Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **5090/61**

Paper 6 Alternative to Practical **May/June 2016**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

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

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **11** printed pages and **1** blank page.

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Answer **all** the questions in the spaces provided.

1 **(a)** Dehydrogenase is an enzyme found in cells such as yeast.
Methylene blue is an indicator that can be used to show the activity of dehydrogenase.

In the presence of active dehydrogenase, methylene blue changes colour from blue to colourless.

A student carried out an experiment to investigate the effect of temperature on the activity of dehydrogenase, using yeast suspension (yeast mixed with water).

They carefully measured 5 cm^3 of yeast suspension and placed this in a test-tube labelled **A**.

The student also measured 5 cm^3 of yeast suspension which had been boiled and then cooled, and placed this in a test-tube labelled **B**.

Both test-tubes were placed in a beaker of water kept at 25 °C. After 5 minutes, the student added 1 cm^3 of methylene blue solution to each test-tube and mixed the contents.

Then every minute for 10 minutes they observed the contents of the two test-tubes and recorded their observations.

The student then repeated this experiment at a temperature of 35 °C.

Their observations are shown in Table 1.1.

Table 1.1

temperature / °C	test-tube	time after adding methylene blue solution / min									
		1	2	3	4	5	6	7	8	9	10
25	**A**	✓	✓	✓	✓	✓	✓	✓	–	–	–
	B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
35	**A**	✓	✓	✓	✓	–	–	–	–	–	–
	B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

key
✓ indicates the presence of a blue colour
– indicates the absence of a blue colour

(i) Explain how you would be able to check that the temperature of the water in the beaker was at 25 °C.

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.....[1]

(ii) Describe how you would adjust the temperature if it became higher or lower than 25 °C.

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.....[1]

(iii) Explain why the test-tubes were left in the beaker of water for 5 minutes before adding methylene blue solution.

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.....[1]

(iv) Using the information in Table 1.1, describe the student's observations.

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.....[3]

(v) Suggest an explanation for their observations.

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.....[3]

(vi) Suggest **one** way in which this experiment could be improved to increase the reliability of the results.

.....[1]

(b) Giving full experimental details, describe an experiment you could carry out to investigate the effect of pH on the activity of dehydrogenase, using yeast suspension and methylene blue solution.

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.....[5]

(c) Yeast is used for the production of alcohol in the brewing industry.

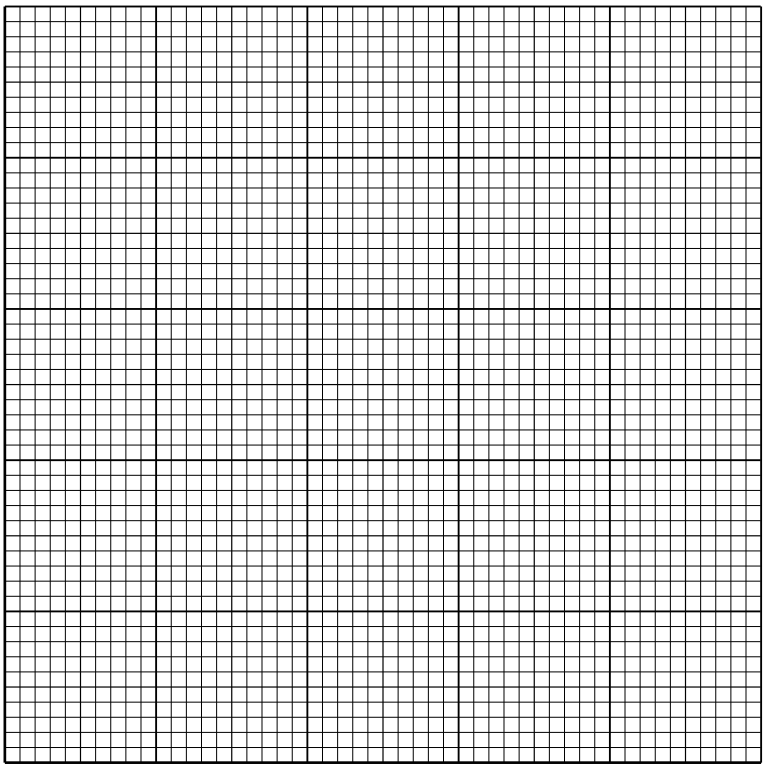
In an investigation, the production of alcohol by yeast was recorded every 5 hours for 25 hours.

The results are shown in Table 1.2.

Table 1.2

time /hr	alcohol concentration /g per dm^3
0	0.0
5	3.7
10	5.6
15	6.8
20	7.5
25	7.8

(i) Construct a line graph of the data in Table 1.2 on the grid below.
Draw a smooth curve through your points.



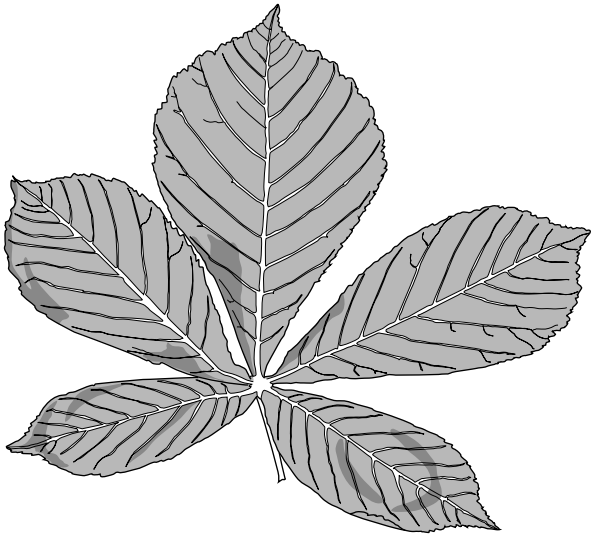
[4]

(ii) Use your graph to find the concentration of alcohol after 12 hours.

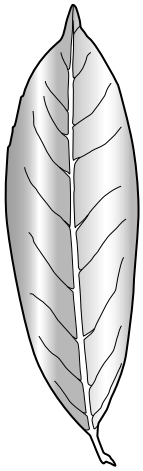
concentration = ...[2]

[Total: 21]

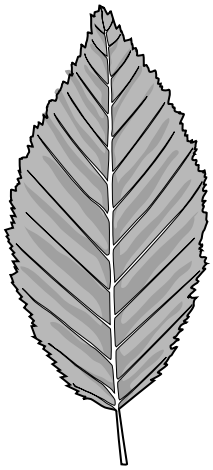
2 Fig. 2.1 shows leaves from four different trees: horse chestnut, laurel, hornbeam and oak.



horse chestnut



laurel



hornbeam

oak

Fig. 2.1

(a) In the space below, make a large drawing of the horse chestnut leaf.
You do not need to label your drawing.

[5]

(b) There are several differences between these leaves, which can be used to identify each leaf.

Complete Table 2.1 by describing the overall shape and the edge (margin) of the laurel leaf and the oak leaf.

The shape and edge of the hornbeam have been described for you.

Table 2.1

feature	**tree**		
	hornbeam	**laurel**	**oak**
shape	oval		
edge (margin)	serrated		

[4]

(c) (i) The actual maximum width of the laurel leaf is 40 mm. Measure and record the maximum width of this leaf in Fig. 2.1.

Draw a line on Fig. 2.1 to show where you have taken this measurement.

maximum width = ...[2]

(ii) Calculate the magnification of the laurel leaf in Fig. 2.1.

Show your working.

magnification × .....[2]

[Total: 13]

Question 3 begins on page 10.

3 An investigation was carried out to study the effect of physical activity on breathing.

The breathing rate (number of breaths per minute) of a student was measured at rest. The student then cycled at a speed of 10 km per hour for 2 minutes and their breathing rate was measured immediately after.

They then rested for five minutes before cycling at 15 km per hour for 2 minutes. Their breathing rate was measured again.

This investigation was repeated for cycling speeds of 20 km per hour and 25 km per hour.

The results are shown in Table 3.1.

Table 3.1

cycling speed /km per hour	breathing rate /number of breaths per minute
rest	12
10	14
15	17
20	20
25	27

(a) (i) Using the information in Table 3.1, state the general relationship between cycling speed and breathing rate.

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.....[1]

(ii) Suggest an explanation for this relationship.

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.....[3]

(b) The volume of air breathed in and out by the student also changed during this investigation, as shown in Table 3.2.

Table 3.2

cycling speed / km per hour	volume of air breathed in and out in each breath / cm^3
rest	600
25	3000

The **minute volume** is found by multiplying the volume of air breathed in and out in each breath by the breathing rate.

Using the information in Table 3.1 and in Table 3.2, calculate the minute volume after cycling at 25 km per hour.

Show your working.

minute volume = ... cm^3 [2]

[Total: 6]

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