Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

BIOLOGY **0610/61**

Paper 6 Alternative to Practical **October/November 2020**

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. Blank pages are indicated.

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1 The enzyme lipase catalyses the break-down of fats into fatty acids and glycerol.

A student investigated how the concentration of lipase affected the break-down of fat in milk.

An increase in the concentration of fatty acids in the milk will change the pH of the milk.

The student used a pH indicator, bromothymol blue, and observed the colour changes of the indicator in the milk and lipase solution.

Table 1.1 shows the colour of bromothymol blue indicator at different pH values.

Table 1.1

pH	6	7	8
colour	yellow	green	blue

View solution

(a) Step 1 Four test-tubes were labelled **L1**, **L2**, **L3** and **L4**.

Step 2 Solutions containing different concentrations of lipase enzyme were made using the volumes of 2% lipase solution and distilled water shown in Table 1.2.

Table 1.2

test-tube	volume of 2% lipase solution / cm^3	volume of distilled water / cm^3	percentage concentration of lipase solution
L1	3.00	0.00	2.0
L2	1.50	1.50	1.0
L3	0.75	2.25	
L4	0.00	3.00	0.0

(i) Calculate the percentage concentration of lipase solution in test-tube **L3** using the information in Table 1.2.

Space for working.

.....% [1]

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Step 3 Another four test-tubes were labelled **M1**, **M2**, **M3** and **M4**.

Step 4 Three different substances were added to each of test-tubes **M1**, **M2**, **M3** and **M4**:

- 5 drops of bromothymol blue indicator
- 2 cm^3 of sodium carbonate solution
- 2 cm^3 of milk.

The student observed that the contents of test-tubes **M1**, **M2**, **M3** and **M4** were all blue.

Step 5 All of the test-tubes were put into a water-bath containing warm water and left for five minutes.

Step 6 After five minutes test-tubes **M1** and **L1** were removed from the water-bath.

Step 7 The contents of test-tube **M1** were poured into **L1** and a stop-clock started.

Step 8 The colour of the bromothymol blue indicator in test-tube **L1** was observed.

The time taken for the bromothymol blue indicator to become yellow was recorded.

If the colour had not changed to yellow in five minutes the result was recorded as **>300**.

Step 9 Steps 6, 7 and 8 were repeated for test-tubes **M2** and **L2**, **M3** and **L3**, **M4** and **L4**.

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The times from step 8 and step 9 are shown in Fig. 1.1.



Fig. 1.1

(ii) Prepare a table for the results. Convert the times shown in Fig. 1.1 to seconds and record them in your table.

View solution

[3]

(iii) State a conclusion for these results.

View solution

.....

.....

..... [1]

(b) (i) Identify the control in this investigation and explain why a control was used.

View solution

control .....

explanation .....

.....

.....

[2]

(ii) Using the information in Table 1.1 and the results, estimate the pH values in test-tube **L1** and test-tube **L4** at the end of the investigation.

L1 .....

L4 .....

[1]

(iii) State the variable that was deliberately changed (the independent variable) in this investigation.

..... [1]

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

1 .....

.....

2 .....

.....

[2]

(v) Suggest why all of the test-tubes were placed into a water-bath, in step 5, for five minutes before mixing their contents.

.....

.....

..... [1]

(vi) State the potential source of error in step 8.

.....

.....

..... [1]

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(c) Describe how you would safely test lipase for the presence of protein and state the result of a positive test.

method .....

.....

.....

positive result .....

.....

safety precaution .....

.....

[3]

(d) The average temperature of the human body is 37 °C. Humans produce lipase for fat digestion. A student thought that lipase would work best at human body temperature.

Plan an investigation to find out if 37 °C is the optimum (best) temperature for lipase activity.

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[6]

View solution [Total: 22]

2 **(a)** Fig. 2.1 is a labelled diagram of the parts of a flower.

View solution

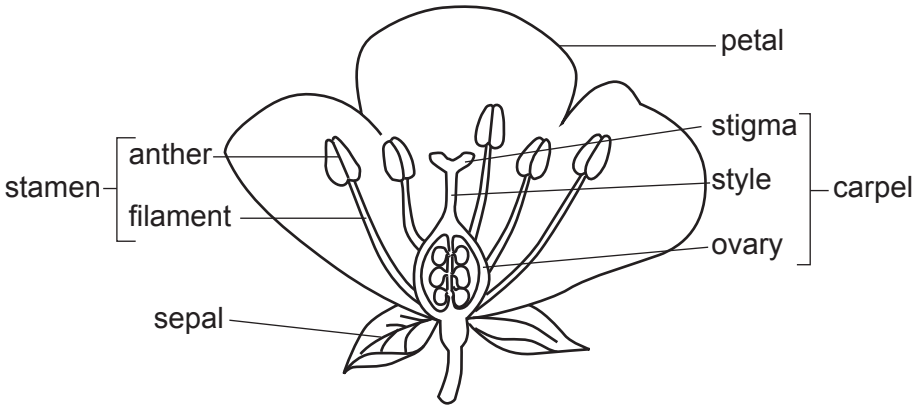


Fig. 2.1

Fig. 2.2 is a photograph showing the parts of a flower that have been separated.

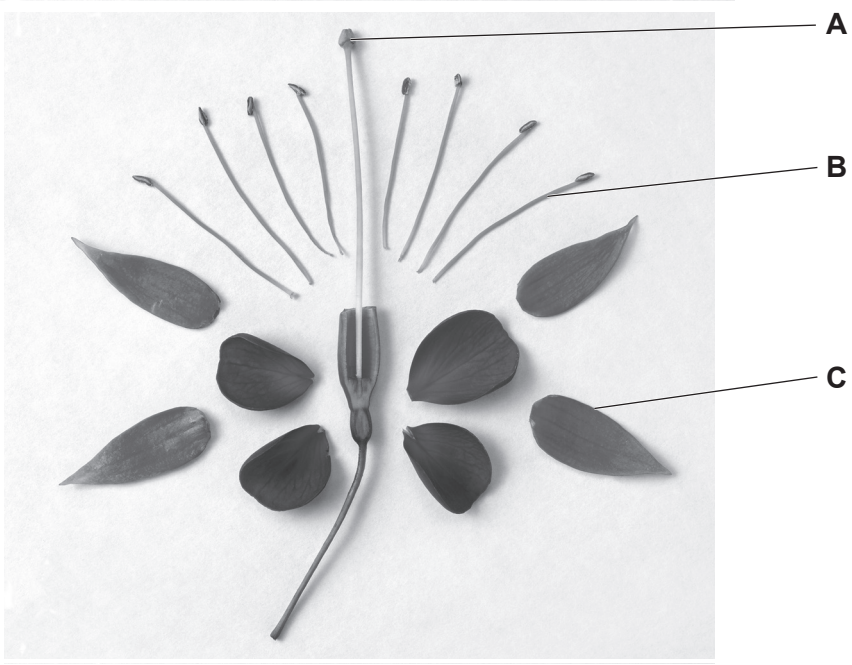


Fig. 2.2

Complete Table 2.1 using the information in Fig. 2.1 and Fig. 2.2 by stating the:
- names of flower parts **A**, **B** and **C**
- number of each of the flower parts **A**, **B** and **C** visible in Fig. 2.2.

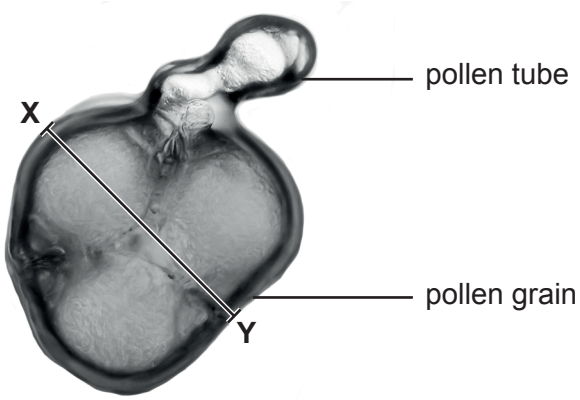
Table 2.1

letter on Fig. 2.2	name of flower part	number visible
A		
B		
C		

[3]

(b) Fig. 2.3 shows a photograph of a germinating pollen grain.

View solution



magnification ×350

Fig. 2.3

(i) Make a large drawing of the germinating pollen grain shown in Fig. 2.3.

Label the pollen tube.

[5]

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(ii) Measure the length of line **XY** on Fig. 2.3.

View solution

length of line **XY** ..... mm

Calculate the actual length of the pollen grain in Fig. 2.3 using the formula.

$$\text{magnification} = \frac{\text{length of } \mathbf{XY} \text{ on Fig. 2.3}}{\text{actual length of } \mathbf{XY}}$$

Include the unit.

Space for working.

.....

[3]

(c) Some students collected pollen from the anthers of flowers to investigate the effect of two different solutions, **S1** and **S2**, on the germination of pollen.

Two microscope slides were prepared.

Slide **one** had 210 pollen grains and two drops of solution **S1**.

Slide **two** had 250 pollen grains and two drops of solution **S2**.

Every 10 minutes the students counted and recorded the number of pollen grains that had germinated.

The percentage of pollen grains that had germinated was calculated.

Fig. 2.4 shows a drawing of the pollen grains as seen with a light microscope.

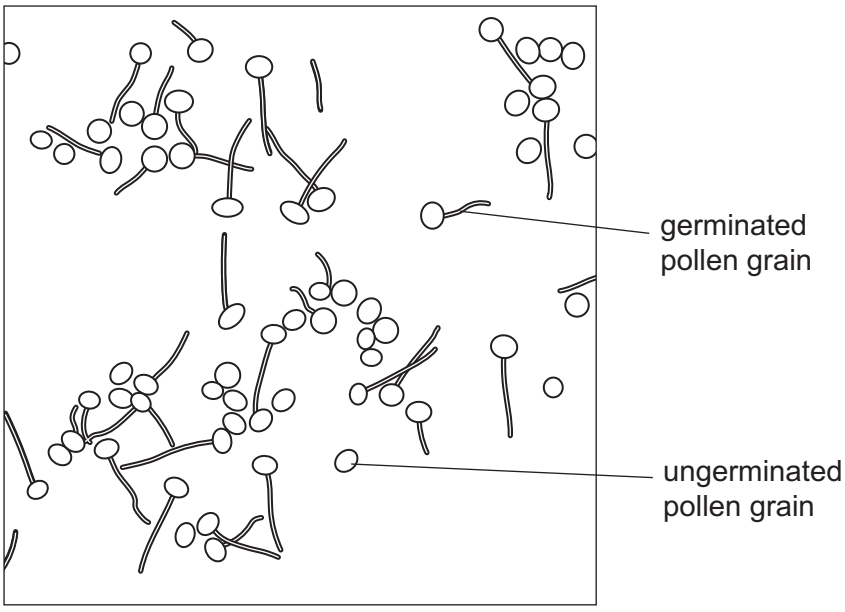

Fig. 2.4

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The results of the investigation are shown in Table 2.2.

Table 2.2

	percentage germination					
time / minutes	10	20	30	40	50	60
solution **S1**	5	18	26	38	51	51
solution **S2**	3	8	18	28	36	51

View solution

(i) State **two** conclusions for these results.

1 .....

.....

.....

2 .....

.....

.....

[2]

(ii) The results in Table 2.2 are shown as percentages rather than as the actual number of germinated pollen grains.

Explain why this enables a valid comparison to be made between the results for **S1** and **S2**.

.....

.....

..... [1]

(iii) Describe how the percentage germination in Table 2.2 was calculated.

.....

.....

.....

..... [2]

(d) The students prepared another three slides using solutions **A**, **B** and **C** and left them for 60 minutes. They measured the length of the pollen tubes in 20 germinated pollen grains.

The results are shown in Table 2.3.

View solution

Table 2.3

solution	average length of pollen tube / μm
A	190
B	220
C	265

Fig. 2.5 shows the grid that the students used to plot a graph of their results.

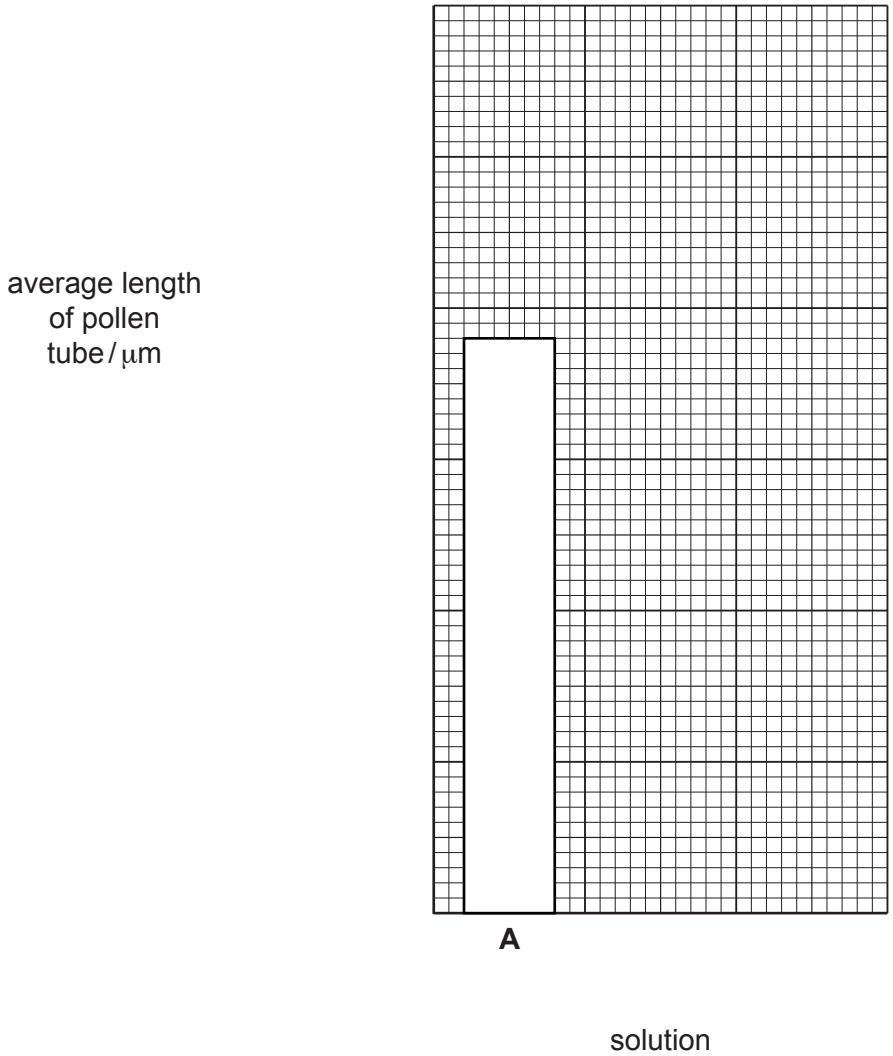

Fig. 2.5

Use the information in Table 2.3 to complete the graph **in Fig. 2.5** by:

- adding the scale for the *y-axis*
- plotting the bars for solutions **B** and **C**.

[2]

[Total: 18]

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