Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

8366961267

BIOLOGY **0610/61**

Paper 6 Alternative to Practical **October/November 2022**

1 hour

You must answer on the question paper.

No additional materials are needed.

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 [ ].

This document has **12** pages. Any blank pages are indicated.

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1 A student investigated the vitamin C concentration in three different health drinks: **A**, **B** and **C**.

The concentration of vitamin C can be estimated in a sample of health drink by testing it with iodine solution. The test involves adding drops of iodine solution to the health drink sample until the sample remains blue-black.

The greater the volume of iodine solution added, the higher the concentration of vitamin C in the health drink.

The student used this method:

Step 1 Label three test-tubes **A**, **B** and **C**.

Step 2 Use a syringe to add 1 cm^3 of starch suspension to each of test-tubes **A**, **B** and **C**.

Step 3 Use a clean syringe to add 3 cm^3 of health drink **A** to test-tube **A**.

Step 4 Use a clean syringe to add 3 cm^3 of health drink **B** to test-tube **B**.

Step 5 Use a clean syringe to add 3 cm^3 of health drink **C** to test-tube **C**.

Step 6 Use a dropping pipette to add one drop of iodine solution to test-tube **A** and shake the test-tube gently to mix the contents.

Step 7 Repeat step 6, counting the number of drops added, until a blue-black colour appears and stays blue-black after mixing.

Step 8 Record the total number of drops of iodine solution added to test-tube **A**.

Step 9 Repeat steps 6 to 8 with test-tubes **B** and **C**. Refill the dropping pipette with more iodine solution as necessary.

Step 10 Pour the contents of test-tubes **A**, **B** and **C** into the waste container and rinse the test-tubes in clean water. Repeat steps 2 to 9 to obtain another set of results.

Step 11 Repeat step 10 to obtain a third set of results.

The student's results are shown in Fig. 1.1.

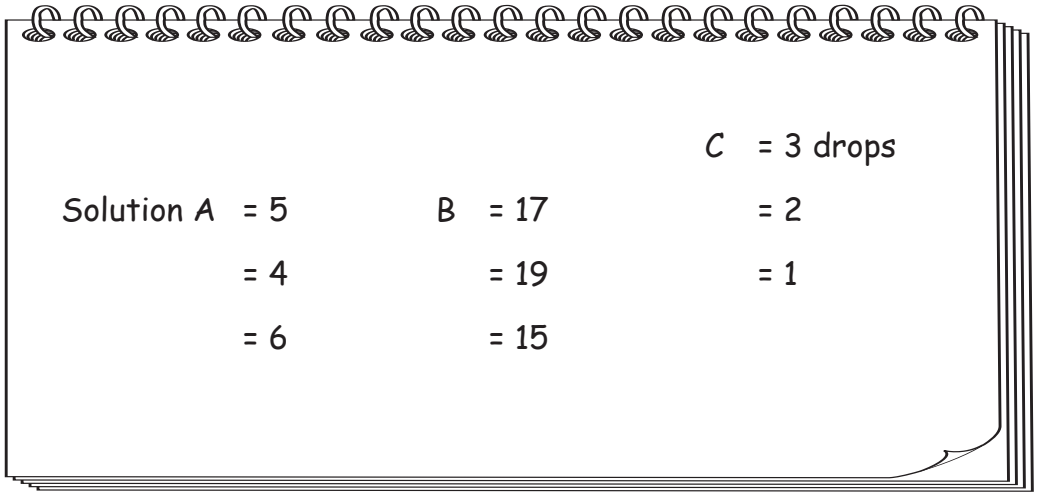


Fig. 1.1

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(a) (i) Prepare a table and record the results shown in Fig. 1.1.

Calculate the average number of drops of iodine solution used for each solution.

Include these averages in your table.

[4]

(ii) Suggest a reason why the starch suspension was added to each of the test-tubes in this investigation.

.....

.....

..... [1]

(iii) State which health drink, **A**, **B** or **C**, has the highest concentration of vitamin C and give a reason for your answer.

.....

.....

..... [1]

(iv) Identify the variable that was measured (the dependent variable) in this investigation.

..... [1]

(v) Explain why it was important to use a clean syringe in steps 3, 4 and 5.

.....

.....

..... [1]

(vi) Identify **one** possible source of error in steps 6 and 7 and suggest an improvement to the method to reduce the effect of this error.

error .....

.....

improvement .....

.....

.....

[2]

(b) A student prepared six vitamin C solutions of different concentrations. They added drops of iodine solution until each concentration of vitamin C solution remained blue-black.

The experiment was repeated three times and the average number of drops of iodine solution added was calculated for each concentration.

Table 1.1 shows the student's results.

Table 1.1

percentage vitamin C concentration	number of drops of iodine solution added			
	trial 1	trial 2	trial 3	average
0.000	1	1	1	1
0.025	3	3	3	3
0.050	4	19	6	5
0.100	11	10	12	11
0.200	20	16	18	18
0.400	38	36	40	38

(i) The student decided that the result for trial 2 of the 0.050% vitamin C solution was anomalous.

State what is meant by an anomalous result.

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..... [1]

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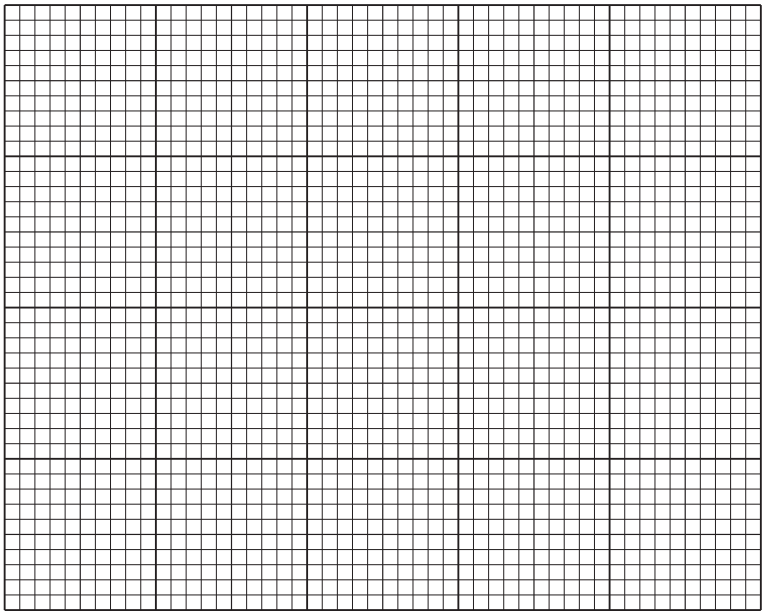
(ii) State how the student dealt with the anomalous result when calculating the average value for the 0.050% vitamin C solution.

.....

.....

..... [1]

(iii) Using the data in Table 1.1, plot a line graph on the grid of the percentage vitamin C concentration against the average number of drops of iodine solution added.



[4]

(iv) The student was given a health drink, **D**. It took seven drops of iodine solution to change it to a blue-black colour.

Use the graph to estimate the vitamin C concentration in health drink **D**.

On the graph, show how you estimated the vitamin C concentration.

vitamin C concentration of **D** ..... %

[2]

(v) Describe **one** way in which the method for testing a substance with Benedict's solution differs from the method for testing a substance with biuret solution.

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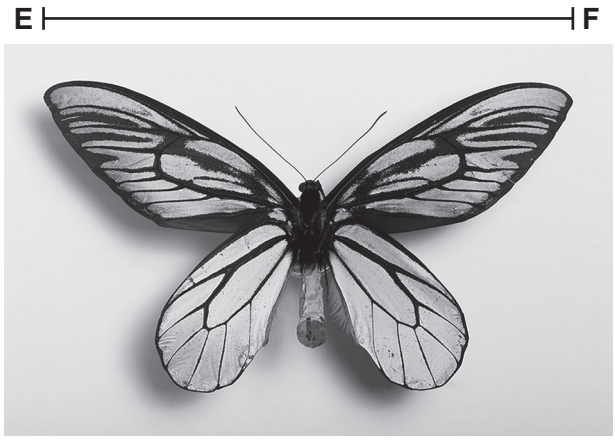
.....

..... [1]

[Total: 19]

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2 **(a)** Fig. 2.1 is a photograph of the largest butterfly in the world, the Queen Alexandra's birdwing butterfly.



magnification ×0.3

Fig. 2.1

(i) Line **EF** represents the wingspan of the Queen Alexandra's birdwing butterfly.

Measure the length of line **EF** on Fig. 2.1.

length of line **EF**..... mm

Calculate the actual wingspan of the butterfly using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line } \mathbf{EF}}{\text{actual wingspan of the butterfly}}$$

Give your answer to **two** significant figures.

Space for working.

..... mm
[3]

(ii) Fig. 2.2 shows one wing from the Queen Alexandra's birdwing butterfly.



Fig. 2.2

Draw a large diagram of the butterfly wing shown in Fig. 2.2.

[4]

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(b) Fig. 2.3 is a photograph of a Queen Alexandra's birdwing caterpillar.



Fig. 2.3

Fig. 2.4 is a photograph of a monarch butterfly caterpillar.



Fig. 2.4

Identify **two** differences between the Queen Alexandra's birdwing caterpillar in Fig. 2.3 and the monarch butterfly caterpillar in Fig. 2.4.

1 .....

.....

2 .....

.....

[2]

(c) Caterpillars turn into butterflies after pupating.

A scientist investigated the effect of temperature on the number of days taken for a caterpillar to become a butterfly.

The scientist collected 120 caterpillars of one species of butterfly. All the caterpillars were the same age.

Four glasshouses were prepared and each was maintained at a different temperature.

30 caterpillars were placed in each glasshouse. Each group of caterpillars was provided with the same mass of food.

The scientist observed the caterpillars in the glasshouses and recorded the number of caterpillars remaining at each temperature.

Table 2.1 shows the scientist's results at 30 days and 60 days.

Table 2.1

temperature / °C	number of caterpillars remaining at 30 days	number of caterpillars remaining at 60 days
15	26	25
20	9	2
25	5	0
30	24	22

(i) State **two** variables that were kept constant in this investigation.

1 .....

2 .....

[2]

(ii) Calculate the percentage change in the number of caterpillars remaining between 30 days and 60 days when the temperature was 15 °C.

Give your answer to **one** decimal place.

Space for working.

..... %

[3]

(iii) Use the information in Table 2.1 to suggest the optimum (best) temperature for changing from a caterpillar into a butterfly.

..... °C [1]

[Total: 15]

3 Plan an investigation to determine the effect of temperature on the rate of photosynthesis in an aquatic plant.

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..... [6]

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