Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

BIOLOGY **0610/62**

Paper 6 Alternative to Practical **May/June 2024**

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 effect of acid concentration on the rate of diffusion in agar jelly. The student was given three test-tubes containing bromothymol blue indicator in agar jelly.

Bromothymol blue is a blue indicator that turns yellow in the presence of an acid.

The student used this method:

Step 1 label three beakers **A1**, **A2** and **A3**

Step 2 put 20 cm^3 of 1 mol per dm^3 hydrochloric acid solution into beaker **A1**

Step 3 put 2 cm^3 of 1 mol per dm^3 hydrochloric acid solution into beaker **A2**

Step 4 add 18 cm^3 of distilled water to the hydrochloric acid solution in beaker **A2**

Step 5 use a clean syringe to transfer 2 cm^3 of the solution from beaker **A2** to beaker **A3**

Step 6 add 18 cm^3 of distilled water to beaker **A3**

Table 1.1 shows the final concentrations of the hydrochloric acid solution in each beaker.

Table 1.1

beaker	final concentration of the hydrochloric acid solution / mol per dm^3	final volume of the solution / cm^3
A1	1.00	20
A2	0.10	.....
A3	0.01	20

(a) (i) Complete Table 1.1 by calculating the final volume of the solution in beaker **A2**.

View solution

Write your answer in Table 1.1. [1]

Step 7 label the three test-tubes that contain the bromothymol blue indicator in agar jelly **A1**, **A2** and **A3**

Step 8 use a syringe to transfer 10 cm^3 of the hydrochloric acid solution from beaker **A1** to test-tube **A1**

Step 9 use a syringe to transfer 10 cm^3 of the hydrochloric acid solution from beaker **A2** to test-tube **A2**

Step 10 use a syringe to transfer 10 cm^3 of the hydrochloric acid solution from beaker **A3** to test-tube **A3**

Step 11 place the three test-tubes into a water-bath at 35 °C

Step 12 start a stop-clock and leave the test-tubes in the water-bath for 20 minutes

Step 13 after 20 minutes, remove the test-tubes from the water-bath

Step 14 measure the temperature of the water in the water-bath.

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Fig. 1.1 shows the three test-tubes after they were removed from the water-bath in step 13.

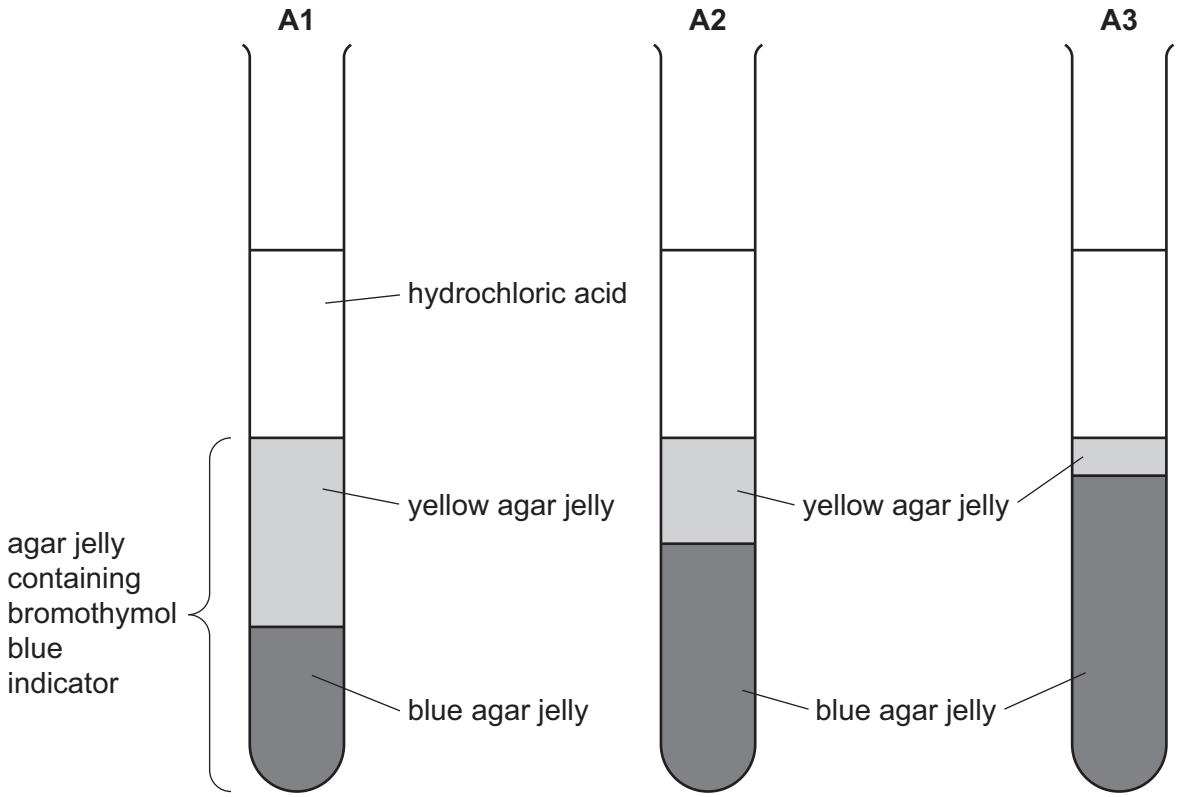

Fig. 1.1

View solution

(ii) Measure the height of the yellow agar jelly in each test-tube shown in Fig. 1.1.

Prepare a table and record the results of the investigation. Include in your table:

- your measurements from Fig. 1.1
- the final concentration of hydrochloric acid.

[4]

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(iii) State a conclusion for the investigation.

View solution

.....

.....

..... [1]

(iv) Identify the independent variable and the dependent variable in this investigation.

View solution

independent variable .....

.....

dependent variable .....

.....

[2]

(v) Fig. 1.2 shows the reading on the thermometer in step 14.

View solution

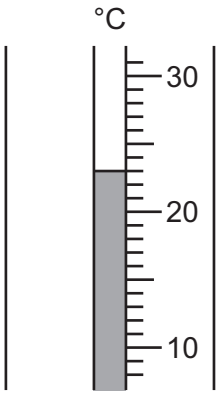

Fig. 1.2

Record the temperature of the water in the water-bath at the end of the investigation, shown in Fig. 1.2.

temperature ..... °C [1]

(vi) The student stated that the change in the temperature of the water-bath was **not** a significant source of error in the investigation.

Explain why the student was correct to state this.

View solution

.....

.....

..... [1]

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(vii) Suggest a control experiment for this investigation.

View solution

.....

.....

..... [1]

(viii) The student repeated the investigation but left the test-tubes in the water-bath for 30 minutes instead of 20 minutes.

Suggest how the results for this second investigation would differ from the results for the first investigation.

.....

.....

..... [1]

View solution

(b) In an experiment, a student cut different-sized cubes of agar containing bromothymol blue indicator. The student placed the cubes in hydrochloric acid and measured the time taken for each cube to become yellow.

View solution

The results are shown in Table 1.2.

Table 1.2

length of the cube sides / mm	volume of the cube / mm^3	time taken for the cubes to become yellow / s
2	8	35
4	.....	60
6	216	170
8	512	275
10	1000	445

(i) Complete Table 1.2 by calculating the volume of the 4 mm cube.

Write your answer in Table 1.2. [1]

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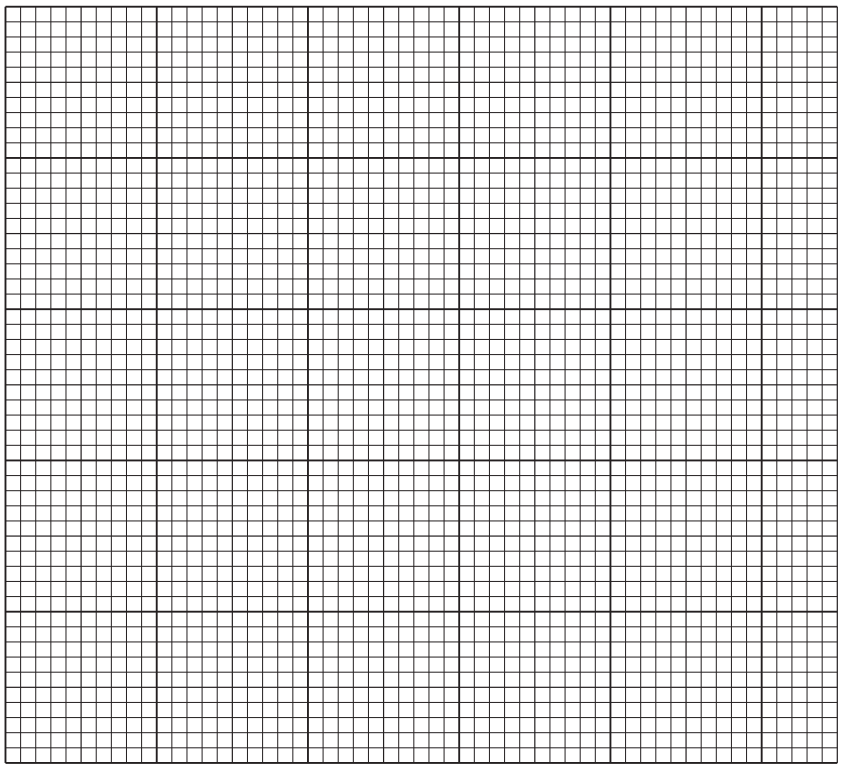
(ii) Plot a line graph on the grid of the length of the cube sides against the time taken for the cubes to become yellow.

View solution



[4]

(iii) Use your graph to estimate the time taken for a cube with a side length of 3 mm to become yellow.

Show on your graph how you obtained your answer.

View solution

..... s

[2]

(iv) State **two** variables that should have been kept constant in this investigation.

View solution

1 .....

.....

2 .....

.....

[2]

[Total: 21]

View solution

2 **(a)** When a seed germinates it grows into a seedling.

Fig. 2.1 is a photograph of a seedling.

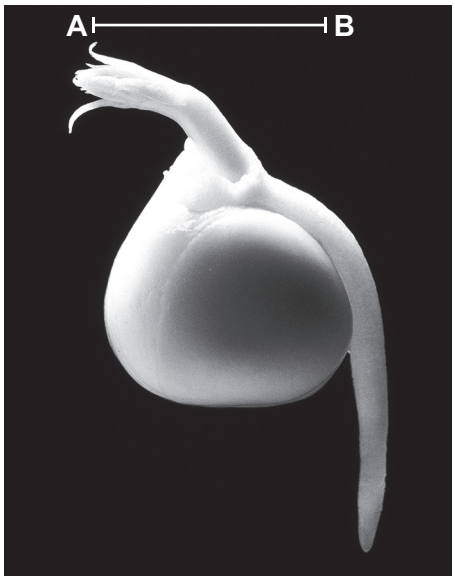


Fig. 2.1

(i) Make a large drawing of the seedling shown in Fig. 2.1.

[4]

View solution

(ii) Line **AB** represents the width of the seedling.

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

length of line **AB** ..... mm

The actual width of the seedling is 9 mm.

Calculate the magnification of the seedling in Fig. 2.1 using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line } \mathbf{AB} \text{ in Fig. 2.1}}{\text{actual width of the seedling}}$$

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

Space for working.

.....

[3]

View solution

(iii) Fig. 2.2 shows photographs of two different seedlings, **P** and **Q**.



P **Q**

Fig. 2.2

Describe **one** visible similarity and **two** visible differences between seedling **P** and seedling **Q** in Fig. 2.2.

similarity 1 .....

.....

difference 1 .....

.....

difference 2 .....

.....

[3]

View solution

(b) As seedlings grow, they change starch into reducing sugars.

Describe the methods you would use to test a sample of seedlings for starch and reducing sugars.

starch test .....

.....

.....

reducing sugar test .....

.....

.....

[3]

(c) When light shines from one side, seedlings grow towards the light.

Fig. 2.3 shows a diagram of a seedling growing towards a light source. The angle of growth is shown on the diagram.

View solution

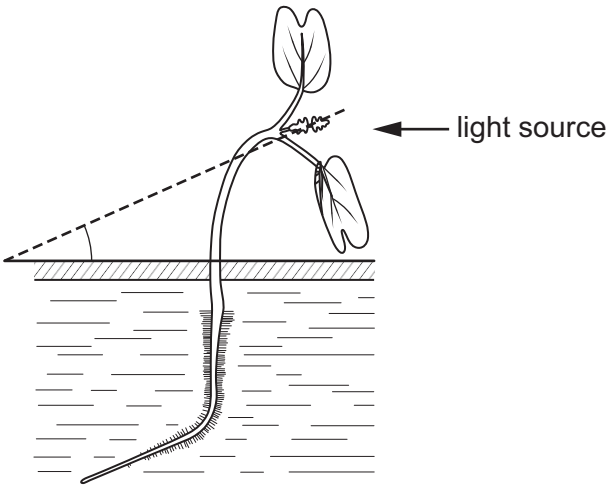


Fig. 2.3

Plan an investigation to find out how light intensity affects the angle at which the seedling grows.

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..... [6]

[Total: 19]

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