Cambridge Assessment International Education

# Cambridge IGCSE™

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CANDIDATE NAME | | | | | | | | | |
| CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | | |

**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.

© UCLES 2022

**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.

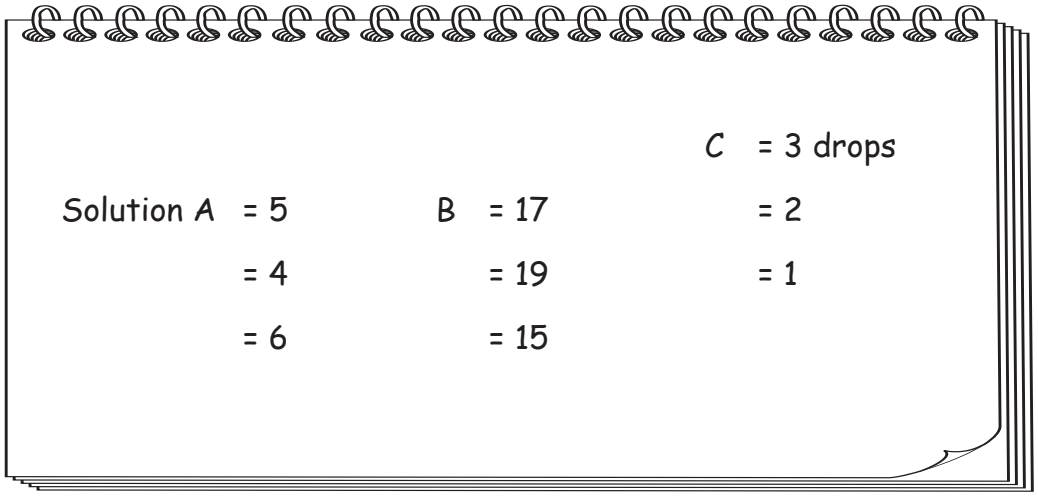



**Fig. 1.1**

© UCLES 2022

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

View solution

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]

© UCLES 2022

**(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.

View solution

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.

.....

.....

..... [1]

© UCLES 2022

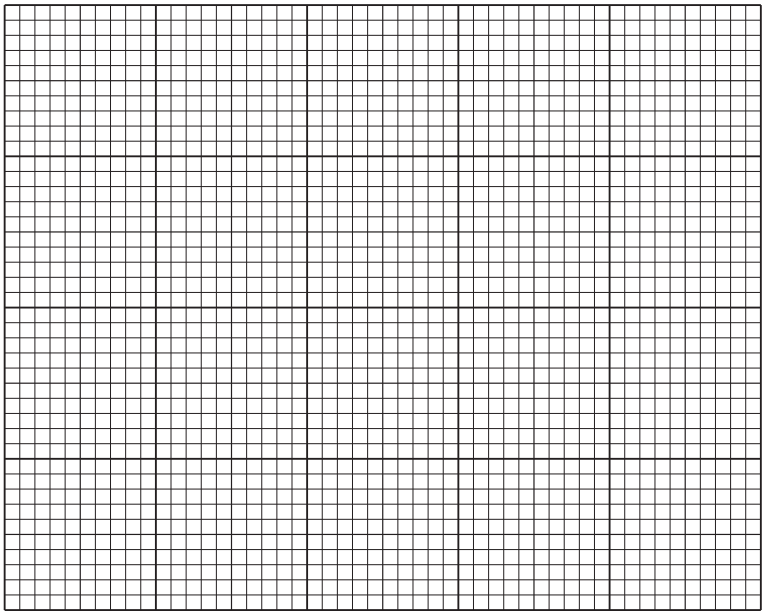
**(ii)** State how the student dealt with the anomalous result when calculating the average value for the 0.050% vitamin C solution.

.....

.....

..... [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.

.....

.....

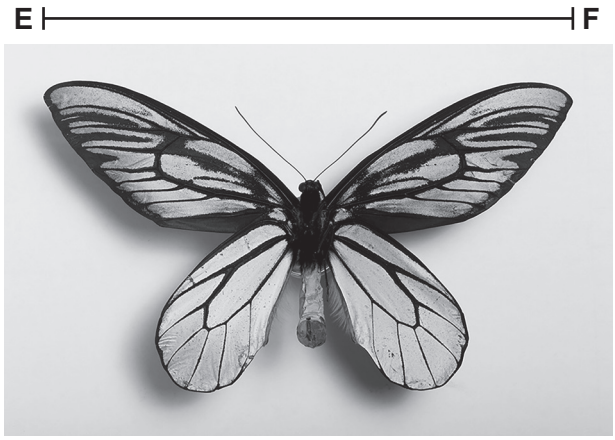
..... [1]

[Total: 19]

© UCLES 2022

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

View solution




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.

View solution



**Fig. 2.2**

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

[4]

© UCLES 2022

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

View solution



**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]

© UCLES 2022

**(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.

View solution

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.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

View solution

**BLANK PAGE**

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

© UCLES 2022