants).

(i) Observe the leaf sections on **L1** and in Fig. 2.1.

- State **one** xerophytic feature that is visible on **L1**.

.....

- State **one** xerophytic feature visible in Fig. 2.1 that is a **different** feature from the one you have identified for **L1**.

.....

[2]

(ii) Observe the vascular tissue on **L1** and in Fig. 2.1.

Identify **one** observable difference between the vascular tissue on **L1** and in Fig. 2.1.

Record the observable difference in Table 2.1.

Table 2.1

feature	L1	Fig. 2.1
vascular tissue		

[1]

(c) A scientist identifies five different types of tree in a forest, as shown in Table 2.2.

Table 2.2

type of tree	percentage of total trees in the forest
Juniperus excelsa (E)	10.5
Pinus pinea (P)	37.0
Cedrus libani (L)	5.0
Juniperus drupacea (D)	3.0
Pinus brutia (B)	44.5

(i) Plot a bar chart of the data in Table 2.2 on the grid in Fig. 2.2.

Use a sharp pencil for drawing bar charts.

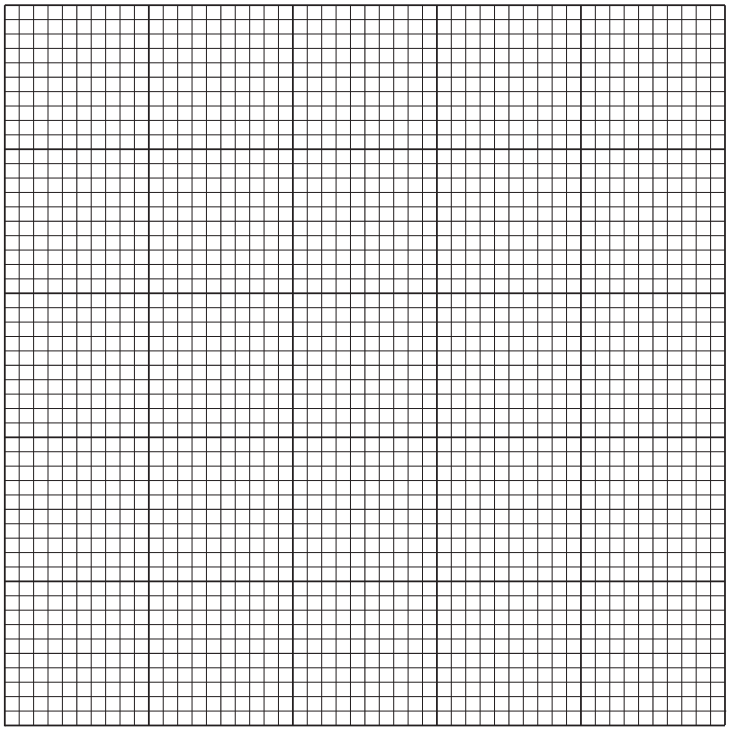

Fig. 2.2

[4]

(ii) The forest has a total of 2344 trees.

Calculate the total number of *Juniperus* trees in the forest using the data in Table 2.2.

Show your working.

total number of *Juniperus* trees = ...

[4]

[Total: 21]

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