CEDAR GIRLS' SECONDARY SCHOOL
End of Year Examination 2021
Year 4

CANDIDATE NAME				
CLASS	4		INDEX NUMBER	

BIOLOGY 6093/03

Paper 3 Practical Test

18 August 2021

1hour 50 minutes

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your name and index number clearly in the spaces at the top of this page.
Give details of the practical shift and laboratory where appropriate, in the boxes provided.

Write in dark blue or black pen.
You may use a 2B pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions in the spaces provided on the Question Paper.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

The number of marks is given in brackets [ ] at the end of each question or part question.

Shift
Laboratory

For Examiner's Use	
1	
2	
Total	

For Examiner's Use

1 You are advised to read the whole question before you start.

Glucose formed from hydrolysis of carbohydrates is absorbed at certain parts of the alimentary canal.

You will be investigating the movement of glucose solution.

You are provided with:

- 20% glucose solution labelled **G**
- distilled water
- a 5cm^3 syringe
- four plastic droppers
- a 50cm^3 measuring cylinder
- four boiling tubes
- four test tubes
- a rubber bung to fit a boiling tube
- a 250 cm^3 beaker labelled **water bath**
- a stopwatch

The apparatus that you will set up is shown in Fig. 1.1, using a boiling tube and a 5 cm^3 syringe.

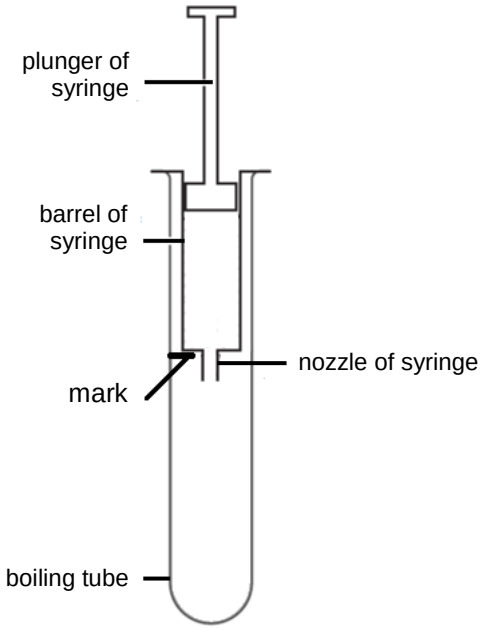

Fig. 1.1

Step 1 Label the four boiling tubes as **G4**, **G8**, **G12** and **G16**.

Step 2 Put an **empty** 5 cm^3 syringe into the boiling tube **G4** as shown in Fig. 1.1.

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Step 3 Using the marker provided, draw a mark on the boiling tube labelled **G4**, as shown in Fig. 1.1, so that the mark is level with the top of the nozzle of the syringe.

(a) (i) Describe how you will use the apparatus provided to find the volume of distilled water needed to fill the boiling tube up to the mark.

.....

..... [2]

(ii) Find the volume of distilled water needed to fill the boiling tube up to the mark, using the method you described in **(a)(i)**.

volume = ... cm^3 [1]

Step 4 Put the volume of distilled water stated in **(a)(ii)** into each of the four boiling tubes **G4**, **G8**, **G12** and **G16**.

Step 5 Fill a 5 cm^3 syringe with slightly more than 5 cm^3 of glucose solution, **G**. Push the plunger in until it reaches the 5 cm^3 mark. This adjustment is done to **ensure that there are no air bubbles in the nozzle**.

Step 6 Put the syringe into the first boiling tube, **G4**, as shown in Fig. 1.2. The nozzle of the syringe must be below the surface of the distilled water. Start the stopwatch.

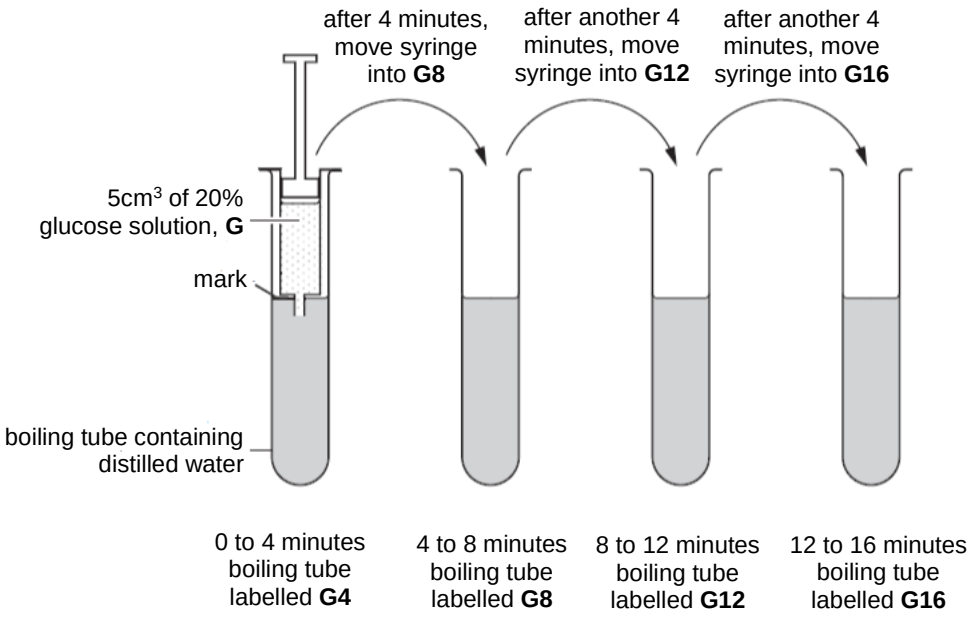

Fig. 1.2

[Turn over

Step 7 Leave the syringe in the boiling tube **G4** for 4 minutes, then remove the syringe and put it immediately into the next boiling tube, **G8**. The nozzle of the syringe must be below the surface of the distilled water. Leave for a further 4 minutes. Do **not** stop the stopwatch.

Step 8 Repeat this process with each of the two remaining boiling tubes, **G12** and **G16**, using the timings indicated in Fig. 1.2. Remove the syringe from the last boiling tube, **G16**, at 16 minutes.

Each time, the nozzle of the syringe must be below the surface of the distilled water. Refer to Fig. 1.2 for the overall setup for the experiment.

Keep the setups **G4** to **G16** for the remaining part of the experiment.

(b) Name the process for the movement of glucose solution from the syringe into the water in boiling tube **G4**.

.....[1]

(c) Name the part of the alimentary canal where the process identified in **(b)** is involved in the absorption of glucose.

.....[1]

To estimate the rate of movement of the glucose solution into distilled water, the solution collected in each boiling tube will be tested with Benedict's test to measure the time taken for the first colour change to occur.

This measurement allows Benedict's test to be semi-quantitative.

Step 9 Label four test tubes as **T4**, **T8**, **T12** and **T16**.

Step 10 Put a rubber bung into boiling tube **G4** and shake the solution to mix well.

Step 11 Remove the rubber bung from **G4** and use a clean plastic dropper to transfer 2 cm^3 of the solution in **G4** into test tube **T4**.

Step 12 Repeat step 10 to step 11 for **each** of the solutions in the remaining boiling tubes. 2 cm^3 of **G8**, **G12** and **G16** should be transferred to test tubes **T8**, **T12** and **T16** respectively.

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Step 13 Use the beaker labelled **water bath** to collect enough of the hot water supplied so that the water fills approximately half the height of the beaker.

Use the Bunsen burner to boil the collected water.

This water bath will be used for step 15.

Step 14 Add 2 cm^3 of Benedict's solution to test tube **T4**. Shake to mix well.

Step 15 Place test tube **T4** into the boiling water bath and start timing using the stopwatch immediately.

Step 16 Measure the time taken to the first appearance of a colour change in the test-tube.

Step 17 Record in **(d)** the result from step 16. If there is no colour change after 180 seconds, **stop timing** and record the result in **(d)** as 'more than 180'. Record all measurements to the nearest 0.01s.

Step 18 Remove the test tube from the water bath and leave it to cool in the test tube rack.

Step 19 Repeat step 14 to step 18 with **T8**, **T12** and **T16**.

(d) Record your results in an appropriate table.

[3]

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(e) How does the rate of movement of glucose solution from the syringe into the water in the boiling tube change with time? Explain your answer.

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.....

.....

..... [3]

(f) State one variable that was kept the same in this investigation.

Explain why it was important to keep this variable the same.

variable .....

.....

explanation .....

..... [2]

(g) Explain the importance of ensuring that there are no air bubbles in the nozzle of the syringe.

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..... [2]

(h) A student modified the procedure by:

- using a 10% glucose solution in the syringe
- collecting glucose solution from the syringe in two-minute periods over a total time of 10 minutes
- collecting any precipitate (solid particles) formed during the Benedict's test
- drying and weighing the precipitate from each test to determine the mass of glucose that had been present.

After carrying out the procedure, the student processed and analysed the results to calculate the rate of movement of the glucose solution at two-minute intervals, as shown in Table 1.1.

Table 1.1

time/minutes	rate of movement of glucose solution / arbitrary units (au)
2	0.18
4	0.09
6	0.04
8	0.02
10	0.01

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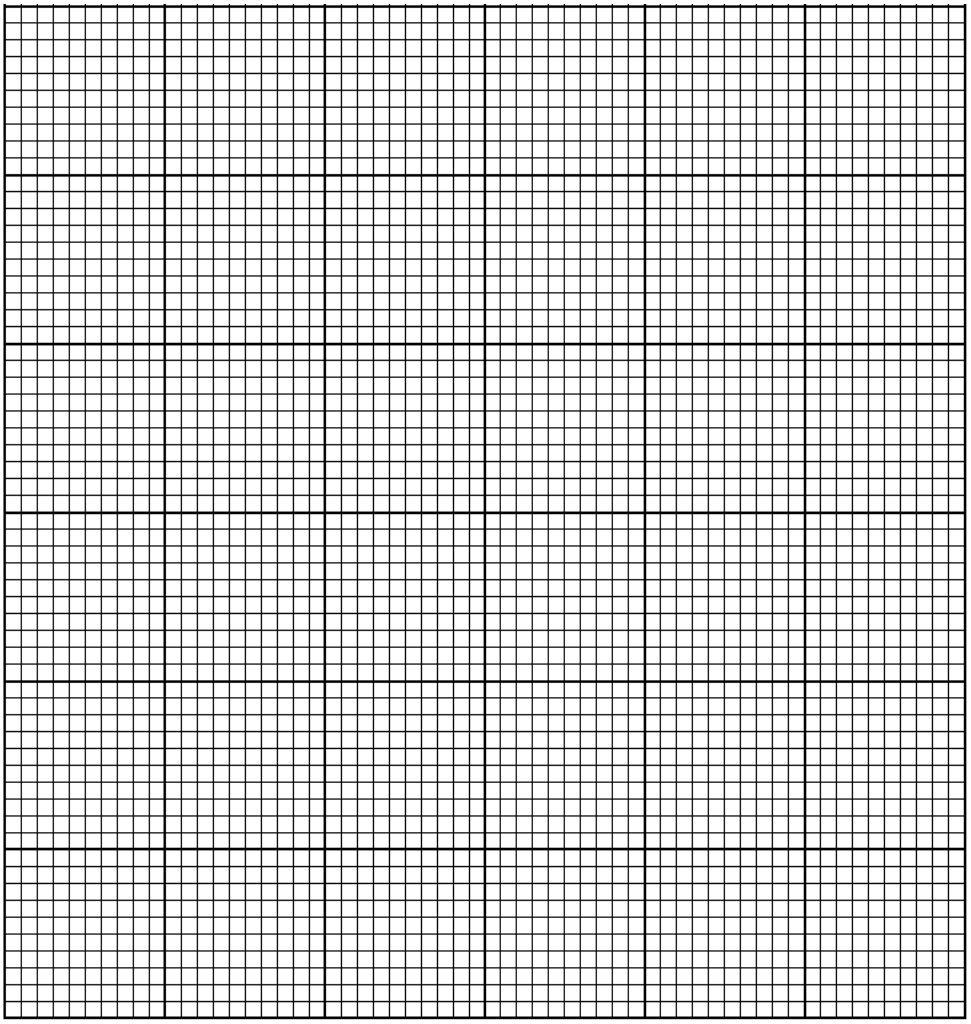
(i) Plot a graph of the data in Table 1.1 on the grid provided.



[4]

(ii) Use your graph to find the rate of movement of glucose solution at 5 minutes.

Show on the graph how you determined your answer.

rate of movement = ... au [2]

[Total: 21]

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2 Fruits such as apples and bananas contain chemicals called polyphenols. An enzyme, polyphenol oxidase, is also present. It catalyses a reaction which converts the polyphenols into brown-coloured compounds.

This reaction happens when the cells are damaged and exposed to oxygen in the air.

$$\text{polyphenols} + \text{oxygen} \xrightarrow{\text{polyphenol oxidase}} \text{brown-coloured compounds}$$

You are going to investigate the effect of hydrochloric acid on the enzyme polyphenol oxidase in apples.

Step 1 Label two Petri dishes **A** and **control**.

Step 2 Use the 50 cm^3 measuring cylinder to add 30 cm^3 of hydrochloric acid into Petri dish **A**.

Step 3 Place the cut surface of one apple half from container **S** on the chopping board, as shown in Fig. 2.1. Cut two slices approximately 5mm in thickness from one half of the apple, avoiding the core.

Fig. 2.1

Step 4 From each slice, cut a rectangular slice of approximately 30 mm × 10 mm × 5 mm in size, without any seeds or peel. Put any leftover apple from this half of the apple into the container labelled **waste**.

Step 5 Chop each of the two rectangular apple slices into tiny pieces, ensuring that they do not mix.

Step 6 Place one of the chopped apple slices into the solution in Petri dish **A** and the other chopped apple slice into the Petri dish **control**. Put the lids on the Petri dishes and leave them for two minutes.

Step 7 Remove the lids of Petri dish **A** and Petri dish **control**.

Do not replace the lid of both Petri dishes.

Step 8 Pour only the liquid from Petri dish **A** into the container labelled **waste**, leaving the chopped apple in the Petri dish.

Step 9 Determine the colour intensity of the chopped apple in each Petri dish after 20 minutes, using the key shown in Table 2.1. Record the results in the table in **2(a)**.

Table 2.1

colour of crushed apple slice	no brown colour	light brown	dark brown
colour intensity value	1	2	3

(a)

petri dish	colour intensity after 20 minutes
A	
control	

[2]

(b) Can hydrochloric acid reduce the rate of browning of apples? Explain your answer.

.....

.....

.....

.....

[3]

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(c) State the purpose of the control set up.

.....

..... [1]

(d) Explain why the lids were not put back onto both Petri dishes after removal.

.....

..... [1]

(e) The enzyme polyphenol oxidase and the substrate polyphenol can be extracted from crushed apples. The substrate turns brown when the enzyme is present.

Some students were provided with extracts of the enzyme and the substrate.

Describe a method the students could use to find the optimum temperature of the enzyme.

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..... [5]

For Examiner's Use

(f) **(i)** In the space below, make a large drawing of the cut surface of the remaining apple half in container **S**. You **do not** need to include any labels or browning shown on the cut surface of the apple.

[4]

(ii) Draw a straight line across the widest part of the cut surface of the apple on your drawing. Measure and record the length of your line.

measurement = ... mm [1]

Measure the matching line on the actual half of the apple.

Use these measurements to calculate the magnification of your drawing compared with the actual apple specimen.

magnification = ... [2]

[Total: 19]

END OF PAPER